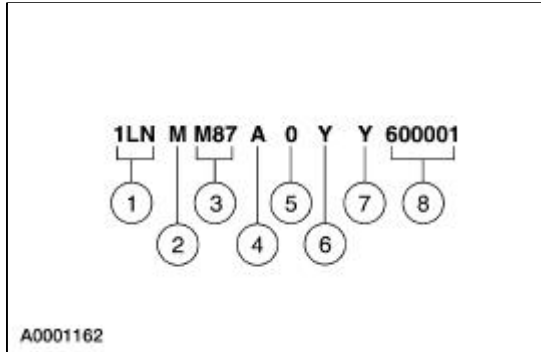


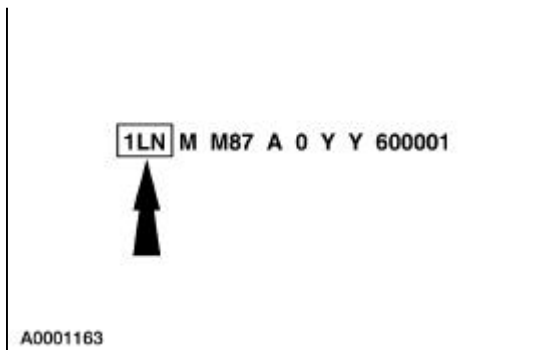
Identification Codes

The vehicle identification number (VIN) is a seventeen-digit combination of letters and numbers. The VIN is stamped on a metal tab riveted on the instrument panel, top upper left of the dash. The VIN number is also found on the vehicle certification (VC) label.



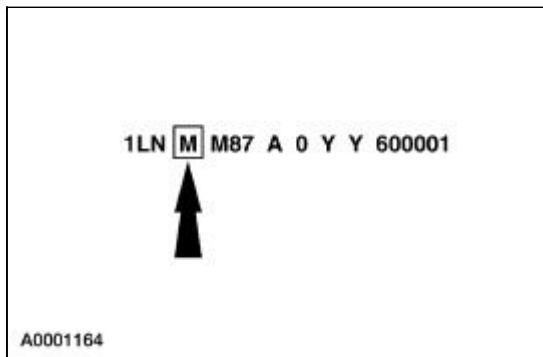
Item	Description
1	World Manufacturer Identifier
2	Restraint Type Code
3	Line, Series, Body Type (Passenger Car)
4	Engine Code
5	VIN Check Digit
6	Model Year Code
7	Assembly Plant Code
8	Production Sequence Number

Vehicle Identification Number



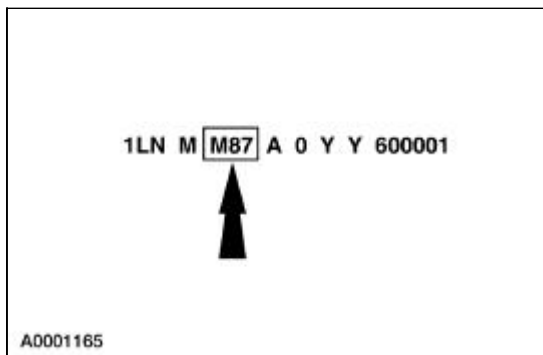
The first three vehicle identification number (VIN) positions are the world manufacturer code.

- 1LN — Ford Motor Company (Lincoln), USA, passenger car
- 1LJ — Ford Motor Company (Lincoln), USA, incomplete vehicle



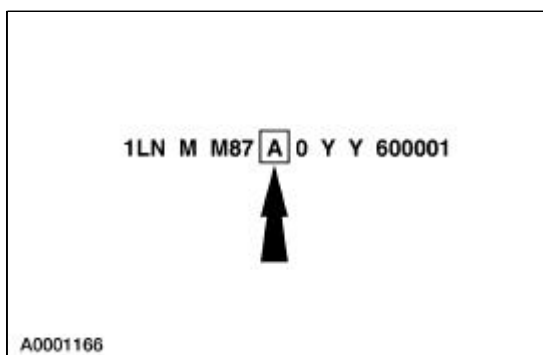
The fourth VIN position is the vehicle restraint system type code.

- M — Active safety belts — all positions, driver and front passenger air bags, driver and front passenger side impact air bags
- F — Active safety belts — all positions, second generation driver and front passenger air bags
- L — Active safety belts — all positions, driver and front passenger air bags



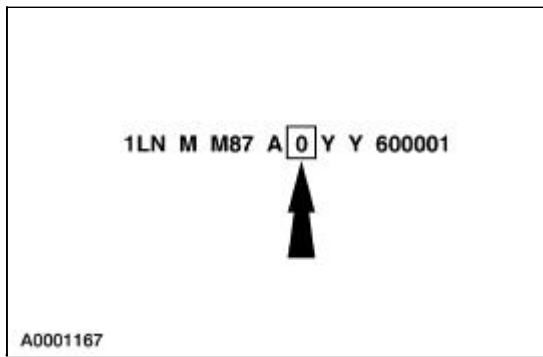
Positions 5 through 7 indicate vehicle line, series and body type.

- M86 — Lincoln LS (six cylinder)
- M87 — Lincoln LS (eight cylinder)

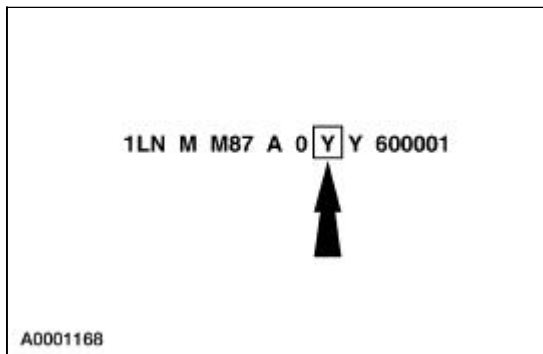


The eighth VIN position is the engine displacement and number of cylinders code.

- A — 3.9L, eight cylinder, DOHC, EFI
- S — 3.0L, six cylinder, DOHC, EFI

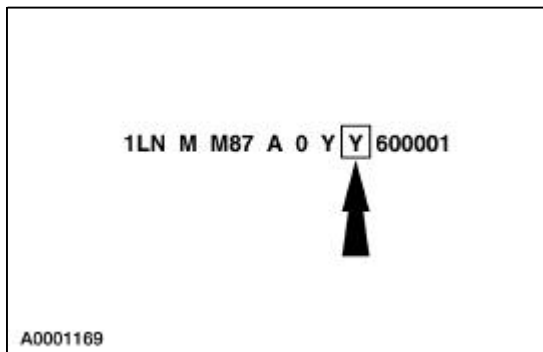


The ninth VIN position is the check digit code (0-9).



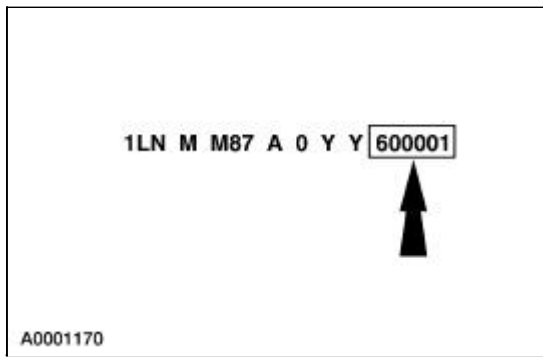
The tenth VIN position is the model year code.

- Y— 2000



The eleventh VIN position is the assembly plant code.

- S — Pilot Plant, Allen Park, Michigan (USA)
- Y — Wixom, Michigan (USA)

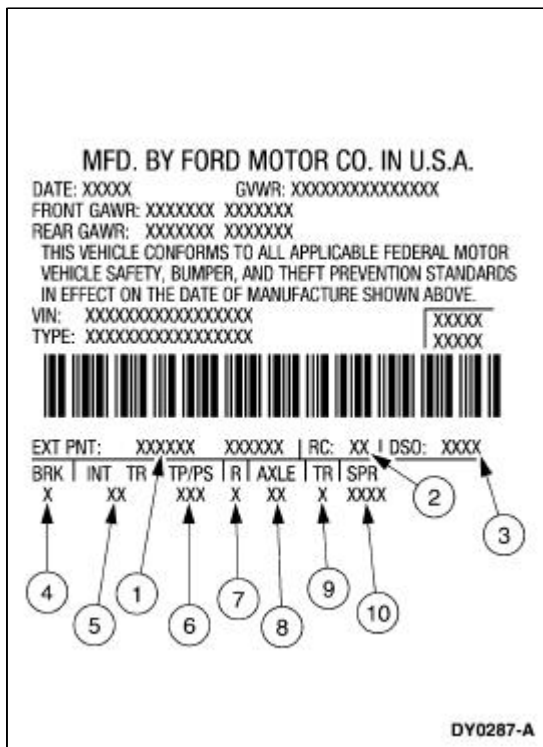


The last six VIN positions are the production sequence number.

- Lincoln/Mercury — 600001

Vehicle Certification (VC) Label

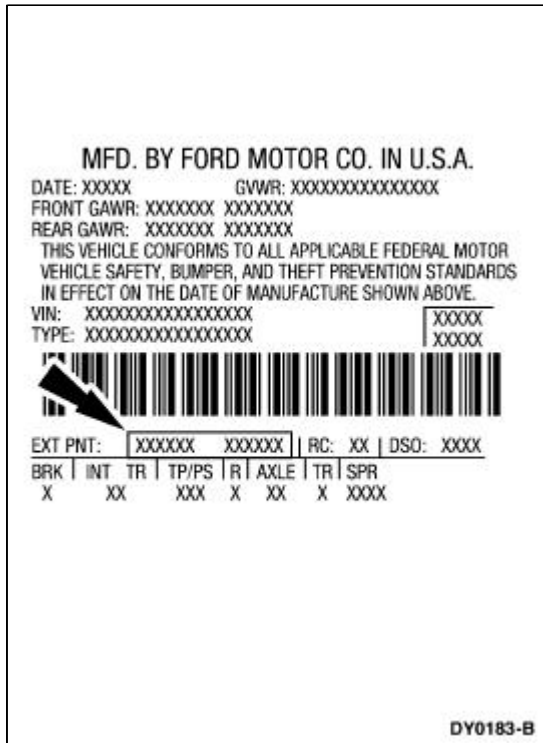
The upper portion of the vehicle certification (VC) label contains the manufacturer name, the month and year of manufacture, the certification statement and the VIN. It also includes gross vehicle weight ratings (GVWR). The VC label is located on the left-hand front door jamb.



Item	Description
1	Exterior Paint Color Code
2	Region Code
3	Special Order Code (DSO — Domestic Special Order FSO — Foreign Special Order, PTO — Paint, Tire Option Special Order)

4	Brake Type Code
5	Interior Trim Code
6	Tape/Paint Stripe Code
7	Radio Type Code
8	Axle Ratio Code
9	Transmission Code
10	Spring Code

Vehicle Certification (VC) Label Reference



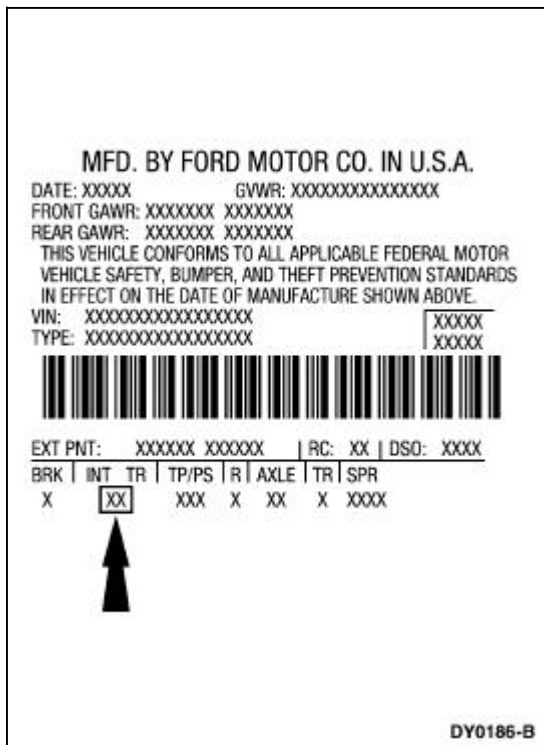
The exterior color codes are:

- BQ — Light Parchment Gold
- FZ — Cordovan
- HC — Ivory Parchment (Tri-Coat)
- KX — Graphite Blue
- LL — Deep Wedgewood Blue
- FU — Dark Satin Green
- ST — Estate Green
- TS — Silver Frost
- TV — Midnight Gray
- UA — Ebony
- WF — White Pearl Tri-Coat
- WT — Performance White



The brake type codes are:

- 6 — Anti-lock brakes (ABS) with Advancetrac®
- 3 — Anti-lock brakes (ABS) with Traction Control



The interior trim codes are listed below. The first letter/number is for the interior fabric. The second letter is for the interior color.

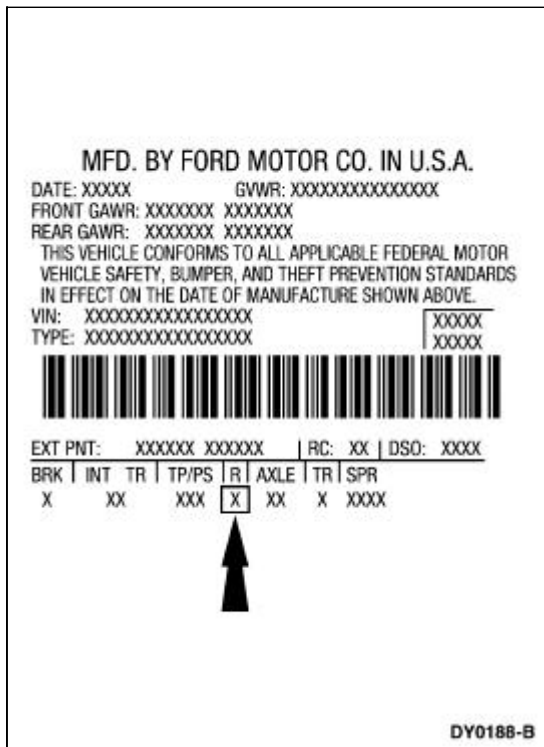
- 3 — Cloth Interior
- 4 — Leather Interior

The interior trim colors are:

- 2 — Light Graphite (not available in cloth interior)
- H — Medium Parchment
- T — Truffle
- W — Midnight Black

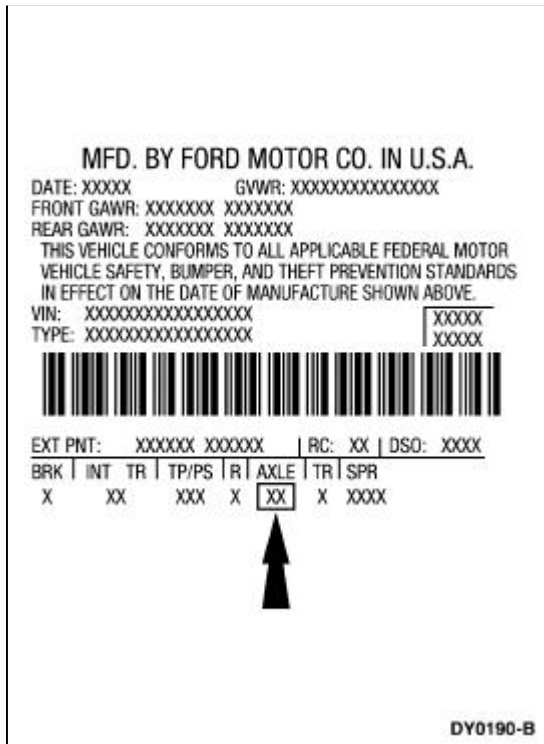


Tape and paint stripe codes do not apply.



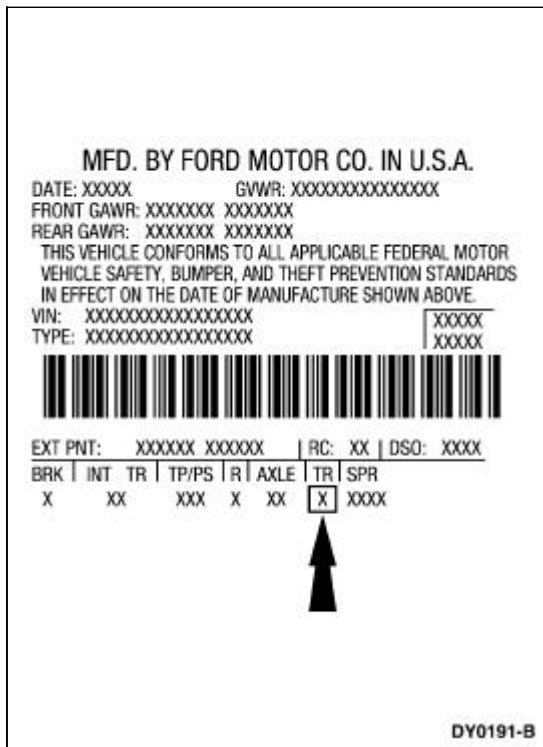
The radio type codes are:

- 8 — Premium AM/FM stereo cassette with clock



The axle ratios are:

- Axle tag number: 554B — 3.31 conventional
- Axle tag number: 556B — 3.58 conventional



The transmission/transaxle codes are:

- 5 — 5-Speed manual (M5 221), Getrag
- A — 5-speed, automatic (5R55N), Sharonville




The spring codes are:


- FPK — 5310 — Front spring (LH)

- CSH — 5310 — Front spring (LH)
- ETR — 5310 — Front spring (RH)
- AML — 5310 — Front spring (RH)
- 5560 — Rear spring

VC Label — Incomplete Vehicle (Typical)

INCOMPLETE VEHICLE MANUFACTURED BY			
FORD MOTOR COMPANY			
DATE: XXXXX	GVWR: XXXXXXXXXXXXXXXXX		
FRONT GAWR: XXXXXXX		REAR GAWR: XXXXXXX	
XXXXXXXXXX	WITH	XXXXXXXXXX	WITH
XXXXXXXXXXXXXX	TIRES	XXXXXXXXXXXXXX	TIRES
XXXXXXXXXX	RIMS	XXXXXXXXXX	RIMS
AT XXXX kPa/XXX PSI	COLD	AT XXXX kPa/XXX PSI	COLD
VIN: XXXXXXXXXXXXXXXXX			
			
EXT PNT: XXXXXX XXXXXX RC: XX DSD: XXXX			
BRK	INT	TR	TP/PS
X	XX	XXX	X XX X XXXX
DY0260-A			

VC Label — Canada (Typical)

MFD. BY FORD MOTOR CO. IN U.S.A.			
DATE: XXXXX	GVWR/PNBV: XXXXXXXXXXXXXXXXX		
FRONT GAWR /	REAR GAWR		
PNBE AV	PNBE AR		
XXXXXXXXXX	XXXXXXXXXX		
XXXXXXXXXX	XXXXXXXXXX		
VIN: XXXXXXXXXXXXXXXXX			XXXXX
TYPE: XXXXXXXXXXXXXXXXX			XXXXX
			
EXT PNT: XXXXXX XXXXXX RC: XX DSD: XXXX			
BRK	INT	TR	TP/PS
X	XX	XXX	X XX X XXXX
DY0197-A			

VC Label — Mexico (Typical)

MFD. BY FORD MOTOR COMPANY

DATE: XXXXX GVWR: XXXXXXXXXXXXXXX

FRONT GAWR: XXXXXXX XXXXXXX

REAR GAWR: XXXXXXX XXXXXXX

THIS VEHICLE CONFORMS TO ALL APPLICABLE FEDERAL MOTOR
VEHICLE SAFETY, BUMPER, AND THEFT PREVENTION STANDARDS
IN EFFECT ON THE DATE OF MANUFACTURE SHOWN ABOVE.

VIN: XXXXXXXXXXXXXXX

XXXXX

TYPE: XXXXXXXXXXXXXXX

XXXXX



EXT PNT: XXXXX XXXXX | RC: XX | DSO: XXXX

BRK | INT TR | TP/PS | R | AXLE | TR | SPR

X XX XXX X XX X XXXX

MADE IN MEXICO

DY0198-A

Jacking

⚠ WARNING: Never run the engine with one wheel off the ground, such as when changing a tire. The wheel still on the ground could cause the vehicle to move.

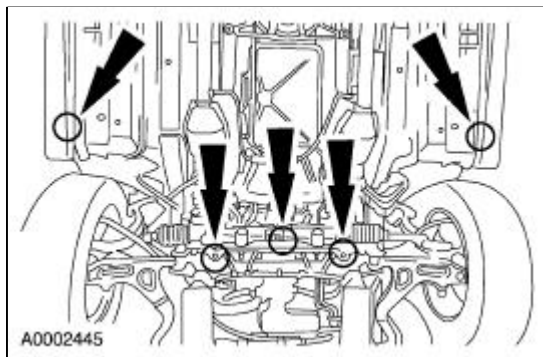
⚠ CAUTION: The jack (17080) provided with the vehicle is intended to be used in an emergency for changing a deflated tire. To avoid damage to the vehicle, never use the jack to lift the vehicle for any other purpose. Refer to the Owner Literature when using the jack supplied with the vehicle.

⚠ CAUTION: Under no circumstances should the vehicle ever be lifted by the front control arms, suspension arm brackets, (if equipped) front I-braces, rear stabilizer or differential housing. Severe damage to the vehicle could result.

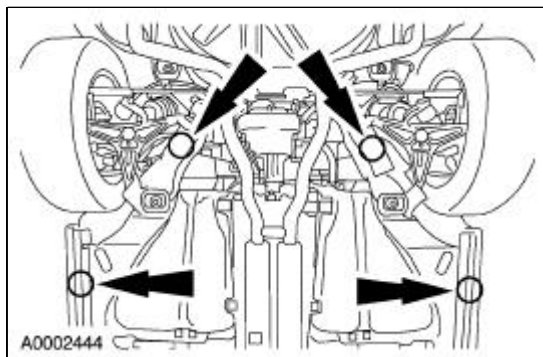
⚠ CAUTION: Do not attempt to use jack pressure on either the front bumper (17757) or the rear bumper (17906) of any vehicle. Damage to the bumper covers will occur.

Lift the vehicle using the following procedure.

Jacking Points




To lift the front or either side of the front end, position the floor jack or the hoist under the front frame lift points.



To lift the rear or either side of the rear end, position the floor jack or the hoist under the rear lift points.

Lifting


 **CAUTION:** Do not allow the lift adapters to contact the steering linkage, suspension arms, (if equipped) front I-braces, stabilizer bar, or to compress the lower suspension arm stabilizer bar insulator (5493). Damage to the suspension, exhaust and steering linkage components may occur if care is not exercised when positioning the lift adapters prior to lifting the vehicle.

 **CAUTION:** Never use the differential housing as a lift point. Damage to the differential housing and cover may occur.

 **CAUTION:** Do not lift the vehicle on the rocker panel pinch flange except at the designated lift points or body damage may occur.

Lift the vehicle using the following procedure.

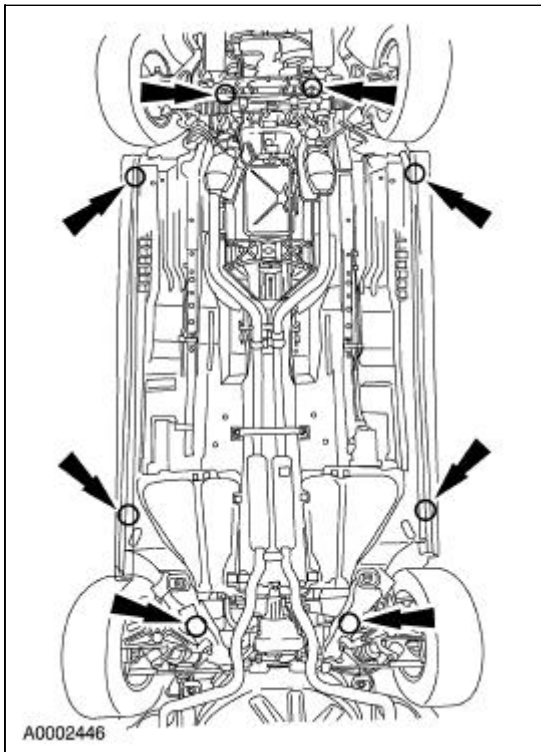
Lifting Points—Drive-On Hoist

 **CAUTION:** To prevent possible damage to the underbody, do not drive the vehicle onto the drive-on hoist without first checking for possible interference.

Check for interference between the upright flanges of the hoist rails and the underbody.

If an interference exists, modify the hoist flanges or build up the approach ramps as necessary to provide clearance.

Lifting Points—Frame Contact Lift, Single-Post Lift, Two-Post Lift



⚠ CAUTION: Under no circumstances should the vehicle be lifted by the front control arms, (if equipped) front I-braces, or rear control arms. Severe damage to the vehicle could result.

⚠ CAUTION: Do not position the lift pads under the No. 3 crossmember.

NOTE: Adapters maybe necessary to clear vehicle components to lift the vehicle safely. The adapters must be placed at the four designated contact points. Position the adapters so they are centered on the adapter contact area.

Lift the vehicle at the applicable lift points.

Noise, Vibration And Harshness (NVH)

Noise is any undesirable sound, usually unpleasant in nature. Vibration is any motion, shaking or trembling, that can be felt or seen when an object moves back and forth or up and down. Harshness is a ride quality issue where the vehicle's response to the road transmits sharply to the customer. Harshness normally describes a firmer than usual response from the suspension system. Noise, vibration and harshness (NVH) is a term used to describe these conditions, which result in varying degrees of dissatisfaction. Although, a certain level of NVH caused by road and environmental conditions is normal. This section is designed to aid in the diagnosis, testing and repair of NVH concerns.

Acceptable Noise, Vibration and Harshness

All internal combustion engines and drivelines produce some noise and vibration; operating in a real world environment adds noise that is not subject to control. Vibration isolators, mufflers and dampers reduce these to acceptable levels. A driver who is unfamiliar with a vehicle can think that some sounds are abnormal when actually the sounds are normal for the vehicle type. For example, Traction-Lok® differentials produce a slight noise on slow turns after extended highway driving. This is acceptable and has no detrimental effect on the locking axle function. As a technician, it is very important to be familiar with vehicle features and know how they relate to NVH concerns and their diagnosis. For example, if the vehicle has automatic overdrive, it is important to test drive the vehicle both in and out of overdrive mode.

Diagnostic Theory

The shortest route to an accurate diagnosis results from:

- system knowledge, including comparison with a known good system.
- system history, including repair history and usage patterns.
- condition history, especially any relationship to repairs or sudden change.
- knowledge of possible sources.
- using a systematic diagnostic method that divides the system into related areas.

The diagnosis and correction of noise, vibration and harshness concerns requires:

- a road or system test to determine the exact nature of the concern.
- an analysis of the possible causes.
- testing to verify the cause.
- repairing any concerns found.
- a road test or system test to make sure the concern has been corrected or brought back to within an acceptable range.

Glossary of Terms

Acceleration-Light

An increase in speed at less than half throttle.

Acceleration-Medium

An increase in speed at half to nearly full throttle, such as 0-97 km/h (0-60 mph) in approximately 30 seconds.

Acceleration-Heavy

An increase in speed at one-half to full throttle, such as 0-97 km/h (0-60 mph) in approximately 20 seconds.

Ambient Temperature

The surrounding or prevailing temperature.

Amplitude

The quantity or amount of energy produced by a vibrating component (G force). An extreme vibration has a high amplitude. A mild vibration has a low amplitude.

Backlash

Gear teeth clearance.

Boom

Low frequency or low pitched noise often accompanied by a vibration. Also refer to Drumming.

Bound Up

An overstressed isolation (rubber) mount that transmits vibration/noise instead of absorbing it.

Brakes Applied

When the service brakes are applied with enough force to hold the vehicle against movement with the transmission in gear.

Buffet/Buffeting

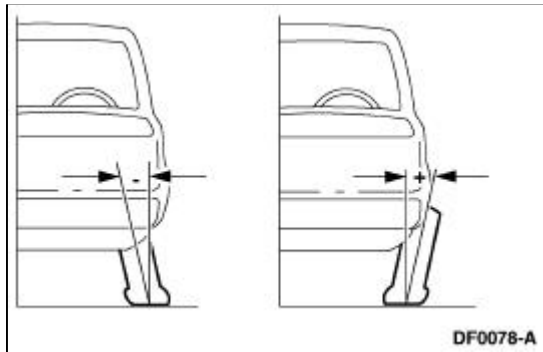
Strong noise fluctuations (less than 1000 Hz) caused by gusting winds. An example would be wind gusts against the side glass.

Buzz

A low-pitched sound like (200-5000 Hz) that from a bee. Often a metallic or hard plastic humming sound. Also describes a high frequency (200-800 Hz) vibration. Vibration feels similar to an electric razor.

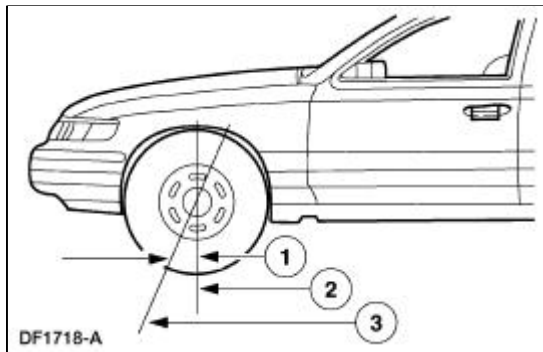
Camber

The angle of the wheel in relation to the true vertical as measured looking from the front of the vehicle. Camber is positive when the wheel angle is offset so that the top of the wheel is positioned away from the vehicle.



Caster

The angle of the steering knuckle in relation to the true vertical as measured looking from the side of the vehicle.



Item	Description
1	Positive caster
2	True vertical
3	Steering axis

Chatter

A pronounced series of rapidly repeating rattling or clicking sounds.

Chirp

A short-duration high-pitched noise associated with a slipping drive belt.

Chuckle

A repetitious low-pitched sound. A loud chuckle is usually described as a knock.

Click

A sharp, brief, non-resonant sound, similar to actuating a ball point pen.

Clonk

A hydraulic knocking sound. Sound occurs with air pockets in a hydraulic system. Also described as hammering.

Clunk/Driveline Clunk

A heavy or dull, short-duration, low-frequency sound. Occurs mostly on a vehicle that is accelerating or decelerating abruptly. Also described as a thunk.

Coast/Deceleration

Releasing the accelerator pedal at cruise, allowing the engine to reduce vehicle speed without applying the brakes.

Coast/Neutral Coast

Placing the transmission range selector in NEUTRAL (N) or depressing the clutch pedal while at cruise.

Constant Velocity (CV) Joint

A joint used to absorb vibrations caused by driving power being transmitted at an angle.

Controlled Rear Suspension Height

The height at which a designated vehicle element must be when driveline angle measurements are made.

Coupling Shaft

The shaft between the transfer case and the front drive axle or, in a two-piece rear driveshaft, the front section.

CPS

Cycles per second. Same as hertz (Hz).

Cracks

A mid-frequency sound, related to squeak. Sound varies with temperature conditions.

Creak

A metallic squeak.

Cruise

Constant speed on level ground; neither accelerating nor decelerating.

Cycle

The process of a vibrating component going through a complete range of motion and returning to the

starting point.

Decibel

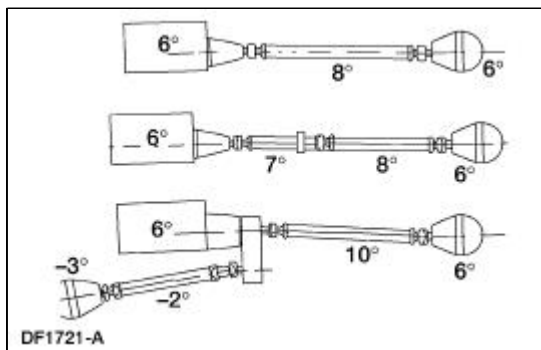
A unit of measurement, referring to sound pressure level, abbreviated dB.

Drive Engine Run-Up (DERU) Test

The operation of the engine through the normal rpm range with the vehicle standing still, the brakes applied and the transmission engaged. This test is used for noise and vibration checks.

Driveline Angles

The differences of alignment between the transmission output shaft, the driveshaft, and the rear axle pinion centerline.



Driveshaft

The shaft that transmits power to the rear axle input shaft (pinion shaft). In a two-piece driveshaft, it is the rearmost shaft.

Drivetrain

All power transmitting components from the engine to the wheels; includes the clutch or torque converter, the transmission, the transfer case, the driveshaft, and the front or rear drive axle.

Drivetrain Damper

A weight attached to the engine, the transmission, the transfer case, or the axle. It is tuned by weight and placement to absorb vibration.

Drone

A low frequency (100-200 Hz) steady sound, like a freezer compressor. Also described as a moan.

Drumming

A cycling, low-frequency (20-100 Hz), rhythmic noise often accompanied by a sensation of pressure on the ear drums. Also described as a low rumble, boom, or rolling thunder.

Dynamic Balance

The equal distribution of weight on each side of the centerline, so that when the wheel and tire assembly spins, there is no tendency for the assembly to move from side-to-side (wobble). Dynamically unbalanced wheel and tire assemblies can cause wheel shimmy.

Engine Imbalance

A condition in which an engine's center mass is not concentric to the rotation center, causing excessive motion.

Engine Misfire

When combustion in one or more cylinders does not occur or occurs at the wrong time.

Engine Shake

An exaggerated engine movement or vibration that directly increases in frequency as the engine speed increases. It is caused by non-equal distribution of mass in the rotating or reciprocating components.

Flexible Coupling

A flexible joint.

Float

A drive mode on the dividing line between cruise and coast where the throttle setting matches the engine speed with the road speed.

Flutter

Mid to high (100-2000 Hz) intermittent sound due to air flow. Similar to a flag flapping in the wind.

Frequency

The rate at which a cycle occurs within a given time.

Gravelly Feel

A grinding or growl in a component, similar to the feel experienced when driving on gravel.

Grind

An abrasive sound, similar to using a grinding wheel, or rubbing sand paper against wood.

Hiss

Steady high frequency (200-800 Hz) noise. Vacuum leak sound.

Hoot

A steady low frequency tone (50-500 Hz), sounds like blowing over a long neck bottle.

Howl

A mid-range frequency (200-800 Hz) noise between drumming and whine. Also described as a hum.

Hum

Mid-frequency (200-800 Hz) steady sound, like a small fan motor. Also described as a howl.

Hz

Hertz; a frequency measured in cycles per second.

Imbalance

Out of balance; heavier on one side than the other. In a rotating component, imbalance often causes vibration.

Inboard

Toward the centerline of the vehicle.

Intensity

The physical quality of sound that relates to the strength of the vibration (measured in decibels). The higher the sound's amplitude, the higher the intensity and vice versa.

Isolate

To separate the influence of one component to another.

Knock

A heavy, loud, repetitious sound, like a knock on the door.

Moan

A constant, low-frequency (100-200 Hz) tone. Also described as a hum.

Neutral Engine Run-Up (NERU) Test

The operation of the engine through the normal rpm range with the vehicle standing still and the transmission disengaged. This test is used to identify engine related vibrations.

Neutralize/Normalize

To return to an unstressed position. Used to describe mounts. Refer to Bound Up.

Outboard

Away from the centerline of the vehicle.

Ping

A short duration, high-frequency sound, which has a slight echo.

Pinion Shaft

The input shaft in a driving axle that is usually a part of the smaller driving or input hypoid gear of a ring and pinion gearset.

Pitch

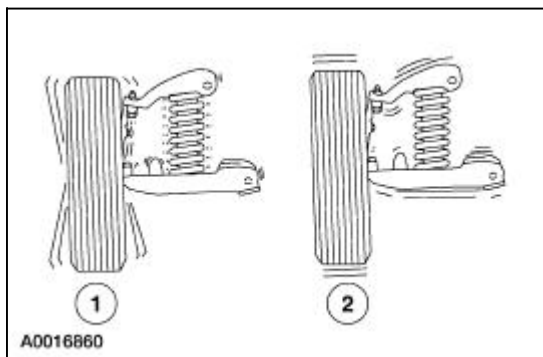
The physical quality of sound that relates to its frequency. Pitch increases as frequency increases and vice versa.

Pumping Feel

A slow, pulsing movement.

Radial/Lateral

Radial is in the plane of rotation; lateral is at 90 degrees to the plane of rotation.



Item	Description
1	Lateral runout
2	Radial runout

Rattle

A random and momentary or short duration noise.

Ring Gear

The large, circular, driven gear in a ring and pinion gearset.

Road Test

The operation of the vehicle under conditions intended to produce the concern under investigation.

Roughness

A medium-frequency vibration. A slightly higher frequency (20 to 50 Hz) than a shake. This type of vibration is usually related to drivetrain components.

Runout

Lateral runout means measuring the movement or "wobble" of a wheel or tire at the sidewall. Radial runout means measuring the out-of-round at the tread surface.

Rustling

Intermittent sound of varying frequency (100-2000 Hz), sounds similar to shuffling through leaves.

Shake

A low-frequency vibration (5-20 Hz), usually with visible component movement. Usually relates to tires, wheels, brake drums or brake discs if it is vehicle speed sensitive, or engine if it is engine speed sensitive. Also referred to as a shimmy or wobble.

Shimmy

An abnormal vibration or wobbling, felt as a side-to-side motion of the steering wheel in the driveshaft rotation. Also described as waddle.

Shudder

A low-frequency vibration that is felt through the steering wheel or seat during light brake application.

Slap

A resonance from flat surfaces, such as safety belt webbing or door trim panels.

Slip Yoke/Slip Spline

The driveshaft coupling that allows length changes to occur while the suspension articulates and while the driveshaft rotates.

Squeak

A high-pitched transient sound, similar to rubbing fingers against a clean window.

Squeal

A long-duration, high-pitched noise.

Static Balance

The equal distribution of weight around the wheel. Statically unbalanced wheel and tire assemblies can cause a bouncing action called wheel tramp. This condition will eventually cause uneven tire wear.

Tap

A light, rhythmic, or intermittent hammering sound, similar to tapping a pencil on a table edge.

Thump

A dull beat caused by two items striking together.

Tick

A rhythmic tap, similar to a clock noise.

Tip-In Moan

A light moaning noise heard during light vehicle acceleration, usually between 40-100 km/h (25-65 mph).

TIR

The acronym for total indicated runout is TIR.

Tire Deflection

The change in tire diameter in the area where the tire contacts the ground.

Tire Flat Spots

A condition commonly caused by letting the vehicle stand while the tires cool off. This condition can be corrected by driving the vehicle until the tires are warm. Also, irregular tire wear patterns in the tire tread resulting from wheel-locked skids.

Tire Force Vibration

A tire vibration caused by variations in the construction of the tire that is noticeable when the tire rotates against the pavement. This condition can be present on perfectly round tires because of variations in the inner tire construction. This condition can occur at wheel rotation frequency or twice rotation frequency.

Transient

A noise or vibration that is momentary, a short duration.

Two-Plane Balance

Radial and lateral balance.

Vibration

Any motion, shaking or trembling, that can be felt or seen when an object moves back and forth or up and down.

Whine

A constant, high-pitched noise. Also described as a screech.

Whistle

High-pitched noise (above 500 Hz) with a very narrow frequency band. Examples of whistle noises are a turbocharger or airflow around an antenna.

Wind Noise

Any noise caused by air movement in, out or around the vehicle.

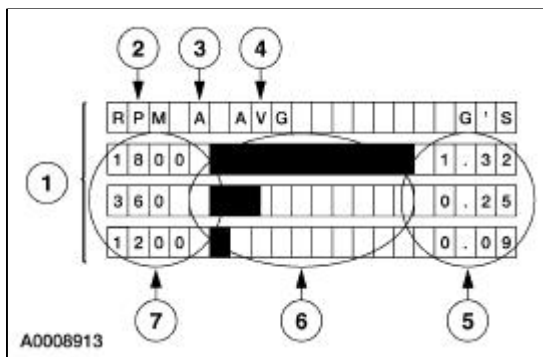
WOT

The acronym for wide open throttle is WOT.

Tools and Techniques

Electronic Vibration Analyzer (EVA)

The EVA is a hand-held electronic diagnostic tool which will assist in locating the source of unacceptable vibrations. The vibration sensor can be remotely mounted anywhere in the vehicle for testing purposes. The unit displays the three most common vibration frequencies and their corresponding amplitudes simultaneously. A bar graph provides a visual reference of the relative signal strength (amplitude) of each vibration being displayed and its relative G force. The keypad is arranged to make the EVA simple to program and use. Some of the functions include the ability to average readings as well as record, play back and freeze readings. The EVA has a strobe balancing function that can be used to detect imbalance on rotating components such as a driveshaft or engine accessories.



Item	Description
1	EVA screen
2	Frequency mode displayed in rpm or Hz
3	Active sensor input (A or B)
4	Current active mode
5	G force indicators or the strongest frequencies in descending strength of each vibration
6	Strength of each vibration
7	Frequency in rpm/Hz of each vibration

The EVA allows for a systematic collection of information that is necessary to accurately diagnose and repair NVH problems. For the best results, carry out the test as follows:

- a. Test drive the vehicle with the vibration sensor inside the vehicle.
- b. Place the sensor in the vehicle according to feel.
 - If the condition is felt through the steering wheel, the source is most likely in the front of the vehicle.
 - A vibration that is felt in the seat or floor only will most likely be found in the driveline, drive axle or rear wheels and tires.
- c. Record the readings. Also note when the condition begins, when it reaches maximum intensity, and if it tends to diminish above/below a certain speed.
 - Frequencies should be read in the "average" mode.

- Frequencies have a range of plus or minus 2. A reading of 10 Hz can be displayed as an 8 Hz through 12 Hz.
- d. Place the vibration sensor on or near the suspect area outside the vehicle.
- e. Continue the road test, driving the vehicle at the speed the symptom occurs, and take another reading.
- f. Compare the readings.
 - A match in frequency indicates the problem component or area.
 - An unmatched test could indicate the concern is caused by the engine, torque converter, or engine accessory. Use the EVA in the rpm mode and check if concern is rpm related.
 - Example: A vibration is felt in the seat. Place the sensor on the console. Record the readings. Place the vibration sensor on the rear axle. Compare the readings. If the frequencies are the same, the axle is the problem component.

Vibrate Software®

Vibrate Software® (Rotunda tool number 215-00003) is a diagnostic aid which will assist in pinpointing the source of unacceptable vibrations. The engine's crankshaft is the point of reference for vibration diagnosis. Every rotating component will have an angular velocity that is faster, slower, or the same as the engine's crankshaft. Vibrate Software® calculates the angular velocity of each component and graphically represents these velocities on a computer screen and on a printed vibration worksheet. The following steps outline how Vibrate Software® helps diagnose a vibration concern:

- Enter the vehicle information. Vibrate will do all the calculations and display a graph showing tire, driveshaft and engine vibrations.
- Print a Vibration Worksheet graph. The printed graph is to be used during the road test.
- Road test the vehicle at the speed where the vibration is most noticeable. Record the vibration frequency (rpm) and the engine rpm on the worksheet graph. The point on the graph where the vibration frequency (rpm) reading and the engine rpm reading intersect indicates the specific component group causing the concern.
 - An EVA or equivalent tool capable of measuring vibration frequency and engine rpm will be needed.
- Provide pictures of diagnostic procedures to aid in testing components.

Combination EngineEAR/ChassisEAR

An electronic listening device used to quickly identify noise and the location under the chassis while the vehicle is being road tested. The ChassisEARs can identify the noise and location of damaged/worn wheel bearings, CV joints, brakes, springs, axle bearings or driveshaft carrier bearings.

EngineEAR Basic Unit

An electronic listening device used to detect even the faintest noises. The EngineEARs can detect the noise of damaged/worn bearings in generators, water pumps, A/C compressors and power steering pumps. They are also used to identify noisy lifters, exhaust manifold leaks, chipped gear teeth and for detecting wind noise. The EngineEAR has a sensing tip, amplifier, and headphones. The directional sensing tip is used to listen to the various components. Point the sensing tip at the suspect component and adjust the volume with the amplifier. Placing the tip in direct contact with a component will reveal structure-borne noise and vibrations, generated by or passing through, the component. Various volume levels can reveal different sounds.

Ultrasonic Leak Detector

The Ultrasonic Leak Detector is used to detect wind noises caused by leaks and gaps in areas where there is weather-stripping or other sealing material. It is also used to identify A/C leaks, vacuum leaks

and evaporative emission noises. The Ultrasonic Leak Detector includes a multi-directional transmitter (operating in the ultrasonic range) and a hand-held detector. The transmitter is placed inside the vehicle. On the outside of the vehicle, the hand-held detector is used to sweep the area of the suspected leak. As the source of the leak is approached, a beeping sound is produced which increases in both speed and frequency.

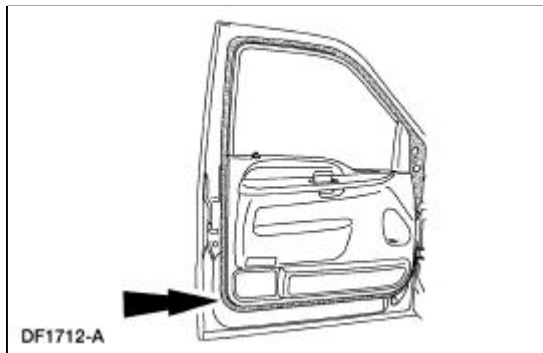
Squeak and Rattle Repair Kit

The squeak and rattle repair kit (Rotunda tool number 164-R4900) contains lubricants and self-adhesive materials that can be used to eliminate interior and exterior squeaks and rattles. The kit consists of the following materials:

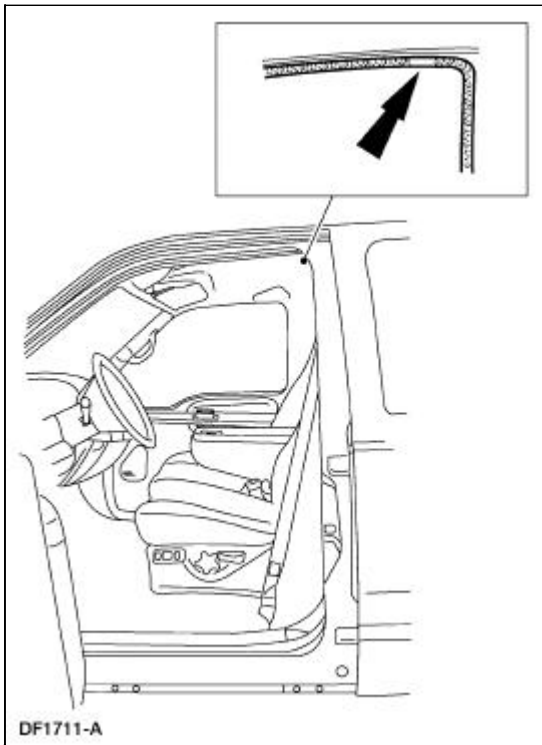
- PVC (soft foam) tape
- Urethane (hard foam) tape
- Flocked (black fuzzy) tape
- UHMW (frosted) tape
- Squeak and rattle oil tube
- Squeak and rattle grease tube

Tracing Powder

Tracing powder is used to check both the uniformity of contact and the tension of a seal against its sealing surface. These tests are usually done when a suspected air leak/noise appears to originate from the seal area or during the alignment and adjustment of a component to a weatherstrip. Tracing powder can be ordered from Crest Industries as ATR Leak Trace. Carry out the tracing powder test as follows:

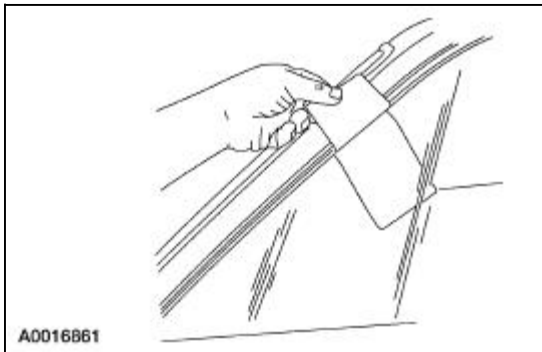


- a. Clean the weatherstrip.
- b. Spray the tracing powder on the mating surface only.
- c. Close the door completely. Do not slam the door.
- d. Open the door. An imprint is made where the weatherstrip contacted the mating surface seal. Gaps or a faint imprint will show where there is poor contact with the weatherstrip.







Index Card

Place an index card or a piece of paper between the weatherstrip and the sealing surface, then close the door. Slowly withdraw the index card or paper after the door is closed and check the amount of pressure on the weatherstrip. There should be a medium amount of resistance as it is withdrawn. Continue around the entire seal area. If there is little or no resistance, this indicates insufficient contact to form a good seal. At these points, the door, the glass, or the weatherstrip is out of alignment.



Noise, Vibration And Harshness (NVH)

Special Tool(s)

 ST2048-A	ChassisEAR 107-R2102 or Equivalent
 ST2311-A	Vibration Analyzer 100-F027 (014-00344) or Equivalent
 ST2312-A	EngineEAR 107-R2100 or Equivalent
 ST2314-A	Ultrasonic Leak Detector 134-R0135 or Equivalent

To assist the service advisor and the technician, a Write-up Job Aid and an NVH Diagnostic Guide are included with this material. The Write-up Job Aid serves as a place to record all important symptom information. The NVH Diagnostic Guide serves as a place to record information reported on the Write-up Job Aid as well as data from the testing to be carried out.

To begin a successful diagnosis, fill out the NVH Diagnostic Guide, record the reported findings, then proceed to each of the numbered process steps to complete the diagnosis.

NVH DIAGNOSTIC GUIDE

Dealer: _____ Date: _____

P.A. Code: _____ Order No. _____ Technician: _____

Owner's Name: _____ Address: _____

Phone No. Home: _____ Work: _____

Vehicle Make: _____ Model: _____ Year: _____

VIN: _____ Mileage: _____ Engine: _____ Trans: _____ Axle: _____

OWNER'S DESCRIPTION OF COMPLAINT:

Did Condition Exist When Vehicle Was New? **Yes / No** (circle one)

How Did Condition Begin? Gradually Suddenly

At What Mileage Did it Occur Or Begin Occurring? _____

Which Driving Conditions Affect The Vehicle?

Light Accel Closed Throttle Decel Brakes Applied/Released
Medium Accel Coast (Float) Driving The Vehicle: Straight
Heavy Accel Constant Speed Cornering

Is Vibration Noticed? If So, Where:

Seat Steering Wheel Instrument Panel Floor Body Panels Ft/Rr of Vehicle

Is There Sound Or Sensation Of Sound? **Yes / No** (circle one)

If So, Describe The Sound :

Boom Hum Whine Growl Other: _____
Drone Tip-In-Moan Squeak Rattle

PREDRIVE CHECKS

Tire Condition/Pressure: _____

Vehicle Body Damage? _____

Other: _____

ROAD TEST:

Vibration/Noise Occurs:

Vehicle Speed _____ Accel _____ Vibration Frequency _____ Hz/RPM
Gear Range _____ Decel/Coast _____ Engine Speed _____ RPM

ENGINE RUN-UP TESTS

Neutral Engine Run-Up (NERU) **Yes / No** Engine RPM _____ Vibration/Frequency _____ Hz/RPM

Drive Engine Run-Up (DERU) **Yes / No** Engine RPM _____ Vibration/Frequency _____ Hz/RPM

Drivetrain Run-Up (DTRU) **Yes / No** Engine RPM _____ Vibration/Frequency _____ Hz/RPM

Indicate Suspected Area of Concern:

Tire/Wheel/Brakes Engine/Accessory Rear
Driveline/Axle Susp/Steering Right
Body Front Left
Other _____

Equipment Used:

Reed Tachometer Electronic Noise Detector Tape
Engine Tachometer Ultrasonic Leak Detector Other _____

WHEEL/TIRE/BRAKES CHECK:

Balance Check **Yes / No**

Maximum Runout Allowed:

Wheel: Radial _____ Lateral _____

Tire: Radial _____ Lateral _____

Measured Runout:

Tire/Wheel Radial: LF _____ LR _____ RF _____ RR _____

Lateral: LF _____ LR _____ RF _____ RR _____

Wheel Only Radial: LF _____ LR _____ RF _____ RR _____

Lateral: LF _____ LR _____ RF _____ RR _____

SUSPENSION INSPECTION:

Can Cause: Shimmy Clunk Squeak Harshness

Suspension Bushings: Loose Worn Missing OK

Front Upper Control Arm Stabilizer (sway bar) Rear Lower Control Arm

Front Lower Control Arm Rear Upper Control Arm Rear Upper Control Arm

Other _____

Suspension/Steering Components: Loose Worn Missing OK

Ball Joints Idler Arm Pitman Arm

Shock Absorbers F/R Center Link Steering Gear

Springs F/R Tie Rod Ends/Sleeve Steering Coupler

DRIVESHAFT CONDITION: Noise Vibration

Balance Weights Missing/Other Visual Defects? **Yes / No**

Maximum Allowable Runout: _____

Actual Runout: Front _____ Middle _____ Rear _____

Two-Piece Driveshaft Runout: Front _____ Rear _____

Middle Support Bearing: Loose Damaged Worn Other _____

Suspect Driveshaft Balanced? **Yes / No**

Pinion Angle: Engine Height: Specification _____ Actual _____

Pinion Angle: Specification _____ Actual _____

Driveline Angle - Truck: Specification _____ Actual _____

ENGINE/ACCESSORY CHECK:

Visual Inspection for Damage or Grounded Condition:

Powertrain Mounts Fuel Lines A/C Lines Power Steering/Cooler Lines

Air Intake Accessories Exhaust Radiator/Condensor

BODY (NOISE/RATTLE)

Indicate Suspected Area of Concern: Doors Windows Dash Panel Other _____

Tests Used to Isolate

NVH Concern: Vacuum/Leak Detector Ultrasonic Leak Detector Tracing Powder

Electronic Noise Detector Other _____

ROAD/ENGINE RUN-UP TESTS: Improved? **Yes / No** Vehicle Acceptable? **Yes / No**

Comments: _____

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1: Customer Interview

The diagnostic process starts with the customer interview. The service advisor must obtain as much information as possible about the concern and take a test drive with the customer. There are many ways a customer will describe NVH concerns and this will help minimize confusion arising from descriptive language differences. It is important that the concern is correctly interpreted and the customer descriptions are recorded. During the interview, ask the following questions:

- When was the concern first noticed?
- Did the concern appear suddenly or gradually?

- Did any abnormal occurrence coincide with or proceed its appearance?

Use the information gained from the customer to accurately begin the diagnostic process.

2: Pre-Drive Check

It is important to do a pre-drive check before road testing the vehicle. A pre-drive check verifies that the vehicle is relatively safe to drive and eliminates any obvious faults on the vehicle.

The pre-drive check consists of a brief visual inspection. During this brief inspection, take note of anything that will compromise safety during the road test and make those repairs or adjustments before taking the vehicle on the road.

3: Preparing for the Road Test

Observe the following when preparing for the road test:

- Review the information recorded on the NVH Diagnostic Guide. It is important to know the specific concern the customer has with the vehicle.
- Do not be misled by the reported location of the noise or vibration. The cause can actually be some distance away, transferred from another part of the vehicle.
- Remember that the vibrating source component (originator) may only generate a small vibration. This small vibration can in turn cause a larger vibration or noise to emanate from another receiving component (reactor), due to contact with other components (transfer path).
- Conduct the road test on a quiet street where it is safe to duplicate the vibration/noise. The ideal testing route is an open, low-traffic area where it is possible to operate the vehicle at the speed in which the condition occurs.
- If possible, lower the radio antenna in order to minimize turbulence. Identify anything that could potentially make noise or be a source of wind noise. Inspect the vehicle for add-on items that create vibration/noise. Turn off the radio and the heating and cooling system blower.
- The engine speed is an important factor in arriving at a final conclusion. Therefore, connect an accurate tachometer to the engine, even if the vehicle has a tachometer. Use a tachometer that has clearly defined increments of less than 50 rpm. This ensures an exact engine speed reading.

4: Verify the Customer Concern

Verify the customer concern by carrying out a road test, an engine run-up test, or both.

The decision to carry out a road test, an engine run-up test, or both depends on the type of NVH concern. A road test may be necessary if the symptom relates to the suspension system or is sensitive to torque. A drive engine run-up (DERU) or a neutral engine run-up (NERU) test identifies noises and vibrations relating to engine and drivetrain rpm. Remember, a condition will not always be identifiable by carrying out these tests, however, they will eliminate many possibilities if carried out correctly.

5: Road Test

NOTE: It may be necessary to have the customer ride along or drive the vehicle to point out the concern. During the road test, take into consideration the customer's driving habits and the driving conditions. The customer's concern just may be an acceptable operating condition for that vehicle.

The following is a brief overview of each test in the order in which it appears. A review of this information helps to quickly identify the most appropriate process necessary to make a successful diagnosis. After reviewing this information, select and carry out the appropriate test(s), proceeding to the next step of this process.

- The Slow Acceleration Test is normally the first test to carry out when identifying an NVH concern, especially when a road test with the customer is not possible.
- The Heavy Acceleration Test helps to determine if the concern is torque-related.
- The Neutral Coast Down Speed Test helps to determine if the concern is vehicle speed-related.
- The Downshift Speed Test helps to determine if the concern is engine speed-related.
- The Steering Input Test helps to determine how the wheel bearings and other suspension components contribute to a vehicle speed-related concern.
- The Brake Test helps to identify vibrations or noise that are brake related.
- The Road Test Over Bumps helps isolate a noise that occurs when driving over a rough or bumpy surface.
- The Engine Run-Up Tests consist of the Neutral Run-up Test and the Engine Load Test. These tests help to determine if the concern is engine speed-related.
- The Neutral Run-up Test is used as a follow-up test to the Downshift Speed Test when the concern occurs at idle.
- The Engine Load Test helps to identify vibration/noise sensitive to engine load or torque. It also helps to reproduce engine speed-related concerns that cannot be duplicated when carrying out the Neutral Run-up Test or the Neutral Coast Down Test.
- The Engine Accessory Test helps to locate faulty belts and accessories that cause engine speed-related concerns.
- The Vehicle Cold Soak Procedure helps to identify concerns occurring during initial start-up and when an extended time lapse occurs between vehicle usage.

Slow Acceleration Test

To carry out this test, proceed as follows:

- Slowly accelerate to the speed where the reported concern occurs. Note the vehicle speed, the engine rpm and, if possible, determine the vibration frequency.
- Attempt to identify from what part of the vehicle the concern is coming.
- Attempt to identify the source of the concern.
- Proceed as necessary.

Heavy Acceleration Test

To carry out this test, proceed as follows:

- Accelerate hard from 0-64 km/h (0-40 mph).
- Decelerate in a lower gear.
- The concern is torque related if duplicated while carrying out this test.
- Proceed as necessary.

Neutral Coast Down Speed Test

To carry out this test, proceed as follows:

- Drive at a higher rate of speed than where the concern occurred when carrying out the Slow Acceleration Test.
- Place the transmission in NEUTRAL and coast down past the speed where the concern occurs.
- The concern is vehicle speed-related if duplicated while carrying out this test. This eliminates the engine and the torque converter as sources.
- If the concern was not duplicated while carrying out this test, carry out the Downshift Speed Test to verify if the concern is engine speed related.
- Proceed as necessary.

Downshift Speed Test

To carry out this test, proceed as follows:

- Shift into a lower gear than the gear used when carrying out the Slow Acceleration Test.
- Drive at the engine rpm where the concern occurs.
- The concern is engine speed related if duplicated while carrying out this test. This eliminates the tires, wheels, brakes and the suspension components as sources.
- If necessary, repeat this test using other gears and NEUTRAL to verify the results.
- Proceed as necessary.

Steering Input Test

To carry out this test, proceed as follows:

- Drive at the speed where the concern occurs, while making sweeping turns in both directions.
- If the concern goes away or gets worse, the wheel bearings, hubs, U-joints (contained in the axles of 4WD applications), and tire tread wear are all possible sources.
- Proceed as necessary.

Brake Test

To carry out this test, proceed as follows:

- Warm the brakes by slowing the vehicle a few times from 80–32 km/h (50–20 mph) using light braking applications. At highway speeds of 89–97 km/h (50–60 mph), apply the brake using a light pedal force.
- Accelerate to 89–97 km/h (55–60 mph).
- Lightly apply the brakes and slow the vehicle to 30 km/h (20 mph).
- A brake vibration noise can be felt in the steering wheel, seat or brake pedal. A brake noise can be heard upon brake application and diminish when the brake is released.

Road Test Over Bumps

To carry out this test, proceed as follows:

- Drive the vehicle over a bump or rough surface one wheel at a time to determine if the noise is coming from the front or the back and the left or the right side of the vehicle.
- Proceed as necessary.


Neutral Engine Run-up (NERU) Test


To carry out this test, proceed as follows:

- Install a tachometer.
- Increase the engine rpm up from an idle to approximately 4000 rpm while in PARK on front wheel drive vehicles with automatic transmissions, or NEUTRAL for all other vehicles. Note the engine rpm and, if possible, determine the vibration frequency.
- Attempt to identify what part of the vehicle the concern is coming from.
- Attempt to identify the source of the concern.
- Proceed as necessary.

Drive Engine Run-up (DERU) Load Test

To carry out this test, proceed as follows:

-  **WARNING: Block the front and rear wheels, and apply the parking brake and the service brake, or injury to personnel can result.**


 **CAUTION: Do not carry out the Engine Load Test for more than five seconds or damage to the transmission or transaxle can result.**


Block the front and rear wheels.

- Apply the parking brake and the service brake.
- Install a tachometer.
- Shift the transmission into DRIVE, and increase and decrease the engine rpm between an idle to approximately 2000 rpm. Note the engine rpm and, if possible, determine the vibration frequency.
- Repeat the test in REVERSE.
- If the vibration/noise is duplicated when carrying out this test, inspect the engine and transmission or transaxle mounts.
- If the concern is definitely engine speed-related, carry out the Engine Accessory Test to narrow down the source.
- Proceed as necessary.

Engine Accessory Test

To carry out this test, proceed as follows:

-  **WARNING: Block the front and rear wheels, and apply the parking brake and the service brake, or injury to personnel can result.**

 **CAUTION: Limit engine running time to one minute or less with belts removed or serious engine damage will result.**


NOTE: A serpentine drive belt decreases the usefulness of this test. In these cases, use a vibration analyzer, such as the VA, to pinpoint accessory vibrations. An electronic listening device, such as an EngineEAR, will also help to identify noises from specific accessories.

Remove the accessory drive belts.

- Increase the engine rpm to where the concern occurs.
- If the vibration/noise is duplicated when carrying out this test, the belts and accessories are not sources.
- If the vibration/noise was not duplicated when carrying out this test, install each accessory belt, one at a time, to locate the source.

Vehicle Cold Soak Procedure

To carry out this procedure, proceed as follows:

- Test preparations include matching customer conditions (if known). If not known, document the test conditions: gear selection and engine rpm. Monitor the vibration/noise duration with a watch for up to three minutes.
- Park the vehicle where testing will occur. The vehicle must remain at or below the concern temperature (if known) for 6-8 hours.
- Before starting the engine, conduct a visual inspection under the hood.
- Turn the key on, but do not start the engine. Listen for the fuel pump, anti-lock brake system (ABS) and air suspension system noises.
- Start the engine.
-  **CAUTION: Never probe moving parts.**

Isolate the vibration/noise by carefully listening. Move around the vehicle while listening to find the general location of the vibration/noise. Then, search for a more precise location by using a stethoscope or EngineEAR.

- Refer to Idle Noise/Vibration in the Symptom Chart to assist with the diagnosis.

6: Check OASIS/TSBs/Repair History

After verifying the customer concern, check for OASIS reports, TSBs and the vehicle repair history for related concerns. If information relating to a diagnosis/repair is found, carry out the procedure(s) specified in that information.

If no information is available from these sources, carry out the vehicle preliminary inspection to eliminate any obvious faults.

7: Diagnostic Procedure

Qualifying the concern by the particular sensation present can help narrow down the concern. Always use the "symptom" to "system" to "component" to "cause" diagnosis technique. This diagnostic method divides the problem into related areas to correct the customer concern.

- Verify the "symptom".
- Determine which "system(s)" can cause the "symptom".

- If a vibration concern is vehicle speed related, the tire and wheel rpm/frequency or driveshaft frequency should be calculated.
- If a vibration concern is engine speed related, the engine, engine accessory or engine firing frequencies should be calculated.
- After determining the "system", use the diagnostic tools to identify the worn or damaged "components".
- After identifying the "components", try to find the "cause" of the failure.

Once the concern is narrowed down to a symptom/condition, proceed to NVH Condition and Symptom Categories.

NVH Condition and Symptom Categories

A good diagnostic process is a logical sequence of steps that lead to the identification of a causal system. Use the condition and symptom categories as follows:

- Identify the operating condition that the vehicle is exhibiting.
- Match the operating condition to the symptom.
- Verify the symptom.
- Identify which category or system could cause the symptom.
- Refer to the diagnostic symptom chart that is referred to.

Operating Condition—Vehicle is Not Moving

1. Static operation
 - Noise occurs during component/system functioning. GO to [Symptom Chart — Squeak and Rattle](#).
2. While cranking
 1. Grinding or whine, differential ring gear or starter motor pinion noise. GO to [Symptom Chart — Engine Noise/Vibration](#).
 2. Rattle. Exhaust hanger, exhaust heat shield or A/C line noise. GO to [Symptom Chart — Squeak and Rattle](#).
 3. Vibration. Acceptable condition.
3. At idle
 - Idle noise. GO to [Symptom Chart — Idle Noise/Vibration](#).
 - Idle vibration or shake. GO to [Symptom Chart — Idle Noise/Vibration](#).
4. During Gear Selection
 1. Vehicle parked on a steep incline. Acceptable noise.
 2. Vehicle parked on a flat surface. GO to [Symptom Chart — Driveline Noise/Vibration](#).
 3. Vehicle with a manual transmission. GO to [Symptom Chart — Transmission \(Manual\) and Transfer Case Noise/Vibration](#).

Operating Condition—Vehicle is Moving

1. Depends more on how the vehicle is operated
 1. Speed related
 - Related to vehicle speed

- Pitch increases with vehicle speed. GO to [Symptom Chart — Tire Noise/Vibration](#) .
 - Noise occurs at specific vehicle speed. A high-pitched noise (whine). GO to [Symptom Chart — Driveline Noise/Vibration](#) .
 - Loudness proportional to vehicle speed. Low-frequency noise at high speeds, noise and loudness increase with speed. GO to [Symptom Chart — Driveline Noise/Vibration](#) .
 - A low-pitched noise (drumming). GO to [Symptom Chart — Engine Noise/Vibration](#) .
 - Vibration occurs at a particular speed (mph) regardless of acceleration or deceleration. GO to [Symptom Chart — Tire Noise/Vibration](#) .
 - Noise varies with wind/vehicle speed and direction. GO to [Symptom Chart — Air Leak and Wind Noise](#) .
- Related to engine speed.
 - Noise varies with engine rpm. GO to [Symptom Chart — Engine Noise/Vibration](#) .
 - Vibration occurs at a particular speed (mph) regardless of engine speed (rpm).
2. Acceleration
- Wide open throttle (WOT)
 - Engine induced contact between components. Inspect and repair as necessary.
 - Noise is continuous throughout WOT. Exhaust system or engine ground out. GO to [Symptom Chart — Engine Noise/Vibration](#) .
 - Light/moderate acceleration
 - Tip-in moan. Engine/exhaust noise. GO to [Symptom Chart — Engine Noise/Vibration](#) .
 - Knock-type noise. GO to [Symptom Chart — Engine Noise/Vibration](#) .
 - Driveline shudder. GO to [Symptom Chart — Driveline Noise/Vibration](#) .
 - Engine vibration. GO to [Symptom Chart — Engine Noise/Vibration](#) .
3. Turning noise. GO to [Symptom Chart — Steering Noise/Vibration](#) .
4. Braking
- Clicking sound is signaling ABS is active. Acceptable ABS sound.
 - A continuous grinding/squeal. GO to [Symptom Chart — Brake Noise/Vibration](#) .
 - Brake vibration/shudder. GO to [Symptom Chart — Brake Noise/Vibration](#) .
5. Clutching
- A noise occurring during clutch operation. GO to [Symptom Chart — Transmission \(Manual\) and Transfer Case Noise/Vibration](#) .
 - Vibration. GO to [Symptom Chart — Transmission \(Manual\) and Transfer Case Noise/Vibration](#) .
6. Shifting
- Noise or vibration condition related to the transmission (automatic). GO to [Symptom Chart — Transmission \(Automatic\) Noise/Vibration](#) .
 - Noise or vibration related to the transmission (manual). GO to [Symptom Chart — Transmission \(Manual\) and Transfer Case Noise/Vibration](#) .
7. Engaged in four-wheel drive. GO to [Symptom Chart — Transmission \(Manual\) and Transfer Case Noise/Vibration](#) .
8. Cruising speeds
- Accelerator pedal vibration. GO to [Symptom Chart — Engine Noise/Vibration](#) .

- Driveline vibration. GO to [Symptom Chart — Driveline Noise/Vibration](#) .
 - A shimmy or shake. GO to [Symptom Chart — Tire Noise/Vibration](#) .
9. Driving at low/medium speeds
- A wobble or shudder. GO to [Symptom Chart — Tire Noise/Vibration](#) .
2. Depends more on where the vehicle is operated
1. Bump/pothole, rough road or smooth road. GO to [Symptom Chart — Suspension Noise/Vibration](#) .
- Noise is random or intermittent occurring from road irregularities. GO to [Symptom Chart — Squeak and Rattle](#) .
 - Noise or vibration changes from one road surface to another. Normal sound changes.
 - Noise or vibration associated with a hard/firm ride. GO to [Symptom Chart — Suspension Noise/Vibration](#) .

Symptom Charts

Symptom Chart — Air Leak and Wind Noise

Condition	Possible Sources	Action
<ul style="list-style-type: none"> ● Air leak around door perimeter 	<ul style="list-style-type: none"> ● Loose fit seal. ● Seal installed incorrectly. ● Door misaligned. ● Scuff plate installed incorrectly. ● Seal or seal push pins damaged. 	<ul style="list-style-type: none"> ● PINCH the seal carrier to improve retention on the seal flange. ● REINSTALL the seal. ● REALIGN the door. CHECK door gaps and fit in the door opening and ADJUST as necessary. ● REINSTALL the scuff plate. ● INSTALL a new seal.
<ul style="list-style-type: none"> ● Air leak around glass run 	<ul style="list-style-type: none"> ● Door glass misaligned. ● Glass run installed incorrectly. ● Leak path behind glass run. ● Glass run channel spread wide. ● Blow-out clip bent or contacting door glass. ● Glass run damaged. 	<ul style="list-style-type: none"> ● ADJUST the door glass. ● ADJUST the glass run. INSERT foam in the glass run carrier. ● INSTALL foam rope behind the glass run. ● PINCH the glass run channel to reduce the size of the opening. ● ADJUST the blow-out clip or INSTALL a new glass run/blow-out clip molding assembly. ● INSTALL a new glass run.
<ul style="list-style-type: none"> ● Air leak at inner belt line 	<ul style="list-style-type: none"> ● Belt line seal installed incorrectly on flange. ● Belt line seal integrated 	<ul style="list-style-type: none"> ● ADJUST the seal. (Do not bend the flange.) ● REINSTALL the door trim.

	<p>with door trim installed incorrectly (no glass contact).</p> <ul style="list-style-type: none"> ● No contact with side glass. ● No contact with glass runs at both ends of belt line seal. ● Belt line seal damaged. 	<ul style="list-style-type: none"> ● ADJUST the door glass. ● ADJUST the belt line seal or ADD foam at the seal ends. ● INSTALL a new seal.
<ul style="list-style-type: none"> ● Air leak at outer belt line 	<ul style="list-style-type: none"> ● Belt line seal installed incorrectly on flange (no glass contact). ● Belt line seal does not contact the glass. ● No contact with glass runs at both ends of belt line seal. ● Belt line seal damaged. 	<ul style="list-style-type: none"> ● ADJUST the seal. ● ADJUST the door glass. ● ADJUST the belt line seal/ADD foam at the seal ends. ● INSTALL a new seal.
<ul style="list-style-type: none"> ● Draft at inner door handle/speaker opening 	<ul style="list-style-type: none"> ● Hole in watershield. ● Watershield misaligned. ● Exterior door handle seal misaligned/damaged. 	<ul style="list-style-type: none"> ● SEAL the hole with a suitable tape. ● REALIGN the watershield. INSTALL a new watershield if the pressure sensitive adhesive fails. ● REALIGN or INSTALL a new seal as necessary.
<ul style="list-style-type: none"> ● Wind noise from side view mirror 	<ul style="list-style-type: none"> ● Outside mirror housing misaligned. ● Mirror sail gasket folded/misaligned. ● Mirror housing trim cap installed incorrectly. ● Air leak through mirror housing hinge. ● Inner sail trim installed incorrectly. ● Inner sail gasket/barrier installed incorrectly. ● Air path through wiring bundle/fastener access holes. ● Exposed fastener access hole on mirror 	<ul style="list-style-type: none"> ● REALIGN with the edges shingled correctly and no gaps. ● REINSTALL with the gasket unfolded and aligned correctly. ● REINSTALL with the edges shingled to the air flow. ● Fully ENGAGE the mirror into its operating position/USE foam to block the air path through the hinge. ● REINSTALL the sail trim/ADJUST the door trim. ● REINSTALL the trim cover with the gasket/barrier aligned correctly. ● BLOCK the air path(s) with foam/tape. ● INSTALL a new cap if it is missing.

	housing/sail.	
<ul style="list-style-type: none"> ● Air leak around perimeter of fixed glass 	<ul style="list-style-type: none"> ● Gaps in the sealant bead. ● Air traveling up windshield molding along A-pillar. ● Windshield/backlite misaligned or not installed correctly. ● Rear hood seal at base of windshield misaligned/damaged. 	<ul style="list-style-type: none"> ● APPLY approved sealant. ● INSTALL foam rope the full length of the A-pillar. ● REINSTALL the windshield/backlite. ● REALIGN or INSTALL a new seal as necessary.
<ul style="list-style-type: none"> ● Air leak at cowl 	<ul style="list-style-type: none"> ● Cowl gasket misaligned/damaged. 	<ul style="list-style-type: none"> ● REALIGN or INSTALL a new seal as necessary.
<ul style="list-style-type: none"> ● Air leak around liftgate perimeter 	<ul style="list-style-type: none"> ● Loose fit seal. ● Seal misaligned. ● Liftgate misaligned. ● Scuff plate misaligned. ● Seal or seal push pins damaged. 	<ul style="list-style-type: none"> ● PINCH the seal carrier to improve retention on the seal flange or INSERT foam in the carrier. ● REINSTALL the seal. ● REALIGN the liftgate. CHECK the liftgate fit in the body opening and ADJUST as necessary. ● REINSTALL the scuff plate. ● INSTALL a new seal.
<ul style="list-style-type: none"> ● Air leak around the liftgate flip window perimeter 	<ul style="list-style-type: none"> ● Loose fit seal. ● Seal misaligned. ● Glass misaligned. ● Seal damaged. 	<ul style="list-style-type: none"> ● PINCH the seal carrier to improve the retention to the seal flange. ● REINSTALL the seal. ● REALIGN the glass. ● INSTALL a new seal.
<ul style="list-style-type: none"> ● Wind noise from antenna 	<ul style="list-style-type: none"> ● Shape of antenna. ● Air leak around antenna cable access hole. 	<ul style="list-style-type: none"> ● INSTALL an antenna boot or a spiral antenna. ● INSPECT the antenna access hole grommet. REPAIR as necessary.
<ul style="list-style-type: none"> ● Air leak from closed roof opening panel 	<ul style="list-style-type: none"> ● Seal installed incorrectly. ● Roof opening panel glass/door misaligned. ● Roof opening panel damaged. 	<ul style="list-style-type: none"> ● REINSTALL the seal. ● REALIGN the roof opening panel glass/door. ● INSTALL a new roof opening panel.
<ul style="list-style-type: none"> ● Buffeting from an open roof opening panel 	<ul style="list-style-type: none"> ● Wind deflector inoperative/damaged. ● Wind deflector height incorrect. 	<ul style="list-style-type: none"> ● REPAIR or INSTALL a new wind deflector as necessary. ● ADJUST the wind deflector higher.
<ul style="list-style-type: none"> ● Wind noise 	<ul style="list-style-type: none"> ● Fender splash shield 	<ul style="list-style-type: none"> ● REALIGN the fender

<p>created by airflow over or behind body panels</p>	<p>misaligned.</p> <ul style="list-style-type: none"> ● Body panel misaligned (exposed edge). ● Hood misaligned (front margin). ● Front grille edge noise. 	<p>splash shield.</p> <ul style="list-style-type: none"> ● REALIGN the appropriate body panel. ● CHECK hood gaps and fit. ADJUST the hood as necessary. ● APPLY foam in the hollow areas behind the louvers.
<ul style="list-style-type: none"> ● Wind noise created by grille opening panel 	<ul style="list-style-type: none"> ● Grille relationship to leading edge on hood. ● Sharp edges due to material imperfections. 	<ul style="list-style-type: none"> ● ADJUST the grille opening panel forward to eliminate wind noise. ● REMOVE the sharp edges (no damage to visible surface).
<ul style="list-style-type: none"> ● Wind noise from air extractor 	<ul style="list-style-type: none"> ● Air extractor housing seated incorrectly. ● Air extractor housing or flaps damaged. 	<ul style="list-style-type: none"> ● REINSTALL the air extractor housing. ● INSTALL a new air extractor.
<ul style="list-style-type: none"> ● Air leak at top of A-pillar — vehicles with a convertible top 	<ul style="list-style-type: none"> ● Seal at windshield header installed incorrectly. ● Seal pinched. ● Gap between side rail and header seal at A-pillar. 	<ul style="list-style-type: none"> ● REINSTALL the seal. ● FILL the seal with foam to reshape it. ● ADJUST the J-hook/vinyl top.
<ul style="list-style-type: none"> ● Air leak at rear quarter glass (division bar) — vehicles with a convertible top 	<ul style="list-style-type: none"> ● No contact between front side glass and quarter glass division bar. 	<ul style="list-style-type: none"> ● ADJUST the front side glass regulator and the rear quarter glass regulator.
<ul style="list-style-type: none"> ● Air leak or wind noise from top of side glass — vehicles with a convertible top 	<ul style="list-style-type: none"> ● Gap between side rail and vinyl top. ● Seal at windshield header installed incorrectly. ● Seal damaged between side rail and vinyl top. ● Vinyl top damaged. 	<ul style="list-style-type: none"> ● ADD additional foam tape to seal between the side rail and the vinyl top. ● REINSTALL the seal. ● INSTALL a new seal. ● INSPECT the vinyl top. INSTALL a new vinyl top as necessary.
<ul style="list-style-type: none"> ● Air leak or wind noise at windshield header — vehicles with a convertible top 	<ul style="list-style-type: none"> ● Vinyl top not flush with header. 	<ul style="list-style-type: none"> ● ADJUST the J-hook to lower the top to achieve a flush condition.

	<ul style="list-style-type: none"> ● Seal at windshield header installed incorrectly. ● Header seal not flush with header. 	<ul style="list-style-type: none"> ● REINSTALL the seal. ● REINSTALL the seal.
<ul style="list-style-type: none"> ● Convertible top flapping with the top up 	<ul style="list-style-type: none"> ● Vinyl top contacting interior headliner. 	<ul style="list-style-type: none"> ● Working from front to back, INSTALL a 6.35 mm (0.25 in) foam sheet between the headliner and the vinyl top at the suspected area. Allow a clearance of 50 mm (2 in) - 75 mm (3 in) away from the roof bows and the side rails.
<ul style="list-style-type: none"> ● Noise from roof rack 	<ul style="list-style-type: none"> ● Roof rack rails or crossbars loose. ● Roof rack fasteners missing. ● Roof rack crossbars installed backward. ● Roof rack rub strips partially lifting from roof. ● Roof rack gaskets loose or misaligned. 	<ul style="list-style-type: none"> ● TIGHTEN the fasteners. ● INSTALL the approved fasteners. ● REINSTALL the crossbars. ● REAPPLY adhesive or fasteners or INSTALL new rub strips as necessary. ● REINSTALL the gasket.
<ul style="list-style-type: none"> ● Wind noise from bug shield/exterior windshield sun visor 	<ul style="list-style-type: none"> ● Turbulence created by location and shape. 	<ul style="list-style-type: none"> ● REMOVE per customer direction if it is a dealer installed option.

Symptom Chart—Brake Noise/Vibration

Condition	Possible Sources	Action
<ul style="list-style-type: none"> ● Rattling noise 	<ul style="list-style-type: none"> ● Caliper mounting bolts loose. ● Damaged or worn caliper pins or retainers. ● Missing or damaged anti-rattle clips or springs. ● Loose brake disc shield. 	<ul style="list-style-type: none"> ● CHECK the caliper bolts. TIGHTEN to specifications. ● CHECK the caliper pins and retainers for lubrication and correct fit. LUBRICATE or INSTALL new components as necessary. REFER to Section 206-03 for front disc brake pads or Section 206-04 for rear disc brake pads. ● CHECK the brake pads for missing clips or broken springs. INSTALL new components as necessary. REFER to Section 206-03 for front disc brake pads or Section 206-04 for rear disc brake pads. ● TIGHTEN the brake disc shield bolts to specification. REFER to Section 206-03

		for front disc brake pads or Section 206-04 for rear disc brake pads.
<ul style="list-style-type: none"> ● Clicking noise—with brakes applied with ABS brakes 	<ul style="list-style-type: none"> ● ABS hydraulic control unit. 	<ul style="list-style-type: none"> ● Acceptable condition.
<ul style="list-style-type: none"> ● Squealing noise—occurs on first (morning) brake application 	<ul style="list-style-type: none"> ● Disc brake pads. 	<ul style="list-style-type: none"> ● Acceptable condition. Caused by humidity and low disc brake pad temperature.
<ul style="list-style-type: none"> ● Squealing noise—a continuous squeal 	<ul style="list-style-type: none"> ● Disc brake pads or linings worn below minimum thickness. 	<ul style="list-style-type: none"> ● INSTALL new disc brake pads. REFER to Section 206-03 for front disc brake pads or Section 206-04 for rear disc brake pads.
<ul style="list-style-type: none"> ● Squealing noise—an intermittent squeal brought on by cold, heat, water, mud or snow 	<ul style="list-style-type: none"> ● Disc brake pads. 	<ul style="list-style-type: none"> ● Acceptable condition.
<ul style="list-style-type: none"> ● Groaning noise—occurs at low speeds with brake lightly applied (creeping) 	<ul style="list-style-type: none"> ● Disc brake pads. 	<ul style="list-style-type: none"> ● Acceptable condition.
<ul style="list-style-type: none"> ● Grinding noise—continuous 	<ul style="list-style-type: none"> ● Disc brake pads or linings worn below minimum thickness. 	<ul style="list-style-type: none"> ● INSPECT the disc brake pads, brake discs/drums and attaching hardware for damage. REPAIR or INSTALL new components as necessary. REFER to Section 206-03 for front disc brake pads or Section 206-04 for rear disc brake pads.
<ul style="list-style-type: none"> ● Moaning noise 	<ul style="list-style-type: none"> ● Brake linings contaminated with grease or oil. 	<ul style="list-style-type: none"> ● INSPECT the brake pads and shoes for contamination. REPAIR or INSTALL new components as necessary.
<ul style="list-style-type: none"> ● Brake vibration/shudder—occurs when brakes are applied 	<ul style="list-style-type: none"> ● Uneven disc or drum wear. ● Uneven disc brake pad or lining transfer. ● Suspension components. 	<ul style="list-style-type: none"> ● Go To Pinpoint Test A .
<ul style="list-style-type: none"> ● Brake vibration/shudder—occurs when the brake pedal is released 	<ul style="list-style-type: none"> ● Brake drag. 	<ul style="list-style-type: none"> ● INSPECT the disc brake pads or linings for premature wear. REPAIR or INSTALL a new caliper or wheel cylinder as necessary. REFER to Section 206-03 for front disc brake pads or Section 206-04 for rear disc brake pads

Symptom Chart—Driveline Noise/Vibration

Condition	Possible Sources	Action
<ul style="list-style-type: none"> ● Axle howling or whine—front or rear axle 	<ul style="list-style-type: none"> ● Axle lubricant low. ● Axle housing damage. ● Damaged or worn wheel bearings or axle bearings. ● Damaged or worn differential ring and pinion. ● Damaged or worn differential side or pinion bearings. ● Damaged or worn differential side gears and pinion gears. 	<ul style="list-style-type: none"> ● CHECK the lubricant level. FILL the axle to specification. REFER to Section 205-02. ● INSPECT the axle housing for damage. REPAIR or INSTALL a new axle as necessary. REFER to Section 205-02. ● CHECK for abnormal wheel bearing play or roughness. Refer to Wheel Bearing Check in this section. ADJUST or INSTALL new wheel bearings as necessary. ● INSPECT the ring and pinion ring for abnormal wear patterns or broken teeth. INSTALL a new ring and pinion as necessary. REFER to Section 205-02. ● CHECK for abnormal bearing play or roughness. INSTALL new bearings as necessary. REFER to Section 205-02. ● DISASSEMBLE the differential carrier. INSPECT the side and pinion gears for abnormal wear patterns or broken teeth. INSTALL new gears as necessary. REFER to Section 205-02.
<ul style="list-style-type: none"> ● Driveline clunk—loud clunk when shifting from reverse to drive 	<ul style="list-style-type: none"> ● Incorrect axle lubricant level. ● Excessive backlash in the axle or transmission. ● Damaged or worn pinion bearings. ● Damaged or worn universal joints (U-joints). ● Loose suspension components. ● Broken powertrain 	<ul style="list-style-type: none"> ● CHECK the lubricant level. FILL the axle to specification. REFER to Section 205-02. ● CARRY OUT a total backlash check. REFER to Section 205-00. ● CHECK for abnormal bearing play or roughness. INSTALL new bearings as necessary. REFER to Section 205-02. ● INSPECT the U-joints for wear or damage. INSTALL new U-joints as necessary. REFER to Section 205-01. ● INSPECT the suspension for damage or wear. REPAIR or INSTALL new components as necessary. ● INSPECT the powertrain mounts. CARRY OUT

	<p>mounts.</p> <ul style="list-style-type: none"> ● Idle speed too high. 	<p>Powertrain/Drivetrain Mount Neutralizing in this section. INSTALL new mounts as necessary. REFER to Section 303-01A for the 3.0L engine, Section 303-01B for the 3.9L engine, Section 307-01 for automatic transmissions and Section 308-03 for manual transmissions.</p> <ul style="list-style-type: none"> ● CHECK for the correct idle speed.
<ul style="list-style-type: none"> ● Driveline clunk—occurs as the vehicle starts to move forward following a stop 	<ul style="list-style-type: none"> ● Worn or galled driveshaft slip-yoke splines. ● Worn or galled driveshaft and coupling shaft splines. ● Loose rear leaf spring U-bolts. 	<ul style="list-style-type: none"> ● CLEAN and INSPECT the splines of the yoke for a worn or galled condition. INSTALL a new yoke as necessary. REFER to Section 205-01. ● CLEAN and INSPECT the splines of the driveshaft and coupling shaft for a worn or galled condition. INSTALL a new driveshaft assembly as necessary. REFER to Section 205-01. ● CHECK the U-bolts for loose nuts. TIGHTEN to specification.
<ul style="list-style-type: none"> ● Driveline clunk (FWD vehicles)—occurs during acceleration or from cruise to coast/deceleration 	<ul style="list-style-type: none"> ● Damaged or worn inboard constant velocity CV joint. 	<ul style="list-style-type: none"> ● INSPECT the inboard CV joint and boot. REPAIR or INSTALL a new CV joint as necessary.
<ul style="list-style-type: none"> ● Driveline clunk (4WD vehicles)—occurs during shift-on-the-fly engagement 	<ul style="list-style-type: none"> ● Clutch relay. ● Shift motor. ● Transfer case. ● GEM. 	<ul style="list-style-type: none"> ● CHECK the 4WD engagement system. REPAIR or INSTALL new components as necessary.
<ul style="list-style-type: none"> ● Clicking, popping or grinding—occurs while vehicle is turning 	<ul style="list-style-type: none"> ● Inadequate or contaminated lubrication in the CV joints. ● Another component contacting the halfshaft. ● Brake components. ● Steering components. ● Suspension components. 	<ul style="list-style-type: none"> ● CHECK the CV boots and joints for wear or damage. REPAIR or INSTALL new components as necessary. REFER to Section 205-05. ● CHECK the halfshafts and the area around the halfshafts. REPAIR as necessary. ● INSPECT the front brakes for wear or damage. REPAIR as necessary. REFER to Section 206-03. ● INSPECT the drag link, inner and outer tie-rods or idler arm for wear or damage. REPAIR as necessary. REFER to Section 211-02. ● INSPECT the upper and lower ball joints for wear or

	<ul style="list-style-type: none"> ● Damaged or worn wheel bearings. 	<p>damage. REPAIR as necessary. REFER to Section 204-01.</p> <ul style="list-style-type: none"> ● CHECK for abnormal wheel bearing play or roughness. Refer to Wheel Bearing Check in this section. ADJUST or INSTALL new wheel bearings as necessary.
<ul style="list-style-type: none"> ● Clicking or snapping—occurs when accelerating around a corner 	<ul style="list-style-type: none"> ● Damaged or worn outboard CV joint. 	<ul style="list-style-type: none"> ● INSPECT the outboard CV joint and boot. REPAIR or INSTALL a new CV joint as necessary. REFER to Section 205-05.
<ul style="list-style-type: none"> ● High pitched chattering—noise from the rear axle when the vehicle is turning 	<ul style="list-style-type: none"> ● Incorrect or contaminated lubricant. ● Damaged or worn differential (differential side gears and pinion gears). 	<ul style="list-style-type: none"> ● CHECK the vehicle by driving in tight circles (5 clockwise, 5 counterclockwise). FLUSH and REFILL with the specified rear axle lubricant and friction modifier as necessary. ● DISASSEMBLE the differential assembly. INSPECT the differential case, pin and gears for wear or damage. REPAIR or INSTALL a new differential as necessary. REFER to Section 205-02.
<ul style="list-style-type: none"> ● Buzz—buzzing noise is the same at cruise or coast/deceleration 	<ul style="list-style-type: none"> ● Damaged or worn tires. ● Incorrect driveline angles. 	<ul style="list-style-type: none"> ● CHECK for abnormal tire wear or damage. INSTALL new tire(s) as necessary. REFER to Section 204-04. ● CHECK for correct driveline angles. REPAIR as necessary. REFER to Section 205-00.
<ul style="list-style-type: none"> ● Rumble or boom—noise occurs at coast/deceleration, usually driveshaft speed related and noticeable over a wide range of speeds 	<ul style="list-style-type: none"> ● Driveshaft is out-of-balance. ● U-joints binding or seized. ● Excessive pinion flange runout. 	<ul style="list-style-type: none"> ● CHECK the driveshaft for damage, missing balance weights or undercoating. CHECK the driveshaft balance. CARRY OUT a driveline vibration test. REFER to Section 205-00. ● ROTATE the driveshaft and CHECK for rough operation or seized U-joints. INSTALL new U-joints as necessary. REFER to Section 205-01. ● CARRY OUT a runout check. REPAIR as necessary. REFER to Section 205-00.
<ul style="list-style-type: none"> ● Grunting—normally associated with a shudder experienced during acceleration 	<ul style="list-style-type: none"> ● Driveshaft slip yoke binding. 	<ul style="list-style-type: none"> ● CLEAN and LUBRICATE the male and female splines.

<p>from a dead stop</p>	<ul style="list-style-type: none"> ● Loose rear spring U-bolts. 	<ul style="list-style-type: none"> ● INSPECT the rear suspension. TIGHTEN the U-bolt nuts to specification.
<ul style="list-style-type: none"> ● Howl—can occur at various speeds and driving conditions. Affected by acceleration and deceleration 	<ul style="list-style-type: none"> ● Incorrect ring and pinion contact, incorrect bearing preload or gear damage. 	<ul style="list-style-type: none"> ● CHECK the ring and pinion and bearings for damage. INSPECT the ring and pinion wear pattern. REFER to Checking Tooth Contact Pattern and Condition of the Ring and Pinion component test in this section. ADJUST or INSTALL new components as necessary. REFER to Section 205-02.
<ul style="list-style-type: none"> ● Chuckle—heard at coast/deceleration. Also described as a knock 	<ul style="list-style-type: none"> ● Incorrect ring and pinion contact or by damaged teeth on the coast side of the ring and pinion. 	<ul style="list-style-type: none"> ● CHECK the ring and pinion for damage. INSPECT the ring and pinion wear pattern. REFER to Checking Tooth Contact Pattern and Condition of the Ring and Pinion component test in this section. ADJUST or INSTALL new components as necessary. REFER to Section 205-02.
<ul style="list-style-type: none"> ● Knock—noise occurs at various speeds. Not affected by acceleration or deceleration 	<ul style="list-style-type: none"> ● Gear tooth damage to the drive side of the ring and pinion. ● Excessive axle shaft end play. (Vehicles with integral axles). 	<ul style="list-style-type: none"> ● CHECK the differential case and ring and pinion for damage. INSTALL new components as necessary. REFER to Section 205-02. ● CHECK the axle end play using a dial indicator. INSTALL a new axle shaft or side gears as necessary. REFER to Section 205-02.
<ul style="list-style-type: none"> ● Scraping noise—a continuous low pitched noise starting at low speeds 	<ul style="list-style-type: none"> ● Worn or damaged pinion bearings. 	<ul style="list-style-type: none"> ● CHECK the pinion bearings. INSTALL new pinion bearings as necessary. REFER to Section 205-02.
<ul style="list-style-type: none"> ● Driveline shudder—occurs during acceleration from a slow speed or stop 	<ul style="list-style-type: none"> ● Rear drive axle assembly mispositioned. ● Loose rear spring U-bolts. ● Incorrect or high CV joint operating angle. ● Damaged or worn front suspension components. 	<ul style="list-style-type: none"> ● CHECK the axle mounts and the rear suspension for damage or wear. REPAIR as necessary. ● INSPECT the U-bolts. TIGHTEN the U-bolt nuts to specification. ● CHECK vehicle ride height is within limits. REPAIR as necessary. REFER to Section 204-00. ● CHECK for a loose stabilizer bar, damaged or loose strut/strut bushings or loose or worn ball joints. INSPECT the steering linkage for wear or damage. REPAIR or INSTALL new components

	<ul style="list-style-type: none"> ● Driveline angles out of specification. ● U-joints binding or seized. ● Binding, damaged or galled splines on the driveshaft slip-yoke. 	<p>as necessary. REFER to Section 204-01.</p> <ul style="list-style-type: none"> ● CHECK for correct driveline angles. REPAIR as necessary. REFER to Section 205-00. ● ROTATE the driveshaft and CHECK for rough operation or seized U-joints. INSTALL new U-joints as necessary. REFER to Section 205-01. ● CLEAN and INSPECT the splines of the slip-yoke, driveshaft and coupling shaft for a worn, damaged or galled condition. INSTALL a new slip-yoke or driveshaft assembly as necessary. REPAIR as necessary. REFER to Section 205-01.
<ul style="list-style-type: none"> ● Driveline vibration—occurs at cruising speeds 	<ul style="list-style-type: none"> ● U-joints are worn. ● Worn or damaged driveshaft center bearing support. ● Loose axle pinion flange bolts. ● Excessive axle pinion flange runout. ● Driveshaft is out-of-balance. ● Binding or damaged splines on the driveshaft slip-yoke. ● Driveshaft runout. 	<ul style="list-style-type: none"> ● CHECK for wear or incorrect seating. INSTALL new U-joints as necessary. REFER to Section 205-01. ● CHECK the insulator for damage or wear. ROTATE the driveshaft and CHECK for rough operation. INSTALL a new center bearing support as necessary. REFER to Section 205-01. ● INSPECT the axle pinion flange. TIGHTEN the pinion flange bolts to specification. REFER to Section 205-01. ● CARRY OUT a Runout Check. REPAIR as necessary. REFER to Section 205-00. ● CHECK the driveshaft for damage, missing balance weights or undercoating. CHECK driveshaft balance. CARRY OUT a driveline vibration test. REFER to Section 205-00. REPAIR as necessary. ● CLEAN and INSPECT the splines of the slip-yoke, driveshaft and coupling shaft for wear or damage. INSTALL a new slip-yoke or driveshaft assembly as necessary. REFER to Section 205-01. REPAIR as necessary. ● CARRY OUT a Runout Check. REFER to Section

	<ul style="list-style-type: none"> ● Incorrect lateral and radial tire/wheel runout. ● Driveline angles out of specification. ● Incorrectly seated CV joint in the front wheel hub. 	<p>205-00 . REPAIR as necessary.</p> <ul style="list-style-type: none"> ● INSPECT the tire and wheels. MEASURE tire runouts. REFER to Section 204-04 . REPAIR or INSTALL new components as necessary. ● CHECK for correct driveline angles. REPAIR as necessary. REFER to Section 205-00 . ● CHECK the outer CV joint for correct seating into the hub. REPAIR as necessary. REFER to Section 205-05 .
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Symptom Chart — Engine Noise/Vibration

Condition	Possible Sources	Action
<ul style="list-style-type: none"> ● Grinding noise—occurs during engine cranking 	<ul style="list-style-type: none"> ● Incorrect starter motor mounting. ● Starter motor. ● Incorrect starter motor drive engagement. 	<ul style="list-style-type: none"> ● INSPECT the starter motor for correct mounting. REPAIR as necessary. REFER to Section 303-06 . ● CHECK the starter motor. REPAIR or INSTALL a new starter motor as necessary. REFER to Section 303-06 . ● INSPECT the starter motor drive and flywheel for wear or damage. INSTALL a new starter motor drive or flexplate as necessary. REFER to Section 303-01A for 3.0L engines or Section 303-01B for 3.9L engines.
<ul style="list-style-type: none"> ● Engine ticking noise 	<ul style="list-style-type: none"> ● Fuel injector. ● Fuel line. ● Oil pump. ● Valve lifter. ● Belt tensioner. ● Water pump. ● Obstruction of cooling fan. 	<ul style="list-style-type: none"> ● Go To Pinpoint Test B .
<ul style="list-style-type: none"> ● Engine drumming noise—normally accompanied by vibration 	<ul style="list-style-type: none"> ● Powertrain mount. ● Damaged or misaligned exhaust system. 	<ul style="list-style-type: none"> ● CARRY OUT Powertrain/Drivetrain Mount Neutralizing in this section. ● INSPECT the exhaust system for loose or broken clamps and brackets. CARRY OUT Exhaust System Neutralizing in this section.
<ul style="list-style-type: none"> ● Whistling noise—normally accompanied with poor idle condition 	<ul style="list-style-type: none"> ● Air intake system. 	<ul style="list-style-type: none"> ● CHECK the air intake ducts, air cleaner, throttle body and vacuum hoses for leaks and correct fit. REPAIR or ADJUST as necessary.

<ul style="list-style-type: none"> ● Clunking noise 	<ul style="list-style-type: none"> ● Water pump has excessive end play or imbalance. ● Generator has excessive end play. 	<ul style="list-style-type: none"> ● CHECK the water pump for excessive end play. INSPECT the water pump with the drive belt off for imbalance. INSTALL a new water pump as necessary. REFER to Section 303-03. ● CHECK the generator for excessive end play. REPAIR or INSTALL a new generator. REFER to Section 414-02.
<ul style="list-style-type: none"> ● Pinging noise 	<ul style="list-style-type: none"> ● Exhaust system leak. ● Gasoline octane too low. ● Knock sensor operation. ● Incorrect spark timing. ● High operating temperature. ● Foul-out spark plug. ● Catalytic converter. 	<ul style="list-style-type: none"> ● INSPECT the exhaust system for leaks. REPAIR as necessary. REFER to Section 309-00. ● VERIFY with customer the type of gasoline used. CORRECT as necessary. ● CHECK the knock sensor. INSTALL a new knock sensor as necessary. REFER to Section 303-14. ● CHECK the spark timing. REPAIR as necessary. ● INSPECT cooling system for leaks. CHECK the coolant level. REFILL as necessary. CHECK the coolant for the correct mix ratio. DRAIN and REFILL as needed. CHECK engine operating temperature is within specifications. REPAIR as necessary. REFER to Section 303-03. ● CHECK the spark plugs. REPAIR or INSTALL new spark plugs as necessary. ● Acceptable noise.
<ul style="list-style-type: none"> ● Knocking noise—light knocking noise, also described as piston slap. Noise is most noticeable when engine is cold with light to medium acceleration. Noise disappears as engine warms 	<ul style="list-style-type: none"> ● Excessive clearance between the piston and the cylinder wall. 	<ul style="list-style-type: none"> ● Engine cold and at high idle. Using an EngineEAR, pull a spark plug or fuel injector connector until the noise goes away. CARRY OUT a cylinder bore clearance to piston check. INSTALL a new piston. REFER to Section 303-01A for 3.0L engines or Section 303-01B for 3.9L engines.
<ul style="list-style-type: none"> ● Knocking noise—light double knock or sharp rap sound. Occurs mostly with warm engine 	<ul style="list-style-type: none"> ● Excessive clearance between the piston and the piston pin. 	<ul style="list-style-type: none"> ● INSTALL a new piston or piston pin. REFER to Section 303-01A for 3.0L engines or Section 303-01B for 3.9L engines.

<p>at idle or low speeds in DRIVE. Increases in relation to engine load. Associated with poor lubrication history</p>		
<ul style="list-style-type: none"> ● Knocking noise—light knocking noise is most noticeable when engine is warm. Noise tends to decrease when vehicle is coasting or in neutral 	<ul style="list-style-type: none"> ● Excessive clearance between the connecting rod bearings and the crankshaft. 	<ul style="list-style-type: none"> ● Engine warm and at idle. Using an EngineEAR, PULL a spark plug or fuel injector connector until the noise goes away. INSTALL new bearings. REFER to Section 303-01A for 3.0L engines or Section 303-01B for 3.9L engines.
<ul style="list-style-type: none"> ● Knocking—deep knocking noise. Noise is most noticeable when engine is warm, at lower rpm and under a light load and then at float 	<ul style="list-style-type: none"> ● Worn or damaged crankshaft main bearings. 	<ul style="list-style-type: none"> ● CARRY OUT Drive Engine Run-Up (DERU) test. CHECK for noise with vehicle at operating temperature, during medium to heavy acceleration. CHECK at idle with injector disconnected, noise does not change. INSTALL new main bearings. REFER to Section 303-01A for 3.0L engines or Section 303-01B for 3.9L engines.
<ul style="list-style-type: none"> ● Knocking noise—occurs mostly with warm engine at light/medium acceleration 	<ul style="list-style-type: none"> ● Spark plugs. ● Carbon accumulation in combustion chamber. 	<ul style="list-style-type: none"> ● CHECK the spark plugs for damage or wear. INSTALL new spark plugs as necessary. ● REMOVE carbon from combustion chamber.
<ul style="list-style-type: none"> ● Whine or moaning noise 	<ul style="list-style-type: none"> ● Air intake system. ● Generator electrical field or bearings. 	<ul style="list-style-type: none"> ● CHECK the air cleaner and ducts for correct fit. INSPECT the air intake system for leaks or damage. REPAIR as necessary. REFER to Section 303-12 . ● CARRY OUT generator load test. REPAIR or INSTALL a new generator as necessary. REFER to Section 414-02 .
<ul style="list-style-type: none"> ● Drone type noise 	<ul style="list-style-type: none"> ● Exhaust system. ● A/C compressor. 	<ul style="list-style-type: none"> ● CARRY OUT Exhaust System Neutralizing in this section. REPAIR as necessary. ● CHECK for noise with vehicle at constant speeds. CYCLE the compressor on

	<ul style="list-style-type: none"> ● Powertrain mounts. 	<p>and off and listen for a change in pitch. REPAIR as necessary. REFER to Section 412-03.</p> <ul style="list-style-type: none"> ● CARRY OUT Powertrain/Drivetrain Mount Neutralizing in this section.
<ul style="list-style-type: none"> ● Sputter type noise—noise worse when cold, lessens or disappears when vehicle is at operating temperature 	<ul style="list-style-type: none"> ● Damaged or worn exhaust system components. 	<ul style="list-style-type: none"> ● INSPECT the exhaust system for leaks or damage. REPAIR as necessary. REFER to Section 309-00.
<ul style="list-style-type: none"> ● Rattling noise—noise from the upper engine (valve train). Worse when engine is cold 	<ul style="list-style-type: none"> ● Low oil level. ● Thin or diluted oil. ● Low oil pressure. ● Worn rocker arms/fulcrums or followers. ● Worn valve guides. ● Excessive runout of valve seats on the valve face. 	<ul style="list-style-type: none"> ● CHECK oil level. FILL as necessary. ● INSPECT the oil for contamination. If oil is contaminated, CHECK for the source. REPAIR as necessary. CHANGE the oil and filter. ● CARRY OUT an oil pressure test. If not within specifications, REPAIR as necessary. REFER to Section 303-00. ● CARRY OUT a valve train analysis. INSTALL new valve train components as necessary. REFER to Section 303-01A for 3.0L engines or Section 303-01B for 3.9L engines. ● CARRY OUT a valve train analysis. INSTALL new valve guides as necessary. REFER to Section 303-01A for 3.0L engines or Section 303-01B for 3.9L engines. ● CARRY OUT a valve seat runout test. INSPECT the valve face and seat. INSTALL new valves as necessary. REFER to Section 303-01A for 3.0L engines or Section 303-01B for 3.9L engines.
<ul style="list-style-type: none"> ● Rattling noise—from the bottom of the vehicle 	<ul style="list-style-type: none"> ● Loose muffler shields or catalytic converter shields. 	<ul style="list-style-type: none"> ● CHECK the exhaust system for loose exhaust shields. REPAIR as necessary.
<ul style="list-style-type: none"> ● Thumping noise—from the bottom of the 	<ul style="list-style-type: none"> ● Exhaust pipe/muffler grounded to chassis. 	<ul style="list-style-type: none"> ● CHECK the exhaust system to chassis clearance. CHECK the exhaust system

<p>vehicle, worse at acceleration</p>		<p>hangers for damage. REPAIR as necessary. REFER to Section 309-00.</p>
<ul style="list-style-type: none"> ● Whoosh—occurs during light vehicle acceleration. Heard inside the vehicle 	<ul style="list-style-type: none"> ● Throttling late, creating turbulence transmitted through the plastic manifold. 	<ul style="list-style-type: none"> ● CHECK for leaks or missing seal in the dash panel.
<ul style="list-style-type: none"> ● Engine vibration—increases intensity as engine rpm is increased 	<ul style="list-style-type: none"> ● Engine out-of-balance. 	<ul style="list-style-type: none"> ● CARRY OUT Neutral Engine Run-Up (NERU) test. ROTATE the torque converter, 120° for 3 bolt and 180° for 4 bolt. INSPECT torque converter pilot outer diameter to crankshaft pilot inner diameter. REPAIR as necessary. REFER to Section 307-01.
<ul style="list-style-type: none"> ● Engine vibration—is felt with increases and decreases in engine rpm 	<ul style="list-style-type: none"> ● Strain on exhaust mounts. ● Damaged or worn powertrain/drivetrain mounts. ● Engine or transmission grounded to chassis. 	<ul style="list-style-type: none"> ● CARRY OUT Exhaust System Neutralizing in this section. REPAIR as necessary. ● CHECK the powertrain/drivetrain mounts for damage. CARRY OUT Powertrain/Drivetrain Mount Neutralizing in this section. REPAIR as necessary. REFER to Section 303-01A for 3.0L engines, Section 303-01B for 3.9L engines, Section 307-01 for automatic transmissions or Section 308-03 for manual transmissions. ● INSPECT the powertrain/drivetrain for correct clearances. REPAIR as necessary. REFER to Section 303-01A for 3.0L engines, Section 303-01B for 3.9L engines, Section 307-01 for automatic transmissions or Section 308-03 for manual transmissions.
<ul style="list-style-type: none"> ● Engine vibration—vibration felt at all times 	<ul style="list-style-type: none"> ● Excessive engine pulley runout. ● Damaged or worn accessory component. 	<ul style="list-style-type: none"> ● CARRY OUT Engine Accessory Test. INSTALL a new engine pulley as necessary. REFER to Section 303-01A for 3.0L engines or Section 303-01B for 3.9L engines. ● CARRY OUT Engine Accessory Test. REPAIR or INSTALL a new component

		as necessary.
<ul style="list-style-type: none"> ● Accelerator pedal vibration—felt through the pedal as a buzz 	<ul style="list-style-type: none"> ● Throttle cable loose or misrouted. 	<ul style="list-style-type: none"> ● INSPECT the throttle cable. REPAIR as necessary. REFER to Section 310-02.
<ul style="list-style-type: none"> ● Engine vibration—mostly at coast/neutral coast. Condition improves with vehicle accelerating 	<ul style="list-style-type: none"> ● Combustion instability. 	<ul style="list-style-type: none"> ● CHECK the ignition system. INSTALL new components as necessary.
<ul style="list-style-type: none"> ● Engine vibration or shudder—occurs with light to medium acceleration above 56 km/h (35 mph) 	<ul style="list-style-type: none"> ● Worn or damaged spark plugs. ● Plugged fuel injector. ● Damaged spark plug wire. ● Contaminated fuel. ● Worn or damaged torque converter. 	<ul style="list-style-type: none"> ● INSPECT the spark plugs for cracks, high resistance or broken insulator. INSTALL a new spark plug (s) as necessary. REFER to Section 303-04A for 3.0L engines or Section 303-04B for 3.9L engines. ● REPAIR or INSTALL a new injector as necessary. ● INSPECT the spark plug wires for damage. INSTALL a new spark plug wire(s) as necessary. ● INSPECT the fuel for contamination. DRAIN the fuel system and refill. REFER to Section 310-01. ● CHECK the torque converter. INSTALL a new torque converter as necessary. REFER to Section 307-01.

Symptom Chart—Idle Noise/Vibration

Condition	Possible Sources	Action
<ul style="list-style-type: none"> ● Idle air control (IAC) valve moan — occurs on throttle tip-out 	<ul style="list-style-type: none"> ● IAC valve is contaminated with oil. 	<ul style="list-style-type: none"> ● GO to Component Tests in this section.
<ul style="list-style-type: none"> ● Accessory drive belt chirp — occurs at idle or high idle, cold or hot. Most common occurrence is during humid weather 	<ul style="list-style-type: none"> ● Accessory drive belt worn, or pulley is misaligned or loose. 	<ul style="list-style-type: none"> ● INSPECT for loose or misaligned pulleys. CHECK the drive belt for wear or damage. INSTALL new pulley(s)/FEAD or drive belt, as necessary. REFER to Section 303-05.
<ul style="list-style-type: none"> ● Accessory drive bearing hoot — occurs at idle or high idle in cold temperatures of approximately +4°C (+40°F) or colder at first start of the day 	<ul style="list-style-type: none"> ● Accessory drive idler or tensioner pulley bearing is experiencing stick/slip between ball bearings and bearing race. 	<ul style="list-style-type: none"> ● Go To Pinpoint Test C.

<ul style="list-style-type: none"> ● Power steering moan — occurs at high idle and possibly at idle during the first cold start of the day in temperatures of approximately -18°C (0°F) or colder. Noise can even be a severe screech for less than one minute in very cold temperatures of approximately -29°C (-20°F) or colder 	<ul style="list-style-type: none"> ● High fluid viscosity, or plugged reservoir screen in power steering reservoir starves pump causing cavitation. 	<ul style="list-style-type: none"> ● Go To Pinpoint Test D .
<ul style="list-style-type: none"> ● Generator whine — during high electrical loads at idle or high idle, a high pitch whine or moan is emitted from the generator 	<ul style="list-style-type: none"> ● Generator electrical field noise. 	<ul style="list-style-type: none"> ● Using an EngineEAR, PROBE near the generator housing. LISTEN for changes in the noise level while changing electrical loads (such as rear defrost, headlamps, etc.). CARRY OUT a generator load test. REFER to Section 414-00 . If the system passes the load test, the noise is from the generator bearings, INSTALL new bearings. If the system fails the load test, INSTALL a new generator. REFER to Section 414-02 .
<ul style="list-style-type: none"> ● Engine-driven cooling fan moan — occurs during the first start of the day. It is most objectionable near idle speeds up to 2000 rpm. The noise increases with rpm 	<ul style="list-style-type: none"> ● The viscous cooling fan clutch engages until the fluid in the clutch reaches normal operating temperature, causing the fan to fully engage. 	<ul style="list-style-type: none"> ● Go To Pinpoint Test E .
<ul style="list-style-type: none"> ● Drumming noise — occurs inside the vehicle during idle or high idle, hot or cold. Very low-frequency drumming is very rpm dependent 	<ul style="list-style-type: none"> ● Exhaust system vibration excites the body resonances inducing interior noise. ● Engine vibration excites the body resonances inducing interior noise. 	<ul style="list-style-type: none"> ● Go To Pinpoint Test F .
<ul style="list-style-type: none"> ● Hissing noise — occurs during idle or high idle that is apparent with the hood open 	<ul style="list-style-type: none"> ● Vacuum leak or idle air control (IAC) valve flow noise. 	<ul style="list-style-type: none"> ● Use the Ultrasonic Leak Detector/EngineEAR to locate the source. Scan the air intake system from the inlet to each cylinder intake port. DISCARD the leaking parts, and INSTALL a new

	<ul style="list-style-type: none"> ● Vehicles with a plastic intake manifold. 	<p>component.</p> <ul style="list-style-type: none"> ● Acceptable condition. Some plastic manifolds exhibit this noise, which is the effect of the plastic manifold.
<ul style="list-style-type: none"> ● Automatic transmission buzz or hiss 	<ul style="list-style-type: none"> ● Incorrect driveline angles. ● Worn or damaged main control solenoids or valves. 	<ul style="list-style-type: none"> ● CHECK for correct driveline angles. REPAIR as necessary. REFER to Section 205-00. ● Using a transmission tester, activate the solenoids to duplicate sound. INSTALL new components as necessary. REFER to Section 307-01.
<ul style="list-style-type: none"> ● Manual Transmission Clutch throw-out bearing whine. A change in noise pitch or loudness while depressing the clutch pedal 	<ul style="list-style-type: none"> ● Worn throw-out bearing. 	<ul style="list-style-type: none"> ● INSTALL a new throw-out bearing. REFER to Section 308-01.
<ul style="list-style-type: none"> ● Heating, vacuum and air conditioning (HVAC) system chirp — most audible inside the vehicle. Listen for a change in noise pitch or loudness while changing the HVAC system blower speed 	<ul style="list-style-type: none"> ● Damaged or worn HVAC blower bearing. 	<ul style="list-style-type: none"> ● INSTALL a new blower motor. REFER to Section 412-02.
<ul style="list-style-type: none"> ● Air conditioning (A/C) clutch ticking — occurs when the compressor clutch engages 	<ul style="list-style-type: none"> ● Acceptable noise. ● Incorrect air gap. 	<ul style="list-style-type: none"> ● LISTEN to the clutch to determine if the noise occurs with clutch engagement. A small amount of noise is acceptable. If the noise is excessive, CHECK the A/C clutch air gap. INSPECT the A/C clutch for wear or damage. INSTALL a new clutch as necessary. REFER to Section 412-03.
<ul style="list-style-type: none"> ● Intermittent rattle, or scraping/rubbing noise 	<ul style="list-style-type: none"> ● Loose exhaust heat shield(s). ● Wiring, hose or other part interfering with accessory drive belt or pulley. 	<ul style="list-style-type: none"> ● INSPECT the exhaust system for loose parts using a glove or clamps to verify cause. REPAIR as necessary. REFER to Section 309-00. ● INSPECT accessory drive system closely verifying there is adequate clearance to all rotating components. REPAIR as necessary.
<ul style="list-style-type: none"> ● Engine ticking or knocking noise — occurs during idle or high idle during the first cold start of the 	<ul style="list-style-type: none"> ● Piston noise or valvetrain noise (bled down lifter/lash adjuster). 	<ul style="list-style-type: none"> ● Go To Pinpoint Test G.

day		
<ul style="list-style-type: none"> ● A continuous, speed-dependent rattle from the engine — occurs during idle or high idle during the first cold start of the day and disappears as the engine warms up 	<ul style="list-style-type: none"> ● Piston noise or valvetrain noise (bled down lifter/lash adjuster). 	<ul style="list-style-type: none"> ● Go To Pinpoint Test G.
<ul style="list-style-type: none"> ● Idle vibration—a low-frequency vibration (5-20 Hz) or mild shake that is felt through the seat/floorpan 	<ul style="list-style-type: none"> ● Cylinder misfire. ● Engine or torque converter out of balance. 	<ul style="list-style-type: none"> ● Using a scan tool, CHECK the ignition system. CARRY OUT a cylinder power test. REFER to Section 303-00. ● VERIFY the torque converter to crankshaft pilot clearance is correct, REPAIR as necessary. RE-INDEX the torque converter on the flex plate by 120° on a 3 bolt converter or 180° for a 4 bolt converter. REFER to Section 307-01. RETEST the vehicle.
<ul style="list-style-type: none"> ● Idle vibration—a high-frequency vibration (20–80 Hz) or buzz, that is felt through the steering wheel or seat 	<ul style="list-style-type: none"> ● Exhaust system mounts bound up. ● Body mounts loose. ● Power steering lines grounded out. 	<ul style="list-style-type: none"> ● VERIFY concern occurs at engine firing frequency. CHECK that the exhaust system vibrates at the same frequency as the engine. ADD 9–14 km (20–30 lb.) to the tail pipe to test. CARRY OUT Exhaust System Neutralizing in this section. ● INSPECT the body mounts. CARRY OUT a Neutral Engine Run-Up (NERU) Test. REPAIR as necessary. REFER to Section 303-01A for 3.0L engines or Section 303-01B for 3.9L engines. ● INSPECT that the power steering lines are not contacting the chassis or each other. REPAIR as necessary.

Symptom Chart—Squeak and Rattle

Condition	Possible Sources	Action
<ul style="list-style-type: none"> ● Squeak—heard inside the vehicle when closing/opening the door 	<ul style="list-style-type: none"> ● Insufficient lubrication on the door hinge or check strap. ● Internal door components loose, rubbing or misaligned. 	<ul style="list-style-type: none"> ● LUBRICATE the hinge or check strap. ● CHECK the inside of the door. TIGHTEN or ALIGN as necessary. USE the Rotunda Squeak and Rattle Kit to isolate

		any rubbing components.
<ul style="list-style-type: none"> ● Squeak—heard inside the vehicle when closing/opening the window 	<ul style="list-style-type: none"> ● Worn or damaged glass run/channel. 	<ul style="list-style-type: none"> ● REPAIR or INSTALL a new glass run/channel. REFER to Section 501-11.
<ul style="list-style-type: none"> ● Squeak—heard outside of vehicle when closing/opening the door 	<ul style="list-style-type: none"> ● Exhaust shield rubbing against the chassis or exhaust pipe. 	<ul style="list-style-type: none"> ● CHECK the exhaust system. REPAIR as necessary. REFER to Section 309-00.
<ul style="list-style-type: none"> ● Squeak—occurs with initial brake pedal application 	<ul style="list-style-type: none"> ● Disc brake pads. 	<ul style="list-style-type: none"> ● Under certain conditions, asbestos free pads can generate a squeak noise. This noise is normal and does not indicate a concern.
<ul style="list-style-type: none"> ● Squeak—a constant noise that occurs with brake pedal applications 	<ul style="list-style-type: none"> ● Damaged or worn disc brake pads. 	<ul style="list-style-type: none"> ● INSPECT the pads for oil, grease or brake fluid contamination. CHECK for glazed linings. A brake disc with hard spots will also cause a squeak type noise. REPAIR or INSTALL new pads as necessary. REFER to Section 206-03 for front disc brakes or Section 206-04 for rear disc brakes.
<ul style="list-style-type: none"> ● Squeak—noise occurs over bumps or when turning 	<ul style="list-style-type: none"> ● Worn control arm bushings. ● Worn or damaged shock absorber/strut. 	<ul style="list-style-type: none"> ● INSPECT the control arm bushings. Spray with lubricant and CARRY OUT a "bounce test" to determine which bushing. REPAIR as necessary. REFER to Section 204-01 for the front suspension or Section 204-02 for the rear suspension. ● INSPECT the shock absorber for damage. CARRY OUT a "bounce test" to isolate the noise. INSTALL a new shock absorber/strut as necessary. REFER to Section 204-01 for the front shock absorber/strut or Section 204-02 for the rear shock absorber/strut.
<ul style="list-style-type: none"> ● Rattle—heard when closing/opening the door or window 	<ul style="list-style-type: none"> ● Loose internal door mechanism, bracket or attachment. 	<ul style="list-style-type: none"> ● REPEAT the motion or CARRY OUT a "tap test" to duplicate the noise. INSPECT the door for loose components. TIGHTEN loose components or USE the Rotunda Squeak and Rattle Kit to isolate any rattling components.
<ul style="list-style-type: none"> ● Squeak or rattle—heard inside the vehicle over rough roads/bumps 	<ul style="list-style-type: none"> ● Misaligned glove compartment door/hinge. ● Instrument panel trim loose or misaligned. 	<ul style="list-style-type: none"> ● ALIGN the glove compartment door. ● INSPECT the instrument panel trim for missing or loose clips or screws. REPAIR as necessary.

	<ul style="list-style-type: none"> ● Loose interior component or trim. 	<ul style="list-style-type: none"> ● CARRY OUT a "touch test". ELIMINATE the noise by pressing or pulling on interior trim and components. USE the Rotunda Squeak and Rattle Kit to isolate any rattling/squeaking components.
<ul style="list-style-type: none"> ● Squeak or rattle—noise with a vibration concern 	<ul style="list-style-type: none"> ● Damaged or worn body mounts. ● Damaged or worn sub-frame mounts. 	<ul style="list-style-type: none"> ● INSPECT the upper and lower absorbers and washers for damage or wear. CHECK the body mount brackets for damage. CHECK the nuts and bolts are tightened to specifications. TIGHTEN as necessary. ● INSPECT the upper and lower absorbers for damage or wear. CHECK the sub-frame for damage. CHECK the nuts and bolts are tightened to specifications. TIGHTEN as necessary.

Symptom Chart—Steering Noise/Vibration

Condition	Possible Sources	Action
<ul style="list-style-type: none"> ● Steering grunt or shudder — occurs when turning into or out of a turn at low speeds (temperature sensitive) 	<ul style="list-style-type: none"> ● Steering gear or power steering hoses. 	<ul style="list-style-type: none"> ● GO to Steering Gear Grunt/Shudder Test component test in this section.
<ul style="list-style-type: none"> ● Steering System clonk—hydraulic knocking sound 	<ul style="list-style-type: none"> ● Air in the steering hydraulic system. 	<ul style="list-style-type: none"> ● PURGE the air from the system. REFER to Section 211-00. CHECK for leaks in the system.
<ul style="list-style-type: none"> ● Power steering pump moan — loud humming noise occurs when the steering wheel is rotated to the stop position. Produces a 120-600 Hz frequency that changes with rpm. 	<ul style="list-style-type: none"> ● Power steering hose grounded out to chassis. ● Aerated fluid. ● Steering gear isolators. ● Low fluid. 	<ul style="list-style-type: none"> ● INSPECT the power steering hoses. REPAIR as necessary. ● PURGE the air from the system. REFER to Section 211-00. CHECK for leaks in the system. ● INSPECT the isolators for wear or damage. REPAIR as necessary. ● CHECK the fluid level. REFILL as necessary.

	<ul style="list-style-type: none"> ● Power steering pump brackets loose or misaligned. 	<ul style="list-style-type: none"> ● CHECK bolts, brackets and bracket alignment. TIGHTEN bolts to specification. REPAIR or INSTALL new brackets as necessary. REFER to Section 211-02.
<ul style="list-style-type: none"> ● Steering gear clunk — occurs only while cornering over a bump (can be temperature sensitive) 	<ul style="list-style-type: none"> ● Steering gear. 	<ul style="list-style-type: none"> ● INSPECT the steering gear for loose mounting bolts. TIGHTEN as necessary. REFER to Section 211-02.
<ul style="list-style-type: none"> ● Feedback (rattle, chuckle or knocking noise in the steering gear) — a condition where roughness is felt in the steering wheel when the vehicle is driven over rough surfaces 	<ul style="list-style-type: none"> ● Column intermediate/flexible shaft joints damaged or worn. ● Loose, damaged or worn tie-rod ends. ● Steering gear insulators or mounting bolts loose or damaged. ● Steering column intermediate shaft bolts are loose. ● Steering column damaged or worn. ● Loose suspension bushings, bolts or ball joints. 	<ul style="list-style-type: none"> ● INSTALL a new intermediate/flexible shaft. REFER to Section 211-04. ● TIGHTEN the nuts to specification or INSTALL new tie-rod ends as necessary. REFER to Section 211-02. ● TIGHTEN the bolts or INSTALL new bolts as necessary. REFER to Section 211-02. ● TIGHTEN the bolts to specification. REFER to Section 211-04. ● REPAIR or INSTALL a new steering column as necessary. REFER to Section 211-04. ● INSPECT the suspension system. TIGHTEN or INSTALL new components as necessary. REFER to Section 204-01.
<ul style="list-style-type: none"> ● Feedback (nibble at the steering wheel) — a condition where slight rotational movement is felt in the steering wheel when the vehicle is driven over rough or grooved surfaces 	<ul style="list-style-type: none"> ● Lateral runout in the tire or wheel. 	<ul style="list-style-type: none"> ● Go To Pinpoint Test H.

	<ul style="list-style-type: none"> ● Yoke spring in the steering gear. 	<ul style="list-style-type: none"> ● CHECK TSBs for revised yoke spring for applicable vehicles.
<ul style="list-style-type: none"> ● Accessory drive belt squeal/chirp—when rotating the steering wheel from stop to stop 	<ul style="list-style-type: none"> ● Loose or worn accessory drive belt. 	<ul style="list-style-type: none"> ● ADJUST or INSTALL a new accessory belt as necessary. REFER to Section 303-05.
<ul style="list-style-type: none"> ● Power steering gear hiss 	<ul style="list-style-type: none"> ● Steering column intermediate/flexible shaft-to-steering gear is binding or misaligned. ● Grounded or loose steering column boot at the dash panel. ● Damaged or worn steering gear input shaft and valve. 	<ul style="list-style-type: none"> ● REPAIR or INSTALL a new intermediate/flexible shaft as necessary. REFER to Section 211-04. ● REPAIR as necessary. ● REPAIR or INSTALL a new steering gear as necessary. REFER to Section 211-02.
<ul style="list-style-type: none"> ● Steering column rattle 	<ul style="list-style-type: none"> ● Loose bolts or attaching brackets. ● Loose, worn or insufficiently lubricated column bearings. ● Steering shaft insulators damaged or worn. ● Intermediate/flexible shaft compressed or extended. 	<ul style="list-style-type: none"> ● TIGHTEN the bolts to specifications. ● LUBRICATE or INSTALL new steering column bearings as necessary. REFER to Section 211-04. ● INSTALL new insulators. REFER to Section 211-04. ● INSPECT the rubber spider coupling for damage. INSTALL a new intermediate/flexible shaft. REFER to Section 211-04.
<ul style="list-style-type: none"> ● Steering column squeak or cracks 	<ul style="list-style-type: none"> ● Insufficient lubricated steering shaft bushings. ● Loose or misaligned steering column shrouds. ● Steering wheel rubbing against steering column shrouds. ● Insufficient lubricated speed control slip ring. ● Upper or lower bearing sleeve out of position. 	<ul style="list-style-type: none"> ● LUBRICATE the steering shaft and shaft tube seals. ● TIGHTEN or ALIGN the steering column shrouds. ● REPOSITION the steering column shrouds. ● LUBRICATE the speed control slip ring. ● REPOSITION the bearing sleeves.
<ul style="list-style-type: none"> ● Power steering pump noisy 	<ul style="list-style-type: none"> ● Incorrect assembly of components. ● Imperfections on the outside diameter or end surface of the power steering pump 	<ul style="list-style-type: none"> ● REPAIR or INSTALL a new power steering pump as necessary. REFER to Section 211-02.

	<ul style="list-style-type: none"> rotor. ● Damaged or worn power steering pump rotor splines. ● A crack on the inner surface of the power steering pump cam. ● Interference between the power steering pump rotor and cam. ● Damaged or worn power steering pump rotor and pressure plates. 	
<ul style="list-style-type: none"> ● Power steering pump swish noise 	<ul style="list-style-type: none"> ● Power steering fluid flow into the bypass valve of the pump valve housing with fluid temperature below 54° C (130°F). 	<ul style="list-style-type: none"> ● Acceptable condition.
<ul style="list-style-type: none"> ● Power steering pump whine noise 	<ul style="list-style-type: none"> ● Aerated fluid. ● Damaged power steering pump cam. ● Damaged valve cover O-ring seal. 	<ul style="list-style-type: none"> ● CHECK for a leak in the system. PURGE the air from the system. REFER to Section 211-00. ● REPAIR or INSTALL a new power steering pump as necessary. REFER to Section 211-02. ● REPAIR or INSTALL a new power steering pump as necessary. REFER to Section 211-02.
<ul style="list-style-type: none"> ● Power steering pump clicking (mechanical) noise 	<ul style="list-style-type: none"> ● Power steering pump rotor slippers too long, excessive rotor slipper-to-slot clearance or damaged or worn rotor assembly. 	<ul style="list-style-type: none"> ● REPAIR or INSTALL a new power steering pump as necessary. REFER to Section 211-02.
<ul style="list-style-type: none"> ● Power steering pump clatter noise 	<ul style="list-style-type: none"> ● Damaged corners on the outside diameter or the power steering rotor or distorted rotor slipper ring. 	<ul style="list-style-type: none"> ● REPAIR or INSTALL a new power steering pump as necessary. REFER to Section 211-02.

Symptom Chart—Suspension Noise/Vibration

Condition	Possible Sources	Action
<ul style="list-style-type: none"> ● Squeak or grunt—noise from the front suspension, occurs more in cold ambient temperatures. More noticeable over rough roads or when turning 	<ul style="list-style-type: none"> ● Front stabilizer bar insulators. 	<ul style="list-style-type: none"> ● Under these conditions, the noise is acceptable. CHECK TSBs for applicable vehicle.
<ul style="list-style-type: none"> ● Clunk—noise from the front suspension, occurs 	<ul style="list-style-type: none"> ● Loose front struts or shocks. 	<ul style="list-style-type: none"> ● INSPECT for loose nuts or bolts. TIGHTEN to

in and out of turns		specifications. REFER to Section 204-01 .
<ul style="list-style-type: none"> ● Clunk—noise from the rear suspension, occurs when shifting from reverse to drive 	<ul style="list-style-type: none"> ● Loose rear suspension components. 	<ul style="list-style-type: none"> ● INSPECT for loose or damaged rear suspension components. REPAIR or INSTALL new components as necessary. REFER to Section 204-02.
<ul style="list-style-type: none"> ● Click or pop—noise from the front suspension. More noticeable over rough roads or over bumps 	<ul style="list-style-type: none"> ● Worn or damaged ball joints. 	<ul style="list-style-type: none"> ● CARRY OUT a ball joint inspection. INSTALL new ball joints or control arms as necessary. REFER to Section 204-01.
<ul style="list-style-type: none"> ● Click or pop (FWD vehicles)—noise occurs when vehicle is turning 	<ul style="list-style-type: none"> ● Worn or damaged ball joints. 	<ul style="list-style-type: none"> ● CARRY OUT a ball joint inspection. INSTALL new ball joints or control arms as necessary.
<ul style="list-style-type: none"> ● Click or snap—occurs when accelerating around a corner 	<ul style="list-style-type: none"> ● Damaged or worn outboard CV joint. 	<ul style="list-style-type: none"> ● INSPECT the outboard CV joint and boot. REPAIR or INSTALL a new CV joint as necessary. REFER to Section 205-05.
<ul style="list-style-type: none"> ● Front suspension noise—a squeak, creak or rattle noise. Occurs mostly over bumps or rough roads 	<ul style="list-style-type: none"> ● Steering components. ● Loose or bent front struts or shock absorbers. ● Damaged spring or spring mounts. ● Damaged or worn control/radius arm bushings. ● Worn or damaged stabilizer bar bushings or links. 	<ul style="list-style-type: none"> ● Go To Pinpoint Test H.
<ul style="list-style-type: none"> ● Rear suspension noise—a squeak, creak or rattle noise. Occurs mostly over bumps or rough roads 	<ul style="list-style-type: none"> ● Loose or bent rear shock absorbers. ● Damaged spring or spring mounts. ● Damaged or worn control arm bushings. ● Worn or damaged stabilizer bar bushings or links. 	<ul style="list-style-type: none"> ● Go To Pinpoint Test I.
<ul style="list-style-type: none"> ● Shudder—occurs during acceleration from a slow 	<ul style="list-style-type: none"> ● Rear drive axle assembly 	<ul style="list-style-type: none"> ● CHECK the axle mounts and the rear suspension

speed or stop	<p>mispositioned.</p> <ul style="list-style-type: none"> ● Incorrect or high CV joint operating angle. ● Damaged or worn front suspension components. 	<p>for damage or wear. REPAIR as necessary. REFER to Section 204-02.</p> <ul style="list-style-type: none"> ● CHECK vehicle ride height is within limits. REPAIR as necessary. REFER to Section 204-00. ● CHECK for a loose stabilizer bar, damaged or loose strut/strut bushings or loose or worn ball joints. INSPECT the steering linkage for wear or damage. REPAIR or INSTALL new components as necessary.
<ul style="list-style-type: none"> ● Shimmy—most noticeable on coast/deceleration. Also hard steering condition 	<ul style="list-style-type: none"> ● Excessive positive caster. 	<ul style="list-style-type: none"> ● CHECK the caster alignment angle. CORRECT as necessary. REFER to Section 204-00.

Symptom Chart—Tire Noise/Vibration

Condition	Possible Sources	Action
<ul style="list-style-type: none"> ● Tire noise—hum/moan at constant speeds 	<ul style="list-style-type: none"> ● Abnormal wear patterns. 	<ul style="list-style-type: none"> ● SPIN the tire and CHECK for tire wear. INSTALL a new tire as necessary. INSPECT for damaged/worn suspension components. CARRY OUT wheel alignment.
<ul style="list-style-type: none"> ● Tire noise—noise tone lowers as the vehicle speed is lowered 	<ul style="list-style-type: none"> ● Out-of-balance tire. 	<ul style="list-style-type: none"> ● BALANCE the tire and road test. INSTALL a new tire as necessary. REFER to Section 204-04.
<ul style="list-style-type: none"> ● Tire noise — ticking noise, changes with speed 	<ul style="list-style-type: none"> ● Nail puncture or stone in tire tread. 	<ul style="list-style-type: none"> ● INSPECT the tire. REPAIR as necessary.
<ul style="list-style-type: none"> ● Wheel and tire—vibration and noise concern is directly related to vehicle speed and is not affected by acceleration, coasting or decelerating 	<ul style="list-style-type: none"> ● Damaged or worn tire. 	<ul style="list-style-type: none"> ● Go To Pinpoint Test J.
<ul style="list-style-type: none"> ● Tire wobble or shudder — occurs at lower speeds 	<ul style="list-style-type: none"> ● Damaged wheel bearings. ● Damaged wheel. 	<ul style="list-style-type: none"> ● SPIN the tire and CHECK for abnormal wheel bearing play or roughness. ADJUST or INSTALL new wheel bearings as necessary. REFER to Section 204-01. ● INSPECT the wheel for

	<ul style="list-style-type: none"> ● Damaged or worn suspension components. ● Loose wheel nuts. ● Damaged or uneven tire wear. 	<p>damage. INSTALL a new wheel as necessary. REFER to Section 204-04.</p> <ul style="list-style-type: none"> ● INSPECT the suspension components for wear or damage. REPAIR as necessary. ● CHECK the wheel nuts. TIGHTEN to specification. REFER to Section 204-04. ● SPIN the tire and CHECK for abnormal tire wear or damage. INSTALL a new tire as necessary. REFER to Section 204-04.
<ul style="list-style-type: none"> ● Tire shimmy or shake— occurs at lower speeds 	<ul style="list-style-type: none"> ● Wheel/tire out of balance. ● Uneven tire wear. ● Excessive radial runout of wheel or tire. ● Worn or damaged wheel studs or elongated stud holes. ● Excessive lateral runout of the wheel or tire. ● Foreign material between the brake disc and hub or in the brake disc fins. 	<ul style="list-style-type: none"> ● BALANCE the wheel/tire assembly. ● CHECK for abnormal tire wear. INSTALL a new tire as necessary. REFER to Section 204-04. ● CARRY OUT a radial runout test of the wheel and tire. INSTALL a new tire as necessary. REFER to Section 204-04. ● INSPECT the wheel studs and wheels. INSTALL new components as necessary. REFER to Section 204-01 for the front wheels or Section 204-02 for the rear wheels. ● CARRY OUT a lateral runout test of the wheel and tire. CHECK the wheel, tire and hub. REPAIR or INSTALL new components as necessary. REFER to Section 204-04. ● CLEAN the mounting surfaces of the brake disc and hub. CHECK the brake disc fins for material.
<ul style="list-style-type: none"> ● High speed shake or shimmy—occurs at high speeds 	<ul style="list-style-type: none"> ● Excessive wheel hub runout. ● Damaged or worn tires. ● Damaged or worn wheel bearings. ● Worn or damaged suspension or 	<ul style="list-style-type: none"> ● Go To Pinpoint Test K.

	steering linkage components. ● Brake disc or drum imbalance.	
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Symptom Chart—Transmission (Manual) Noise/Vibration

Condition	Possible Sources	Action
● Clutch rattling noise—occurs with clutch engaged, noise changes/disappears with clutch pedal depressed	● Flywheel bolts, clutch housing bolts or clutch pressure plate bolts loose.	● TIGHTEN the bolts to specifications. CHECK the bolts for damage. REFER to Section 308-01 .
● Clutch squeaking noise—noise is heard when the clutch is operated. Vehicle moves slowly or creeps when the clutch is disengaged. Can also be difficult to shift into first and reverse gear	● Pilot bearing seized or damaged.	● INSTALL a new pilot bearing. REFER to Section 308-01 .
● Clutch squeaking noise—occurs with clutch pedal depressed/released	● Worn clutch pedal shaft or bushings.	● INSPECT the clutch pedal for wear or damage. REPAIR as necessary. REFER to Section 308-02 .
● Clutch whirring/rattle noise—occurs when clutch pedal is depressed	● Worn, damaged or misaligned clutch release bearing.	● INSTALL a new clutch release bearing. REFER to Section 308-01 .
● Clutch grating/grinding noise—occurs when clutch pedal is depressed	● Clutch pressure plate fingers bent or worn. ● Contact surface of clutch release bearing worn or damaged.	● INSPECT the clutch pressure plate release fingers. INSTALL a new pressure plate as necessary. REFER to Section 308-01 . ● INSTALL a new clutch release bearing. REFER to Section 308-01 .
● Clutch chatter—a small amount of noise when clutch pedal is released at initial take-off	● Clutch engagement.	● Acceptable operating condition.
● Clutch chatter/grabs—in some cases a shudder is felt. Occurs with clutch pedal depressed/released	● Damaged or worn powertrain/driveline mounts.	● INSPECT the powertrain/drivetrain mounts. CARRY OUT Powertrain/Drivetrain Mount Neutralizing in this section. INSTALL new mounts as necessary. REFER to Section 303-01A for 3.0L engines, Section 303-01B for 3.9L

	<ul style="list-style-type: none"> ● Binding or dragging plunger of the clutch master cylinder or slave cylinder. ● Grease or oil on the clutch disc facing. ● Clutch disc surface glazed or damaged. ● Damaged or worn clutch pressure plate. ● Flywheel surface damaged or glazed. 	<p>engines or Section 308-03.</p> <ul style="list-style-type: none"> ● CHECK the master and slave cylinder operation. INSPECT the components for damage or wear. INSTALL a new master or slave cylinder as necessary. REFER to Section 308-02. ● CHECK the input shaft seal and rear main oil seal. REPAIR as necessary. INSTALL a new clutch disc. REFER to Section 308-01. ● INSPECT the clutch disc surface for a glazed, hardened or damage condition. CARRY OUT a disc check. INSTALL a new clutch disc as necessary. REFER to Section 308-01. ● INSPECT the clutch pressure plate for wear or damage. INSTALL a new clutch pressure plate as necessary. REFER to Section 308-01. ● INSPECT the flywheel for damage or wear. CARRY OUT a flywheel runout check. INSTALL a new flywheel as necessary. REFER to Section 308-01.
<ul style="list-style-type: none"> ● Clutch chatter noise—noise when clutch pedal is released at initial take-off. Clutch is hard to engage and disengage 	<ul style="list-style-type: none"> ● Pilot bearing worn, damaged or not correctly aligned in bore. 	<ul style="list-style-type: none"> ● INSPECT the clutch pressure plate release fingers for uneven wear, clutch components burnt or a seized pilot bearing. INSTALL a new pilot bearing as necessary. REFER to Section 308-01.
<ul style="list-style-type: none"> ● Clutch vibration 	<ul style="list-style-type: none"> ● Loose flywheel bolts. ● Damaged or loose clutch pressure plate. ● Excessive flywheel runout. 	<ul style="list-style-type: none"> ● Go To Pinpoint Test L.
<ul style="list-style-type: none"> ● Transmission rattling/clattering noise—noise at idle or on light acceleration 	<ul style="list-style-type: none"> ● Gearshift lever joint worn or damaged. 	<ul style="list-style-type: none"> ● INSTALL a new gearshift lever. REFER to Section 308-03.

<p>from a stop. Gear selection difficult</p>	<ul style="list-style-type: none"> ● Gearshift lever loose. ● Gearshift linkage rods worn or damaged. 	<ul style="list-style-type: none"> ● TIGHTEN the bolts to specification. REFER to Section 308-03. ● CHECK the linkage bushings for wear. INSTALL new linkage rods as necessary. REFER to Section 308-03.
<ul style="list-style-type: none"> ● Transmission rattling/clattering noise—occurs in neutral or in gear, at idle 	<ul style="list-style-type: none"> ● Incorrect fluid level or fluid quality. 	<ul style="list-style-type: none"> ● CHECK that the transmission is filled to the correct level and with the specified fluid. REFER to Section 308-03.
<ul style="list-style-type: none"> ● Transmission rattling/clattering noise—noise at idle in neutral 	<ul style="list-style-type: none"> ● Worn or rough reverse idler gear. ● Rough running engine, cylinder misfire. ● Excessive backlash in gears ● Worn countershaft gears. 	<ul style="list-style-type: none"> ● CHECK the reverse idler gear. REPAIR as necessary. REFER to Section 308-03. ● CHECK the ignition system. CARRY OUT a cylinder power test. REFER to Section 308-03. ● CHECK the gear backlash. ADJUST as necessary. REFER to Section 308-03. ● REPAIR as necessary. REFER to Section 308-03.
<ul style="list-style-type: none"> ● Transmission whine—a mild whine at extreme speeds or high rpm 	<ul style="list-style-type: none"> ● Rotating gears/geartrain. 	<ul style="list-style-type: none"> ● Acceptable noise.
<ul style="list-style-type: none"> ● Transmission whine—a high pitched whine, also described as a squeal 	<ul style="list-style-type: none"> ● Transmission gears are worn (high mileage vehicle). ● Mismatched gear sets. ● Damaged or worn transmission bearing. 	<ul style="list-style-type: none"> ● Result of normal gear wear. REPAIR as necessary. REFER to Section 308-03. ● INSPECT the gear sets for an uneven wear pattern on the face of the gear teeth. REPAIR as necessary. REFER to Section 308-03. ● INSPECT the transmission bearings. INSTALL new bearings as necessary. REFER to Section 308-03.
<ul style="list-style-type: none"> ● Transmission growling/humming—noise occurs in the forward gears. The noise is more prominent when the 	<ul style="list-style-type: none"> ● Gear is cracked, chipped or rough. 	<ul style="list-style-type: none"> ● INSPECT the transmission gears for damage or wear. INSTALL new gears as necessary. REFER to Section 308-03.

gear is loaded. The problem gear can be located as the noise occurs in a specific gear position		
<ul style="list-style-type: none"> ● Transmission hissing—noise in neutral or in forward gears. As bearings wear or break up, the noise changes to a thumping noise 	<ul style="list-style-type: none"> ● Damaged or worn bearings. 	<ul style="list-style-type: none"> ● INSPECT the transmission bearings. INSTALL new bearings as necessary. REFER to Section 308-03.
<ul style="list-style-type: none"> ● Transmission knocking/thudding—noise at low speeds in forward gears 	<ul style="list-style-type: none"> ● Bearings with damaged balls or rollers or with pitted and spalled races. 	<ul style="list-style-type: none"> ● INSPECT the transmission bearings. INSTALL new bearings as necessary. REFER to Section 308-03.
<ul style="list-style-type: none"> ● Transmission rumble/growl—noise at higher speeds in forward gears, more pronounced in a coast/deceleration condition 	<ul style="list-style-type: none"> ● Incorrect driveline angle. ● Driveshaft out of balance or damaged. 	<ul style="list-style-type: none"> ● CHECK the driveline angle. REPAIR as necessary. REFER to Section 205-00. ● CHECK the driveshaft for damage, missing balance weights or undercoating. Using the vibration analyzer (VA). CHECK the driveshaft balance. CARRY OUT a driveline vibration test. REFER to Section 205-01. REPAIR as necessary.
<ul style="list-style-type: none"> ● Transmission rumble/growl—noise at all speeds in forward gears, more pronounced in a heavy acceleration condition 	<ul style="list-style-type: none"> ● Damaged or worn transmission bearing or gears (high mileage vehicles). 	<ul style="list-style-type: none"> ● CHECK transmission fluid for excessive metal particles. REPAIR as necessary. REFER to Section 308-03.

Symptom Chart—Transmission (Automatic) Noise/Vibration

Condition	Possible Sources	Action
<ul style="list-style-type: none"> ● Rattle—occurs at idle or at light acceleration from a stop 	<ul style="list-style-type: none"> ● Damaged engine or transmission mounts. ● A loose front exhaust pipe heat shield. ● Loose inspection plate or dust cover plate. ● Loose flexplate to converter nuts. 	<ul style="list-style-type: none"> ● CHECK the powertrain/drivetrain mounts for damage. CARRY OUT Powertrain/Drivetrain Mount Neutralizing in this section. ● REPAIR or INSTALL a new heat shield as necessary. ● CHECK for loose bolts. TIGHTEN to specifications. REFER to Section 307-01. ● CHECK for loose nuts. TIGHTEN to specifications. REFER to Section 307-01.

<ul style="list-style-type: none"> ● Whine—pitch increases with vehicle speed. Starts in first and second gear, decreases or goes away at higher gears. 	<ul style="list-style-type: none"> ● Damaged or worn low one-way clutch. ● Damaged or worn intermediate one-way clutch. ● Friction elements. ● Damaged or worn planetary or sun gear. 	<ul style="list-style-type: none"> ● INSPECT the transmission for wear or damage. REPAIR or INSTALL new components as necessary. REFER to Section 307-01.
<ul style="list-style-type: none"> ● Whine—the pitch changes with engine speed 	<ul style="list-style-type: none"> ● A worn or damaged accessory drive component. ● Incorrect fluid level. ● Partially blocked filter. ● Worn or damaged torque converter. ● Worn or damaged front pump. 	<ul style="list-style-type: none"> ● CARRY OUT the Engine Accessory Test. REPAIR or INSTALL new components as necessary. ● CHECK that the transmission is filled to the correct level. ADD fluid as necessary. REFER to Section 307-01. ● INSPECT the filter. CLEAN or INSTALL a new filter as necessary. REFER to Section 307-01. ● CARRY OUT the torque converter service and replacement check. REFER to Section 307-01. ● INSPECT the front pump. INSTALL a new front pump as necessary. REFER to Section 307-01.
<ul style="list-style-type: none"> ● Whine—pitch changes with vehicle speed 	<ul style="list-style-type: none"> ● Speedometer cable or gears. 	<ul style="list-style-type: none"> ● REPAIR or INSTALL new cables or gears as necessary. REFER to the appropriate workshop manual for the service procedures.
<ul style="list-style-type: none"> ● Whine/roan type noise—pitch increases or changes with vehicle speed 	<ul style="list-style-type: none"> ● Damaged engine or transmission mount. ● U-joints worn or damaged. ● Damaged or worn differential ring and pinion. ● Planetary gears nicked or chipped. 	<ul style="list-style-type: none"> ● CHECK the powertrain/drivetrain mounts for damage. CARRY OUT Powertrain/Drivetrain Mount Neutralizing in this section. ● INSPECT the U-joints for wear or damage. INSTALL new U-joints as necessary. REFER to Section 205-01. ● INSPECT the differential ring and pinion for damage. CARRY OUT the Checking Tooth Contact Pattern and Condition of the Ring and Pinion component test in this section. REPAIR or INSTALL a new differential ring and pinion as necessary. REFER to Section 205-02. ● CHECK the planetary gears for damage. INSTALL new components as necessary. REFER to Section 307-01.

<ul style="list-style-type: none"> ● Whistle—noise is high pitched, constant. Changes in pitch with throttle position 	<ul style="list-style-type: none"> ● Hydraulic pressure in the main control. ● Incorrect band/clutch apply pressure. ● Worn or damaged torque converter. 	<ul style="list-style-type: none"> ● INSPECT the main control. REPAIR or INSTALL new components as necessary. REFER to Section 307-01. ● CARRY OUT the line pressure tests. REPAIR or INSTALL components as necessary. REFER to Section 307-01. ● CARRY OUT the torque converter service and replacement check. REFER to Section 307-01.
<ul style="list-style-type: none"> ● Clunk—occurs when shifting from PARK to a drive or reverse position 	<ul style="list-style-type: none"> ● Damaged powertrain mounts. ● Damaged or worn pinion bearings. ● Worn or galled driveshaft slip yoke splines. ● Worn friction elements or excessive clutch pack end plate play. 	<ul style="list-style-type: none"> ● INSPECT the powertrain mounts for damage. INSTALL new mounts as necessary. REFER to Section 303-01A for 3.0L engines, Section 303-01B for 3.9L engines or Section 307-01. ● CHECK for abnormal bearing play or roughness. INSTALL new bearings as necessary. REFER to Section 205-02. ● CLEAN and INSPECT the splines of the yoke. INSTALL a new slip yoke as necessary. REFER to Section 205-01. ● INSPECT the transmission for wear. CHECK that all end play and clearances are within specification. REPAIR or INSTALL new components as necessary. REFER to Section 307-01.
<ul style="list-style-type: none"> ● Bump—occurs when shifting from PARK to a drive or reverse position. Similar to Clunk but with no sound 	<ul style="list-style-type: none"> ● Initial gear engagement. 	<ul style="list-style-type: none"> ● Acceptable condition.
<ul style="list-style-type: none"> ● Buzz or hiss 	<ul style="list-style-type: none"> ● Incorrect driveline angles. ● Worn or damaged main control solenoids or valves. 	<ul style="list-style-type: none"> ● CHECK for correct driveline angles. REPAIR as necessary. REFER to Section 205-00. ● Using a transmission tester, ACTIVATE the solenoids to duplicate sound. INSTALL new components as necessary. REFER to Section 307-01.
<ul style="list-style-type: none"> ● Vibration—a high frequency 	<ul style="list-style-type: none"> ● Transmission cooler lines grounded out. 	<ul style="list-style-type: none"> ● CHECK the transmission cooler lines. REPAIR as

<p>(20–80 Hz) that is felt through the seat or gear shifter. Changes with engine speed</p>	<ul style="list-style-type: none"> ● Flexplate to torque converter nuts loose. ● Fluid filler tube grounded out. ● Shift cable incorrectly routed, grounded out or loose. 	<p>necessary.</p> <ul style="list-style-type: none"> ● CHECK the flexplate nuts. TIGHTEN to specification. REFER to Section 307-01. ● CHECK the fluid filler tube. REPAIR as necessary. ● CHECK the shift cable. REPAIR as necessary. REFER to Section 307-05.
<ul style="list-style-type: none"> ● Shutter or chatter—occurs with light to medium acceleration from low speeds or a stop 	<ul style="list-style-type: none"> ● Electrical inputs/outputs. ● Vehicle wiring harness. ● Incorrect inputs/outputs from the powertrain control module (PCM), digital transmission range (TR) sensor, brake pedal position (BPP) sensor, throttle position (TP) sensor, transmission speed sensor (TSS), output speed shaft (OSS) sensor or the torque converter clutch (TCC). 	<ul style="list-style-type: none"> ● CARRY OUT a Torque Converter Clutch Operation Test. RUN on-board diagnostics or self-test. REFER to the Powertrain Control/Emissions Diagnosis (PC/ED) manual for diagnosis and testing of the powertrain control system. CLEAR the DTCs, road test and rerun on-board diagnostics or self-test. REFER to Section 307-01.

Pinpoint Tests

The pinpoint tests are a step-by-step diagnostic process designed to determine the cause of a condition. It may not always be necessary to follow a pinpoint test to its conclusion. Carry out only the steps necessary to correct the condition. Then, test the system for normal operation. Sometimes, it is necessary to remove various vehicle components to gain access to the component requiring testing. For additional information, REFER to the appropriate Workshop Manual section for removal and installation procedures. Reinstall all components after verifying system operation is normal.

PINPOINT TEST A: BRAKE VIBRATION/SHUDDER

CONDITIONS	DETAILS/RESULTS/ACTIONS
	<p>A1 ROAD TEST THE VEHICLE—LIGHT BRAKING</p> <ol style="list-style-type: none"> 1 Check that the wheel and tires are correct for the vehicle. Inspect the tires for abnormal wear patterns. 2 Road test the vehicle. Warm the brakes by slowing the vehicle a few times from 80–32 km/h (50 to 20 mph) using light braking applications. At highway speeds of 89–97 km/h (55-60 mph), apply the brake using a light pedal force.

● **Is there a vibration/shudder felt in the steering wheel, seat or brake pedal?**

→ **Yes**
GO to [A4](#).

→ **No**
GO to [A2](#).

A2 ROAD TEST THE VEHICLE—MODERATE TO HEAVY BRAKING

1 Road test the vehicle. At highway speeds of 89–97 km/h (55-60 mph), apply the brake using a moderate to heavy pedal force.

● **Is there a vibration/shudder?**

→ **Yes**
For vehicles with ABS, GO to [A3](#).
For vehicles with standard brakes, GO to [A4](#).

→ **No**
Vehicle is OK. VERIFY condition with customer. TEST the vehicle for normal operation.

A3 NORMAL ACTUATION OF THE ABS SYSTEM DIAGNOSIS

1 During moderate to heavy braking, noise from the hydraulic control unit (HCU) and pulsation in the brake pedal can be observed. Pedal pulsation coupled with noise during heavy braking or on loose gravel, bumps, wet or snowy surfaces is acceptable and indicates correct functioning of the ABS system. Pedal pulsation or steering wheel nibble (frequency is proportioned to the vehicle speed) indicates a concern with a brake or suspension component.

● **Is the vibration/shudder vehicle speed sensitive?**

→ **Yes**
GO to [A5](#).

→ **No**
The brake system is operating correctly.

A4 APPLICATION OF THE PARKING BRAKE

1 **NOTE:** Begin at the front of the vehicle unless the vibration or shudder has been isolated to the rear.

This test is not applicable to vehicles with drum-in-hat type parking brakes. For vehicles with drum-in-hat parking brakes, proceed to the next test. For all other vehicles, apply the parking brake to identify if the problem is in the front or rear brake. At highway speeds of 89–97 km/h (55-60 mph), lightly apply the parking brake until the vehicle slows down. Release the parking brake immediately after the test.

● **Is there a vibration/shudder?**

→ **Yes**
GO to [A8](#).

→ **No**
GO to [A5](#).

A5 CHECK THE FRONT WHEEL BEARINGS

1 Check the front wheel bearings. Refer to [Wheel Bearing Check](#) in this section.

- **Are the wheel bearings OK?**

→ **Yes**
GO to [A6](#).

→ **No**
INSPECT the wheel bearings. ADJUST or REPAIR as necessary. TEST the system for normal operation.

A6 CHECK THE FRONT SUSPENSION

1 Check the front suspension for:

- Broken or loose bolts.
- Damaged springs.
- Worn or damaged upper and lower control arm bushings.
- Loose or rough front bearings.
- Uneven tire wear.

- **Are all the suspension components in satisfactory condition?**

→ **Yes**
GO to [A7](#).

→ **No**
REPAIR or INSTALL new components as necessary. TEST the system for normal operation.

A7 RESURFACE THE FRONT BRAKE DISCS

1  **CAUTION: Do not use a bench lathe to machine brake discs.**

NOTE: Follow the manufacturer's instructions to machine the brake discs. After machining, make sure the brake disc meets the thickness specification.

Resurface the front brake discs. Refer to [Brake Disc Machining](#) in this section. Road test the vehicle.

- **Is the vibration/shudder present?**


→ **Yes**
GO to [A8](#).

→ **No**
Vehicle is OK.

A8 CHECK THE REAR SUSPENSION

1 Check the rear suspension for:

- Broken or loose bolts.

	<ul style="list-style-type: none"> ● Damaged or worn springs or spring bushings. ● Worn or damaged upper and lower control arm bushings. ● Worn or damaged trailing arms. ● Loose or rough rear bearings. ● Uneven tire wear. <p>● Are all the suspension components in satisfactory condition?</p> <p>→ Yes GO to A9.</p> <p>→ No REPAIR or INSTALL new components as necessary. TEST the system for normal operation.</p>
A9 RESURFACE THE REAR BRAKE DISC OR DRUM	
	<p>1  CAUTION: Do not use a bench lathe to machine brake discs.</p> <p>NOTE: Follow the manufacturers instructions to machine the brake discs. After machining, make sure the brake disc meets the thickness specification.</p> <p>Resurface the rear brake discs or drums. Refer to Brake Disc Machining in this section. Road test the vehicle.</p> <p>● Is the vibration/shudder present?</p> <p>→ Yes CHECK the front suspension for wear or damage. RESURFACE the front brake discs. TEST the system for normal operation.</p> <p>→ No Vehicle is OK.</p>

PINPOINT TEST B: ENGINE TICKING NOISE

CONDITIONS	DETAILS/RESULTS/ACTIONS
B1 CHECK FOR TICKING NOISE AT THE FUEL RAIL	
	<p>1 Disconnect the first fuel line clip.</p> <p>● Is the ticking noise gone?</p> <p>→ Yes CHECK for TSB for applicable vehicle. REPAIR as necessary. TEST the system for normal operation.</p> <p>→ No GO to B2.</p>
B2 CHECK FOR TICKING NOISE AT THE FUEL INJECTOR	
	<p>1 Using an EngineEAR, listen at the fuel injectors by placing a probe on each injector. To isolate the faulty injector, disconnect the injector electrical connector and listen for the noise.</p>

● **Is the fuel injector the source of the ticking noise?**

- **Yes**
INSTALL a new fuel injector. REFER to [Section 303-04A](#) for 3.0L engines or [Section 303-04B](#) for 3.9L engines. TEST the system for normal operation.
- **No**
GO to [B3](#).

B3 CHECK THE BELT TENSIONER FOR TICKING NOISE

- 1** INSPECT the accessory drive. CHECK for the belt tensioner bottoming at end of travel or not at end of stroke.
- 2** Using an EngineEAR, listen at the belt tensioner.
- **Is the belt tensioner the source of the noise?**
- **Yes**
INSTALL a new belt tensioner. TEST the system for normal operation.
- **No**
GO to [B4](#).

B4 CHECK THE WATER PUMP FOR TICKING NOISE

- 1** Using an EngineEAR, listen at the water pump for ticking noise.
- **Is the water pump the source of the noise?**
- **Yes**
INSTALL a new water pump. TEST the system for normal operation.
- **No**
GO to [B5](#).

B5 CHECK FOR AN OBSTRUCTION OF THE COOLING FAN



- 1** Inspect the cooling fan for obstructions.
- 2** Check the cooling fan and shroud for wear or damage.
- **Was there an obstruction or does the cooling fan show signs of damage?**
- **Yes**
REPAIR or INSTALL a new cooling fan. REFER to [Section 303-03](#). TEST the system for normal operation.
- **No**
GO to [B6](#).

B6 CHECK THE OIL PUMP FOR TICKING NOISE

- 1** CHECK the oil pump using EngineEARs and probe at the oil filter adapter to verify the oil pump as a source.
- **Is the oil pump the source of the noise?**


	<p>→ Yes INSTALL a new oil pump. REFER to Section 303-01A for 3.0L engines or Section 303-01B for 3.9L engines. TEST the system for normal operation.</p> <p>→ No GO to B7.</p>
B7 CHECK VALVE LIFTERS OR LASH ADJUSTERS FOR CORRECT OPERATION	
	<p>1 CHECK valve lifter/lash adjuster for correct operation, using EngineEARs.</p> <ul style="list-style-type: none"> ● Are the valve lifters/lash adjusters operating correctly? <p>→ Yes VERIFY customer concern. CONDUCT a diagnosis of other suspect components.</p> <p>→ No INSTALL a new valve lifter/lash adjuster(s). TEST the system for normal operation.</p>

PINPOINT TEST C: ACCESSORY DRIVE BEARING HOOT


CONDITIONS	DETAILS/RESULTS/ACTIONS
C1 CHECK THE ACCESSORY DRIVE IDLER AND TENSIONER PULLEY BEARINGS	
<p>2</p>  <p>4</p> 	<p>1 Carry out the Vehicle Cold Soak Procedure in this section.</p> <p>3 Place an EngineEAR probe directly on the pulley center post or bolt to verify which bearing is making the noise.</p> <ul style="list-style-type: none"> ● Is either bearing making the noise? <p>→ Yes INSTALL a new pulley/idler. CARRY OUT the Vehicle Cold Soak Procedure and TEST the system for normal operation.</p> <p>→ No CONDUCT a diagnosis on other suspect accessory drive components.</p>

PINPOINT TEST D: POWER STEERING MOAN

CONDITIONS	DETAILS/RESULTS/ACTIONS
D1 CHECK THE POWER STEERING SYSTEM	

2 

3 Turn the steering wheel while the noise is occurring and listen for changes in sound pitch or loudness.


4 

- Does the sound pitch or loudness change while turning the steering wheel?


→ **Yes**
GO to [D2](#).

→ **No**
CONDUCT a diagnosis on other suspect accessory drive components.

D2 VERIFY THE SOURCE

1 

2 Place an EngineEAR probe near the power steering pump/reservoir while the noise is occurring. While an assistant turns the steering wheel, listen for changes in sound pitch or loudness.

3 

- Does the sound pitch or loudness change while turning the steering wheel?

→ **Yes**
VERIFY that the supply tube to the pump is unobstructed. CHECK the fluid condition and level. DRAIN the fluid and REFILL. REFER to [Section 211-02](#). CARRY OUT the Vehicle Cold Soak Procedure and TEST the system for normal operation.

→ **No**
Normal system operation.

PINPOINT TEST E: ENGINE DRIVEN COOLING FAN MOAN

CONDITIONS	DETAILS/RESULTS/ACTIONS
E1 CHECK THE ENGINE DRIVEN COOLING FAN AFTER A COLD SOAK	

<p>2</p> <p>5</p>	<p>1 Carry out the Vehicle Cold Soak Procedure in this section.</p> <p>3 Assess the airflow.</p> <p>4 Raise the engine speed to 1500 rpm while listening for the moan to increase in proportion to the airflow.</p> <p>● Does the moan increase in proportion to the airflow?</p> <p>→ Yes TEST the fan for normal operation. If the fan tests normal, GO to E2. Otherwise, REPAIR as necessary.</p> <p>→ No Normal system operation.</p>
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E2 CHECK THE ENGINE DRIVEN COOLING FAN AT NORMAL OPERATING TEMPERATURE

<p>1</p> <p>3</p>	<p>2 Run the engine to normal operating temperature while listening for the moan to stop.</p> <p>● Does the moan stop?</p> <p>→ Yes Normal clutch operation.</p> <p>→ No INSTALL a new fan clutch. TEST the system for normal operation.</p>
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PINPOINT TEST F: DRUMMING NOISE

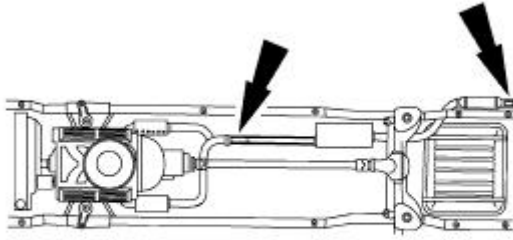
CONDITIONS	DETAILS/RESULTS/ACTIONS
F1 CHECK THE EXHAUST SYSTEM	
1	



3



4



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5



7



2 Increase the engine rpm until the noise is the loudest. Note the engine rpm.

4 Add approximately 9 kg (20 lb) of weight to the exhaust system. First place the weight at the tail pipe and test, then at the front pipe.

6 Increase the engine rpm and listen for the drumming noise. Note the engine rpm if the noise occurs.

8 Using a vibration analyzer (VA), determine the amount of vibration that occurs with the drumming noise.

- **Is the noise/vibration reduced or eliminated, or does the noise/vibration occur at a different rpm?**

→ **Yes**
CARRY OUT [Exhaust System Neutralizing](#) in this section. TEST the system for normal operation.




→ **No**
GO to [F2](#).

F2 POWERTRAIN/DRIVETRAIN MOUNT NEUTRALIZING

1 Carry out [Powertrain/Drivetrain Mount Neutralizing](#) in this section. Test the system for normal operation.

	<ul style="list-style-type: none"> ● Is the noise reduced or eliminated? <p>→ Yes Vehicle OK. TEST the system for normal operation.</p> <p>→ No CONDUCT diagnosis of other suspect components.</p>
--	--

PINPOINT TEST G: ENGINE TICKING, KNOCKING OR CONTINUOUS RATTLE

CONDITIONS	DETAILS/RESULTS/ACTIONS
G1 CHECK FOR NOISE AT THE VALVE COVERS AND THE FRONT COVERS (OHC ENGINES)	
<p>2</p>  <p>4</p> 	<p>1 Carry out the Vehicle Cold Soak Procedure in this section.</p> <p>3 NOTE: For a short-duration ticking noise, multiple engine starts may be necessary.</p> <p>Using an EngineEAR, listen closely at the valve covers and the front covers (OHC engines) by placing the probe near the surface of the valve cover and then on the surface front cover.</p> <ul style="list-style-type: none"> ● Is the noise source apparent? <p>→ Yes REMOVE the appropriate cover and INSPECT for loose, worn/broken components. REPAIR as necessary. TEST the system for normal operation.</p> <p>→ No GO to G2.</p>
G2 CHECK FOR NOISE AT THE CYLINDER BLOCK	
<p>1</p>  <p>3</p>	<p>2 Using an EngineEAR, listen closely at the cylinder block by placing a probe on or near each freeze plug.</p>



● **Is the noise source apparent?**

- **Yes**
REPAIR or INSTALL new components as necessary.
- **No**
GO to [G3](#).

G3 CHECK FOR NOISE WHILE DISCONNECTING EACH FUEL INJECTOR ELECTRICAL CONNECTOR, ONE AT A TIME

1



- 2 Disconnect each fuel injector electrical connector, one at a time, to decrease piston force and listen for the noise.

3



● **Is the noise reduced or eliminated?**


- **Yes**
INSTALL a new fuel injector. TEST the system for normal operation.
- **No**
INSPECT accessory drive or the transmission as a possible source.

PINPOINT TEST H: FRONT SUSPENSION NOISE

CONDITIONS	DETAILS/RESULTS/ACTIONS
H1 ROAD TEST THE VEHICLE	
	<p>1 Test drive the vehicle.</p> <p>2 NOTE: An assistant will be needed for this road test.</p> <p>During the road test, drive the vehicle over a rough road. Using ChassisEARS, determine from which area/component the noise is originating.</p> <p>● Is there a squeak, creak or rattle noise?</p> <p>→ Yes GO to H2.</p> <p>→ No</p>

The suspension system is OK. CONDUCT a diagnosis on other suspect systems.

H2 INSPECT THE STEERING SYSTEM

- 1  **WARNING:** The electrical power to the air suspension system must be shut off prior to hoisting, jacking or towing an air suspension vehicle. This can be accomplished by turning off the air suspension switch. Failure to do so can result in unexpected inflation or deflation of the air springs, which can result in shifting of the vehicle during these operations.

Raise and support the vehicle.

- 2 Check the steering system for wear or damage. Carry out a steering linkage test. Refer to [Section 211-00](#).
- 3 Inspect the tire wear pattern. Refer to Tire Wear Patterns chart in this section.

● **Are the steering components worn or damaged?**

→ **Yes**

REPAIR the steering system. INSTALL new components as necessary. TEST the system for normal operation.

→ **No**

GO to [H3](#).

H3 FRONT SHOCK ABSORBER/STRUT CHECK

- 1 Check the front shock absorbers/strut mounts for loose bolts or nuts.
- 2 Check the front shock absorbers/struts for damage or wear. Carry out a "bounce test".

● **Are the front shock absorbers/struts loose or damaged?**

→ **Yes**

TIGHTEN to specifications if loose. INSTALL new front shock absorbers/struts if damaged. TEST the system for normal operation.

→ **No**

GO to [H4](#).

H4 CHECK THE FRONT SPRINGS

- 1 Check the front spring and front spring mounts/brackets for wear or damage.

● **Are the front springs or spring mounts/brackets worn or damaged?**

→ **Yes**

REPAIR or INSTALL new components as necessary. TEST the system for normal operation.

→ **No**


GO to [H5](#).

H5 CHECK THE CONTROL ARMS/RADIUS ARMS

- 1 Inspect the control arm bushings for wear or damage.

	<p>2 Inspect for twisted or bent control/radius arm.</p> <ul style="list-style-type: none"> ● Are the control/radius arms damaged or worn? <p>→ Yes REPAIR or INSTALL new components as necessary. TEST the system for normal operation.</p> <p>→ No GO to H6.</p>
H6 CHECK THE STABILIZER BAR/TRACK BAR	
	<p>1 Check the stabilizer bar/track bar bushings and links for damage or wear.</p> <p>2 Check the stabilizer bar/track bar for damage.</p> <p>3 Check for loose or damaged stabilizer bar isolators or brackets.</p> <ul style="list-style-type: none"> ● Are the stabilizer bar/track bar components loose, worn or damaged? <p>→ Yes REPAIR or INSTALL new components as necessary. TEST the system for normal operation.</p> <p>→ No Suspension system OK. CONDUCT diagnosis on other suspect systems.</p>

PINPOINT TEST I: REAR SUSPENSION NOISE

CONDITIONS	DETAILS/RESULTS/ACTIONS
I1 ROAD TEST THE VEHICLE	
	<p>1 Test drive the vehicle.</p> <p>2 NOTE: An assistant will be needed for this road test.</p> <p>During the road test, drive the vehicle over a rough road. Using ChassisEARS, determine from which area/component the noise is originating.</p> <ul style="list-style-type: none"> ● Is there a squeak, creak or rattle noise? <p>→ Yes GO to I2.</p> <p>→ No The suspension system is OK. CONDUCT a diagnosis on other suspect systems.</p>
I2 REAR SHOCK ABSORBER/STRUT CHECK	
	<p>1  WARNING: The electrical power to the air suspension system must be shut off prior to hoisting, jacking or towing an air suspension vehicle. This can be accomplished by turning off the air suspension switch. Failure to do so can result in unexpected inflation or deflation of the air springs, which can result in shifting of the vehicle during</p>

these operations.

Raise and support the vehicle.

- 2 Check the rear shock absorber/strut mounts for loose bolts or nuts.
- 3 Check the rear shock absorbers/struts for damage. Carry out a shock absorber check.

● **Are the rear shock absorbers/struts loose or damaged?**

→ **Yes**

TIGHTEN to specifications if loose. INSTALL new rear shock absorbers/struts if damaged. TEST the system for normal operation.

→ **No**

GO to [13](#).

I3 CHECK THE REAR SPRINGS

- 1 Check the rear springs and rear spring mounts/brackets for wear or damage.

● **Are the rear springs or spring mounts/brackets worn or damaged?**

→ **Yes**

REPAIR or INSTALL new components as necessary. TEST the system for normal operation.

→ **No**

GO to [14](#).

I4 CHECK THE CONTROL ARMS/TRAILING ARMS

- 1 Inspect the control arm/trailing arm bushings for wear or damage. Check for loose control arm/trailing arm bolts.

- 2 Inspect for twisted or bent control arm/trailing arms.

● **Are the control arms/trailing arms loose, damaged or worn?**

→ **Yes**

REPAIR or INSTALL new components as necessary. TEST the system for normal operation.

→ **No**

GO to [15](#).

I5 CHECK THE STABILIZER BAR/TRACK BAR

- 1 Check the stabilizer bar/track bar bushings and links for damage or wear.

- 2 Check the stabilizer bar/track bar for damage.

- 3 Check for loose or damaged stabilizer bar isolators or brackets.

● **Are the stabilizer bar/track bar components loose, worn or damaged?**

→ **Yes**

REPAIR or INSTALL new components as necessary. TEST the system for normal operation.

→ **No**
 Suspension system OK. CONDUCT diagnosis on other suspect systems.

PINPOINT TEST J: WHEEL AND TIRE

CONDITIONS	DETAILS/RESULTS/ACTIONS
J1 ROAD TEST THE VEHICLE	
	<p>1 NOTE: Wheel or tire vibrations felt in the steering wheel are most likely related to the front wheel or tire. Vibration felt through the seat are most likely related to the rear wheel or tire. This may not always be true, but it can help to isolate the problem to the front or rear of the vehicle.</p> <p>Test drive the vehicle at different speed ranges.</p> <p>2 During the road test, if the vibration can be eliminated by placing the vehicle in neutral or is affected by the speed of the engine, the cause is not the wheels or tires.</p> <p>● Is there a vibration and noise?</p> <p>→ Yes GO to J2.</p> <p>→ No The wheel and tires are OK. CONDUCT a diagnosis on other suspect systems.</p>
J2 CHECK THE FRONT WHEEL BEARINGS	
	<p>1 Check the front wheel bearings. Refer to Wheel Bearing Check in this section.</p> <p>● Are the wheel bearings OK?</p> <p>→ Yes GO to J3.</p> <p>→ No INSPECT the wheel bearings. ADJUST or REPAIR as necessary. TEST the system for normal operation.</p>
J3 INSPECT THE TIRES	
	<p>1 Check the tires for missing weights.</p> <p>2 Check the wheels for damage.</p> <p>3 Inspect the tire wear pattern. Refer to the Tire Wear Patterns chart in this section.</p>

- Do the tires have an abnormal wear pattern?

→ **Yes**
CORRECT the condition that caused the abnormal wear. INSTALL new tire(s). TEST the system for normal operation.

→ **No**
GO to [J4](#).

J4 TIRE ROTATION DIAGNOSIS

1



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2



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1 Spin the tires slowly and watch for signs of lateral runout.

2 Spin the tires slowly and watch for signs of radial runout.

- Are there signs of visual runout?

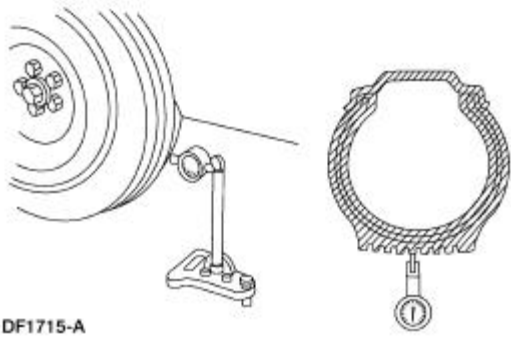
→ **Yes**
GO to [J5](#).

→ **No**
CHECK the wheel and tire balance. CORRECT as necessary. TEST the system for normal operation.

J5 RADIAL RUNOUT CHECK ON THE TIRE

1

1 Measure the radial runout of the wheel and tire assembly. A typical specification for total radial runout is 0.045 inch.



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- Is the radial runout within specifications?

→ **Yes**
GO to [J8](#).

→ **No**
GO to [J6](#).

J6 RADIAL RUNOUT CHECK ON THE WHEEL

1 Measure the radial runout of the wheel. A typical specification for total radial runout is 0.045 inch.

- Is the radial runout within specifications?

→ **Yes**
INSTALL a new tire. TEST the system for normal operation.

→ **No**
GO to [J7](#).

J7 CHECK THE HUB/BRAKE DISC OR DRUM PILOT RUNOUT OR BOLT CIRCLE RUNOUT

1 Measure the pilot or bolt circle runout. A typical specification for radial runout is:

- Pilot runout— less than 0.15 mm (0.006 inch).
- Bolt circle runout— less than 0.38 mm (0.015 inch).

- Is the radial runout within specifications?

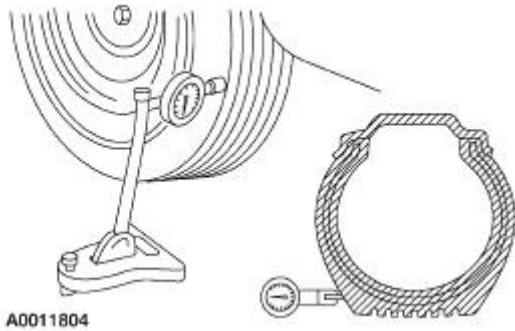
→ **Yes**
INSTALL a new wheel. TEST the system for normal operation.

→ **No**
REPAIR or INSTALL new components as necessary. REFER to [Section 204-01](#) for the front wheels or [Section 204-02](#) for the

rear wheels.

J8 LATERAL RUNOUT CHECK ON THE TIRE

1



1

Measure the lateral runout of the wheel and tire assembly. A typical specification for total lateral runout is 1.14 mm (0.045 inch).

- **Is the lateral runout within specifications?**

→ **Yes**

Wheel and tires OK. CONDUCT diagnosis on other suspect systems.

→ **No**

GO to [J9](#).

J9 LATERAL RUNOUT CHECK ON THE WHEEL

1

Measure the lateral runout of the wheel. A typical specification for total radial runout is 1.14mm (0.045 inch).

- **Is the lateral runout within specifications?**

→ **Yes**

INSTALL a new tire. TEST the system for normal operation.

→ **No**

GO to [J10](#).

J10 CHECK THE FLANGE FACE LATERAL RUNOUT

1

Measure the flange face lateral runout. A typical specification for lateral runout is:

- Hub/brake disc— less than 0.13 mm (0.005 inch).
- Axle shaft— less than 0.25 mm (0.010 inch).

- **Is the lateral runout within specifications?**

→ **Yes**

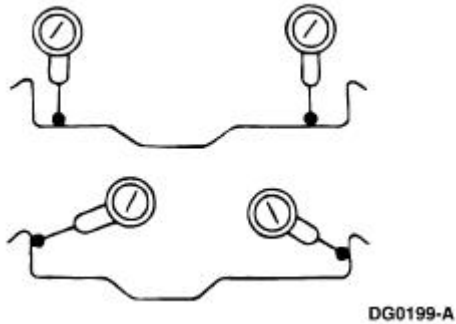
INSTALL a new wheel. TEST the system for normal operation.

→ **No**
 REPAIR or INSTALL new components as necessary. REFER to [Section 204-01](#) for the front wheels or [Section 204-02](#) for the rear wheels.

PINPOINT TEST K: HIGH SPEED SHAKE OR SHIMMY

CONDITIONS	DETAILS/RESULTS/ACTIONS
K1 CHECK FOR FRONT WHEEL BEARING ROUGHNESS	
	<p>1 Check the rear wheels.</p> <p>2 Raise and support the front end of the vehicle so that the front wheel and tire assemblies can spin.</p> <p>3 Spin the front tires by hand. Refer to Wheel Bearing Check in this section.</p> <p>● Do the wheel bearings feel rough?</p> <p>→ Yes INSPECT the wheel bearings. REPAIR as necessary. TEST the system for normal operation.</p> <p>→ No GO to K2.</p>
K2 CHECK THE END PLAY OF THE FRONT WHEEL BEARINGS	
	<p>1 Check the end play of the front wheel bearings. Refer to Section 204-00.</p> <p>● Is the end play OK?</p> <p>→ Yes GO to K3.</p> <p>→ No ADJUST or REPAIR as necessary. TEST the system for normal operation.</p>
K3 MEASURE THE LATERAL RUNOUT AND THE RADIAL RUNOUT OF THE FRONT WHEELS ON THE VEHICLE	
	<p>1 Measure the lateral runout and the radial runout of the front wheels on the vehicle. Go To Pinpoint Test J.</p> <p>● Are the measurements within specifications?</p> <p>→ Yes GO to K4.</p>

	<p>→ No INSTALL new wheels as necessary and BALANCE the assembly. TEST the system for normal operation.</p>
K4 MEASURE THE LATERAL RUNOUT OF THE FRONT TIRES ON THE VEHICLE	
	<p>1 Measure the lateral runout of the front tires on the vehicle. Go To Pinpoint Test J.</p> <p>● Is the runout within specifications?</p> <p>→ Yes GO to K5.</p> <p>→ No INSTALL new tires as necessary and BALANCE the assembly. TEST the system for normal operation.</p>
K5 MEASURE THE RADIAL RUNOUT OF THE FRONT TIRES ON THE VEHICLE	
	<p>1 Measure the radial runout of the front tires on the vehicle. Go To Pinpoint Test J.</p> <p>● Is the runout within specifications?</p> <p>→ Yes BALANCE the front wheel and tire assemblies. If any tire cannot be balanced, INSTALL a new tire. TEST the system for normal operation.</p> <p>→ No GO to K6.</p>
K6 MATCH MOUNT THE TIRE AND WHEEL ASSEMBLY	
	<p>1 Mark the high runout location on the tire and also on the wheel. Break the assembly down and rotate the tire 180 degrees (halfway around) on the wheel. Inflate the tire and measure the radial runout.</p> <p>● Is the runout within specifications?</p> <p>→ Yes BALANCE the assembly. TEST the system for normal operation.</p> <p>→ No If the high spot is not within 101.6 mm (4 inches) of the first high spot on the tire, GO to K7.</p>
K7 MEASURE THE WHEEL FLANGE RUNOUT	
1	1 Dismount the tire and mount the wheel



on a wheel balancer. Measure the runout on both wheel flanges. Refer to [Section 204-04](#).

● **Is the runout within specifications?**

→ **Yes**

LOCATE and MARK the low spot on the wheel. INSTALL the tire, matching the high spot on the tire with the low spot on the wheel. BALANCE the assembly. TEST the system for normal operation. If the condition persists, GO to [K8](#).

→ **No**

INSTALL a new wheel. CHECK the runout on the new wheel. If the new wheel is within limits, LOCATE and MARK the low spot. INSTALL the tire, matching the high spot on the tire with the low spot on the wheel. BALANCE the assembly. TEST the system for normal operation. If the condition persists, GO to [K8](#).

K8 CHECK FOR VIBRATION FROM THE FRONT OF THE VEHICLE

⚠ WARNING: If only one drive wheel is allowed to rotate, speed must be limited to 55 km/h (34 mph) using the speedometer reading, since actual wheel speed will be twice that indicated on the speedometer. Exceeding a speed of 55 km/h (34 mph) or allowing the drive wheel to hang unsupported can result in tire disintegration or differential failure, which can cause serious personal injury and extensive vehicle damage.

1 Spin the front wheel and tire assemblies with a wheel balancer while the vehicle is raised on a hoist. Feel for vibration in the front fender or while seated in the vehicle.

● **Is the vibration present?**

→ **Yes**

SUBSTITUTE known good wheel and tire assemblies as necessary. TEST the system for normal operation.

→ **No**

GO to [K9](#).


K9 CHECK FOR VIBRATION FROM THE REAR OF THE VEHICLE

⚠ WARNING: If only one drive wheel is allowed to rotate, speed must be limited to 55

km/h (34 mph) using the speedometer reading, since actual wheel speed will be twice that indicated on the speedometer. Exceeding a speed of 55 km/h (34 mph) or allowing the drive wheel to hang unsupported can result in tire disintegration or differential failure, which can cause serious personal injury and extensive vehicle damage.

	<ol style="list-style-type: none"> 1 Chock the front wheels. 2 Raise and support the rear end of the vehicle so that the rear wheel and tire assemblies can spin. 3 Engage the drivetrain and carefully accelerate the drive wheels while checking for vibration. <p>● Is the vibration present?</p> <p>→ Yes GO to K10.</p> <p>→ No TEST the system for normal operation.</p>
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K10 CHECK THE DRIVETRAIN

 **WARNING:** If only one drive wheel is allowed to rotate, speed must be limited to 55 km/h (34 mph) using the speedometer reading, since actual wheel speed will be twice that indicated on the speedometer. Exceeding a speed of 55 km/h (34 mph) or allowing the drive wheel to hang unsupported can result in tire disintegration or differential failure, which can cause serious personal injury and extensive vehicle damage.

	<ol style="list-style-type: none"> 1 Remove the rear wheel and tire assemblies. Refer to Section 204-04. 2 Secure the brake drums (if so equipped), by installing wheel hub bolt nuts, reversed. 3 Carefully accelerate the drivetrain while checking for vibration. <p>● Is the vibration present?</p> <p>→ Yes CHECK/TEST the drivetrain and driveline components. TEST the system for normal operation.</p> <p>→ No SUBSTITUTE known good wheel and tire assemblies as necessary. TEST the system for normal operation.</p>
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PINPOINT TEST L: CLUTCH VIBRATION

CONDITIONS	DETAILS/RESULTS/ACTIONS
L1 CHECK ENGINE COMPONENTS FOR GROUNDING	
	<ol style="list-style-type: none"> 1 NOTE: Make sure the clutch is the cause of the vibration concern. The

vibration should occur during clutch operation. The clutch can also be difficult to engage or disengage. Eliminate all related systems before checking the clutch components.

NOTE: Check the driveline angles and driveshaft runout before disassembling the clutch system. Refer to [Section 205-00](#).

Check the powertrain/drivetrain mounts, exhaust manifolds or other engine components for grounding on the chassis.

● **Are any mounts or engine components grounded?**

→ **Yes**
REPAIR as necessary. TEST the system for normal operation.

→ **No**
GO to [L2](#).

L2 CHECK THE ACCESSORY DRIVE BELT

1 Remove the accessory drive belt.

● **Does the vibration stop with the accessory drive belt removed?**

→ **Yes**
DIAGNOSE the accessory drive components.

→ **No**
GO to [L3](#).

L3 CHECK FOR LOOSE CLUTCH PRESSURE PLATE BOLTS

1 Check for loose clutch pressure plate bolts. Inspect the clutch pressure plate for damage or for material between the pressure plate and flywheel.

● **Are there any loose bolts or damage?**

→ **Yes**
TIGHTEN the bolts to specifications or if damaged, INSTALL a new clutch pressure plate. REFER to [Section 308-01](#). TEST the system for normal operation.

→ **No**
GO to [L4](#).

L4 CHECK THE CLUTCH DISC SPRINGS

1 Check for worn, broken or loose clutch disc springs.

● **Are the clutch springs worn, broken or loose?**

→ **Yes**
INSTALL a new clutch disc. REFER to [Section 308-01](#). TEST the system for normal operation.

→ **No**
GO to [L5](#).

L5 CHECK THE CLUTCH DISC SPLINES

	<p>1] Inspect the clutch disc splines for damage or wear.</p> <ul style="list-style-type: none"> ● Is there damage or wear? <p>→ Yes INSTALL a new clutch disc. REFER to Section 308-01. TEST the system for normal operation.</p> <p>→ No GO to L6.</p>
L6 CHECK THE FLYWHEEL BOLTS	
	<p>1] Check for loose flywheel bolts.</p> <ul style="list-style-type: none"> ● Are the bolts loose? <p>→ Yes TIGHTEN the bolts to specifications. REFER to Section 303-01A for 3.0L engines or Section 303-01B for 3.9L engines. TEST the system for normal operation.</p> <p>→ No GO to L7.</p>
L7 CHECK THE FLYWHEEL SURFACE	
	<p>1] Inspect the flywheel surface for wear or damage. Check the flywheel runout.</p> <ul style="list-style-type: none"> ● Is there any damage or excessive wear? <p>→ Yes INSTALL a new flywheel. REFER to Section 303-01A for 3.0L engines or Section 303-01B for 3.9L engines. TEST the system for normal operation.</p> <p>→ No Clutch system normal. CONDUCT a diagnosis on other suspect systems.</p>

Component Tests

Idle Air Control (IAC) Valve


1. Open the hood.
2. **NOTE:** Key symptom is elevated idle speed while noise is occurring.

NOTE: "Snapping" the throttle can induce the noise.

Verify the condition by operating the vehicle for a short time.

3. Inspect the IAC valve. If physical evidence of contamination exists, install a new IAC valve.
4. While the noise is occurring, either place an EngineEAR probe near the IAC valve and the inlet tube, or create a 6.35 mm (0.25 in)-12.7 mm (0.50 in) air gap between the inlet tube and the clean air tube. If the IAC valve is making the noise, install a new IAC valve.
5. Test the vehicle for normal operation.

Steering Gear Grunt/Shudder Test

1. Start and run the vehicle to operating temperature.
2. Set engine idle speed to 1200 rpm.
3.  **CAUTION: Do not hold the steering wheel against the stops for more than three to five seconds at a time. Damage to the power steering pump will occur.**

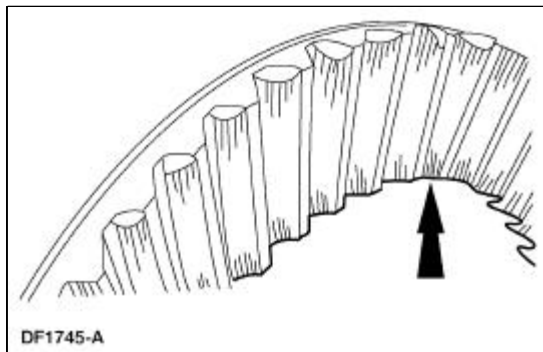
Rotate the steering wheel to the RH stop, then turn the steering wheel 90° back from that position. Turn the steering wheel slowly in a 15° to 30° arc.

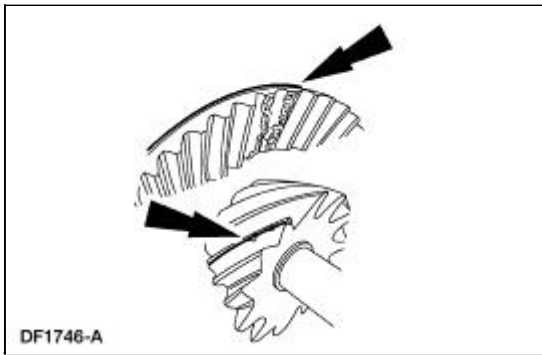
4. Turn the steering wheel another 90°. Turn the steering wheel slowly in a 15° to 30° arc.
5. Repeat the test with power steering fluid at different temperatures.
6. If a light grunt is heard or a low (50-200 Hz) shudder is present, this is a normal steering system condition.
7. If a loud grunt is heard, or strong shudder is felt, fill and purge the power steering system.

Checking Tooth Contact Pattern and Condition of the Ring and Pinion

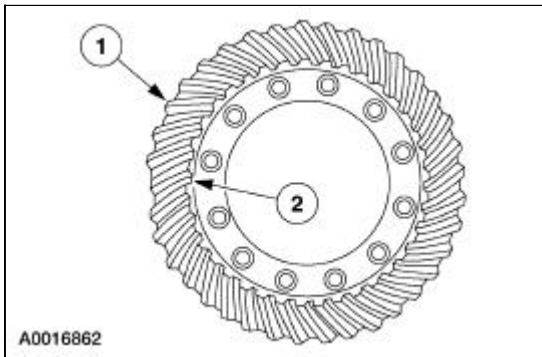
There are two basic types of conditions that will produce ring and pinion noise. The first type is a howl or chuckle produced by broken, cracked, chipped, scored or forcibly damaged gear teeth and is usually quite audible over the entire speed range. The second type of ring and pinion noise pertains to the mesh pattern of the gear pattern. This gear noise can be recognized as it produces a cycling pitch or whine. Ring and pinion noise tends to peak in a narrow speed range or ranges, and will tend to remain constant in pitch.

1. Raise and support the vehicle. For additional information, refer to [Section 100-02](#).
2. Drain the axle lubricant. For additional information, refer to [Section 205-02](#).
3. Remove the carrier assembly or the axle housing cover depending on the axle type. Refer to [Section 205-02](#).
4. Inspect the gear set for scoring or damage.



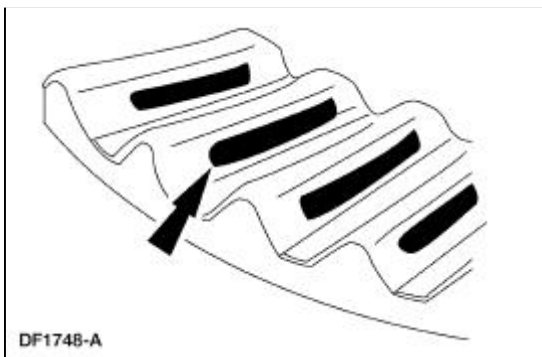


5. In the following steps, the movement of the contact pattern along the length is indicated as toward the "heel" or "toe" of the differential ring gear.



Item	Description
1	Heel
2	Toe

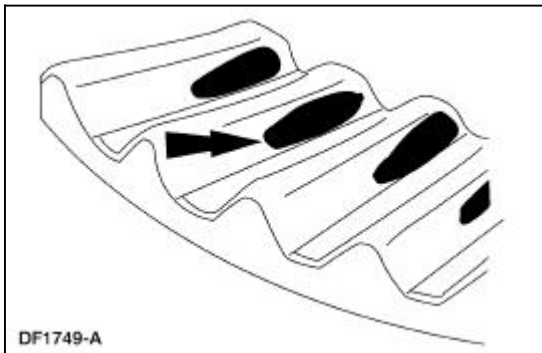
6. Apply a marking compound to a third of the gear teeth on the differential ring gear. Rotate the differential ring gear several complete turns in both directions until a good, clear tooth pattern is obtained. Inspect the contact patterns on the ring gear teeth.
7. A good contact pattern should be centered on the tooth. It can also be slightly toward the toe. There should always be some clearance between the contact pattern and the top of the tooth.
 - Tooth contact pattern shown on the drive side of the gear teeth.



8. A high, thick contact pattern that is worn more toward the toe.

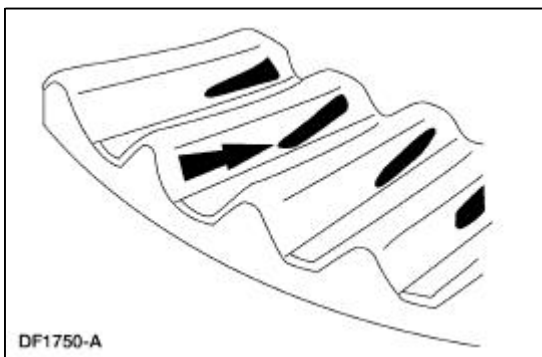
- Tooth contact pattern shown on the drive side of the gear teeth.

- The high contact pattern indicates that the drive pinion is not installed deep enough into the carrier.
- The differential ring gear backlash is correct, a thinner drive pinion shim is needed. A decrease will move the drive pinion toward the differential ring gear.



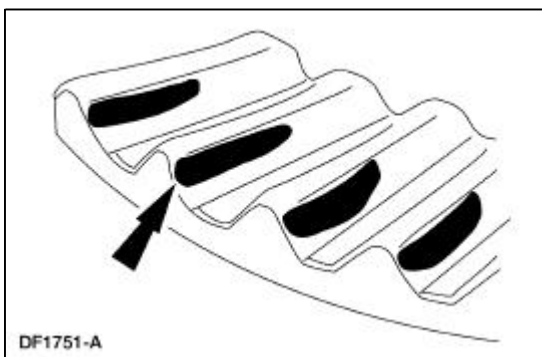
9. A high, thin contact pattern that is worn toward the toe.

- Tooth contact pattern shown on the drive side of the gear teeth.
- The drive pinion depth is correct. Increase the differential ring gear backlash.



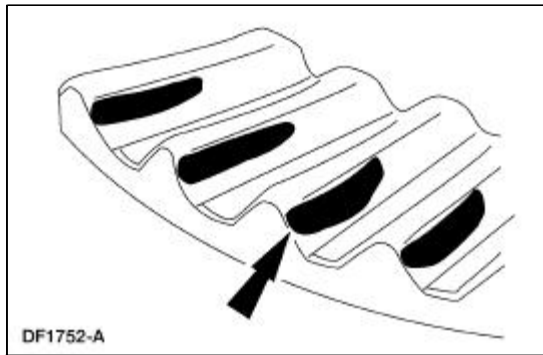
10. A contact pattern that is worn in the center of the differential ring gear tooth toward the heel.

- Tooth contact pattern shown on the drive side of the gear teeth.
- The low contact pattern indicates that the drive pinion is installed too deep into the carrier.
- The differential ring gear backlash is correct. A thicker drive pinion shim is needed.



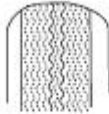
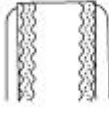
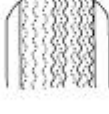




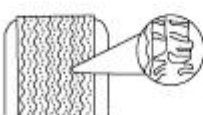
11. A contact pattern that is worn at the top of the differential ring gear tooth toward the heel.

- Tooth contact pattern shown on the drive side of the gear teeth.
- The pinion gear depth is correct. Decrease the differential ring gear backlash.



Tire Wear Patterns and frequency calculations

Tire Wear Chart

TIRE WEAR	CONDITION	POSSIBLE CAUSES
	<ul style="list-style-type: none"> • Rapid wear at both shoulders. 	<ul style="list-style-type: none"> • Tires underinflated. • Worn suspension components. • Excessive cornering speeds. • Lack of rotation.
	<ul style="list-style-type: none"> • Rapid wear at the center. 	<ul style="list-style-type: none"> • Tires overinflated. • Lack of rotation. • Excessive toe on drive wheels. • Heavy acceleration on drive wheels.
	<ul style="list-style-type: none"> • Wear at one shoulder. 	<ul style="list-style-type: none"> • Toe adjustment out of specification. • Camber out of specification. • Damaged strut. • Damaged lower control arm.
	<ul style="list-style-type: none"> • Feather edges. 	<ul style="list-style-type: none"> • Toe adjustment out of specification. • Damaged or worn tie rods. • Damaged spindle or knuckle.
	<ul style="list-style-type: none"> • Bald spots or cupping. 	<ul style="list-style-type: none"> • Unbalanced wheel. • Excessive radial runout. • Worn strut or shock absorber.
	<ul style="list-style-type: none"> • Tire scalloped. 	<ul style="list-style-type: none"> • Toe adjustment out of specification. • Camber out of specification. • Worn or damaged suspension components.
	<ul style="list-style-type: none"> • Wear pattern - FWD vehicles. 	<ul style="list-style-type: none"> • Excessive toe on non-drive wheels. • Lack of rotation.
	<ul style="list-style-type: none"> • Wear pattern - FWD vehicles. • Edge of tread blocks worn. 	<ul style="list-style-type: none"> • Excessive toe on non-drive wheels. • Lack of rotation.

DF1717-A

Wheel and tire NVH concerns are directly related to vehicle speed and are not generally affected by acceleration, coasting or decelerating. Also, out-of-balance wheel and tires can vibrate at more than one speed. A vibration that is affected by the engine rpm, or is eliminated by placing the transmission in NEUTRAL is not related to the tire and wheel. As a general rule, tire and wheel vibrations felt in the steering wheel are related to the front tire and wheel assemblies. Vibrations felt in the seat or floor are related to the rear tire and wheel assemblies. This can initially isolate a concern to the front or rear.

Careful attention must be paid to the tire and wheels. There are several symptoms that can be caused by damaged or worn tire and wheels. Carry out a careful visual inspection of the tires and wheel assemblies. Spin the tires slowly and watch for signs of lateral or radial runout. Refer to the tire wear chart to determine the tire wear conditions and actions.

For a vibration concern, use the vehicle speed to determine tire/wheel frequency and rpm. Calculate tire and wheel rpm and frequency by carrying out and following:



- Measure the diameter of the tire.
- Record the speed at which the vibration occurs.
- Obtain the corresponding tire and wheel rpm and frequency from the Tire Speed and Frequency Chart.
 - If the vehicle speed is not listed, divide the vehicle speed at which the vibration occurs by 16 km/h (10 mph). Multiply that number by 16 km/h (10 mph) tire rpm listed for that tire diameter in the chart. Then divide that number by 60. For example: a 40 mph vibration with 835 mm (33 in) tires. $40 \div 10 = 4$. Multiply 4 by 105 = 420 rpm. Divide 420 rpm by 60 seconds = 7 Hz at 40 mph.

Tire Speed and Frequency Chart

Tire Diameter	Tire RPM/Hz	Tire RPM/Hz	Tire RPM/Hz	Tire RPM/Hz
mm (inch)	@ 16 km/h (10 mph)	@ 80 km/h (50 mph)	@ 97 km/h (60 mph)	@ 113 km/h (70 mph)
483 (19)	182	910/15	1092/18	1274/21
508 (20)	173	865/14	1038/17	1211/20
533 (21)	165	825/14	990/16	1155/19
560 (22)	158	790/13	948/16	1106/18
585 (23)	151	755/13	906/15	1057/18
610 (24)	145	725/12	870/14	1015/17
635 (25)	139	695/12	834/14	973/16
660 (26)	134	670/11	804/13	938/16
685 (27)	129	645/11	774/13	903/15
710 (28)	124	620/10	744/12	868/14
735 (29)	119	595/10	714/12	833/14
760 (30)	115	575/10	690/11	805/13
785 (31)	111	555/9	666/11	777/13
810 (32)	108	540/9	648/11	756/13
835 (33)	105	525/9	630/10	735/12
864 (34)	102	510/8	612/10	714/12

Brake Disc Machining

Special Tool(s)

 <p>ST1348-A</p>	Gauge, Clutch Housing 308-021 (T75L-4201-A)
 <p>ST1214-A</p>	Dial Indicator Gauge with Holding Fixture 100-002 (TOOL-4201-C) or equivalent

Material

Item	Specification
Metal Surface Cleaner F4AZ-19A536-RA or equivalent	WSE-M5B392-A
High Temperature Nickel Anti-Seize Lubricant F6AZ-9L494-AA or equivalent	ESE-M12A4-A

⚠ WARNING: The electrical power to the air suspension system must be shut off prior to hoisting, jacking or towing an air suspension vehicle. This can be accomplished by turning off the air suspension switch. Failure to do so can result in unexpected inflation or deflation of the air springs, which can result in shifting of the vehicle during these operations.

⚠ CAUTION: Do not install brake discs that are less than the minimum thickness specified. Do not machine a brake disc below the minimum thickness specification.

1. Check wheel bearing end-play and correct as necessary.
2. **NOTE:** Begin at the front of the vehicle unless the vibration has been isolated to the rear.
 Remove the tire and wheel assembly.
3. Remove the brake caliper and the brake caliper anchor plate. Refer to the appropriate section in Group [206](#) for the procedure.
4. Inspect the brake linings. Install new brake linings if below specification. For additional information, refer to the appropriate brake section.
5. Measure and record the brake disc thickness. Install a new brake disc if the thickness after machining will be at or below specification. The specification is molded into the brake disc.
 - Do not machine a new brake disc.

6. For vehicles with a two-piece hub and brake disc assembly:
 - Match-mark before disassembly.
 - Remove the brake disc.
 - Clean the hub and brake disc mounting surfaces with metal surface cleaner.
 - Using a die grinder with a mild abrasive (Scotch Brite® type), remove any rust or corrosion from the hub and brake disc mounting surfaces.
 - Align the match-marks and reinstall the brake disc on the hub.


7.  **CAUTION: Do not use a bench lathe to machine brake discs.**


NOTE: The depth of cut must be between 0.10 and 0.20 mm (0.004 and 0.008 inch). Lighter cuts will cause heat and wear. Heavier cuts will cause poor brake disc surface finish.

Using an on-car brake lathe, machine the brake discs. Follow the manufacturer's instructions. After machining, make sure the brake disc still meets the thickness specification.

8. Using the special tools, verify that the brake disc lateral runout is now within specification. For additional information, refer to [Section 206-00](#).
 9. Remove the special tool hub adapter.
 10. Remove any remaining metal chips from the machining operation.
 11. For vehicles with a two-piece hub and brake disc assembly:
 - Remove the brake disc from the hub.
 - Remove any remaining metal chips from hub and brake disc mounting surfaces and from the ABS sensor.
 - Apply a liberal amount of lubricant to the hub flange, pilot area and to the brake disc-to-hub mounting surface.
 - Using the match marks, mount the brake disc on the hub.
 12. Install the brake caliper anchor plate and the brake caliper.
 13. Install the tire and wheel assembly.
 14. Test the system for normal operation.
-

Powertrain/Drivetrain Mount Neutralizing

 **WARNING:** The electrical power to the air suspension system must be shut off prior to hoisting, jacking or towing an air suspension vehicle. This can be accomplished by turning off the air suspension switch. Failure to do so can result in unexpected inflation or deflation of the air springs, which can result in shifting of the vehicle during these operations.

1. Raise and support the vehicle.
 2. Loosen, but do not remove, the powertrain/drivetrain mount fasteners.
 3. Lower the vehicle.
 4.  **CAUTION:** Do not twist or strain the powertrain/drivetrain mounts.
Move the vehicle in forward and reverse 0.6-1.2 meters (2-4 ft).
 5. Raise and support the vehicle.
 6. Tighten the powertrain/drivetrain mount fasteners.
 7. Lower the vehicle.
 8. Test the system for normal operation.
-

Exhaust System Neutralizing




WARNING: Exhaust gases contain carbon monoxide, which is harmful to health and potentially lethal. Repair exhaust system leaks immediately. Never operate the engine in an enclosed area.



WARNING: Exhaust system components are hot.

NOTE: Neutralize the exhaust system to relieve strain on mounts which can be sufficiently bound up to transmit vibration as if grounded.

1.  **WARNING:** The electrical power to the air suspension system must be shut off prior to hoisting, jacking or towing an air suspension vehicle. This can be accomplished by turning off the air suspension switch. Failure to do so can result in unexpected inflation or deflation of the air springs, which can result in shifting of the vehicle during these operations.




CAUTION: Make sure the system is warmed up to normal operating temperature, as thermal expansion can be the cause of a strain problem.

Raise and support the vehicle.

2. Loosen all exhaust hanger attachments and reposition the hangers until they hang free and straight.
 3. Loosen all exhaust flange joints.
 4. Place a stand to support the muffler parallel to the vehicle frame with the muffler pipe bracket free of stress.
 5. Tighten the muffler connection.
 6. Tighten all the exhaust hanger clamps and flanges (tighten the exhaust manifold flange joint last).
 - Verify there is adequate clearance to prevent grounding at any point in the system. Make sure that the catalytic converter and heat shield do not contact the frame rails.
 - After neutralization, the rubber in the exhaust hangers should show some flexibility when movement is applied to the exhaust system.
 - With the exhaust system installed securely and cooled, the rear hanger should be angled forward.
 7. Lower the vehicle.
 8. Test the exhaust system for normal operation.
-

Wheel Bearing Check

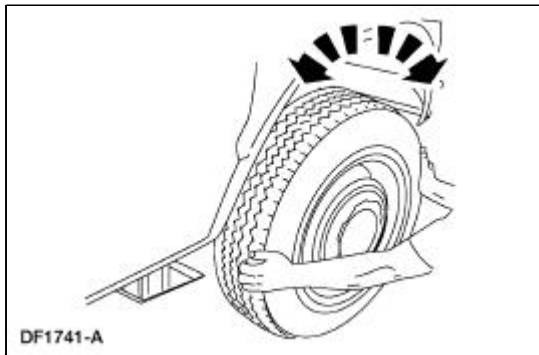
1.  **WARNING:** The electrical power to the air suspension system must be shut off prior to hoisting, jacking or towing an air suspension vehicle. This can be accomplished by turning off the air suspension switch. Failure to do so can result in unexpected inflation or deflation of the air springs, which can result in shifting of the vehicle during these operations.

Raise the vehicle until the front tires are off the floor.

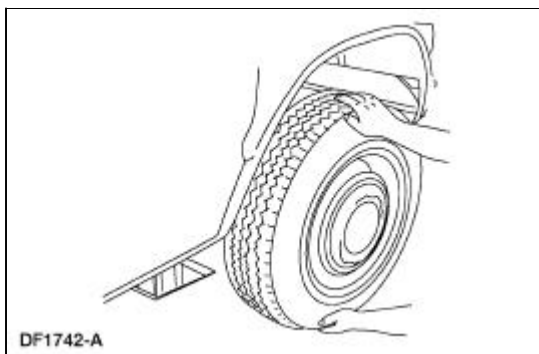
- Make sure the wheels are in a straight forward position.

2. **NOTE:** Make sure the wheel rotates freely and that the brake pads are retracted sufficiently to allow free movement of the tire and wheel assembly.

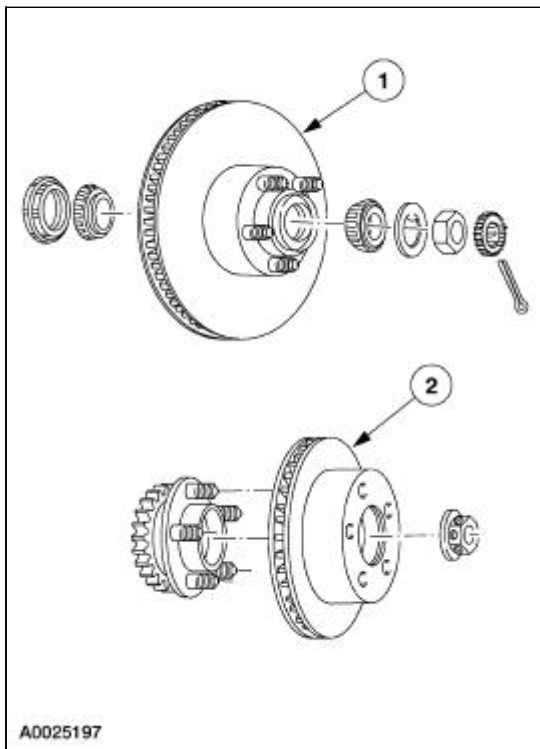
Spin the tire by hand to check the wheel bearings for roughness.



3. Grip each front tire at the top and bottom and move the wheel inward and outward while lifting the weight of the tire off the front wheel bearing.



4. If the tire and wheel (hub) is loose on the spindle, does not rotate freely, or has a rough feeling when spun, carry out one of the following:
 1. On vehicles with inner and outer bearings, inspect the bearings and cups for wear or damage. Adjust or install new bearings and cups as necessary.
 2. On vehicles with one sealed bearing, install a new wheel hub.



General Specifications

Item	LH	RH	Split
Alignment Specifications — Front			
Caster	8.10° ± 0.50°	8.10° ± 0.50°	0° ± 0.70°
Camber	-0.15° ± 0.50°	-0.15° ± 0.50°	0° ± 0.70°
Toe @ curb ride height (positive value is toe-in, negative value is toe-out)	—	—	+0.16° ± 0.25°
Alignment Specifications — Rear			
Caster	—	—	—
Camber	-1.0° ± 0.75°	-1.0° ± 0.75°	0° ± 0.75°
Toe @ curb ride height (positive value is toe-in, negative value is toe-out)	0.12° ± 0.25°	0.12° ± 0.25°	0.24° ± 0.25°

General Specifications

Item	Specification
Dogtracking — maximum (centerline of front tires compared to centerline of rear tires)	12.7 mm (0.5 in.)
Clear Vision	
Clear vision (negative value is counterclockwise)	0° ± 3°
Ride Height	
Front	60.5 mm ± 8 mm (2.4 in. ± 0.3 in.)
Rear	25.8 mm ± 8 mm (1 in. ± 0.3 in.)
Ball Joint Radial Play	
Lower ball joint — maximum	0.8 mm (1/32 in.)
Upper ball joint — maximum	0.8 mm (1/32 in.)
Vehicle Lean (Side-to-Side Height Differences)	
Front wheel opening difference — maximum	12 mm

	(0.5 in.)
Rear wheel opening difference — maximum	12 mm (0.5 in.)
Vehicle Attitude (Front-to-Rear Height Difference)	
Maximum vehicle attitude = average front - average rear	14.5 mm (0.6 in.)

Torque Specifications

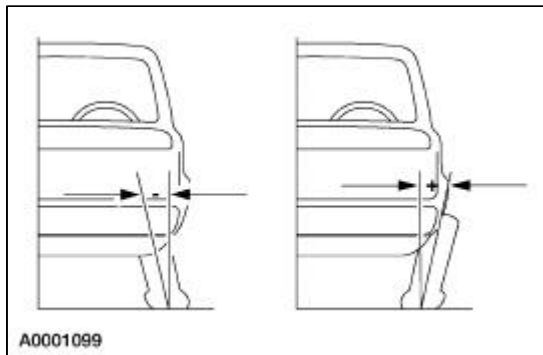
Description	Nm	lb-ft
Lower front suspension arm nuts	175	129
Rear toe link lock nuts	70	52
Steering column intermediate shaft pinch bolt	35	26
Steering gear lock nuts	103	76

Wheel Alignment Angles

Camber, caster and toe are adjustable on the front suspension system. Only the toe is adjustable on the rear suspension system. Camber and caster are adjusted by means of eccentric cams on the lower control arm mounting bolts. The front toe is adjusted by use of the front wheel spindle tie rod (3280). The rear toe is adjusted by the use of toe link assemblies connecting the knuckles to the rear sub-frame.

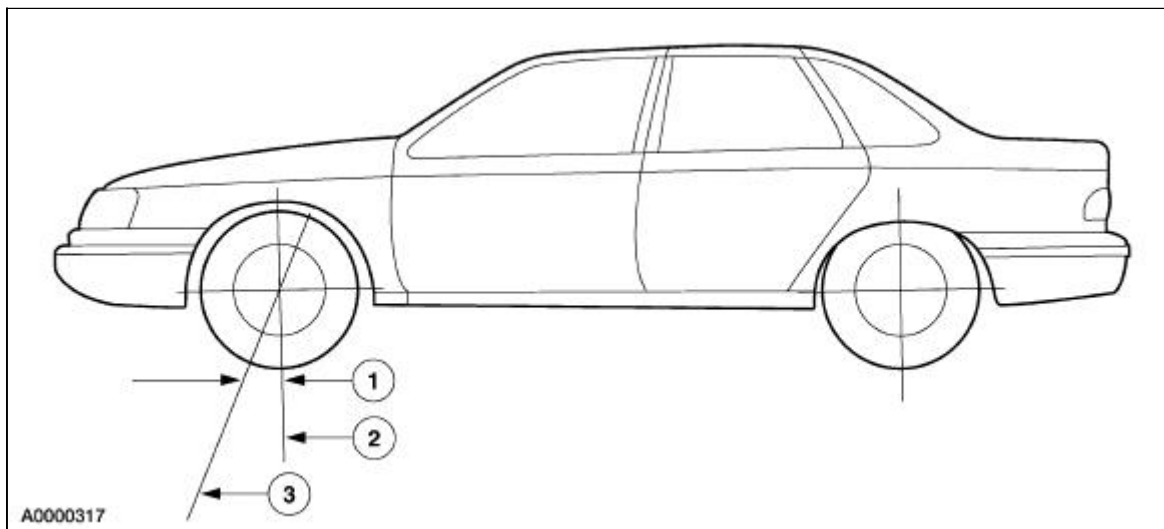
Camber

Negative and Positive Camber



Camber is the vertical tilt of the wheel when viewed from the front. Camber can be positive or negative and has a direct effect on tire wear.

Caster



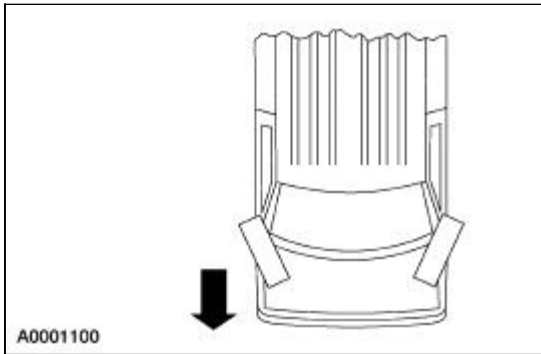
Item	Description

1	Positive caster
2	True vertical
3	Steering axis

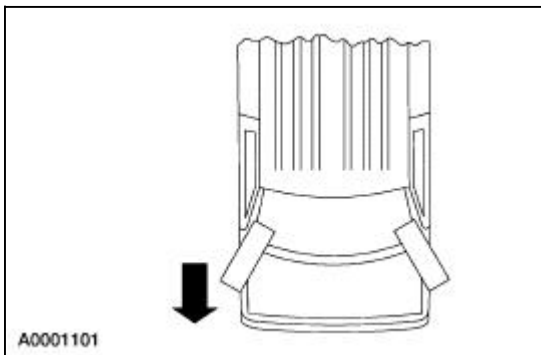
Caster is the deviation from vertical of an imaginary line drawn through the ball joints when viewed from the side. The caster specifications in this section will give the vehicle the best directional stability characteristics when loaded and driven. The caster setting is not related to tire wear.

Toe

Positive Toe (Toe-In)



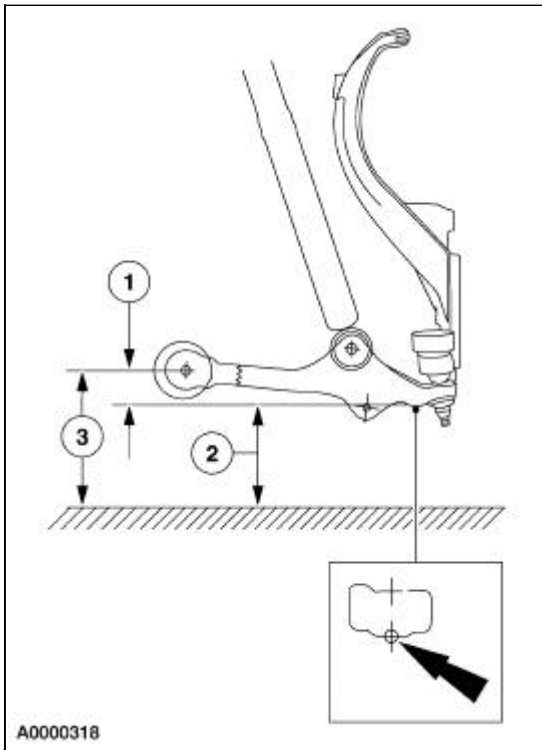
Negative Toe (Toe-Out)



The vehicle toe setting affects tire wear and directional stability.

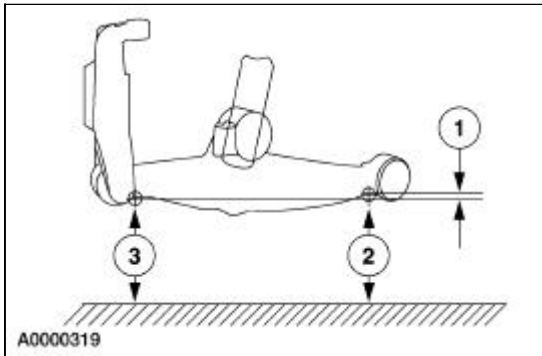
Ride Height

Front Ride Height Measurement



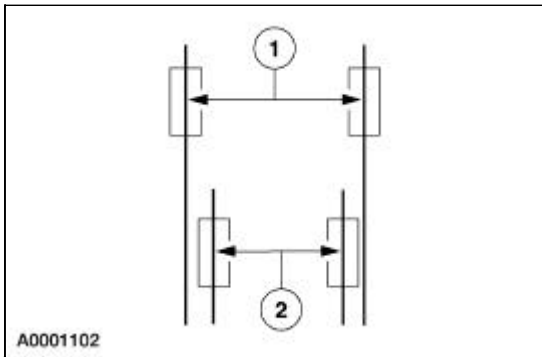
Item	Description
1	Ride height = B-A
2	Measurement A
3	Measurement B

Rear Ride Height Measurement



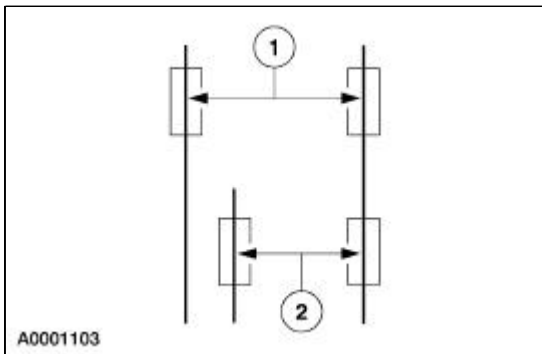
Item	Description
1	Ride height = A-B
2	Measurement A
3	Measurement B

Wheel Track



Item	Description
1	Front track
2	Rear track

Dogtracking



Item	Description
1	Front track
2	Rear track dogtracking

Dogtracking is the condition in which the independent rear suspension (IRS) system is not square to the chassis. Heavily crowned roads can give the illusion of dogtracking.

Wander

Wander is the tendency of the vehicle to require frequent, random left and right steering wheel (3600) corrections to maintain a straight path down a level road.

Shimmy

Shimmy, as observed by the driver, is large, consistent, rotational oscillations of the steering wheel resulting from large, side-to-side (lateral) tire/wheel movements.

Shimmy is usually experienced near 64 km/h (40 mph), and can begin or be amplified when the tire

contacts pot holes or irregularities in the road surface.

Nibble

Sometimes confused with shimmy, nibble is a condition resulting from tire interaction with various road surfaces and observed by the driver as small rotational oscillations of the steering wheel.

Poor Returnability/Sticky Steering

Poor returnability and sticky steering is used to describe the poor return of the steering wheel to center after a turn or the steering correction is completed.

Drift/Pull

Pull is a tugging sensation, felt by the hands on the steering wheel, that must be overcome to keep the vehicle going straight.

Drift describes what a vehicle with this condition does with hands off the steering wheel.

- A vehicle-related drift/pull, on a flat road, will cause a consistent deviation from the straight-ahead path and require constant steering input in the opposite direction to counteract the effect.
- Drift/pull may be induced by conditions external to the vehicle (i.e., wind, road crown).

Poor Groove Feel

Poor groove feel is characterized by little or no buildup of turning effort felt in the steering wheel as the wheel is rocked slowly left and right within very small turns around center or straight-ahead (under 20 degrees of steering wheel turn). Efforts may be said to be "flat on center."

- Under 20 degrees of turn, most of the turning effort that builds up comes from the mesh of gear teeth in the steering gear (3504). In this range, the steering wheel is not yet turned enough to feel the effort from the self-aligning forces at the road wheel or tire patch.
 - In the diagnosis of a roadability problem, it is important to understand the difference between wander and poor groove feel.
-

Suspension System

Inspection and Verification

1. Road test.
 - Verify the customer's concern by performing a road test on a smooth road. If any vibrations are apparent, refer to [Section 100-04](#).
2. Inspect tires.
 - Check the tire pressure with all normal loads in the vehicle and the tires cold. For additional information, refer to the vehicle certification (VC) label.
 - Verify that all tires are sized to specification.
 - Inspect the tires for incorrect wear and damage.
3. Inspect chassis and underbody.
 - Remove any excessive accumulation of mud, dirt or road deposits from the chassis and underbody.
4. Inspect for aftermarket equipment.
 - Check for aftermarket changes to the steering, suspension, wheel and tire components (such as competition, heavy duty, etc.) The specifications shown in this manual do not apply to vehicles equipped with aftermarket equipment.

Visual Inspection Chart

Mechanical
<ul style="list-style-type: none">● Wheel bearing(s)● Loose or damaged front or rear suspension components● Loose, damaged or missing suspension fastener(s)● Incorrect spring usage● Damaged or sagging spring(s)● Damaged or leaking shock absorber(s)● Damaged or leaking strut(s)● Worn or damaged suspension bushing(s)● Loose, worn or damaged steering system components● Damaged axle components

5. If an obvious cause for an observed or reported condition is found, correct the cause (if possible) before proceeding to the next step.
6. If the fault is not visually evident, determine the symptom and proceed to the following symptom chart.

Symptom Chart

Condition	Possible Sources	Action
<ul style="list-style-type: none"> ● Dogtracking 	<ul style="list-style-type: none"> ● Incorrect rear thrust angle. ● Front or rear suspension components. ● Drive axle damaged. 	<ul style="list-style-type: none"> ● CHECK the wheel alignment. ADJUST as necessary. ● INSPECT the front and rear suspension systems. REPAIR or INSTALL new suspension components as necessary. REFER to Section 204-01 or Section 204-02. ● REPAIR as necessary. REFER to appropriate section in Group 2.
<ul style="list-style-type: none"> ● Drift/Pull 	<ul style="list-style-type: none"> ● Unequal tire pressure. ● Excessive side-to-side difference in caster or camber. ● Tire forces. ● Unevenly loaded or overloaded vehicle. ● Steering components. ● Brake drag. 	<ul style="list-style-type: none"> ● ADJUST tire pressure. REFER to the VC label. ● CHECK the wheel alignment. ADJUST as necessary. ● ROTATE tires front to rear. ● NOTIFY the customer of incorrect vehicle loading. ● REFER to Section 211-00. ● REFER to Section 206-00.
<ul style="list-style-type: none"> ● Front Bottoming or Riding Low 	<ul style="list-style-type: none"> ● Shock absorbers (s). ● Sagging spring (s). ● Incorrect spring (s). 	<ul style="list-style-type: none"> ● INSTALL new shock and spring assemblies as necessary. REFER to Section 204-01. ● CHECK ride height. INSTALL new springs as necessary. REFER to Section 204-01. ● NOTE the part number on the spring(s). NOTE the spring code on the vehicle certification (VC) label. REFER to Section 100-01 to convert the spring code to a part number. VERIFY that the part numbers match. INSTALL new spring(s) with the correct part number, if necessary. REFER to Section 204-01.
<ul style="list-style-type: none"> ● Incorrect Tire Wear 	<ul style="list-style-type: none"> ● Incorrect tire pressure (rapid center rib or inner and outer edge wear). ● Excessive front or rear toe (rapid inner or outer edge wear). ● Excessive negative or positive camber (rapid inner or outer edge wear). 	<ul style="list-style-type: none"> ● ADJUST tire pressure. REFER to the VC label. ● CHECK the wheel alignment. ADJUST as necessary. ● CHECK the wheel alignment. ADJUST as necessary.

	<ul style="list-style-type: none"> ● Tires out of balance (tires cupped or dished). 	<ul style="list-style-type: none"> ● BALANCE tires.
<ul style="list-style-type: none"> ● Rough Ride 	<ul style="list-style-type: none"> ● Shock absorber (s). ● Sagging or weak spring(s). ● Incorrect spring (s). 	<ul style="list-style-type: none"> ● INSTALL new shock and spring assemblies as necessary. REFER to Section 204-01. ● INSTALL new springs as necessary. REFER to Section 204-01. ● NOTE the part number on the spring(s). NOTE the spring code on the vehicle certification (VC) label. REFER to Section 100-01 to convert the spring code to a part number. VERIFY that the part numbers match. INSTALL new spring(s) with the correct part number, if necessary. REFER to Section 204-01.
<ul style="list-style-type: none"> ● Shimmy or Wheel Tramp 	<ul style="list-style-type: none"> ● Loose wheel nut (s). ● Loose front suspension fasteners. ● Front wheel bearing(s). ● Wheel or tire concerns. ● Shock absorber (s). ● Sagging or weak spring(s). ● Incorrect spring (s). ● Loose, worn or damaged ball joint(s). ● Loose, worn or damaged steering components. ● Front wheel alignment. 	<ul style="list-style-type: none"> ● TIGHTEN to specification. REFER to Section 204-04. ● TIGHTEN to specification. REFER to Section 204-01. ● REFER to Wheel Bearing Inspection—Front and Rear ● REFER to Section 204-04. ● INSTALL new shock and spring assemblies as necessary. REFER to Section 204-01. ● INSTALL new springs as necessary. REFER to Section 204-01 or Section 204-02. ● NOTE the part number on the spring(s). NOTE the spring code on the vehicle certification (VC) label. REFER to Section 100-01 to convert the spring code to a part number. VERIFY that the part numbers match. INSTALL new spring(s) with the correct part number, if necessary. REFER to Section 204-01 or Section 204-02. ● GO to the Ball Joint Inspection component test in this section. ● REFER to Section 211-00. ● CHECK the wheel alignment. ADJUST as necessary.
<ul style="list-style-type: none"> ● Sticky Steering, Poor 	<ul style="list-style-type: none"> ● Ball joints. 	<ul style="list-style-type: none"> ● GO to the Ball Joint Inspection component test in this section.

Returnability	<ul style="list-style-type: none"> ● Steering components. 	<ul style="list-style-type: none"> ● REFER to Section 211-00.
<ul style="list-style-type: none"> ● Steering Wheel Off-Center 	<ul style="list-style-type: none"> ● Unequal front or rear toe settings (side-to-side). ● Steering components. 	<ul style="list-style-type: none"> ● CHECK the wheel alignment. ADJUST as necessary. ● REFER to Section 211-00.
<ul style="list-style-type: none"> ● Sway or Roll 	<ul style="list-style-type: none"> ● Overloaded, unevenly or incorrectly loaded vehicle. ● Loose wheel nut (s). ● Sagging or weak spring(s). ● Incorrect spring (s). ● Shock absorber (s). ● Loose front stabilizer bar (5482) or rear stabilizer bar (5A772). ● Worn lower suspension arm stabilizer bar insulators (5493). 	<ul style="list-style-type: none"> ● NOTIFY the customer of incorrect vehicle loading. ● TIGHTEN to specification. REFER to Section 204-04. ● INSTALL new springs as necessary. REFER to Section 204-01 or Section 204-02. ● NOTE the part number on the spring(s). NOTE the spring code on the vehicle certification (VC) label. REFER to Section 100-01 to convert the spring code to a part number. VERIFY that the part numbers match. INSTALL new spring(s) with the correct part number, if necessary. REFER to Section 204-01 or Section 204-02. ● INSTALL new shock and spring assemblies as necessary. REFER to Section 204-01. ● TIGHTEN to specification. REFER to Section 204-01 or Section 204-02. ● INSTALL new lower suspension arm stabilizer bar insulators as necessary. REFER to Section 204-01 or Section 204-02.
<ul style="list-style-type: none"> ● Vehicle Leans to One Side 	<ul style="list-style-type: none"> ● Unevenly loaded or overloaded vehicle. ● Front or rear suspension components. ● Shock absorber (s). ● Sagging spring (s). ● Incorrect spring 	<ul style="list-style-type: none"> ● NOTIFY the customer of incorrect vehicle loading. ● INSPECT the front and rear suspension systems. REPAIR or INSTALL new suspension components as necessary. REFER to Section 204-01 or Section 204-02. ● INSTALL new shock and spring assemblies as necessary. REFER to Section 204-01. ● INSTALL new springs as necessary. REFER to Section 204-01 or Section 204-02. ● NOTE the part number on the

	(s).	spring(s). NOTE the spring code on the vehicle certification (VC) label. REFER to Section 100-01 to convert the spring code to a part number. VERIFY that the part numbers match. INSTALL new spring(s) with the correct part number, if necessary. REFER to Section 204-01 or Section 204-02 .
<ul style="list-style-type: none"> ● Vibration/Noise 	<ul style="list-style-type: none"> ● Incorrect ride height. Lateral tilt out of specification. ● Tires and wheel concerns. ● Wheel bearings. ● Wheel hubs. ● Brake components. ● Suspension components. ● Steering components. 	<ul style="list-style-type: none"> ● CHECK the ride height. INSTALL new springs as necessary. REFER to Section 204-01 or Section 204-02. ● REFER to Section 100-04.
<ul style="list-style-type: none"> ● Wander 	<ul style="list-style-type: none"> ● Unevenly loaded or overloaded vehicle. ● Ball joint(s). ● Front wheel bearing(s). ● Loose, worn or damaged suspension components. ● Loose suspension fasteners. ● Steering components. ● Wheel alignment (excessive total front or rear toe-out). 	<ul style="list-style-type: none"> ● NOTIFY the customer of incorrect vehicle loading. ● GO to the Ball Joint Inspection component test in this section. ● REFER to Wheel Bearing Inspection—Front and Rear ● INSTALL new suspension components as necessary. REFER to Section 204-01 or Section 204-02. ● TIGHTEN to specification. REFER to Section 204-01 or Section 204-02. ● REFER to Section 211-00. ● CHECK the wheel alignment. ADJUST as necessary.

Component Tests

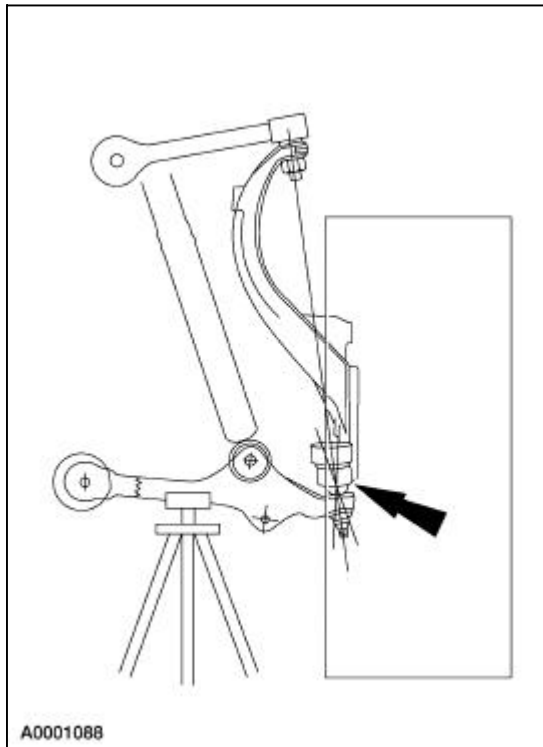
Ball Joint Inspection

NOTE: The front suspension is shown in the following procedures. The inspection of the rear suspension upper ball joint is similar.

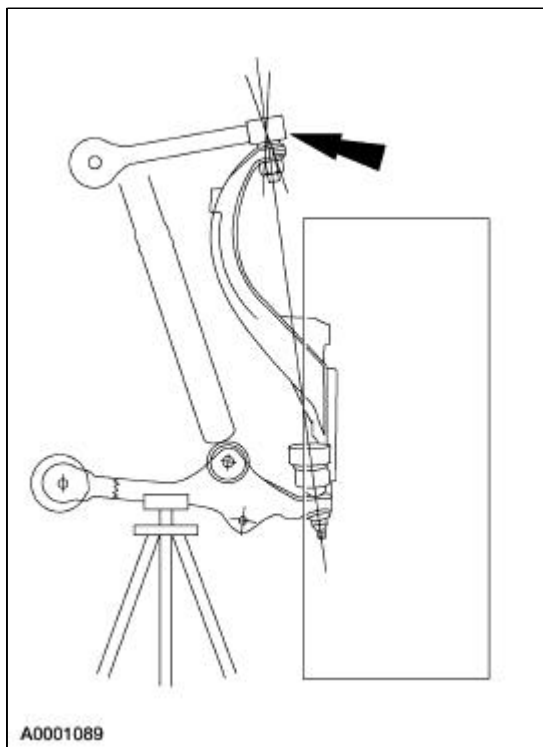
1. Raise and support the vehicle. For additional information, refer to [Section 100-02](#).
2. Prior to performing any inspection of the ball joints, inspect the front wheel bearings. For

additional information, refer to [Wheel Bearing Inspection—Front and Rear](#).

3. Position a safety stand beneath the front suspension lower arm (3079) or rear suspension lower arm to be tested.



4. While an assistant pulls and pushes the top and bottom of the tire, observe the relative movement between the ball joint and the front suspension lower arm. Any movement at or exceeding the specification indicates a worn or damaged ball joint. Install a new spindle as necessary. For additional information, refer to [Section 204-01](#).



5. While an assistant pulls and pushes the top and bottom of the tire, observe the relative movement between the ball joint and the front suspension upper arm or rear suspension upper arm. Any movement at or exceeding the specification indicates a worn or damaged ball joint. Install a new front suspension upper arm or rear suspension upper arm as necessary. For additional information, refer to [Section 204-01](#) or [Section 204-02](#).
 6. Remove the safety stand.
 7. Lower the vehicle.
-

Wheel Bearing Inspection —Front and Rear

1. Raise the vehicle until the tire is off the floor. For additional information, refer to [Section 100-02](#).
2. **NOTE:** Make sure the wheel rotates freely and the brake pads are retracted sufficiently to allow movement of the tire and wheel assembly.

Grasp each tire at the top and bottom and move the wheel inward and outward while lifting the weight of the tire off the wheel bearing.

3. If the tire and wheel (hub) is loose on the wheel spindle or does not rotate freely, install a new front wheel hub (1104) or rear hub (1109) as necessary. For additional information, refer to [Section 204-01](#) or [Section 204-02](#).
-

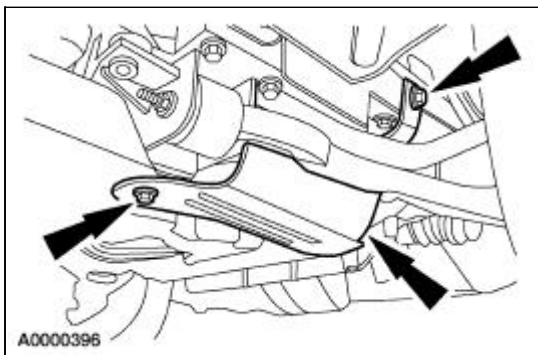
Camber and Caster Adjustment

NOTE: If the vehicle is equipped with hex head bolts in the lower control arm, new cam bolts and lock nuts must be installed before adjusting the cast and camber.

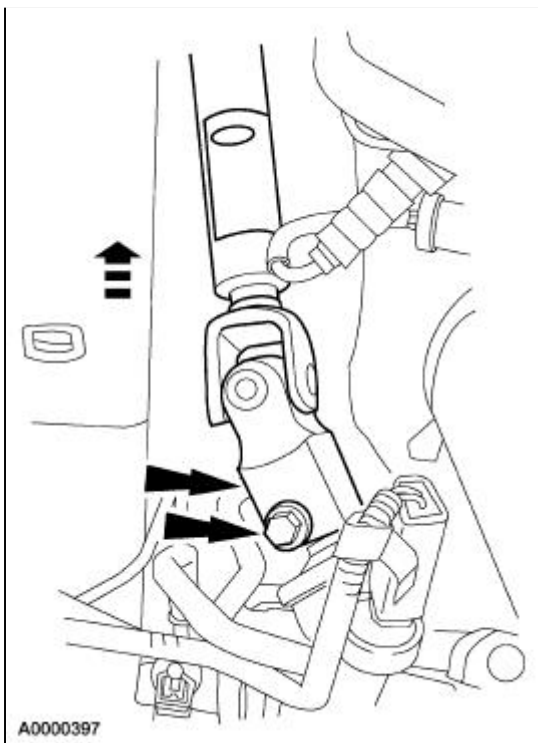
NOTE: The camber and caster adjustment for the LH side is shown. The procedure for adjusting the RH side is similar.

Vehicles without camber and caster adjustment cam bolts

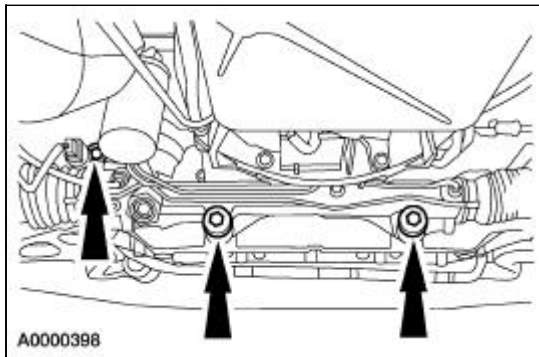
1. Remove two bolts, one pushpin and the splash shield.



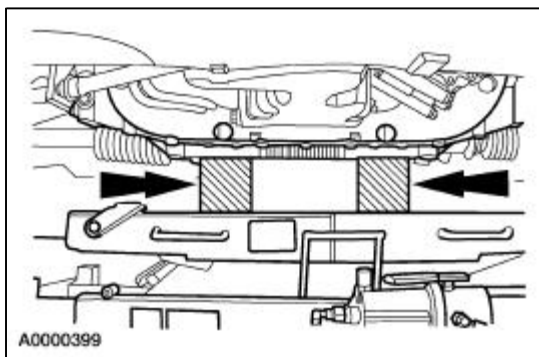
2. Remove and discard the pinch bolt. Disconnect the steering shaft.



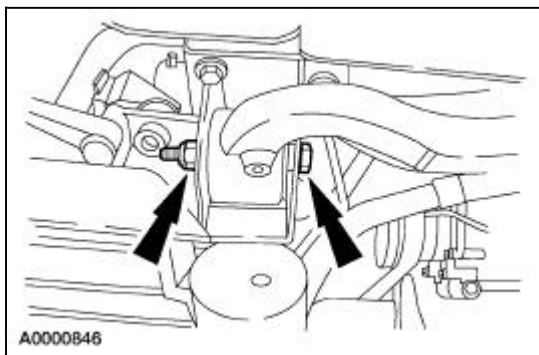
3. Remove three lock nuts and bolts. Discard the lock nuts.



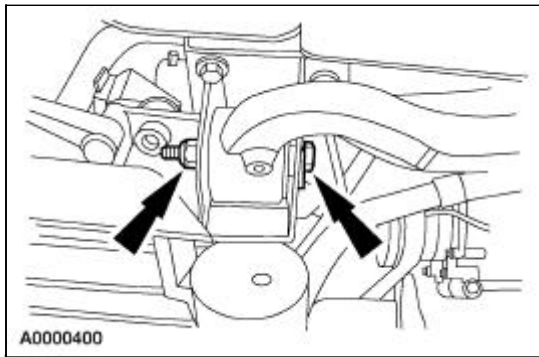
4. Raise and support the front end and the No. 2 crossmember.
 - Position two 4 in. x 4 in. pieces of wood between the No. 2 crossmember and the lifting device.



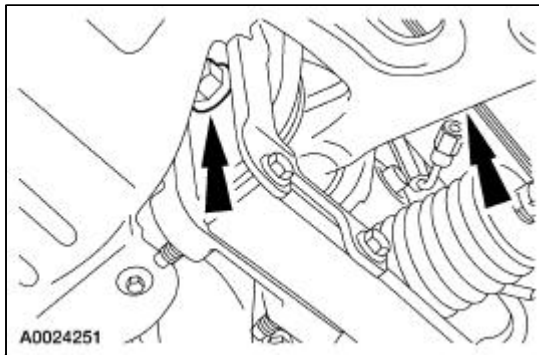
5. Remove and discard the front nut and bolt.



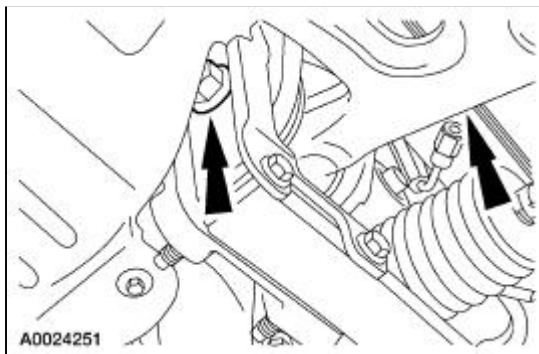
6. Install the caster adjustment cam bolt and a new lock nut.
 - The bolt must be installed from the rear as shown.
 - Install the bolt with the cam lobe down.
 - The cam must be seated between the cam guides on the No. 1 crossmember.



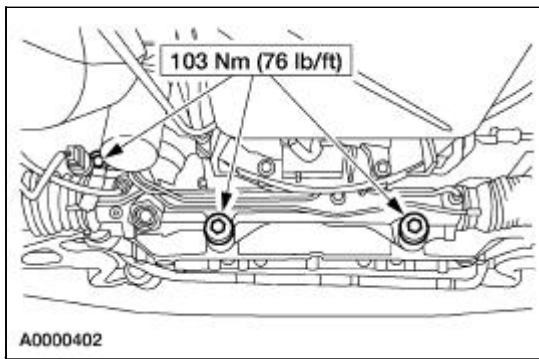
7. Position the steering gear (3504) aside.
8. Remove and discard the rear nut and bolt.



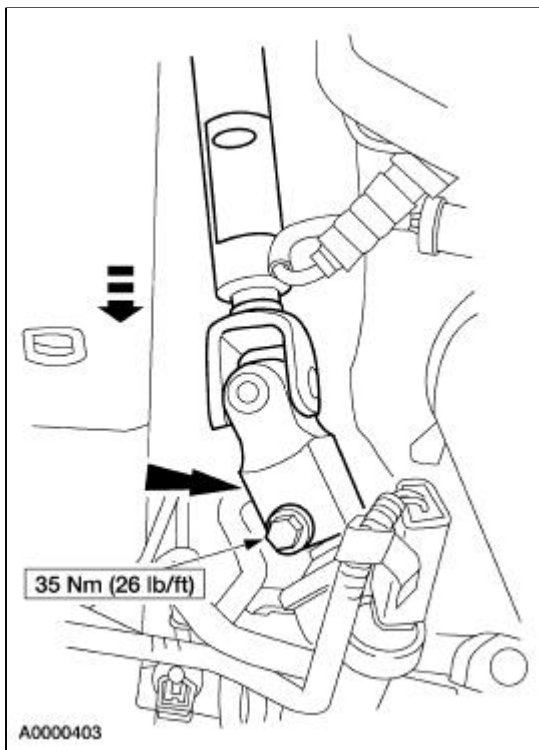
9. Loosely, install the camber adjustment cam bolt, a new lock nut and the I-brace bracket (if equipped).
 - The bolt must be installed from the rear as shown.
 - Install the bolt with the cam lobe down.
 - The cam must be seated in the groove in the No. 2 crossmember.



10. Lower the front end.
11. Install the steering gear, three bolts and new lock nuts.



12. Connect the steering shaft. Install a new pinch bolt.

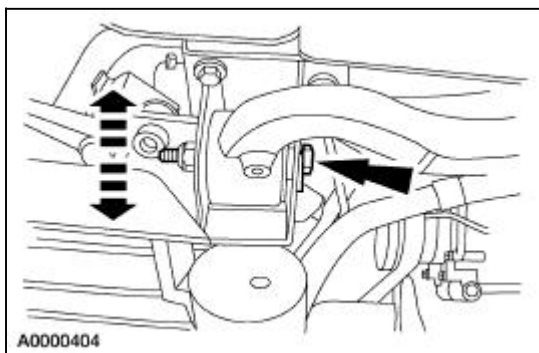


All vehicles

13. Measure the wheel alignment values. Follow the equipment manufacturer's instructions.

Vehicles requiring caster adjustment

14. Rotate the caster adjustment cam bolt (front) to adjust the caster.



15. Recheck the alignment settings. Follow the equipment manufacturer's instructions. Readjust as necessary.

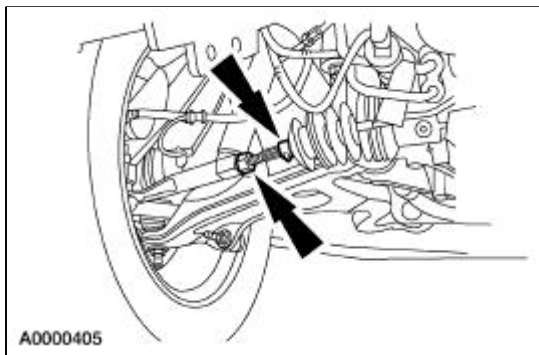
Vehicles requiring camber adjustment

16. **NOTE:** Adjustments to the camber impact the toe settings. Therefore, the camber and toe may need to be adjusted at the same time to get the correct values.

NOTE: Both the LH and RH toe need to be adjusted when adjusting the camber.

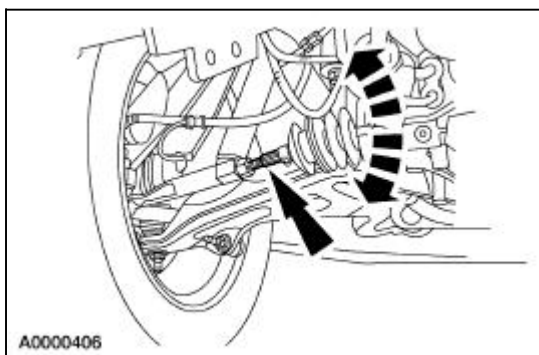
Loosen the jam nut. Remove the clamp.

- Clean and lubricate the jam nut and front wheel spindle tie-rod threads.



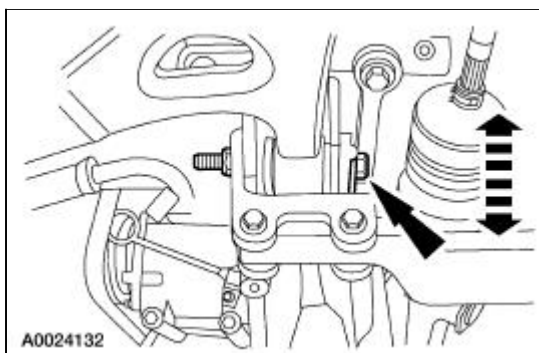
17. **NOTE:** Do not allow the steering gear bellows to twist when the front wheel spindle tie-rod is rotated.

Rotate the front wheel spindle tie-rod to adjust the toe.



18. **NOTE:** To aid in accurate camber and toe measurements, support the front suspension lower arm by hand while rotating the camber adjustment cam bolt.

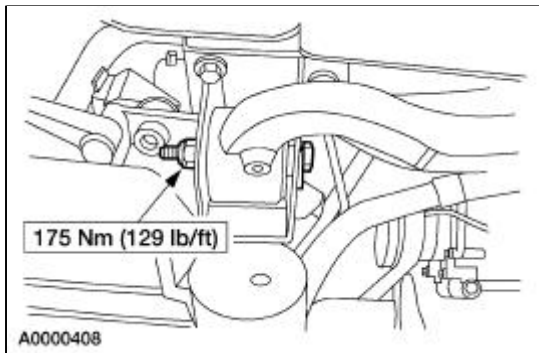
Rotate the camber adjustment cam bolt (rear) to adjust the camber.



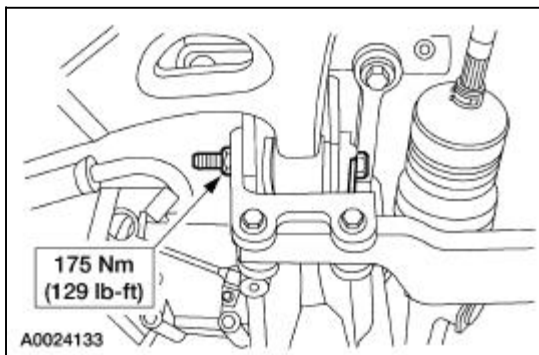
19. Repeat the above camber adjustment steps until the correct camber and toe measurements are achieved.

All vehicles

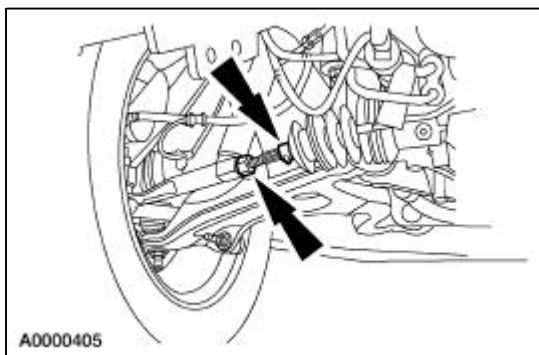
20. Tighten the nut.



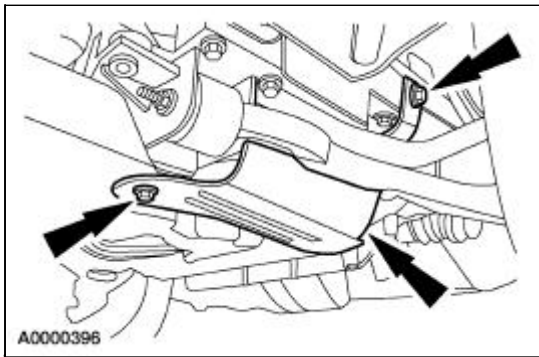
21. Tighten the nut.



22. Tighten the nut. Install the clamp.



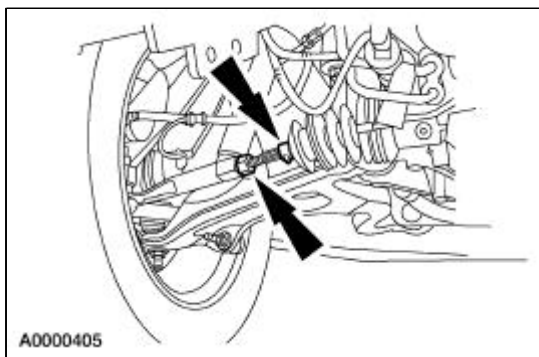
23. Recheck the alignment settings. Follow the equipment manufacturer's instructions. Readjust the caster as necessary.
24. Install the splash shield, one pushpin, and two bolts.



A0000396

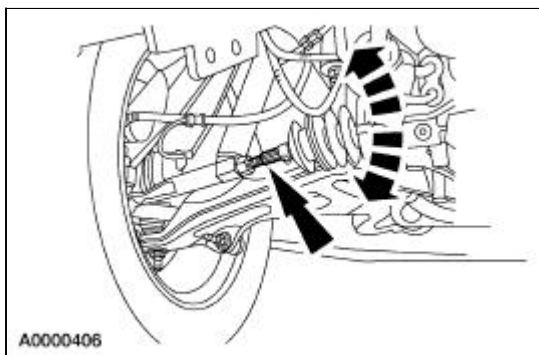
Toe Adjustment —Front

1. Start the engine and center the steering wheel (3600).
2. Turn the engine off, and hold the steering wheel in the "straight forward" position by attaching a rigid link from the steering wheel to the brake pedal.
3. Check the toe settings. Follow the equipment manufacturer's instructions.
4. Loosen the nuts. Remove the clamps.
 - Clean and lubricate the nuts and front wheel spindle tie-rod threads.

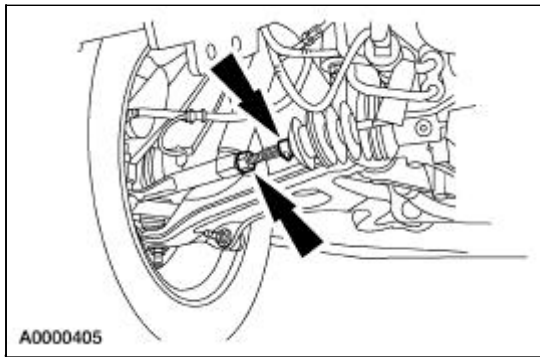


5. **NOTE:** Do not allow the steering gear bellows to twist when the front wheel spindle tie-rod (3280) is rotated.

Rotate the front wheel spindle tie-rods.



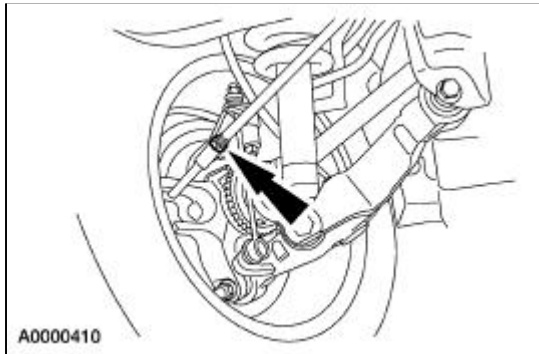
6. Tighten the nuts. Install the clamps.



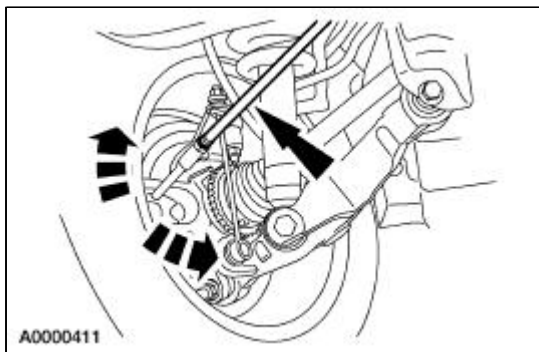
7. Recheck the toe settings. Follow the equipment manufacturer's instructions.
-

Toe Adjustment —Rear

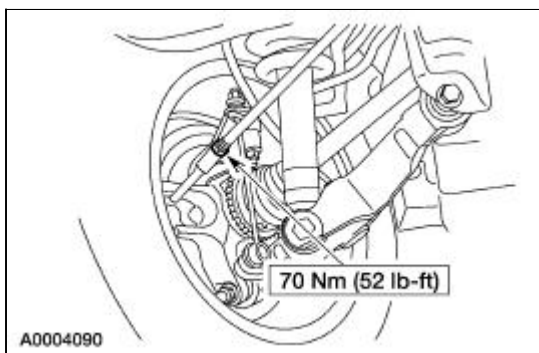
1. Loosen the nut.
 - Clean the nut and toe link threads.



2. Rotate the toe link to adjust the toe.



3. Tighten the nut.



4. Recheck the toe settings. Follow the equipment manufacturer's instructions.

General Specifications

Item	Specification
Motorcraft High Temperature Nickel Anti-Seize Lubricant F6AZ-9L494-AA (in Canada CXG-2-B)	ESE-M12A4-A
Rust Penetrant and Inhibitor F2AZ-19A501-A (in Canada CXC-51-A)	ESR-M99C56-A

Torque Specifications

Description	Nm	lb-ft	lb-in
Suspension upper arm-to-body nuts	48	35	—
Suspension upper arm-to-knuckle nut	90	66	—
Suspension lower arm-to-frame nuts	175	129	—
Suspension lower arm-to-knuckle nut	150	111	—
Stabilizer bar bracket bolts	75	55	—
Stabilizer bar link nuts	55	41	—
Tie-rod end-to-knuckle nut	80	59	—
Hub and bearing-to-knuckle bolts	90	66	—
Shock and spring assembly-to-lower control arm bolts and nuts	175	129	—
Shock and spring assembly-to-body nuts	28	21	—
Upper shock rod-to-upper mount nut	50	37	—
Wheel nuts	135	100	—
Heater water valve bracket	5	—	44
Engine control wiring bracket	5	—	44
Power steering gear nuts and bolts	103	76	—

Front Suspension



WARNING: All vehicles are equipped with gas-pressurized shock absorbers which will extend unassisted. Do not apply heat or flame to the shock absorbers during removal or component servicing. Failure to follow these instructions may result in personal injury.

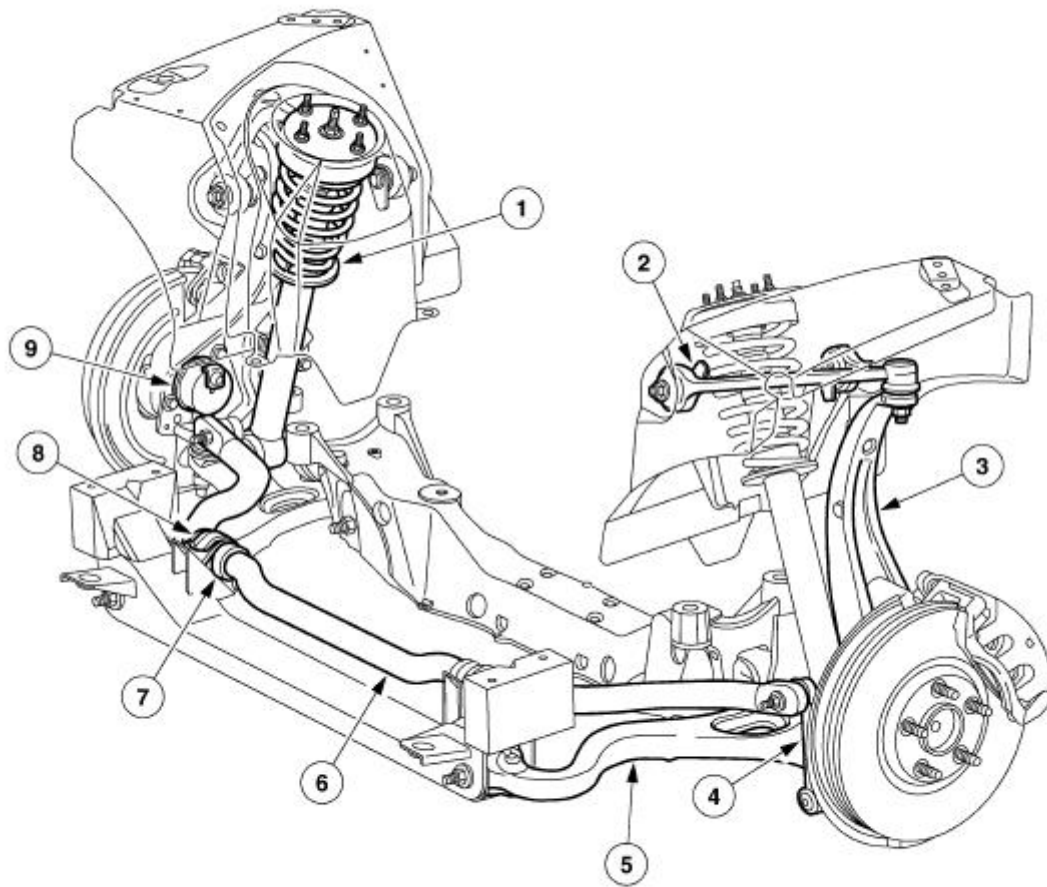


CAUTION: All front suspension fasteners are important attaching parts because they can affect the performance of vital parts and systems and their failure can result in major service expense. A new part with the same part number must be installed if installation becomes necessary. Do not use a new part of lesser quality or substitute design. Torque values must be used as specified during assembly to make sure of correct retention of these parts. Never attempt to heat, quench or straighten any front suspension part. Install a new part.

The front suspension consists of the following components:

- upper suspension arm and bushing (3082)
- lower suspension arm and bushing (3078)
- shock absorber and spring assembly
- stabilizer bar (5482)
- stabilizer bar bushings (5493)
- stabilizer bar brackets (5486)
- stabilizer bar links (5K483)
- wheel knuckle (3K185)
- wheel hub and bearing (1104)

Front Suspension



A0001090

Item	Part Number	Description
1	—	Shock absorber and spring assembly
2	3082	Upper arm and bushing
3	3K185	Wheel knuckle
4	5K483	Stabilizer bar link
5	3078	Lower arm and bushing
6	5482	Stabilizer bar
7	5493	Stabilizer bar bushing
8	5486	Stabilizer bar bracket
9	1104	Wheel hub and bearing

Front Suspension

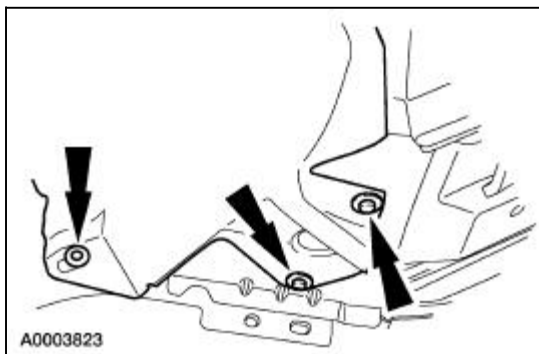
Refer to [Section 204-00](#) .

Wheel Bearing and Hub

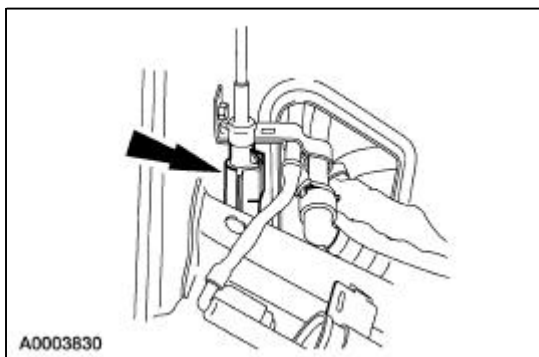
Removal

⚠ CAUTION: Suspension fasteners are critical parts because they affect the performance of vital components and systems and their failure can result in major service expense. A new part with the same part number must be installed if installation becomes necessary. Do not use a new part of lesser quality or substitute design. Torque values must be used as specified during reassembly to make sure of correct retention of these parts.

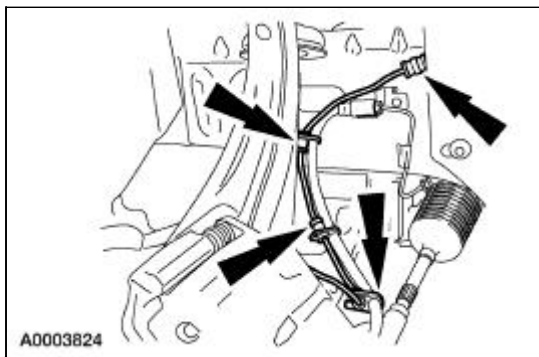
1. Raise the vehicle on a hoist. For additional information, refer to [Section 100-02](#).
2. Remove the wheel and tire assembly. For additional information, refer to [Section 204-04](#).
3. Remove the brake disc. For additional information, refer to [Section 206-03](#).
4. Remove the pushpins.



5. Move the inner fender skirt aside and disconnect the anti-lock brake (ABS) sensor.



6. Detach the ABS sensor wire from the retainers.

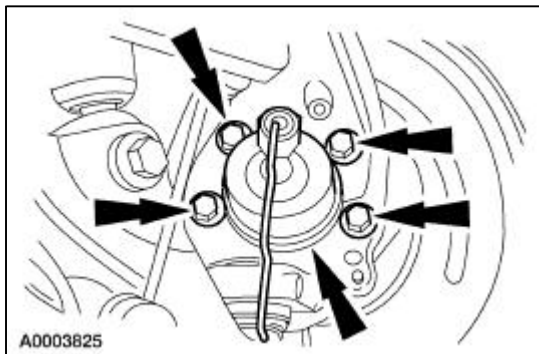


7. **⚠ CAUTION:** The wheel hub and bearing (1104) is not pressed into the wheel knuckle (3K185). Do not use a slide hammer, or strike the back of the wheel hub and bearing to remove a stuck wheel hub and bearing. Damage to the bearing or the wheel hub will occur.

NOTE: If necessary, clean any rust or corrosion from the back of the wheel hub and bearing and lubricate the wheel hub and bearing with Rust Penetrant and Inhibitor D7AZ-19A501-AA or equivalent meeting Ford specification ESR-M99C56-A.

NOTE: Do not remove the ABS sensor and wire from the hub and bearing unless a new ABS sensor and wire is being installed. If the ABS sensor is separated from the hub and bearing, make sure the O-ring is in place and is not worn or damaged. Install a new O-ring if necessary.

Remove and discard the bolts. Remove the wheel hub and bearing.

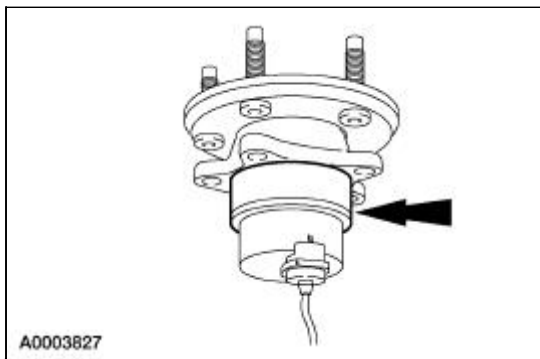


Installation

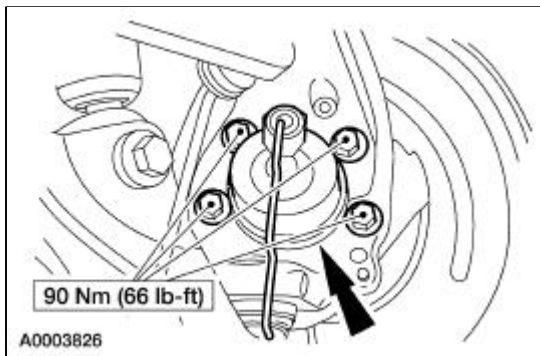
1. **⚠ CAUTION:** The knuckle bore must be clean to allow the wheel hub and bearing to be completely seated by hand. Do not press or draw the wheel hub and bearing into place.

Clean and inspect the knuckle bearing bore.

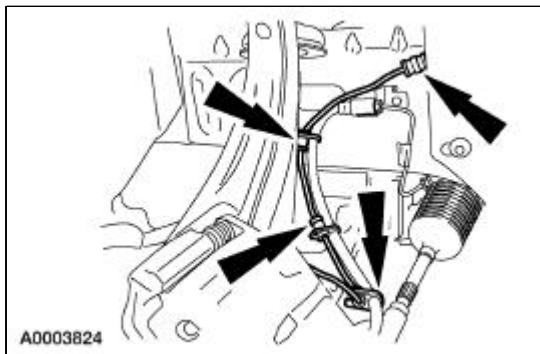
2. Lightly coat the surfaces of the bearing carrier and the wheel knuckle with Motorcraft High Temperature Nickel Anti-Seize Lubricant F6AZ-9L494-AA or equivalent meeting Ford specification ESE-M12A4-A.



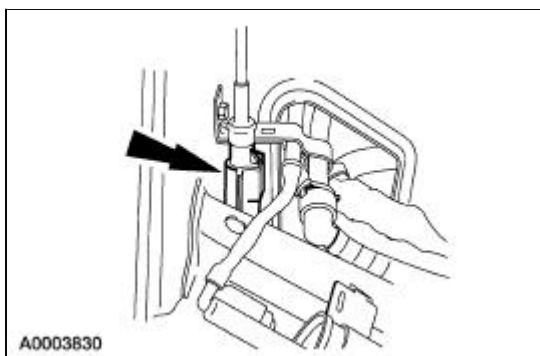
3. Install the wheel hub and bearing and new bolts.



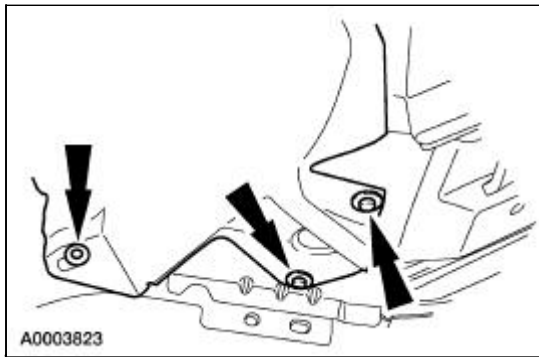
4. Route the ABS sensor wire and attach it to the retainers.



5. Move the inner fender skirt aside and connect the ABS sensor.



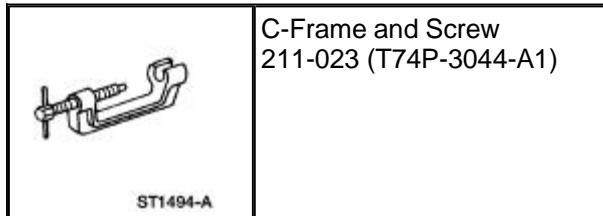
6. Position the inner fender skirt and install the pushpins.



7. Install the brake disc. For additional information, refer to [Section 206-03](#).
 8. Install the wheel and tire assembly. For additional information, refer to [Section 204-04](#).
 9. Lower the vehicle.
-

Wheel Studs

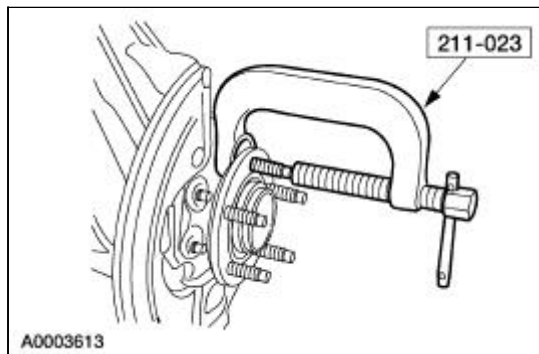
Special Tool(s)



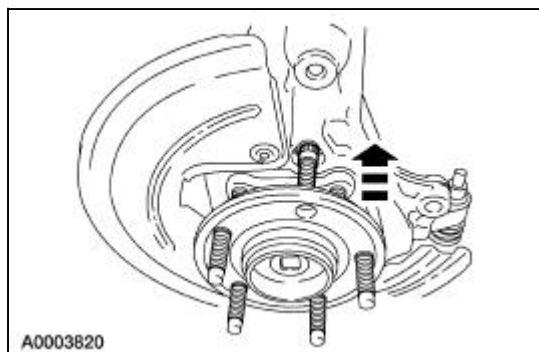
Removal

⚠ CAUTION: Suspension fasteners are critical parts because they affect the performance of vital components and systems and their failure can result in major service expense. A new part with the same part number must be installed if installation becomes necessary. Do not use a new part of lesser quality or substitute design. Torque values must be used as specified during reassembly to make sure of correct retention of these parts.

1. Remove the wheel and tire assembly. For additional information, refer to [Section 204-04](#).
2. Remove the front brake disc. For additional information, refer to [Section 206-03](#).
3. Using the special tool, press the stud from the flange.

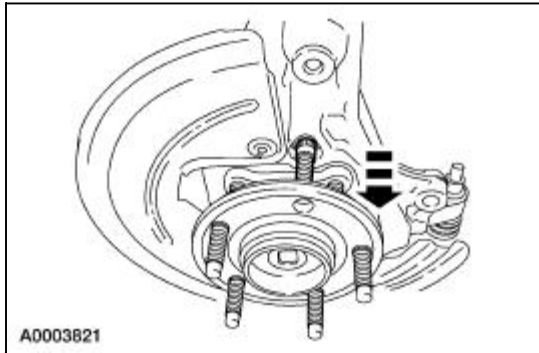


4. Line up the stud with the hole in the knuckle and remove the stud.



Installation

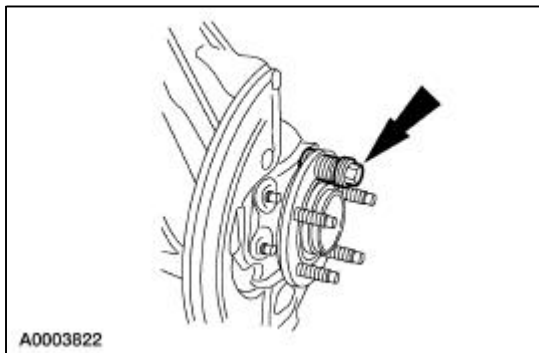
1. Insert the stud through the hole in the knuckle and into the flange, making sure the serrations on the stud line up with the serrations in the flange.



2.  **CAUTION:** Do not use power tools to install a wheel stud. The serrations in the flange can be stripped.

NOTE: Do not use the wheel nuts that came with the vehicle.

Install washers and a wheel nut on the wheel stud and tighten the nut until the stud seats against the flange. Discard the nut after use.



3. Install the front brake disc. For additional information, refer to [Section 206-03](#).
 4. Install the wheel and tire assembly. For additional information, refer to [Section 204-04](#).
-

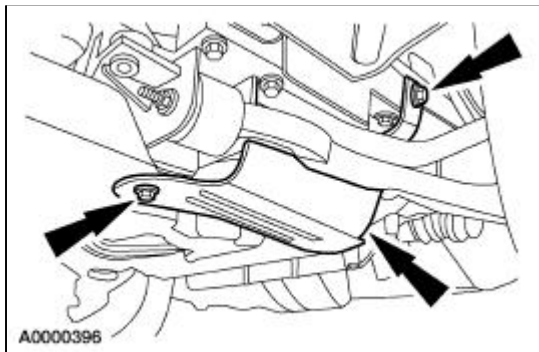
Lower Arm

Removal

⚠ CAUTION: Suspension fasteners are critical parts because they affect the performance of vital components and systems and their failure can result in major service expense. A new part with the same part number must be installed if installation is necessary. Do not use a new part of lesser quality or substitute design. Torque values must be used as specified during reassembly to make sure of correct retention of these parts.

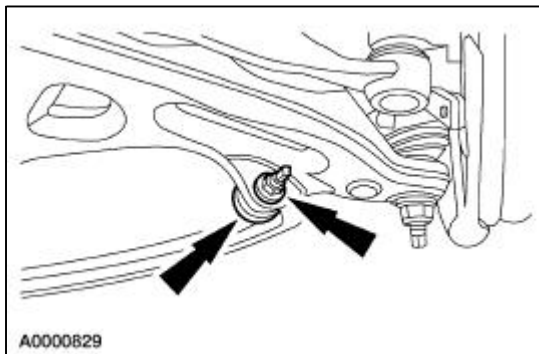
NOTE: New cam bolts and lock nuts must be installed whenever the lower control arm is removed.

1. Turn the ignition switch to the off, unlocked position.
2. Raise the vehicle on a hoist. For additional information, refer to [Section 100-02](#).
3. Remove the wheel and tire assembly. For additional information, refer to [Section 204-04](#).
4. Remove two bolts, one pushpin and the splash shield.

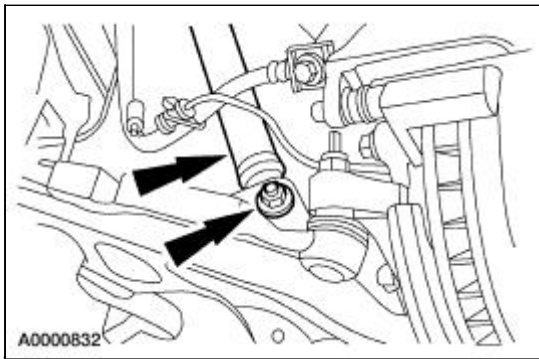


5. **NOTE:** To remove the nut, first loosen the nut, then use the hex holding feature to prevent the stabilizer bar link ball joint from turning while removing the nut.

Remove and discard the nut. Disconnect the stabilizer bar link (5K483).



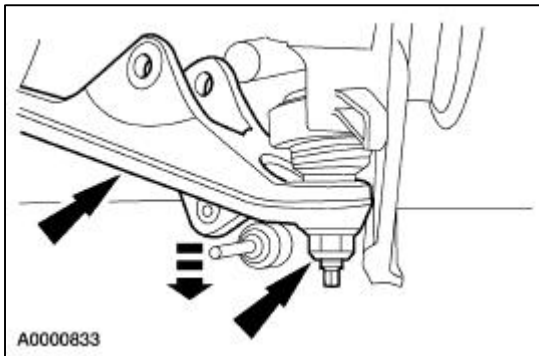
6. Remove and discard the nut and bolt. Disconnect the shock absorber and spring assembly.



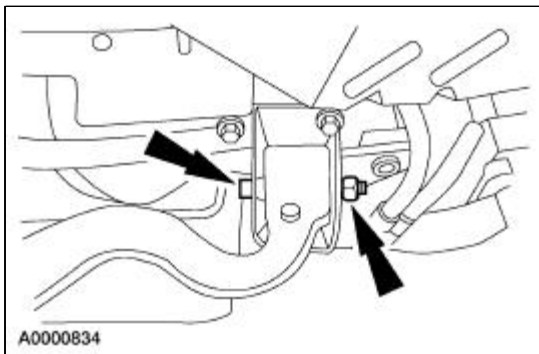
7. **NOTE:** To remove the nut, first loosen the nut, then use the hex holding feature to prevent the lower control arm ball joint from turning while removing the nut.

NOTE: Make sure not to lose the tapered washer on the ball joint.

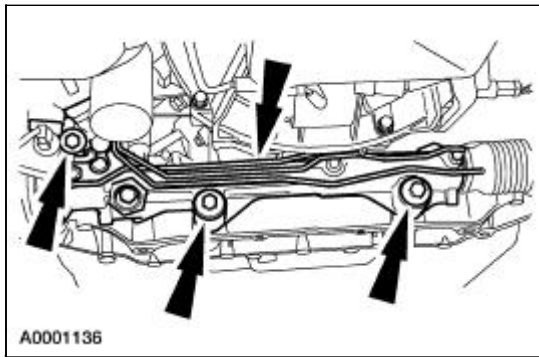
Remove and discard the nut. Separate the front suspension lower arm (3078) from the wheel knuckle.



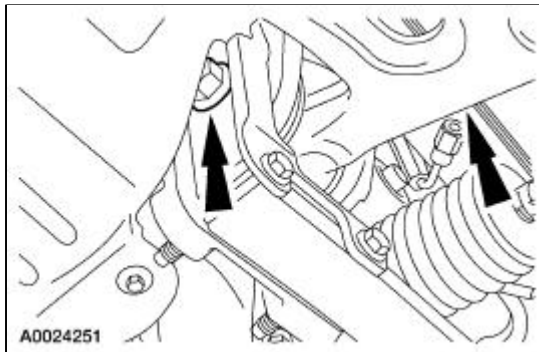
8. Remove and discard the front nut and bolt.



9. Position the power steering gear aside.
- Remove two nuts and bolts. Discard the nuts.
 - Remove the nut and bolt. Discard the nut.
 - Position the power steering gear to access the lower control arm rear bolt.

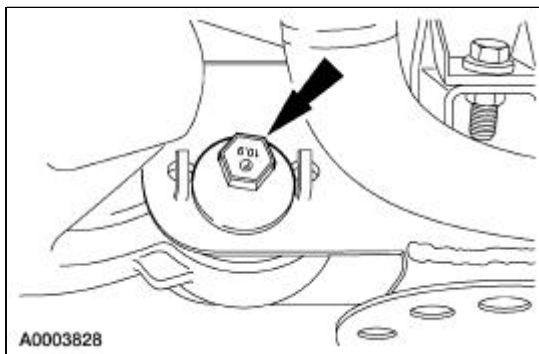


10. Remove and discard the rear nut and bolt. Remove the front suspension lower arm.

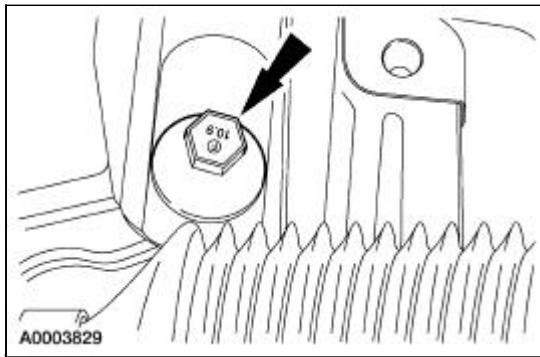


Installation

1. Position the front suspension lower arm.
2. Install a new caster adjustment cam bolt and a new nut.
 - The bolt must be installed from the rear, as shown.
 - Install the bolt with the cam lobe down.
 - The cam must be seated between the cam guides on the No. 1 crossmember.
 - The nut should only be snugged up at this time to allow for wheel alignment adjustment.



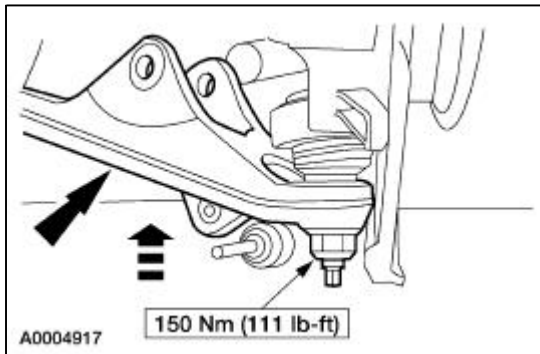
3. Install a new camber adjustment cam bolt and a new nut.
 - The bolt must be installed from the rear as shown.
 - Install the bolt with the cam lobe down.
 - The cam must be seated in the groove in the No. 2 crossmember.
 - The nut should only be snugged up at this time to allow for wheel alignment adjustment.



4. **NOTE:** Make sure the tapered washer is installed on the ball joint before connecting the lower control arm to the knuckle.

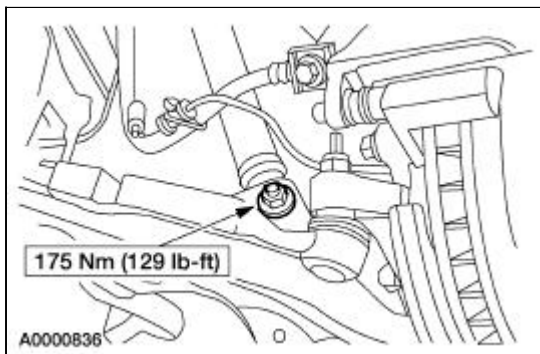
NOTE: To install the nut, first install the nut until snug using the hex holding feature. Final tighten the nut using a socket and a torque wrench. If the ball stud turns during final tighten, use a crow's foot wrench while using the hex holding feature to final tighten the nut.

Connect the lower control arm to the knuckle. Install a new nut.



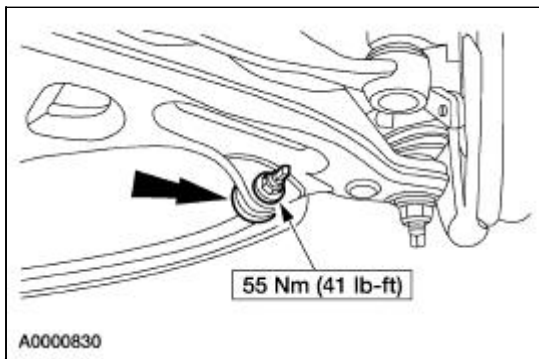
5. **NOTE:** Make sure the shock absorber lower bushing end caps are in place before installing the bolt and nut.

Connect the shock absorber and spring assembly. Install a new bolt and nut.

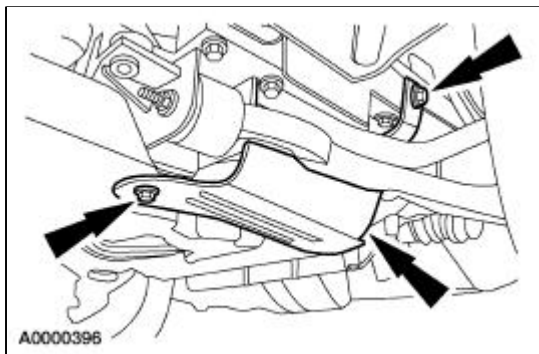


6. **NOTE:** To install the nut, first install the nut until snug using the hex head feature. Final tighten the nut using a socket and a torque wrench.

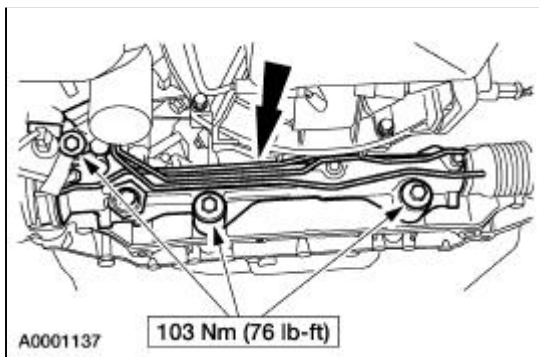
Connect the stabilizer bar link. Install a new nut.



7. Install the splash shield, two bolts and one pushpin.



8. Attach the power steering gear.
 1. Remove the nut from the center bolt.
 2. Install two bolts and three new nuts.



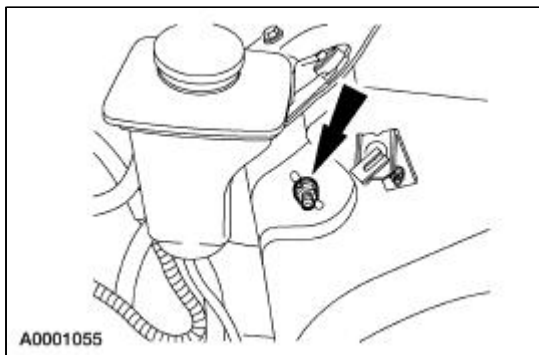
9. Install the wheel and tire assembly. For additional information, refer to [Section 204-04](#).
 10. Lower the vehicle.
 11. Check the wheel alignment. Adjust as necessary. For additional information, refer to [Section 204-00](#).
-

Upper Arm —Left Side

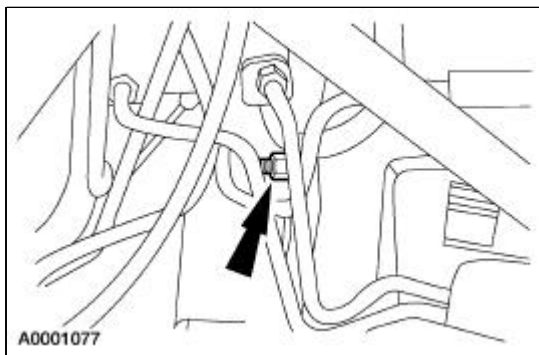
Removal

⚠ CAUTION: Suspension fasteners are critical parts because they affect the performance of vital components and systems and their failure can result in major service expense. A new part with the same part number must be installed if installation becomes necessary. Do not use a new part of lesser quality or substitute design. Torque values must be used as specified during reassembly to make sure of correct retention of these parts.

1. Remove the air cleaner. For additional information, refer to [Section 303-12](#).
2. Remove and discard the nut.



3. Remove the canister purge valve. For additional information, refer to [Section 303-13](#).
4. Remove and discard the nut.



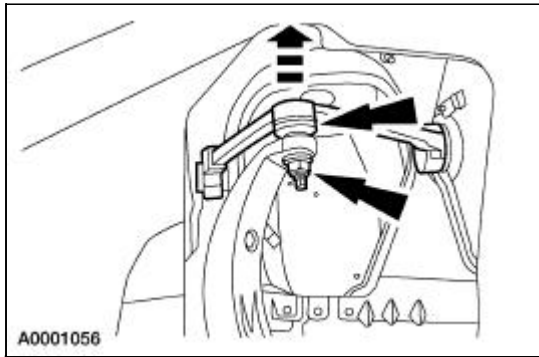
5. Remove the shock absorber and spring assembly. For additional information, refer to [Shock Absorber and Spring Assembly](#) in this section.
6. **NOTE:** Wire the top of the wheel knuckle to the body to prevent knuckle movement.

NOTE: To remove the nut, first loosen the nut, then use the hex holding feature to prevent the upper control arm ball joint from turning while removing the nut.

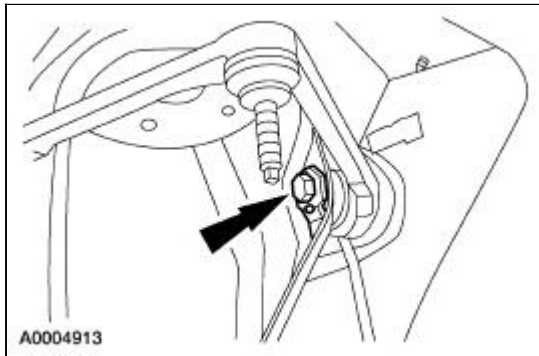
NOTE: Make sure not to lose the tapered washer on the ball joint.

Remove and discard the nut. Disconnect the suspension upper arm (3082) from the knuckle

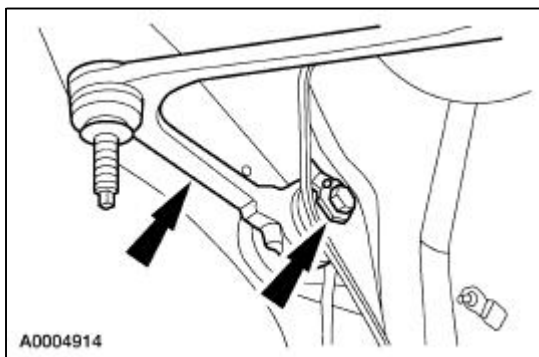
(3K185).



7. Remove and discard the bolt.

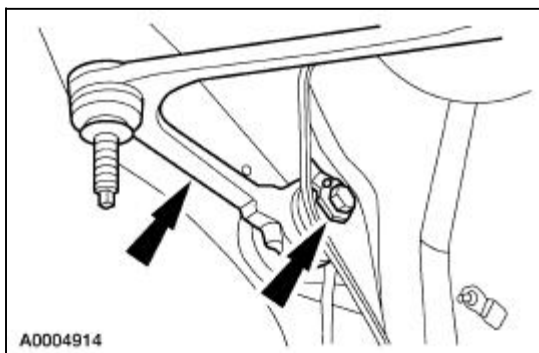


8. Remove the bolt and the suspension upper arm. Discard the bolt.

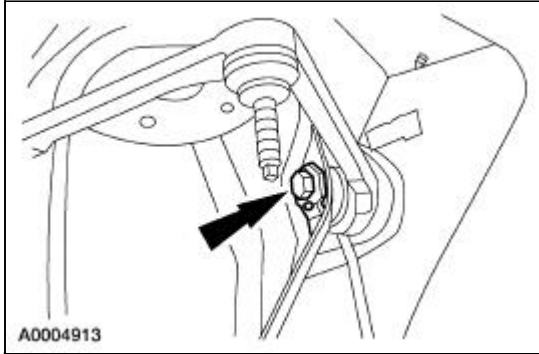


Installation

1. Position the suspension upper arm and install a new bolt.



2. Install a new bolt.

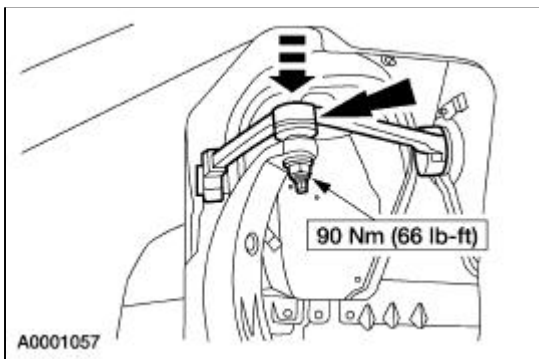


3. **NOTE:** Make sure the tapered washer is installed on the ball joint before connecting the upper control arm to the knuckle.


NOTE: To install the nut, first install the nut until snug using the hex holding feature. Final tighten using a socket and a torque wrench.

NOTE: Remove the wire holding the knuckle after tightening the nut.

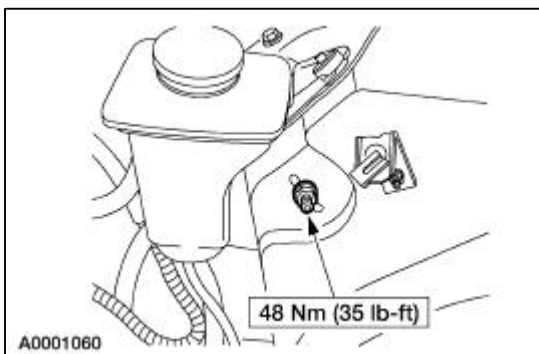
Connect the suspension upper arm to the knuckle. Install a new nut.



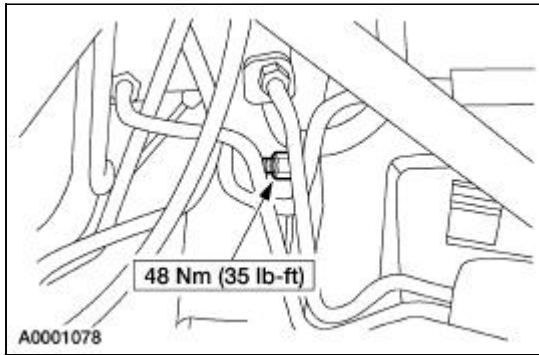
4. Install the shock absorber and spring assembly. For additional information, refer to [Shock Absorber and Spring Assembly](#) in this section.

5. **CAUTION:**  The suspension lower arm-to-body nuts must be tightened with the suspension at curb height. Make sure the vehicle is completely lowered before tightening these nuts. Failure to do so can cause bushing failure, resulting in poor ride and handling.

Install a new nut.



6. Install a new nut.



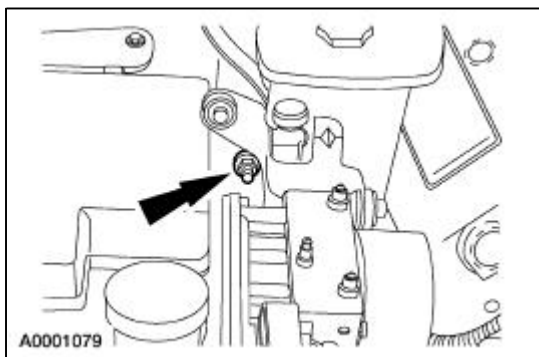
7. Install the air cleaner. For additional information, refer to [Section 303-12](#).
 8. Install the canister purge valve. For additional information, refer to [Section 303-13](#).
-

Upper Arm —Right Side

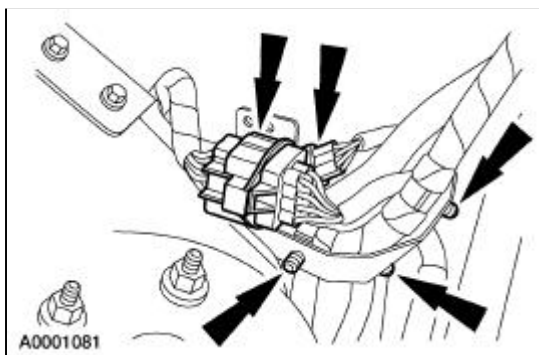
Removal

⚠ CAUTION: Suspension fasteners are critical parts because they affect the performance of vital components and systems and their failure can result in major service expense. A new part with the same part number must be installed if installation becomes necessary. Do not use a new part of lesser quality or substitute design. Torque values must be used as specified during reassembly to make sure of correct retention of these parts.

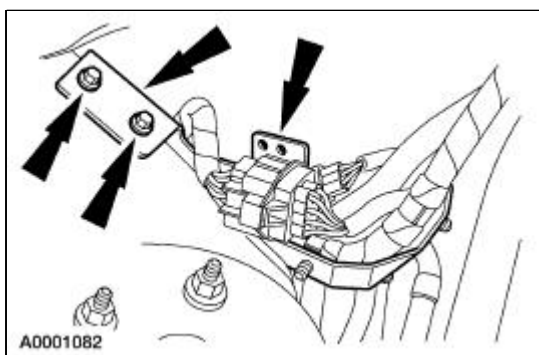
1. Remove and discard the nut.



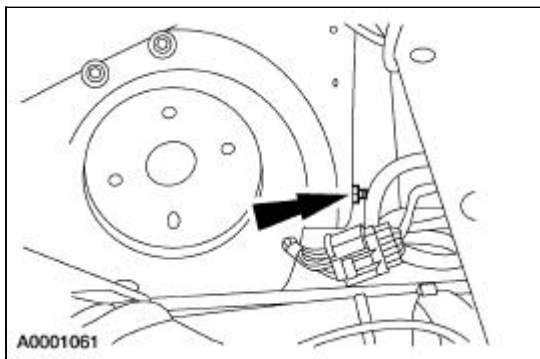
2. Detach the wires and electrical connectors from the bracket.



3. Remove three bolts and the bracket.



4. Remove and discard the nut.



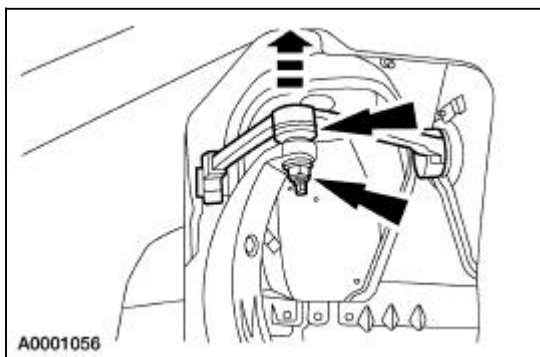
5. Remove the strut and spring assembly. For additional information, refer to [Shock Absorber and Spring Assembly](#) in this section.

6. **NOTE:** Wire the top of the wheel knuckle to the body to prevent knuckle movement.

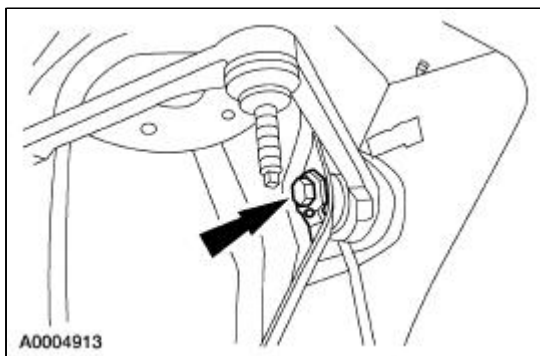
NOTE: To remove the nut, first loosen the nut, then use the hex holding feature to prevent the ball joint from turning while removing the nut.

NOTE: Make sure not to lose the tapered washer on the ball joint.

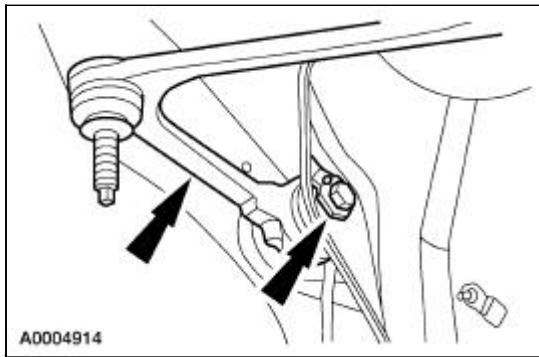
Remove and discard the nut. Disconnect the suspension upper arm (3082) from the knuckle (3K185).




7. Remove and discard the bolt.



8. Remove the bolt and the suspension upper arm. Discard the bolt.



Installation

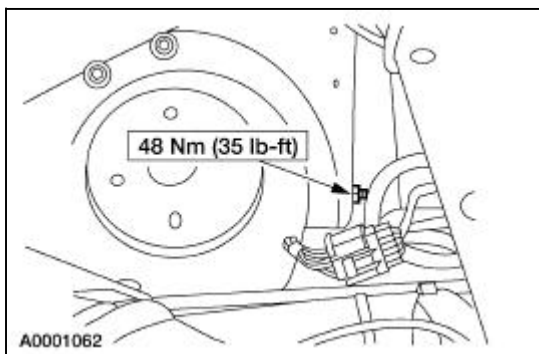
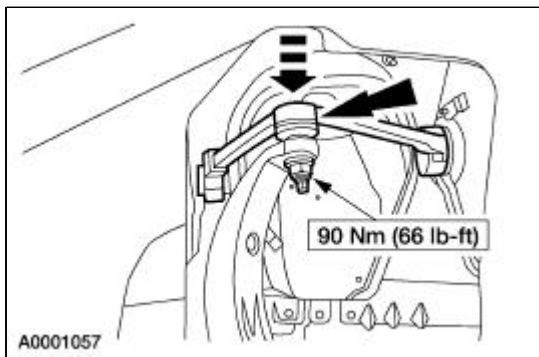
1.  **CAUTION:** The suspension upper arm nuts must be tightened with the suspension at curb height. Make sure the vehicle is completely lowered before tightening these nuts. Failure to do so can cause bushing failure, resulting in poor ride and handling.

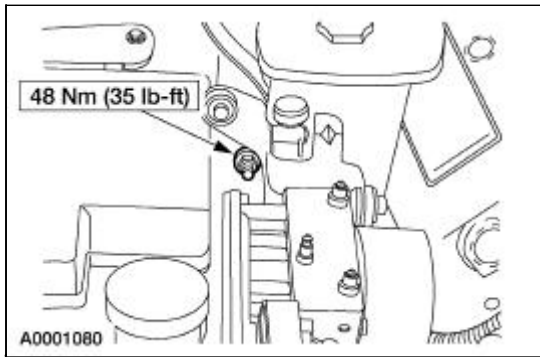
NOTE: The suspension upper arm bolts and nuts are of a torque prevailing design. New bolts and nuts must be installed.

NOTE: Make sure the tapered washer is installed on the ball joint before connecting the upper control arm to the knuckle.

NOTE: To install the upper control arm ball joint nut, first install the nut until snug using the hex holding feature, then final tighten the nut using a socket and torque wrench.

To install, reverse the removal procedure.



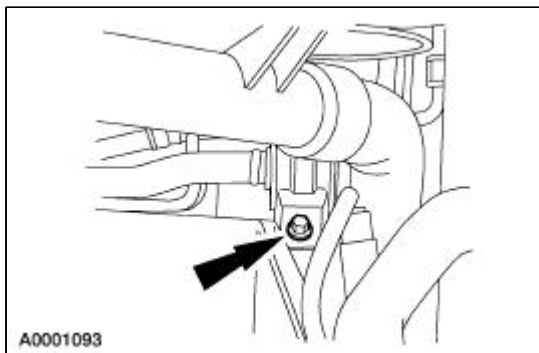


Stabilizer Bar

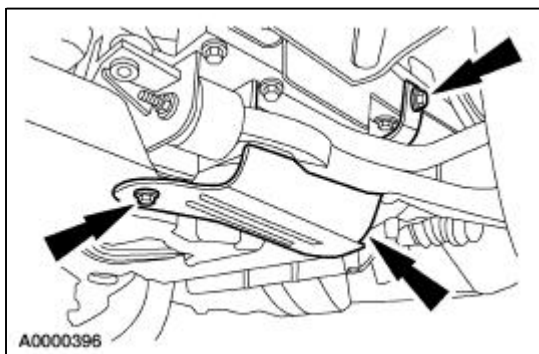
Removal

⚠ CAUTION: Suspension fasteners are critical parts because they affect the performance of vital components and systems and their failure can result in major service expense. A new part with the same part number must be installed if installation becomes necessary. Do not use a new part of lesser quality or substitute design. Torque values must be used as specified during reassembly to make sure of correct retention of these parts.

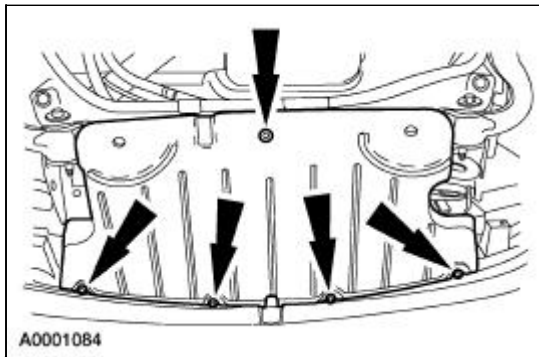
1. Remove the air cleaner. For additional information, refer to [Section 303-12](#).
2. Remove the bolt.



3. Raise the vehicle on a hoist. For additional information, refer to [Section 100-02](#).
4. Remove both wheel and tire assemblies. For additional information, refer to [Section 204-04](#).
5. Remove two pushpins, four bolts and both splash shields.

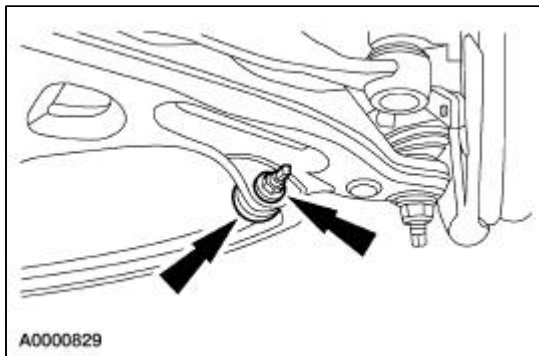


6. Remove the bolts and the shield.



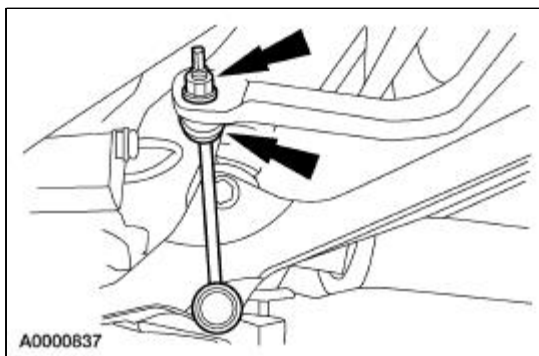
7. **NOTE:** To remove the nut, first loosen the nut, then use the hex holding feature to prevent the stabilizer bar link ball joint from turning while removing the nut.

Remove the nut and disconnect the stabilizer bar link (5K483). Discard the nut.

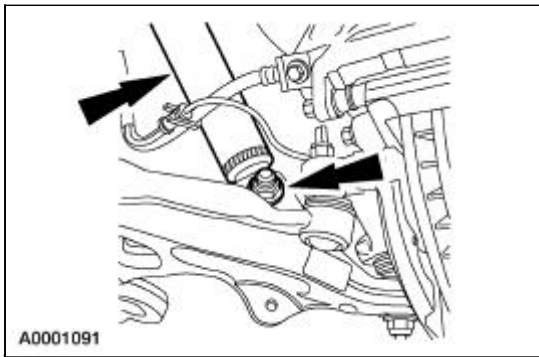


8. **NOTE:** To remove the nut, first loosen the nut, then use the hex holding feature to prevent the stabilizer bar link ball joint from turning while removing the nut.

Remove the nut and stabilizer bar link. Discard the nut.



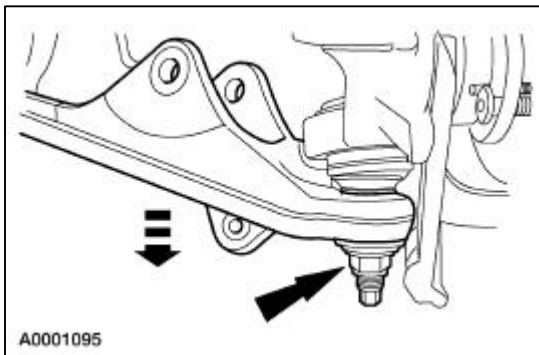
9. Remove and discard the nut and bolt. Disconnect the left shock absorber and spring assembly.



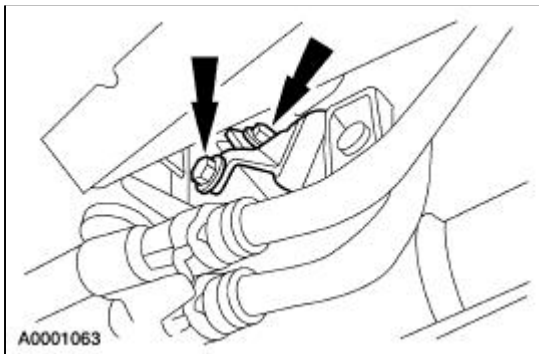
10. **NOTE:** To remove the nut, first loosen the nut, then use the hex holding feature to prevent the lower control arm ball joint from turning while removing the nut.

NOTE: Make sure not to lose the tapered washer on the ball joint.

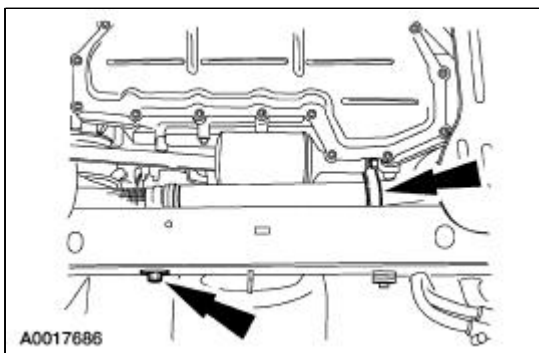
Remove and discard the nut. Disconnect the left suspension lower arm and position the knuckle (3K185) out of the way.



11. Remove the bolts and position the heater water valve and bracket out of the way.

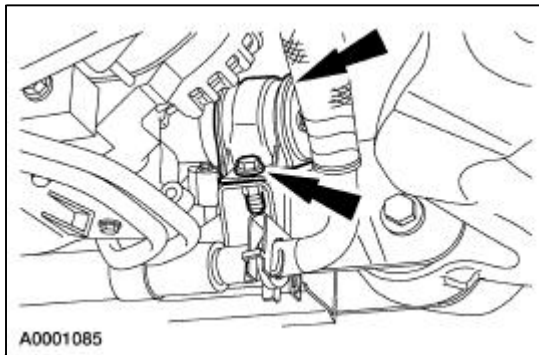


12. Remove the bolt and detach the A/C hose retainer. Position the A/C hose aside.

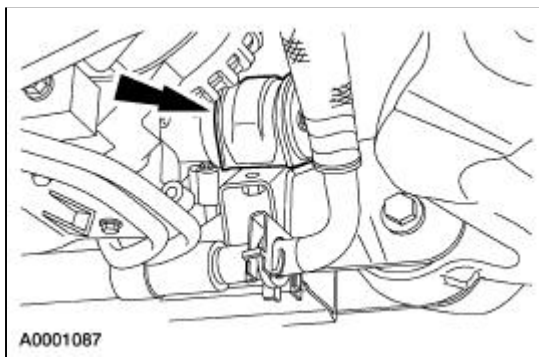


- NOTE:** To ease removal of the right front bolt, remove it first.

Remove the bolts and the stabilizer bar brackets (5486).



- Remove the stabilizer bar bushings (5493).



- NOTE:** Deflect the LH lower control arm downward to ease removal of the stabilizer bar.

Carefully remove the stabilizer bar through the left wheel well.

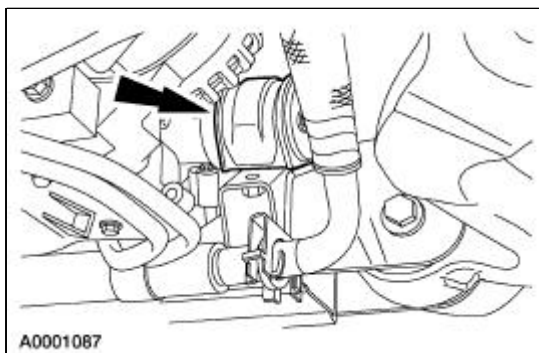
Installation

- NOTE:** Deflect the LH lower control arm downward to ease installation of the stabilizer bar.

Carefully install the stabilizer bar through the left wheel well.

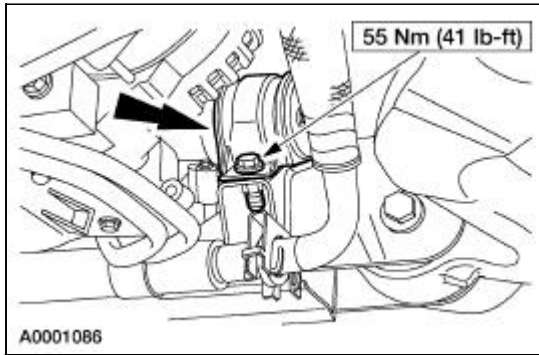
- NOTE:** If the stabilizer bar bushings are badly worn or have no grease, install new bushings. Do not grease the bushings.

Install the stabilizer bar bushings.

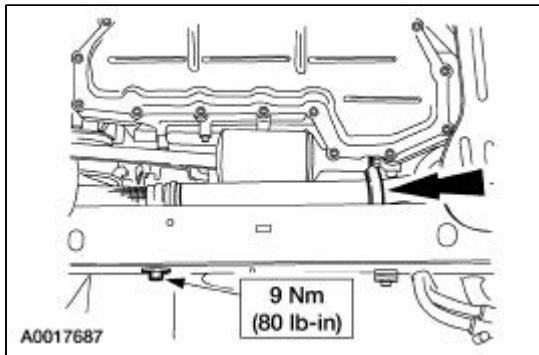


- NOTE:** To ease installation of the right front bolt, install the right rear bolt first.

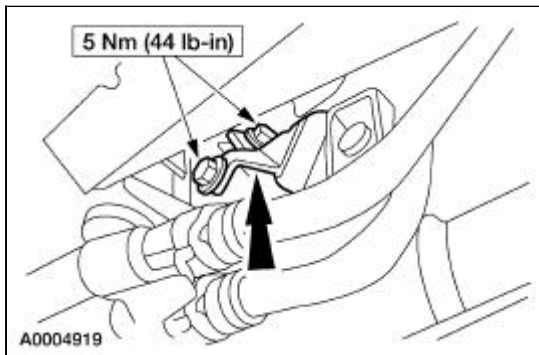
Install the stabilizer bar brackets and the bolts.



4. Position the A/C hose, attach the retainer, and install the bolt.



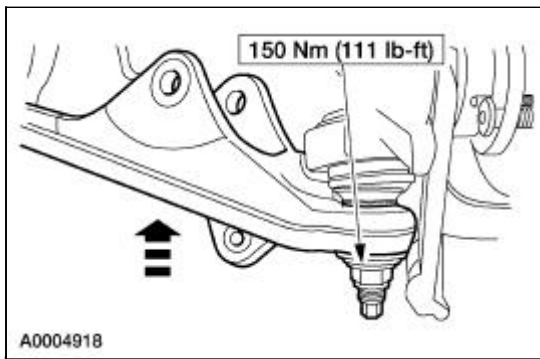
5. Position the heater water valve and bracket and install the bolts.



6. **NOTE:** Make sure the tapered washer is installed on the ball joint before connecting the lower control arm to the knuckle.

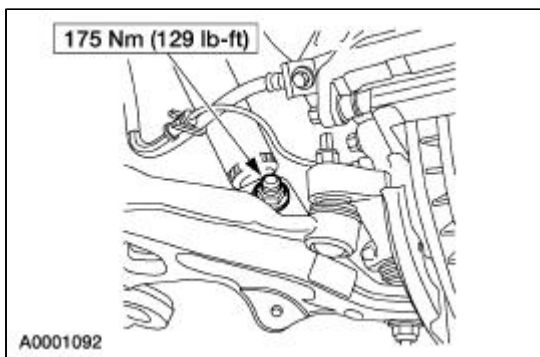
NOTE: To install the nut, first install the nut until snug using the hex holding feature. Final tighten the nut using a socket and a torque wrench. If the ball stud turns during final tighten, use a crow's foot wrench to turn the nut while using the hex holding feature to final tighten the nut.

Connect the suspension lower arm and install a new nut.



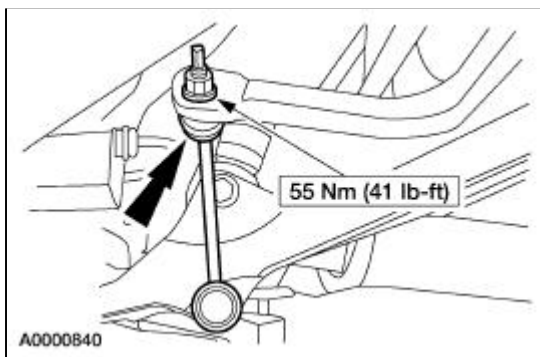
- NOTE:** Make sure the shock absorber lower bushing end caps are in place before installing the bolt and nut.

Connect the shock absorber and spring assembly and install a new nut and bolt.



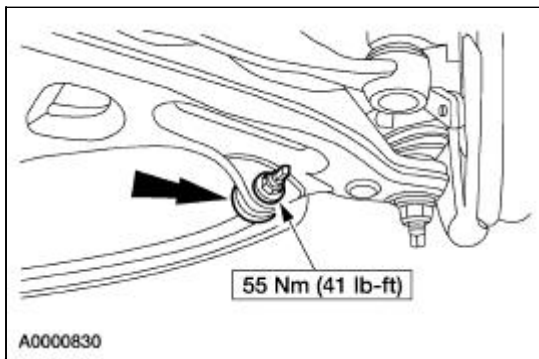
- NOTE:** To install the nut, first install the nut until snug using the hex holding feature. Final tighten the nut using a socket and a torque wrench.

Position the stabilizer bar link and install a new nut.

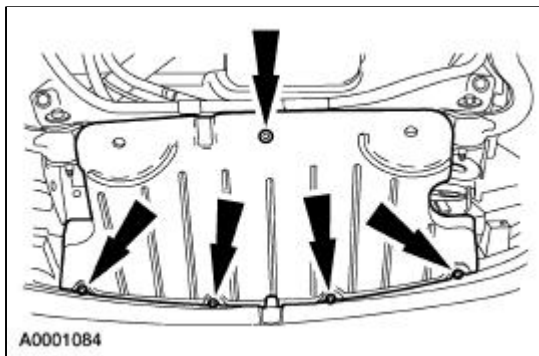


- NOTE:** To install the nut, first install the nut until snug using the hex holding feature. Final tighten the nut using a socket and a torque wrench.

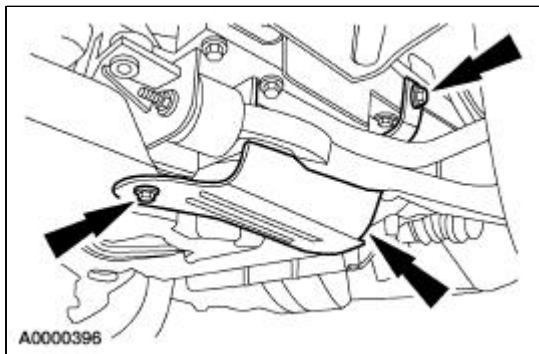
Connect the stabilizer bar link and install a new nut.



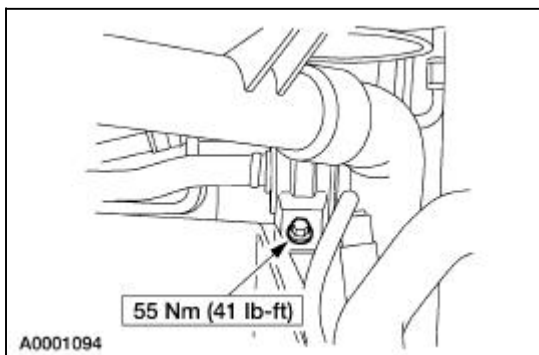
10. Install the shield and the bolts.



11. Install the shields, two pushpins and four bolts.




12. Install the wheel and tire assemblies. For additional information, refer to [Section 204-04](#).
13. Lower the vehicle.
14. Install the bolt.



15. Install the air cleaner. For additional information, refer to [Section 303-12](#).

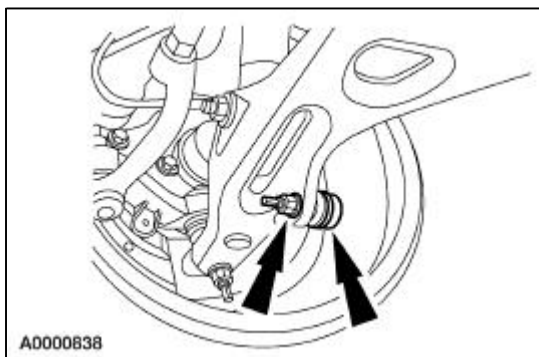
Stabilizer Bar Link

Removal

 **CAUTION:** Suspension fasteners are critical parts because they affect the performance of vital components and systems and their failure can result in major service expense. A new part with the same part number must be installed if installation is necessary. Do not use a new part of lesser quality or substitute design. Torque values must be used as specified during reassembly to make sure of correct retention of these parts.

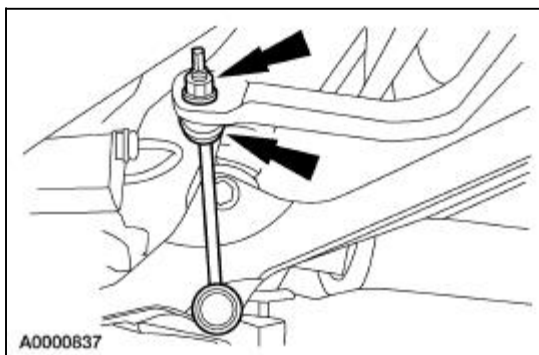
1. Raise the vehicle on a hoist. For additional information, refer to [Section 100-02](#).
2. **NOTE:** To remove the nut, first loosen the nut, then use the hex holding feature to prevent the stabilizer bar link ball joint from turning while removing the nut.

Remove the nut and disconnect the stabilizer bar link (5K483) from the suspension lower arm (3078).



3. **NOTE:** To remove the nut, first loosen the nut, then use the hex holding feature to prevent the stabilizer bar link ball joint from turning while removing the nut.

Remove the nut and stabilizer bar link.



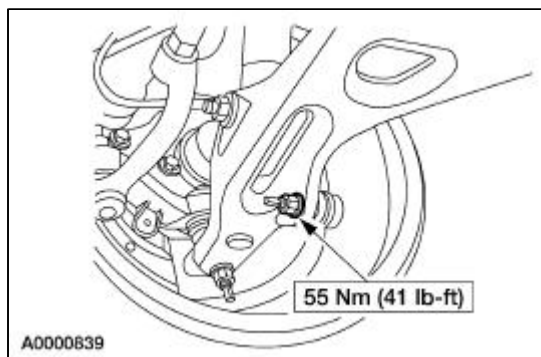
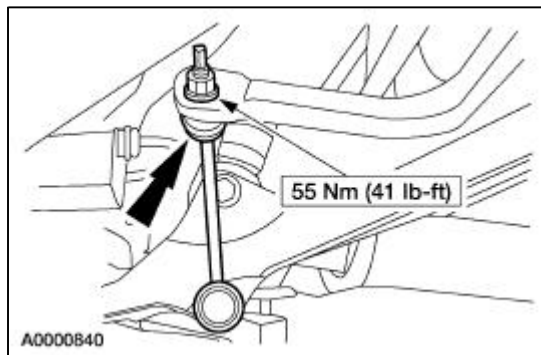
Installation

1. **NOTE:** The stabilizer bar nuts are of torque prevailing design. New nuts must be installed during assembly.

NOTE: To install the nuts, first install the nuts until snug using the hex holding feature. Final

tighten the nuts using a socket and a torque wrench.

To install, reverse the removal procedure.

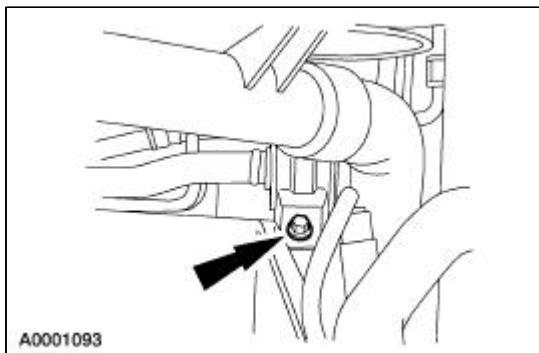


Stabilizer Bar Bushing

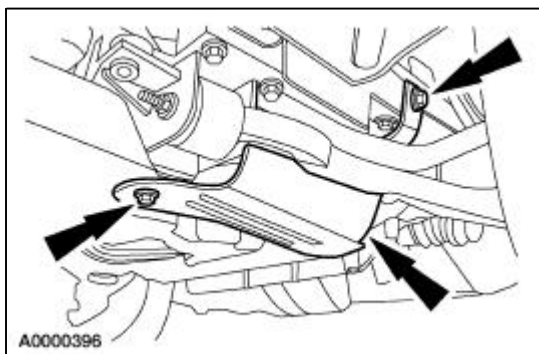
Removal

⚠ CAUTION: Suspension fasteners are critical parts because they affect the performance of vital components and systems and their failure can result in major service expense. A new part with the same part number must be installed if installation becomes necessary. Do not use a new part of lesser quality or substitute design. Torque values must be used as specified during reassembly to make sure of correct retention of these parts.

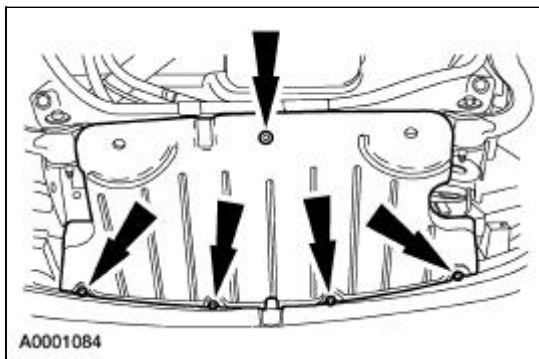
1. Remove the air cleaner. For additional information, refer to [Section 303-12](#).
2. Remove the bolt.



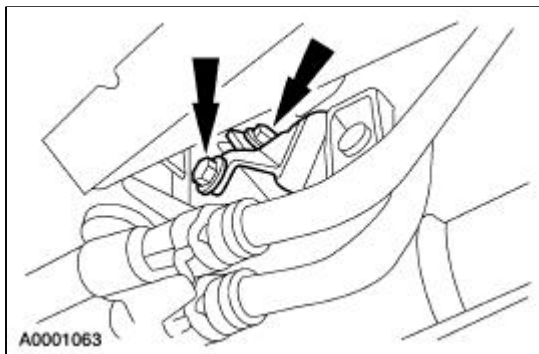
3. Raise the vehicle on a hoist. For additional information, refer to [Section 100-02](#).
4. Remove both wheel and tire assemblies. For additional information, refer to [Section 204-04](#).
5. Remove two pushpins, four bolts and both splash shields.



6. Remove the bolts and the shield.

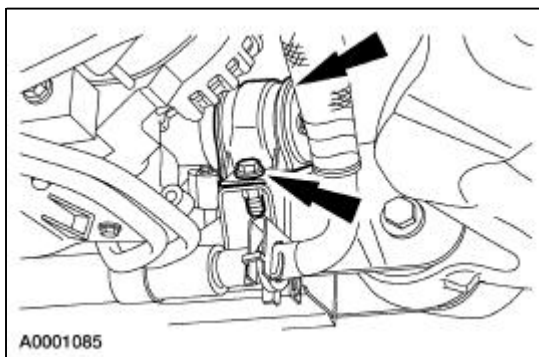


7. Remove the bolts and position the heater water valve and bracket out of the way.

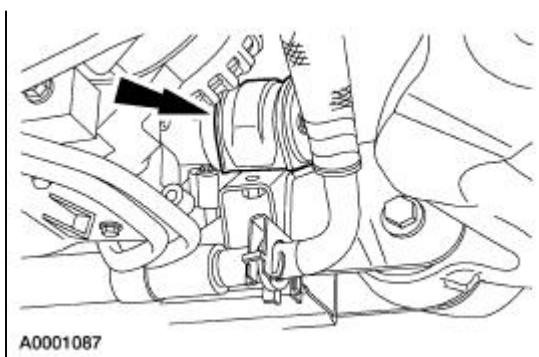


8. **NOTE:** To ease removal of the right front bolt, remove it first.

Remove the bolts and the stabilizer bar brackets (5486).



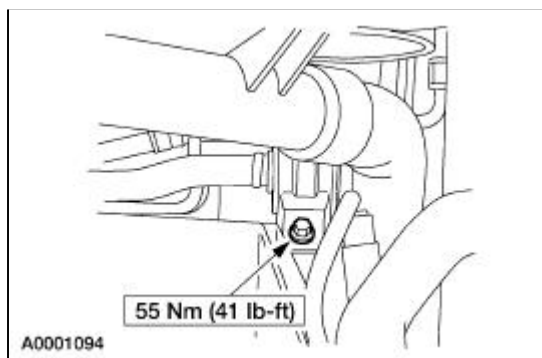
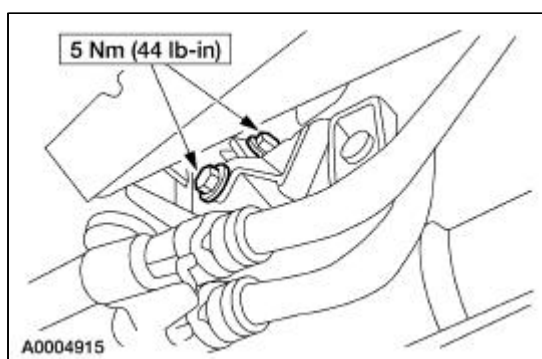
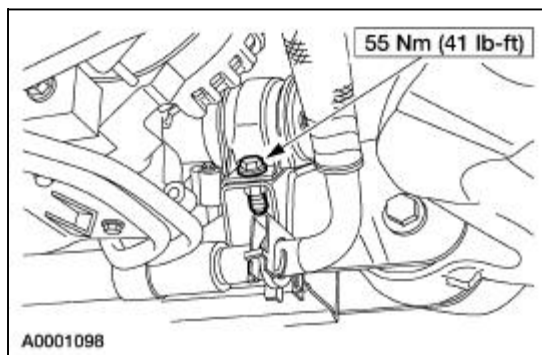
9. Remove the stabilizer bar bushings (5493).



Installation

1. **NOTE:** If the stabilizer bar bushings are badly worn or have no grease, install new bushings. Do not grease the bushings.

To install, reverse the removal procedure.



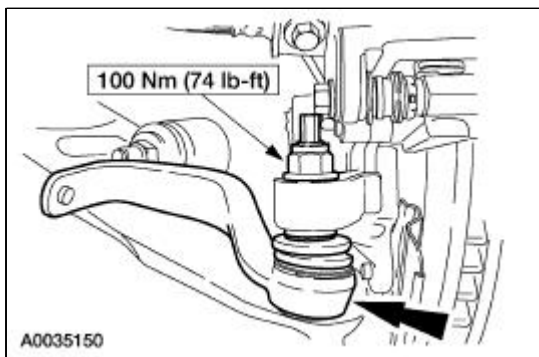
Wheel Knuckle

Removal and Installation

⚠ CAUTION: Suspension fasteners are critical parts because they affect the performance of vital components and systems and their failure can result in major service expense. A new part with the same part number must be installed if installation becomes necessary. Do not use a new part of lesser quality or substitute design. Torque values must be used as specified during reassembly to make sure of correct retention of these parts.

1. Remove the wheel bearing and hub (1104). For additional information, refer to [Wheel Bearing and Hub](#) in this section.
2. **NOTE:** The hex holding feature can be used to prevent turning of the stud while removing the nut.

Remove the nut and disconnect the tie-rod end from the wheel knuckle (3K185). Discard the nut.

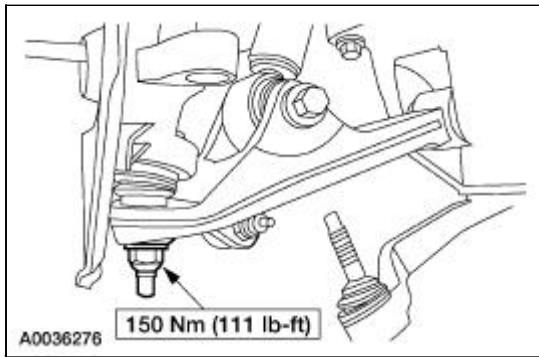


3. **⚠ CAUTION:** Support the weight of the knuckle with a jack stand after disconnecting the lower control arm, or damage to the upper control arm can result.

NOTE: The hex holding feature can be used to prevent turning of the stud while removing the nut.

NOTE: Make sure not to lose the tapered washer from the ball joint.

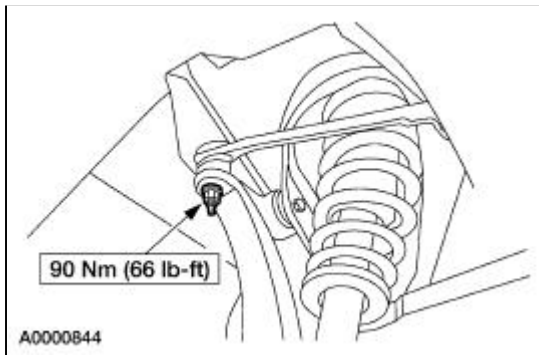
Remove the nut and disconnect the suspension lower arm (3078) from the knuckle. Discard the nut.



4. **NOTE:** The hex holding feature can be used to prevent turning of the stud while removing the nut.

NOTE: Make sure not to lose the tapered washer from the ball joint.

Remove the nut and the knuckle. Discard the nut.



5. **CAUTION:** Support the weight of the knuckle with a jack stand while connecting the knuckle to the upper control arm or damage to the upper control arm can result.

NOTE: The upper arm-to-knuckle nut, lower arm-to-knuckle nut and the tie-rod-to-knuckle nut are of a torque prevailing design. New nuts must be installed.

NOTE: Make sure the tapered washer is installed on the ball joints before connecting the upper and lower control arms to the knuckle.

To install, reverse the removal procedure.

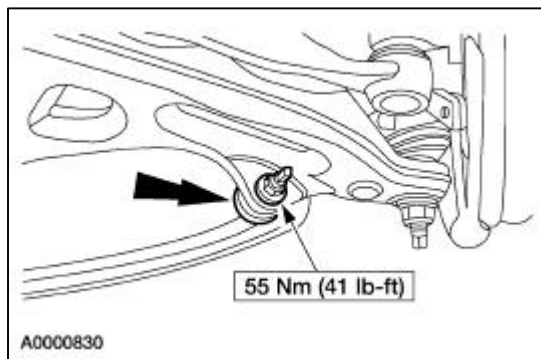
Shock Absorber and Spring Assembly

Removal and Installation

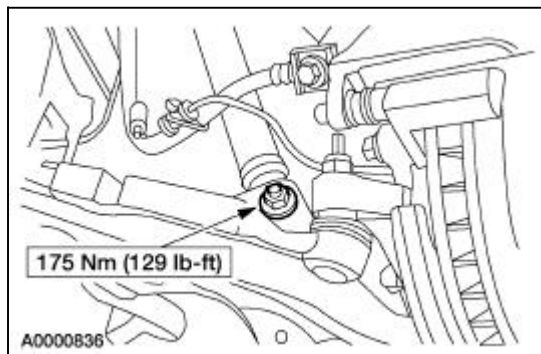
⚠ CAUTION: Suspension fasteners are critical parts because they affect the performance of vital components and systems and their failure can result in major service expense. A new part with the same part number must be installed if installation is necessary. Do not use a new part of lesser quality or substitute design. Torque values must be used as specified during reassembly to make sure of correct retention of these parts.

1. Remove the wheel and tire assembly. For additional information, refer to [Section 204-04](#).
2. **NOTE:** The hex holding feature can be used to prevent turning of the stud while removing the nut.

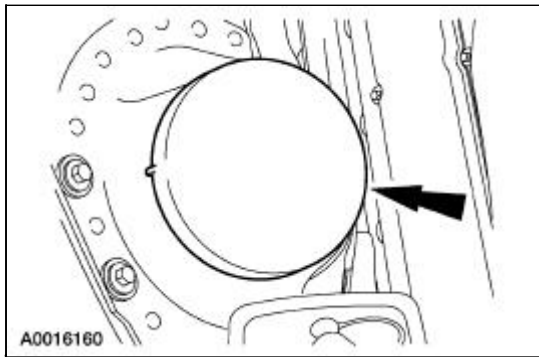
Remove the nut and disconnect the stabilizer bar link (5K483). Discard the nut.



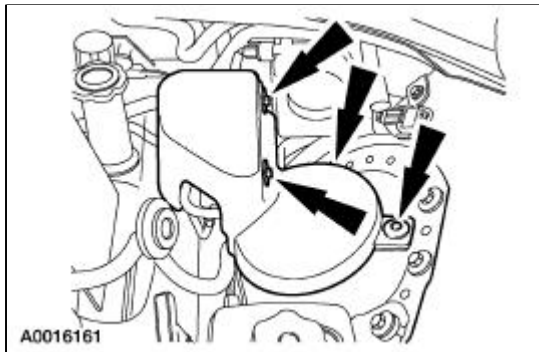
3. Remove the nut and bolt and disconnect the shock absorber and spring assembly.
 - Discard the nut and bolt.




4. Partially lower the vehicle.
5. Remove the right upper shock mount cover.

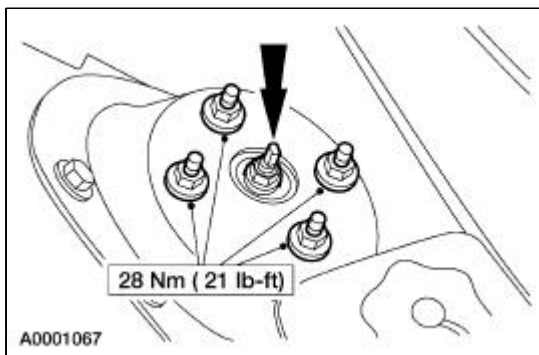


6. Remove the retainers and the left upper shock mount cover.



7.  **WARNING:** Do not remove the center nut. This nut holds the upper spring mount in place and if this nut is removed the spring tension will be released. Failure to follow these instructions may result in personal injury.

Remove and discard four nuts. Remove the shock absorber and spring assembly.



8.  **CAUTION:** Make sure the shock absorber lower bushing end caps are in place before installing the bolt and nut.

To install, reverse the removal procedure.

Shock Absorber and Spring Assembly

Disassembly

⚠ WARNING: All vehicles are equipped with gas pressurized shock absorbers which will extend unassisted. Do not apply heat or flame to the shock absorbers during removal or component servicing. Failure to follow these instructions can result in personal injury.

⚠ WARNING: The shock absorber and spring assembly is under extreme load. Do not attempt to disassemble the shock absorber and spring assembly without using a spring compressor. Failure to follow these instructions can result in personal injury.

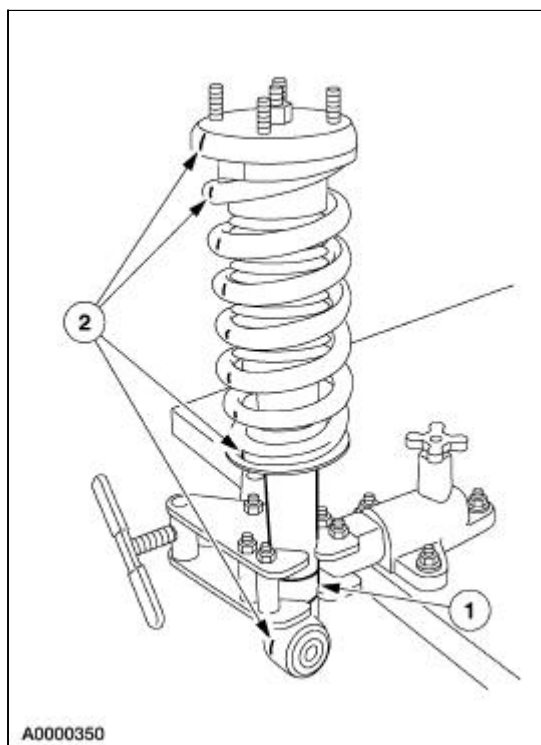
⚠ CAUTION: Suspension fasteners are critical parts because they affect performance of vital components and systems and their failure can result in major service expense. A new part with the same part number must be installed if installation is necessary. Do not use a new part of lesser quality or substitute design. Torque values must be used as specified during reassembly to make sure of correct retention of these parts.

1. Remove the shock absorber and spring assembly. For additional information, refer to [Shock Absorber and Spring Assembly](#) in this section.

2. **⚠ CAUTION:** Over tightening the vise can damage the shock absorber tube.

Mount and mark the shock absorber and spring assembly.

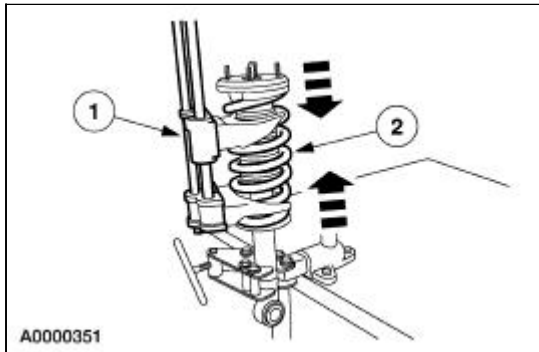
1. Position the shock absorber and spring assembly in a suitable holding device.
2. Mark the upper mount, spring and shock absorber for assembly reference.



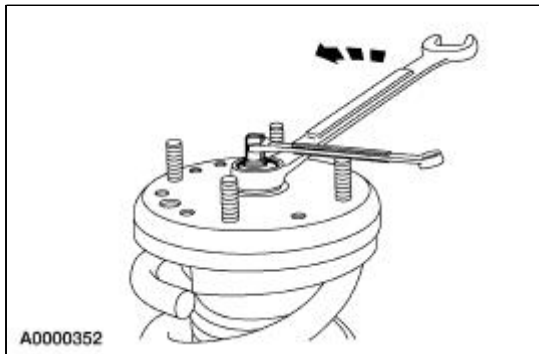
3. **NOTE:** If installing a new spring, make sure the part number is correct. Refer to the vehicle certification (VC) label for the correct spring code. Refer to [Section 100-01](#) to convert the spring code to a part number.

Compress the spring.

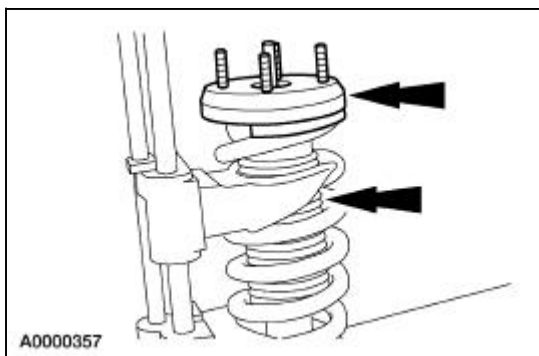
1. Install an appropriate spring compressor.
2. Compress the spring.



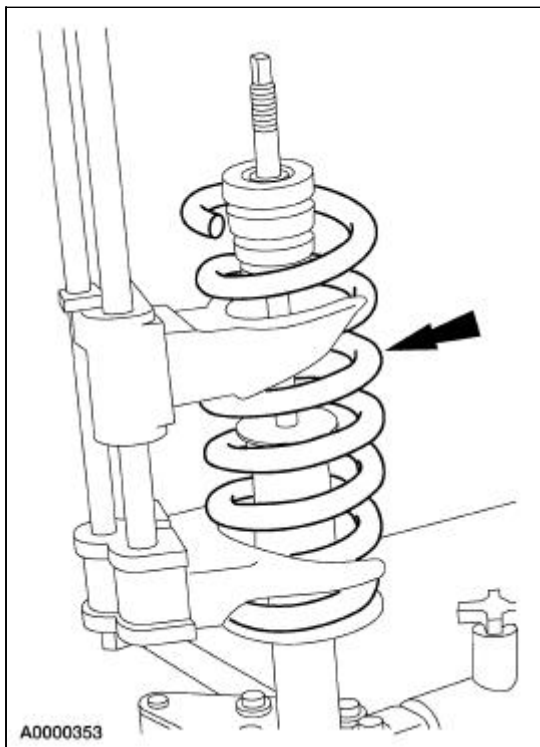
4. While holding the shock absorber rod, remove and discard the nut.



5. Remove the upper mount and dust boot as an assembly.



6. Carefully remove the spring and spring compressor.



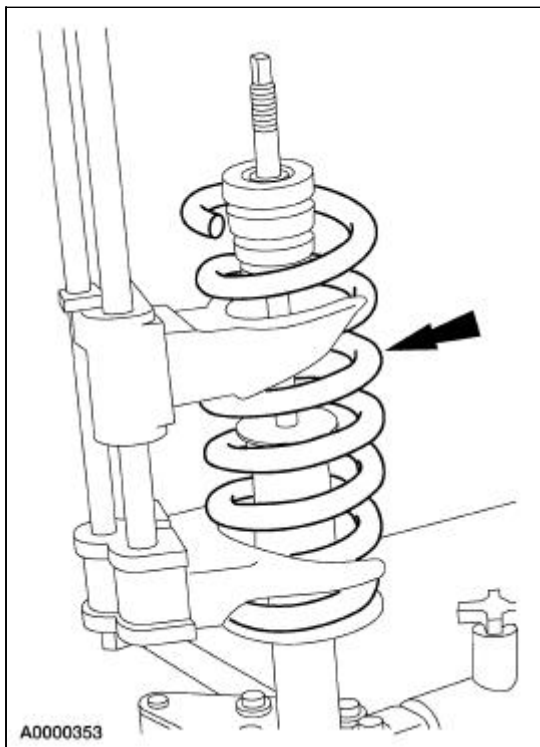
Assembly

NOTE: If a new shock absorber, spring or upper mount is installed, the new part should be marked in the same place as the old part to make sure the assembly is correctly aligned.

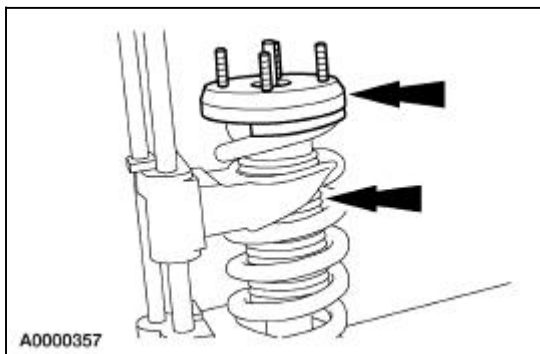
1. Inspect the lower and upper spring seats for damage.
2. Inspect the spring insulator for wear or damage. Install a new upper mount if necessary.
3. **NOTE:** If installing a new spring make sure the part number is correct. Refer to the vehicle certification (VC) label for the correct spring code. Refer to [Section 100-01](#) to convert the spring code to a part number.

Inspect the spring for nicked or scratched paint. If the paint is nicked or scratched, install a new spring.

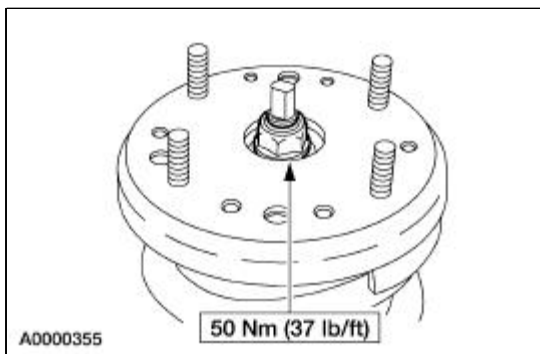
4. If removed, place the shock absorber into the vise.
5. Position the shock and spring compressor onto the strut.



6. Position the upper mount and dust boot onto the spring. Make sure the marks made during disassembly, Step 2, are lined up.



7. Install a new nut.



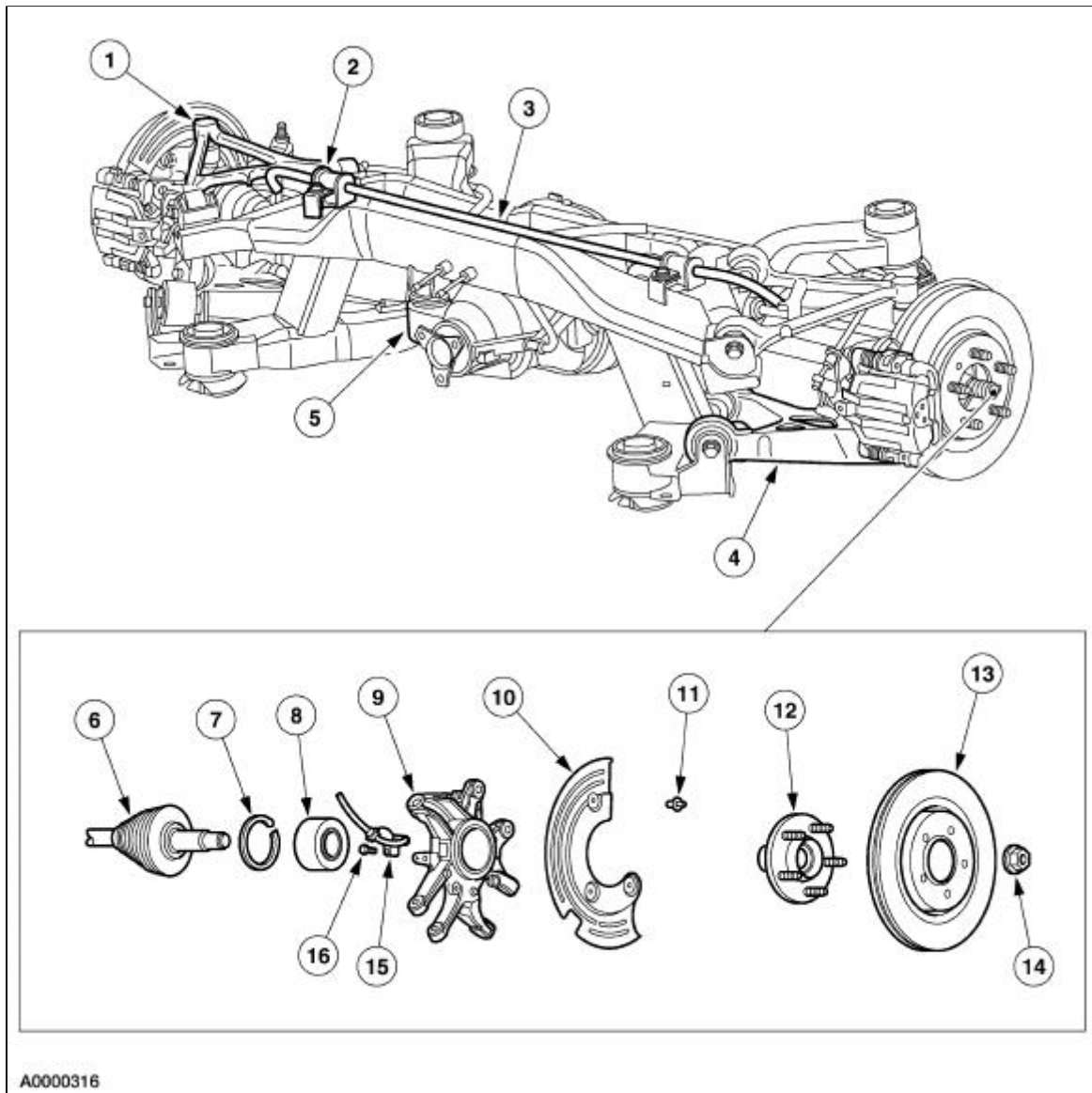
8. Remove the spring compressor.
9. Install the shock absorber and spring assembly. For additional information, refer to [Shock Absorber and Spring Assembly](#) in this section.

Torque Specifications

Description	Nm	lb-ft	lb-in
Subframe-to-body bolts	103	76	—
Upper arm and bushing-to-subframe pivot bolt nuts	90	66	—
Upper ball joint nut	90	66	—
Lower arm and bushing-to-subframe pivot bolt and nut	150	111	—
Lower arm and bushing-to-knuckle pivot bolt nut	150	111	—
Toe link nut (outer)	55	41	—
Toe link nut (inner)	70	52	—
Stabilizer bar link nuts	48	35	—
Stabilizer bar bracket bolts	55	41	—
Anti-lock brake sensor bolt	10	—	89
Shock absorber and spring assembly-to-lower arm and bushing bolt	133	98	—
Upper shock absorber rod-to-upper shock absorber mount nut	50	37	—
Upper shock absorber mount-to-body nuts	28	21	—
Axle shaft retaining nut	300	221	—

Rear Suspension

Rear Suspension Components



A0000316

Item	Part Number	Description
1	5500	Upper arm
2	5C488	Stabilizer bar link
3	5486	Stabilizer bar retaining bracket
4	5A772	Stabilizer bar
5	—	Lower arm
6	—	Axle shaft
7	W701904-S309M	Snap ring
8	1244	Wheel hub bearing

9	—	Knuckle
10	2C028	Rear brake disc shield
11	W701950-S100	Rivet
12	1109	Hub
13	2C026	Rear brake disc
14	4B477	Hub retainer
15	2C190	ABS sensor
16	W500014-S426	Screw

The independent rear suspension consists of the following components:

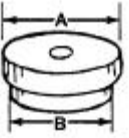

- upper arms (5500)
 - lower arms
 - shock absorber and spring assemblies
 - adjustable toe links
 - stabilizer bar (5A772)
 - rear wheel knuckles
 - hubs (1109)
 - wheel bearings (1244)
-

Rear Suspension

Refer to [Section 204-00](#) .

Hub

Special Tool(s)

 ST1690-A	Step Plate Adapter Set 205-DS011 (D80L-630-A) or Equivalent
 ST1310-A	Universal Bearing Puller 205-055 (T71P-4621-B)

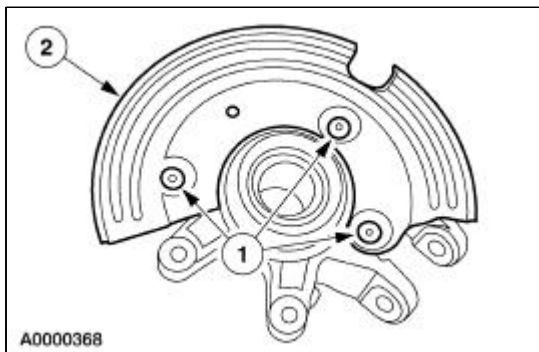
Removal

⚠ CAUTION: Suspension fasteners are critical parts because they affect the performance of vital components and systems and their failure can result in major service expense. A new part with the same part number must be installed if installation is necessary. Do not use a new part of lesser quality or substitute design. Torque values must be used as specified during reassembly to make sure of correct retention of these parts.

1. Remove the knuckle. For additional information, refer to [Knuckle](#) in this section.
2. **⚠ CAUTION:** Use extreme care not to damage the knuckle when drilling out the dust shield rivets.

Remove the dust shield (2C028).

1. Using a 5.5 mm (0.22 in) drill bit, drill out the dust shield rivets. If a larger drill bit is needed, it must not be larger than 6 mm (0.24 in).
2. Remove the dust shield.

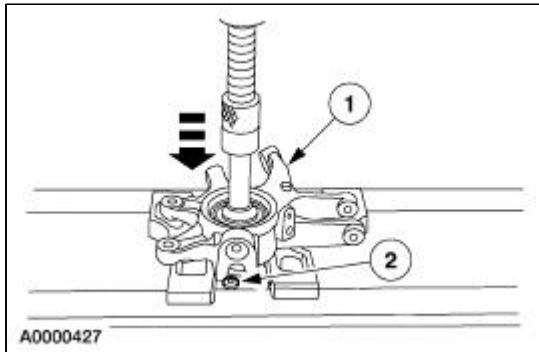


3. **⚠ CAUTION:** When the wheel hub is pressed from the bearing, the bearing inner race will come out with the hub. Never try to install the race back into the bearing. Always install a new bearing.

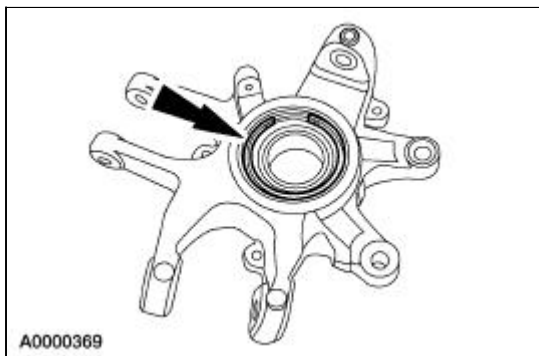
⚠ CAUTION: Make sure to keep the knuckle level and supported during pressing operations, or damage to the knuckle can occur. Support the knuckle as close to the bearing bore as possible. Do not use knuckle extremities as supports.

Remove the hub (1109).

1. Correctly support the knuckle in a press.
2. Using the appropriate step plate adapter, press the hub from the bearing. The bearing inner race will come out with the hub.



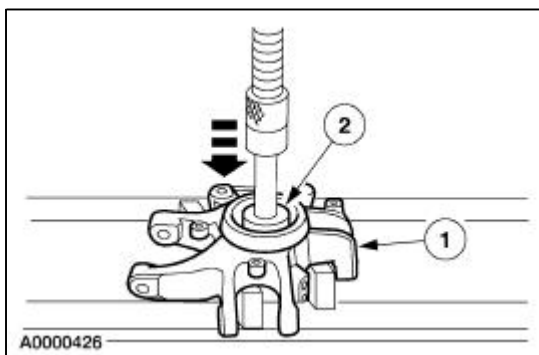
4. Remove the snap ring.



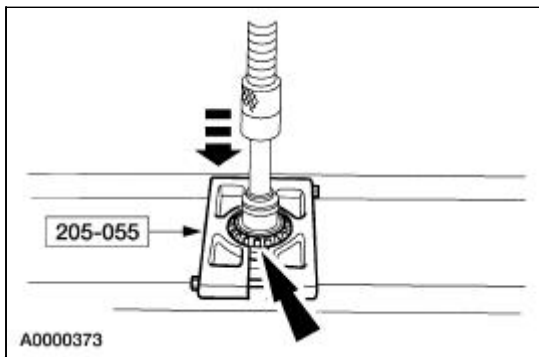
5. **⚠ CAUTION:** Make sure to keep the knuckle level and supported during pressing operations, or damage to the knuckle can occur. Support the knuckle as close to the bearing bore as possible. Do not use knuckle extremities as supports.

Remove the bearing (1244).


1. Correctly support the knuckle in a press.
2. Using the appropriate step plate adapter, press the bearing from the knuckle.



6. If the hub is to be reused, remove the bearing inner race from the hub using the special tool.

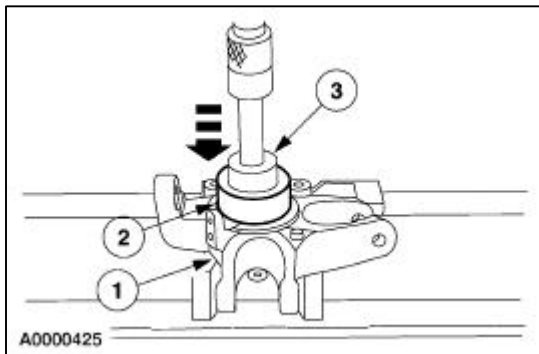


Installation

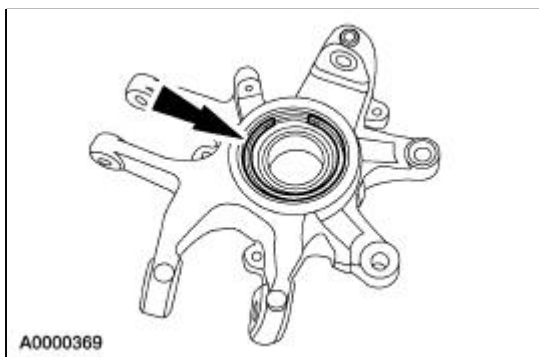
1. Thoroughly clean and inspect the wheel knuckle to bearing mating surface before installing the bearing.
2.  **CAUTION: Make sure to keep the knuckle level and supported during pressing operations, or damage to the knuckle can occur. Support the knuckle as close to the bearing bore as possible. Do not use knuckle extremities as supports.**

Install a new bearing.

1. Correctly support the knuckle in a press.
2. Position the new bearing in the knuckle.
3. Using the appropriate step plate adapter, press the new bearing into the knuckle until the bearing clears the snap ring groove and bottoms out in the bore.



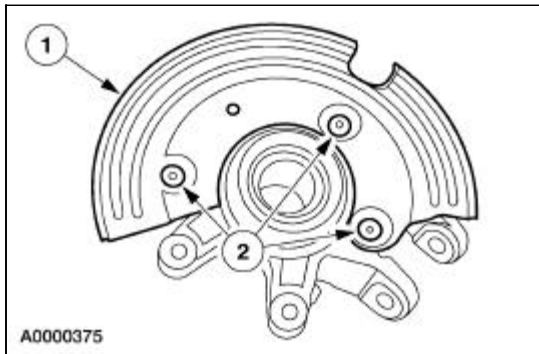
3. Install the snap ring.




4.  **CAUTION: Use only the appropriate size aluminum rivets on the rear brake disc dust shield. Galvanic corrosion will result if steel rivets are used.**

Install the rear brake dust shield.

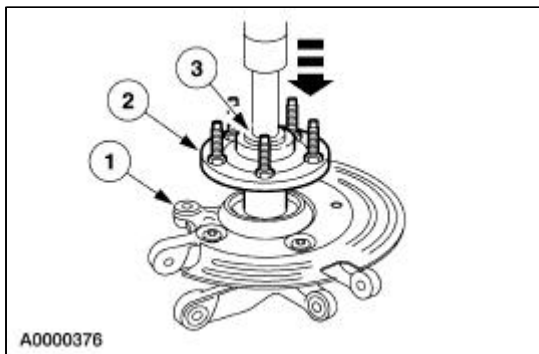
1. Position the shield on the knuckle.
2. Install the rivets.



5.  **CAUTION: The wheel bearing inner race must be supported during hub installation. Failure to do so will damage the bearing.**

Install the hub.


1. Position the knuckle in a press, using the appropriate step plate adapter to support the wheel bearing inner race.
2. Position the hub in the bearing.
3. Using the appropriate step plate adapter, press the hub into the bearing.



6. Install the knuckle. For additional information, refer to [Knuckle](#) in this section.
-

Wheel Studs

Special Tool(s)

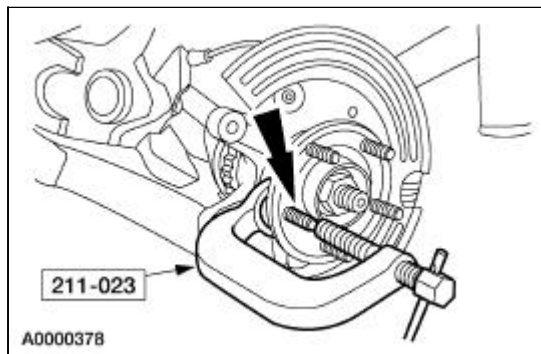
	C-Frame and Clamp Assembly 211-023 (T74P-3044-A1)
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Removal

1. Raise the vehicle on a hoist. For additional information, refer to [Section 100-02](#).
2. Remove the wheel and tire assembly. For additional information, refer to [Section 204-04](#).
3. Remove the rear brake disc. For additional information, refer to [Section 206-04](#).
4. **NOTE:** Grind off the stud to ease removal if necessary.

Using the special tool, press the wheel stud (1107) out of the rear hub (1109) between the caliper mounting pads.

- Discard the wheel stud. Do not reuse wheel studs.

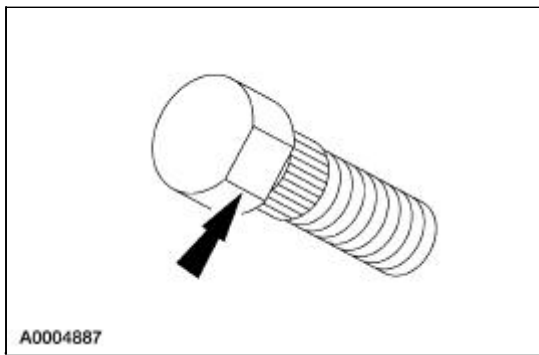


Installation



CAUTION: Never use air tools to install wheel studs. The serrations can be stripped from the stud.

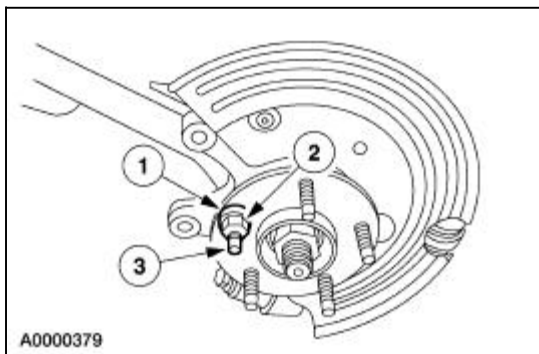
1. If necessary, grind the head of a new wheel stud to a "D" shape to clear the wheel knuckle.



2. Position the new wheel stud into the hub flange, making sure the serrations on the stud are aligned with the serrations in the flange.
3. Install the wheel stud.
 1. Place four flat washers on the wheel stud.
 2. **NOTE:** Do not use the wheel nuts that came with the vehicle.

Thread a standard wheel nut (1012) onto the wheel stud with the flat side against the washers.

3. Tighten the wheel nut until the wheel stud head seats against the hub flange.



4. Remove the wheel nut and washers.
 5. Install the rear brake disc. For additional information, refer to [Section 206-04](#).
 6. Install the wheel and tire assembly. For additional information, refer to [Section 204-04](#).
 7. Lower the vehicle.
-

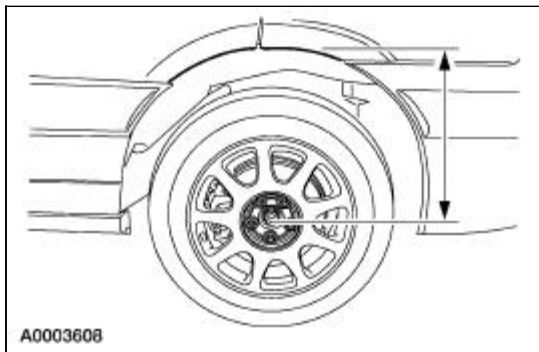
Arm —Upper

Removal

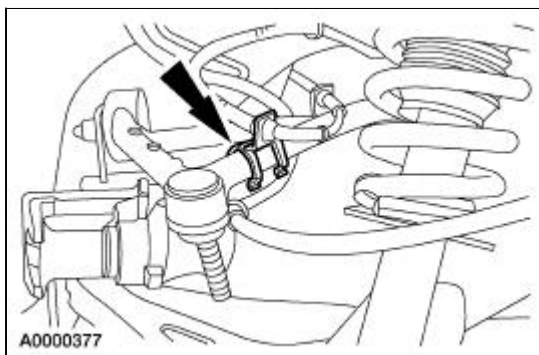
⚠ CAUTION: Suspension fasteners are critical parts because they affect the performance of vital components and systems and their failure can result in major service expense. A new part with the same part number must be installed if installation is necessary. Do not use a new part of lesser quality or substitute design. Torque values must be used as specified during reassembly to make sure of correct retention of these parts.

NOTE: The suspension upper arm bushings or ball joints are not serviced separately from the upper rear suspension arm. If the bushings or ball joints require service a new suspension upper arm (5500) must be installed.

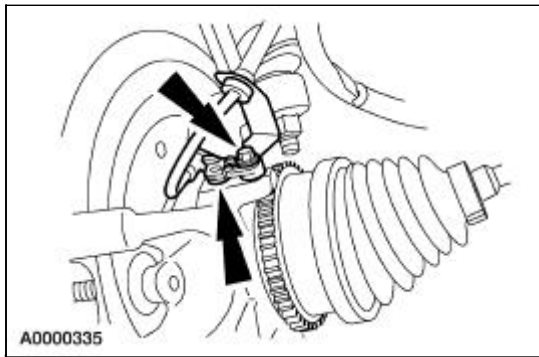
1. Remove the hub cap. Measure the distance from the center of the hub to the lip of the fender with the vehicle in a level, static ground position.




2. Raise the vehicle on a hoist. For additional information, refer to [Section 100-02](#).
3. Remove the wheel and tire assembly. For additional information, refer to [Section 204-04](#).
4. Unclip the ABS sensor wire retainer from the suspension upper arm.



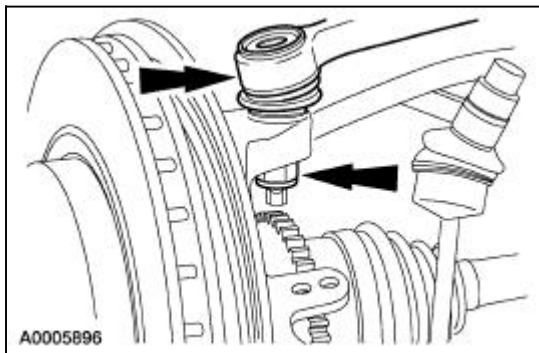
5. Remove the bolt and disconnect the ABS sensor. Position the sensor aside.



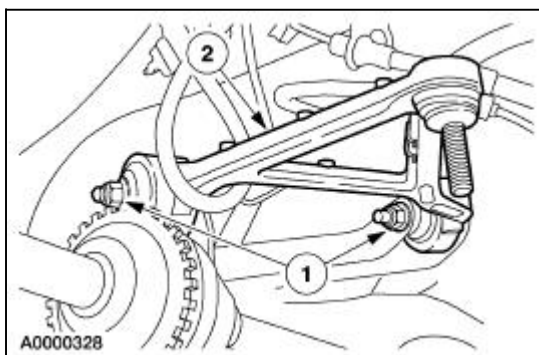
6.  **CAUTION:** Use care not to damage the anti-lock brake system (ABS) sensor ring. A damaged sensor ring will result in incorrect ABS operation.

NOTE: To remove the nut, first loosen the nut, then use the hex holding feature to prevent the ball joint from turning while removing the nut.


Remove and discard the nut. Disconnect the ball joint from the knuckle.



7. Remove the suspension upper arm (5500).
1. Remove the suspension upper arm-to-subframe nuts and bolts. Discard the nuts and bolts.
 2. Remove the suspension upper arm.



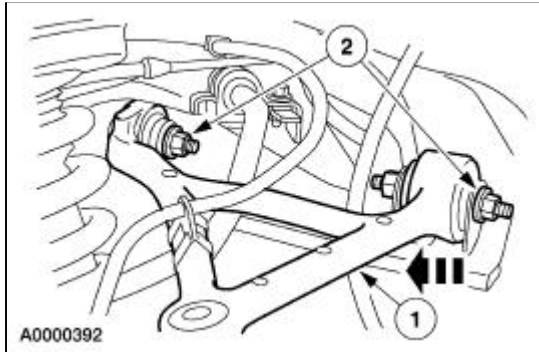
Installation


 **CAUTION:** Do not tighten the suspension upper arm-to-subframe nuts until the suspension is at curb height. Failure to do so can cause severe damage to the bushings resulting in poor ride quality and handling.

1. **NOTE:** The bolts and nuts retaining the suspension upper arm are of a torque prevailing design. New bolts and nuts must be used.

Install the suspension upper arm.

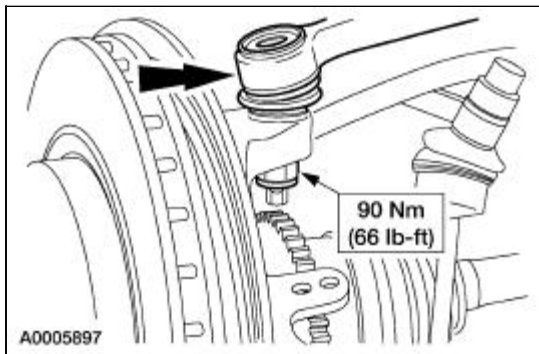
1. Position the arm on the subframe.
2. Install new nuts and bolts. Do not tighten at this time.



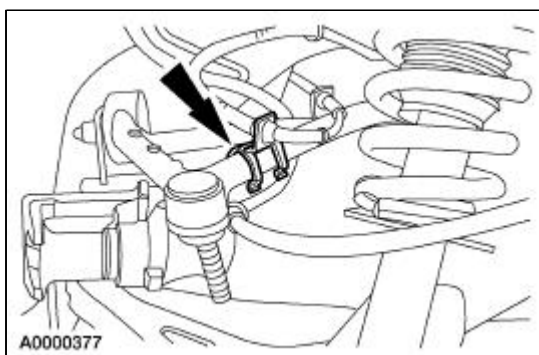
2.  **CAUTION:** Use care not to damage the anti-lock brake system (ABS) sensor ring. A damaged sensor ring will result in incorrect ABS operation.

NOTE: To install the nut, first install the nut using the hex holding feature until snug. Final tighten the nut using a line-type crow's foot and a torque wrench.

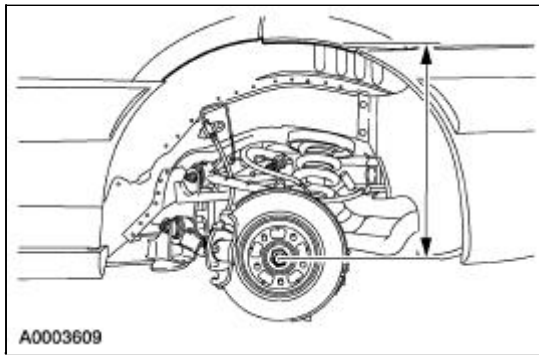
Connect the ball joint to the knuckle and install a new nut.



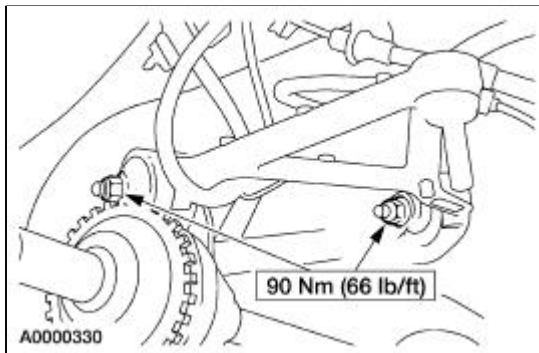
3. Clip the ABS sensor wire to the suspension upper arm.



4. Position a jack stand under the suspension lower arm and raise the suspension until the distance between the center of the hub and the lip of the fender is equal to the measurement taken in Removal, Step 1.



5. Tighten the nuts.



6. Lower the suspension and remove the jack stand.
 7. Install the wheel and tire assembly. For additional information, refer to [Section 204-04](#).
 8. Lower the vehicle.
-

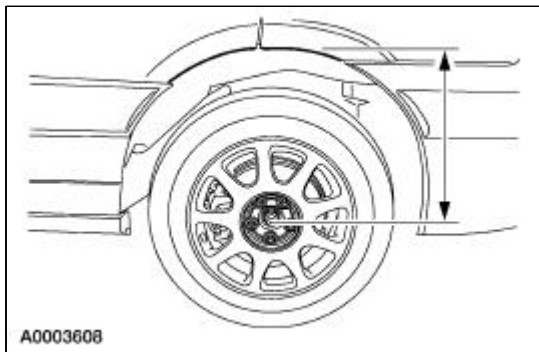
Arm —Lower

Removal

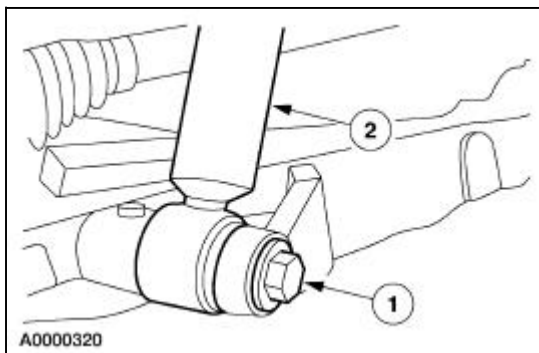
⚠ CAUTION: Suspension fasteners are critical parts because they affect the performance of vital components and systems and their failure can result in major service expense. A new part with the same part number must be installed if installation is necessary. Do not use a new part of lesser quality or substitute design. Torque values must be used as specified during reassembly to make sure of correct retention of these parts.

NOTE: The suspension lower arm bushings are not serviced separately from the lower suspension arm. If the bushings require service a new lower arm must be installed.

1. With the vehicle in a static, level ground position, remove the hub cap and measure the distance from the center of the hub (1109) to the lip of the fender (curb height).



2. Raise the vehicle on a hoist. For additional information, refer to [Section 100-02](#).
3. Remove the wheel and tire assembly. For additional information, refer to [Section 204-04](#).
4. Remove the rear brake disc. For additional information, refer to [Section 206-04](#).
5. Disconnect the shock absorber and spring assembly.
 1. Remove and discard the bolt.
 2. Disconnect the shock absorber and spring assembly from the lower arm and bushing.

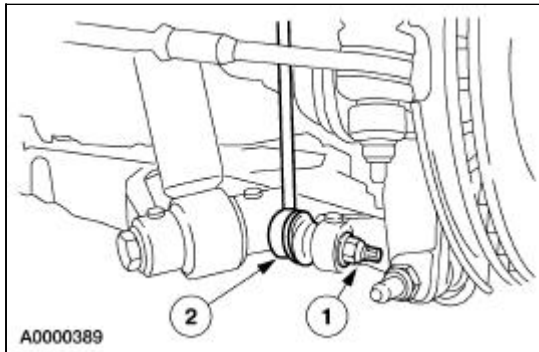


6. **⚠ CAUTION:** Do not use air tools to remove the nut. Damage to the boot can result.

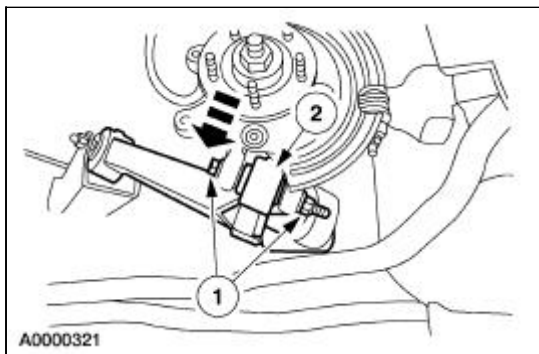
NOTE: To remove the nut, first loosen the nut, then remove the nut using the hex holding feature to prevent the stabilizer bar link ball joint from turning.

Disconnect the stabilizer bar link (5C488) from the suspension lower arm.

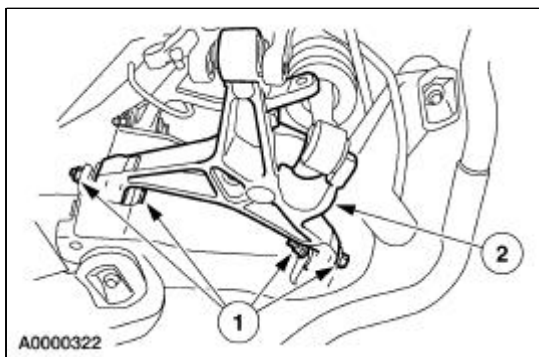
1. Remove and discard the nut.
2. Disconnect the stabilizer bar link.



7. Disconnect the suspension lower arm from the knuckle.
 1. Remove and discard the nut and bolt.
 2. Disconnect the suspension lower arm.



8. Remove the suspension lower arm and bushing.
 1. Remove and discard the nuts and bolts.
 2. Remove the suspension lower arm.

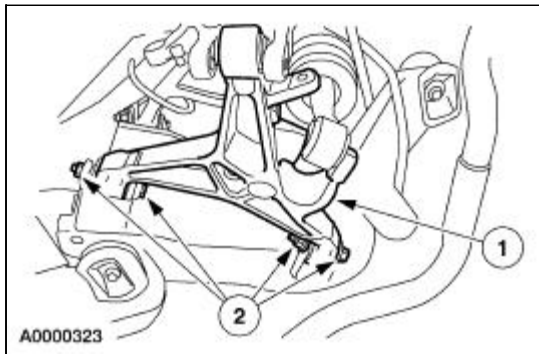


Installation

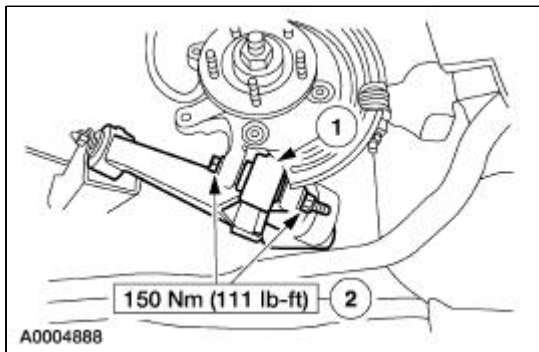
⚠ CAUTION: Do not tighten the suspension lower arm-to-subframe fasteners until the suspension is at curb height. Failure to do so can cause severe damage to the bushings resulting in poor ride quality and handling.

1. Install the suspension lower arm.

1. Position the suspension lower arm onto the subframe (5R003).
2. Install new bolts and nuts. Do not tighten at this time.



2. Connect the suspension lower arm to the knuckle.
 1. Position the suspension lower arm.
 2. Install a new bolt and nut. Tighten the nut.

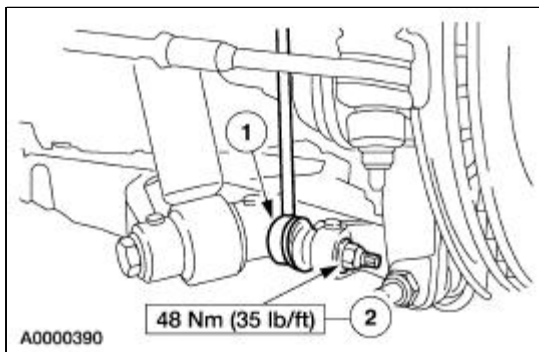


3.  **CAUTION: Do not use air tools to install the nut. Damage to the boot can result.**

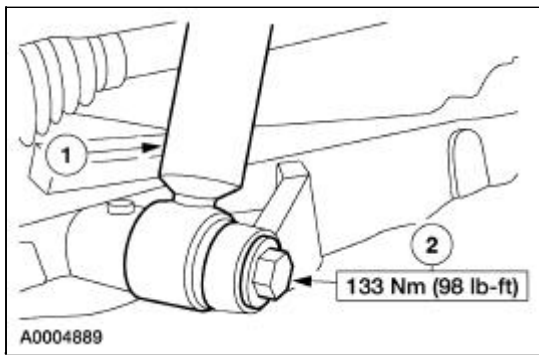
NOTE: To install the nut, first install the nut until snug using the hex holding feature. Final tighten the nut using a socket and a torque wrench.

Connect the stabilizer bar link to the suspension lower arm.

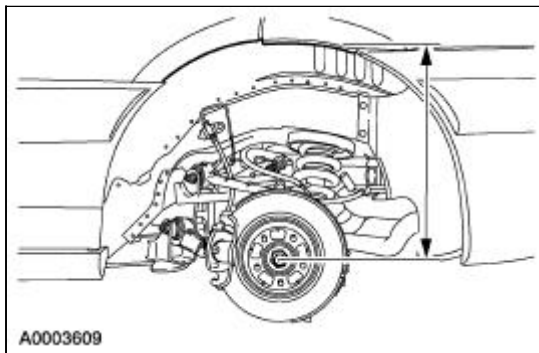
1. Position the stabilizer bar link on the suspension lower arm.
2. Install a new nut.



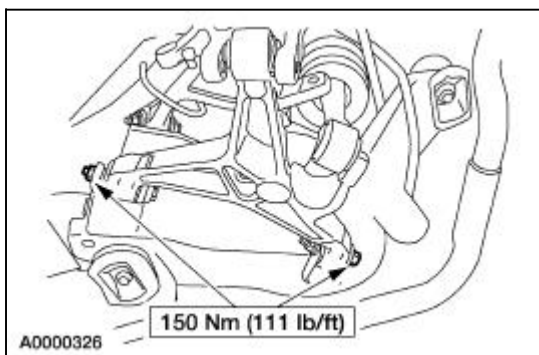
4. Install the rear shock absorber and spring assembly.
 1. Position the shock absorber and spring assembly onto the suspension lower arm.
 2. Install a new bolt.



5. Position a jack stand under the suspension lower arm and raise the suspension until the measurement between the center of the hub and the lip of the fender is equal to the measurement taken in Removal, Step 1 (curb height).



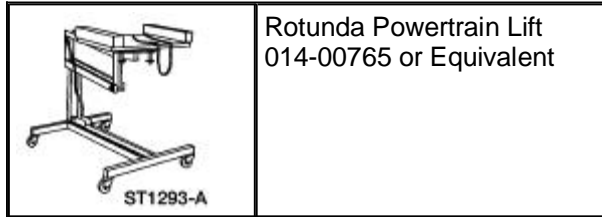
6. Tighten the lower suspension arm -to-subframe rear bolt. Tighten the suspension lower arm-to-subframe front nut.



7. Lower the suspension and remove the jack stand.
 8. Install the rear brake disc. For additional information, refer to [Section 206-04](#).
 9. Install the wheel and tire assembly. For additional information, refer to [Section 204-04](#).
 10. Lower the vehicle.
-

Bar —Stabilizer

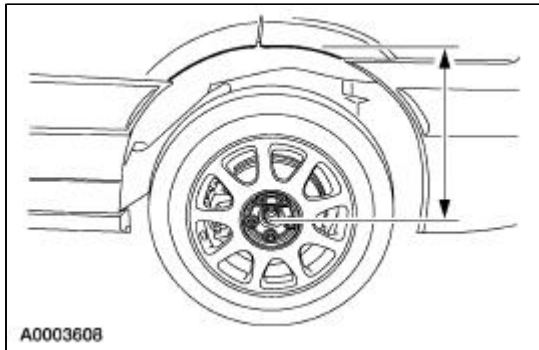
Special Tool(s)



Removal

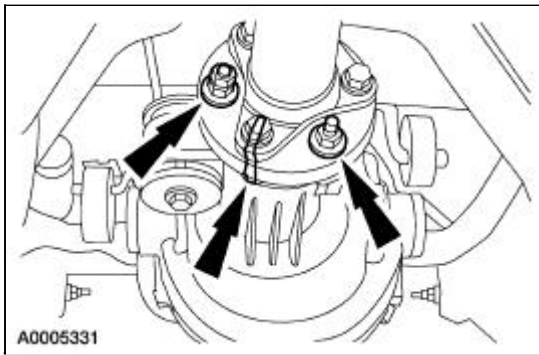
⚠ CAUTION: Suspension fasteners are critical parts because they affect the performance of vital components and systems and their failure can result in major service expense. A new part with the same part number must be installed if installation is necessary. Do not use a new part of lesser quality or substitute design. Torque values must be used as specified during reassembly to make sure of correct retention of these parts.

1. Remove the hub cap and measure the distance from the center of the wheel hub to the lip of the fender with the vehicle in a static, level ground position (curb height).



2. Remove both wheel and tire assemblies. For additional information, refer to [Section 204-04](#).
3. Remove the muffler and heat shield. For additional information, refer to [Section 309-00](#).
4. **⚠ CAUTION:** The driveshaft-to-pinion flange bolts, nuts and weighted nuts must be installed in the same locations from which they were removed.

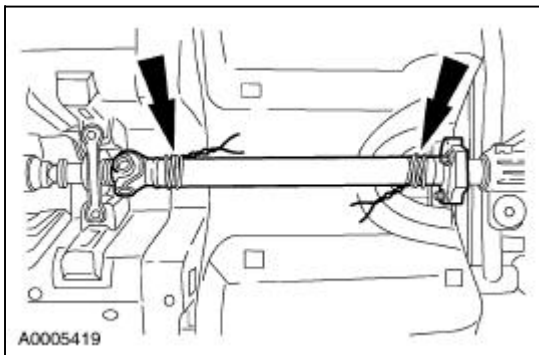
Mark the pinion flange, the driveshaft flexible coupling and each of the three driveshaft-to-pinion flange bolts, nuts and weighted nuts with different color paint so that the driveshaft and differential may be realigned during installation.



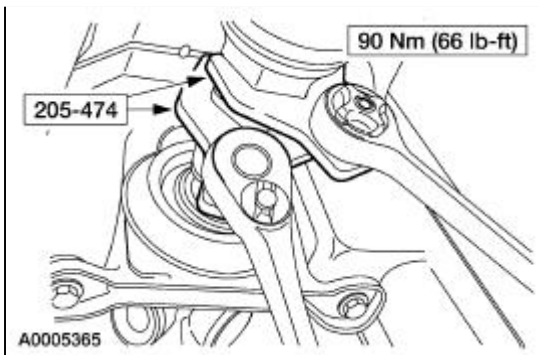
5.  **CAUTION:** Do not remove the flex coupling on the driveshaft flange. Make sure to remove only the driveshaft-to-pinion flange bolts and nuts.

Remove the three driveshaft-to-pinion flange bolts and nuts.

6. Support the driveshaft at the center and rear.



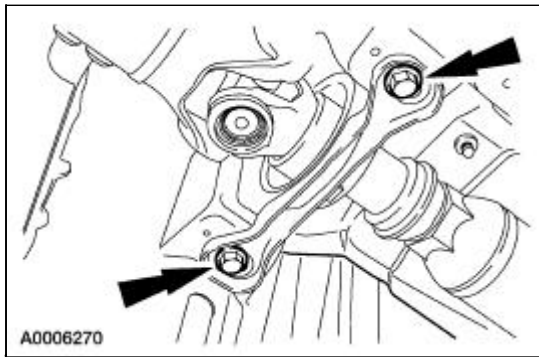
7. Loosen the driveshaft yoke adjuster nut.





8. **NOTE:** There are shims between the center bearing mounting bracket and the body.

NOTE: The shims must be installed in their original locations.

Remove the bolts and the shims.



9. Position special tool 014-00765, or equivalent, under the rear subframe (5R003).
10.  **WARNING:** Do not smoke or carry lighted tobacco or open flame of any type when working on or near any fuel-related components. Highly flammable mixtures are always present and may be ignited. Failure to follow these instructions can result in personal injury.

 **CAUTION:** Do not allow the subframe to hang from the shock absorbers. The shock absorbers can be damaged. Always keep the subframe supported on the special tool.

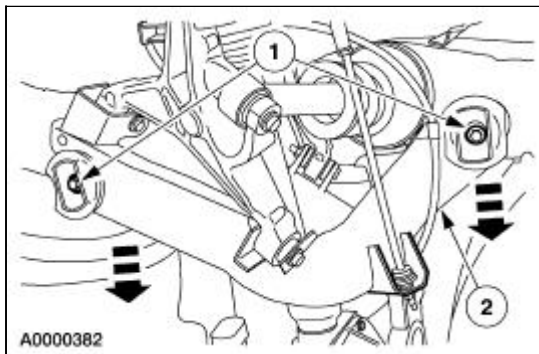
Lower the rear subframe.

1. **NOTE:** Paint or otherwise mark the relative position of the subframe retaining bolts to the subframe bushings for assembly reference.

Remove the four subframe bolts.

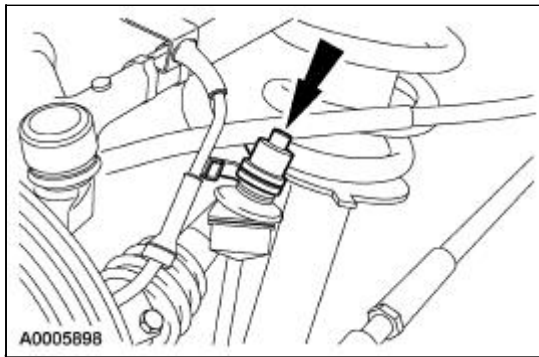
2.  **CAUTION:** To avoid damaging the fuel tank filler hose, do not lower the subframe more than specified.

Carefully lower the subframe approximately 56.25 mm (2.25 in) using the special tool.



NOTE: Components must be removed from both sides of the vehicle. Only the right side is shown.

11. Remove the cap from the stabilizer link.

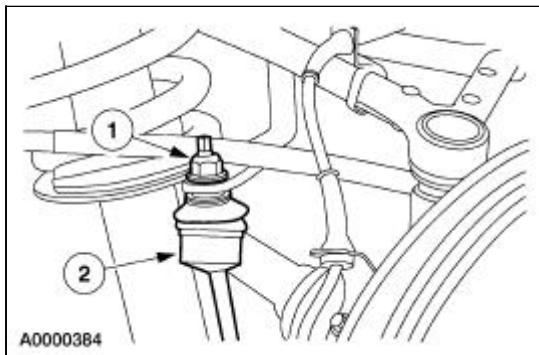


12.  **CAUTION: Do not use air tools to remove the nut. Damage to the boot can occur.**

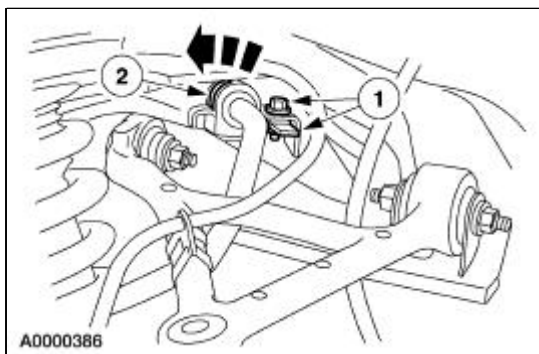
NOTE: To remove the nut, first loosen the nut, then use the hex holding feature to prevent the stabilizer bar link ball joint from turning.

Disconnect the rear stabilizer bar links (5C488) from the rear stabilizer bar (5A772).

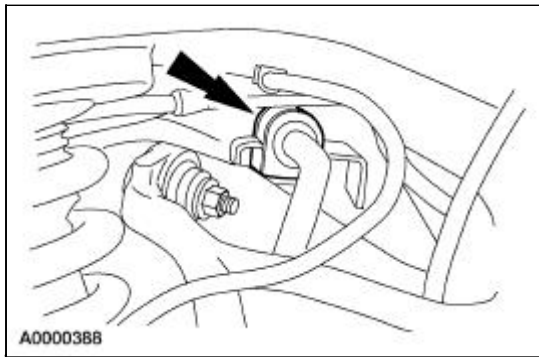
1. Remove and discard the nuts.
2. Disconnect the links from the bar.



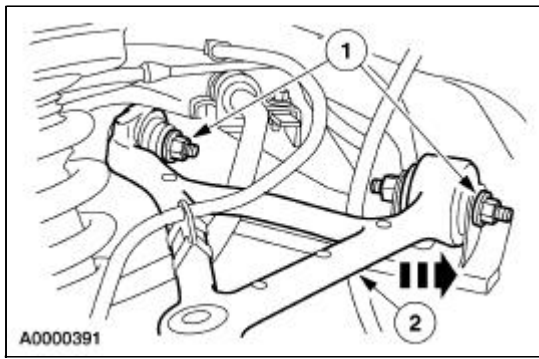
13. Remove the stabilizer bar brackets.
1. Remove the bolts and nuts.
 2. Remove the brackets.



14. Remove the stabilizer bar bushings.

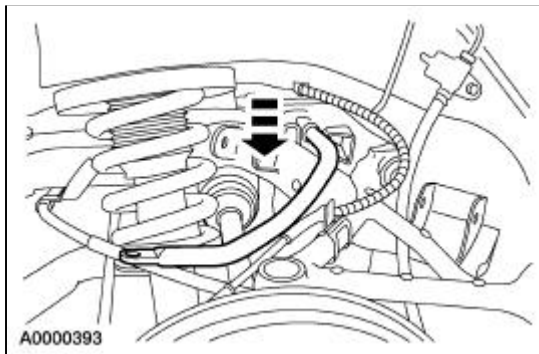


15. Secure the knuckles to the subframe with mechanic's wire.
16. Disconnect the suspension upper arms (5500) from the subframe.
 1. Remove and discard the nuts and bolts.
 2. Disconnect the arms and rotate them out of the way.



17. **NOTE:** The stabilizer bar can be removed from either side.

Remove the stabilizer bar.

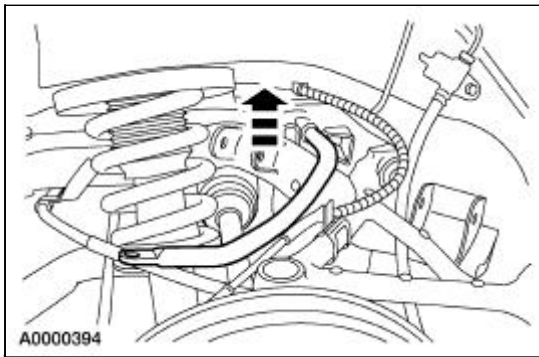


Installation

NOTE: Components on both sides of the vehicle must be installed or connected. Only the right side is shown.

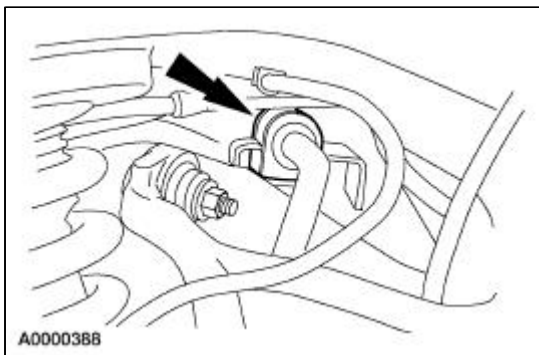
1. **NOTE:** The stabilizer bar can be installed from either side.

Position the stabilizer bar in the vehicle.

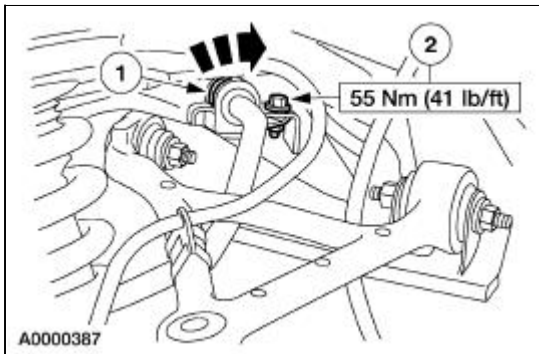



2. **NOTE:** If the stabilizer bar bushings are badly worn or have no grease, install new bushings. Do not grease the bushings.

Install the stabilizer bar bushings.



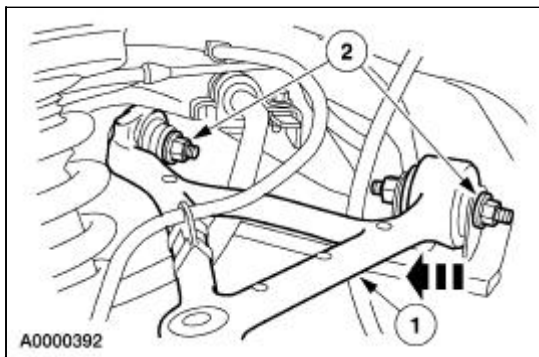
3. Install the stabilizer bar brackets.
 1. Position the brackets on the bushings.
 2. Install the nuts and bolts.



4.  **CAUTION:** The suspension upper arm and bushing must be at curb height before the nuts can be tightened. Failure to do so will result in damage to the bushings resulting in poor ride quality and handling.

Connect the suspension upper arm and bushing to the subframe.

1. Position the arm on the subframe.
2. Install new bolts and nuts. Do not tighten the nuts at this time.



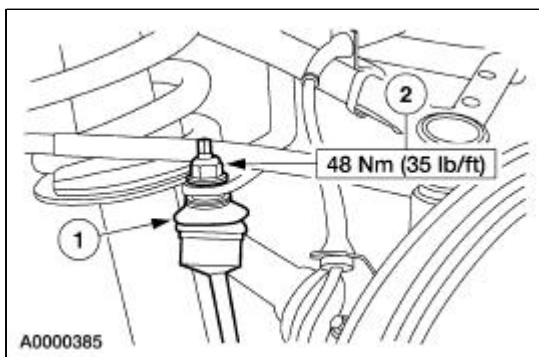
5. Remove the wires holding the knuckles to the subframe.

6.  **CAUTION: Do not use air tools to install the nut. Damage to the boot can occur.**

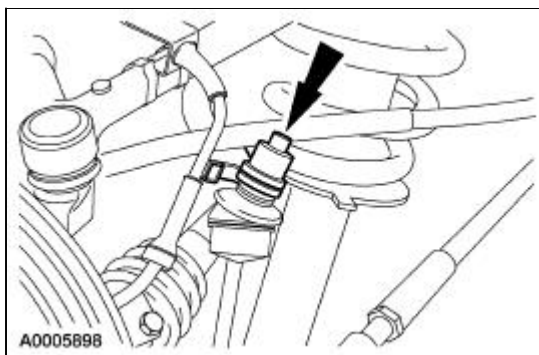
NOTE: To install the nut, first install the nut until snug using the hex holding feature. Final tighten the nut using a socket and a torque wrench.

Connect the stabilizer bar links to the stabilizer bar.

1. Connect the links to the bar.
2. Install new nuts.



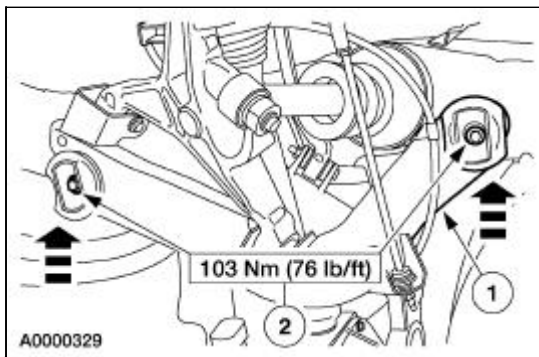
7. Install the protective cap on the stabilizer bar link.



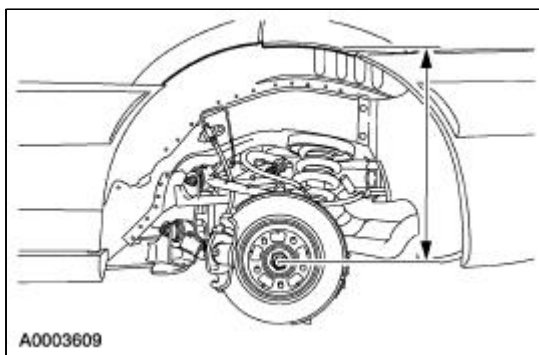
8. Secure the subframe to the body.

1. Raise the subframe using the special tool.
2. **NOTE:** Make sure the bolts are installed in the same position on the subframe bushings as they were before removal.

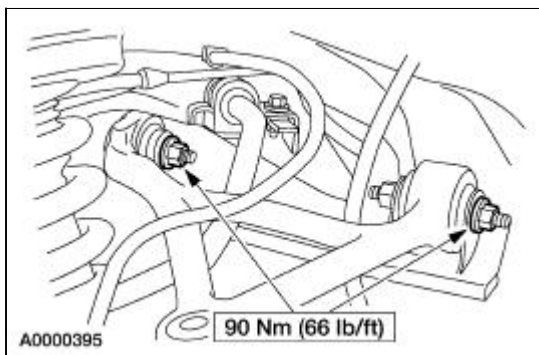
Install the four bolts.



9. Remove the special tool.
10. Position jack stands under the suspension lower arm and bushings and raise the suspension until the distance between the center of the hub and the lip of the fender is equal to the measurement taken during Removal, Step 1 (curb height).



11. Tighten the suspension upper arm and bushing nuts.



12. Lower the suspension and remove the jack stands.
 13. Connect the driveshaft to the rear axle housing. For additional information, refer to [Section 205-01](#).
 14. Install both wheel and tire assemblies. For additional information, refer to [Section 204-04](#).
 15. Lower the vehicle.
-

Link —Stabilizer Bar

Removal

⚠ CAUTION: Suspension fasteners are critical parts because they affect the performance of vital components and systems and their failure can result in major service expense. A new part with the same part number must be installed if installation is necessary. Do not use a new part of lesser quality or substitute design. Torque values must be used as specified during reassembly to make sure of correct retention of these parts.

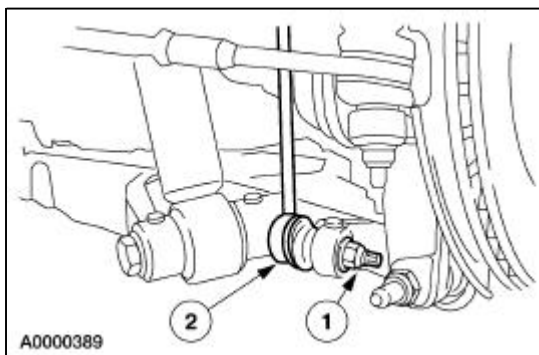
1. Raise the vehicle on a hoist. For additional information, refer to [Section 100-02](#).
2. Remove the wheel and tire assembly. For additional information, refer to [Section 204-04](#).

3. **⚠ CAUTION:** Do not use air tools to remove the nut. Damage to the boot can occur.

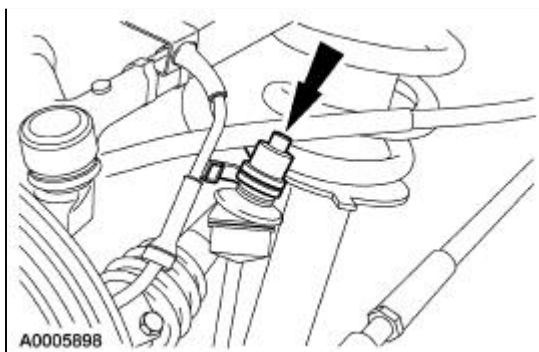
NOTE: To remove the nut, first loosen the nut, then use the hex holding feature to prevent the stabilizer bar link ball joint from turning while removing the nut.

Disconnect the stabilizer bar link (5C488) from the suspension lower arm.

1. Remove and discard the nut.
2. Remove the link from the arm.



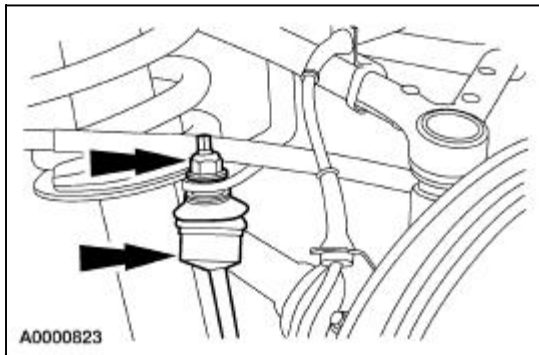
4. Remove the protective cap from the stabilizer bar link.



5. **⚠ CAUTION:** Do not use air tools to remove the nut. Damage to the boot can occur.

NOTE: To remove the nut, first loosen the nut, then use the hex holding feature to prevent the stabilizer link ball joint from turning while removing the nut.

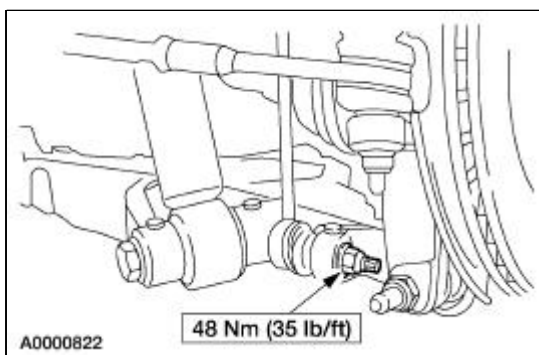
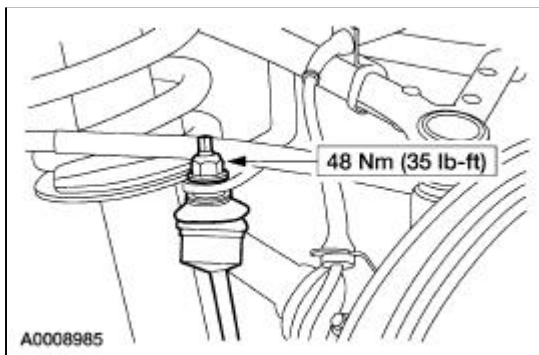
Remove the nut and the stabilizer bar link. Discard the nut.



Installation

1. **NOTE:** The nuts retaining the stabilizer bar link are of a torque prevailing design and new nuts must be used during installation of the stabilizer bar link.

To install, reverse the removal procedure.



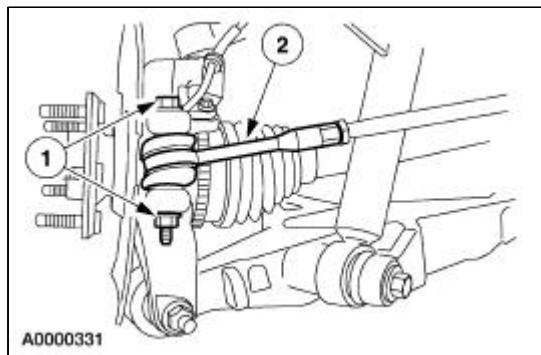
Link —Toe

Removal

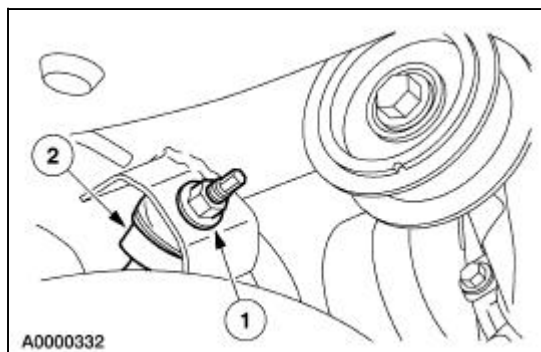
⚠ CAUTION: Suspension fasteners are critical parts because they affect performance of vital components and systems and their failure can result in major service expense. A new part with the same part number must be installed if installation is necessary. Do not use a new part of lesser quality or substitute design. Torque values must be used as specified during reassembly to make sure of correct retention of these parts.

NOTE: The toe links are not serviced separately. If a toe link requires service a new assembly must be installed.

1. Raise the vehicle on a hoist. For additional information, refer to [Section 100-02](#).
2. Remove the wheel and tire assembly. For additional information, refer to [Section 204-04](#).
3. Disconnect the toe link from the knuckle.
 1. Remove and discard the nut and bolt.
 2. Disconnect the toe link.



4. Remove the toe link from the subframe.
 1. **NOTE:** To remove the nut, first loosen the nut, then use the hex holding feature to prevent the ball joint from turning while removing the nut.
Remove and discard the nut.
 2. Remove the toe link.

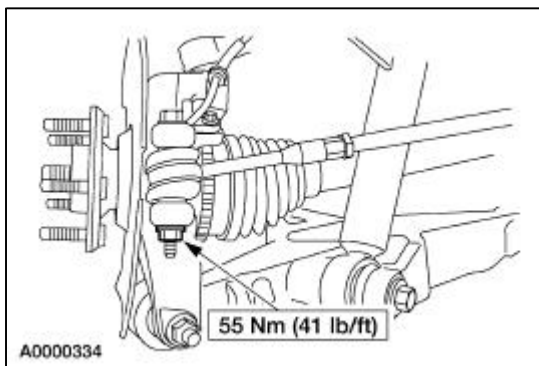
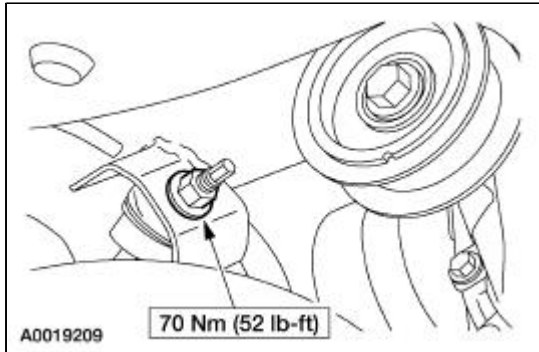


Installation

1. **NOTE:** The bolts and nuts retaining the toe link are of a torque prevailing design and new bolts and nuts must be used during installation of the toe link.

NOTE: To install the toe link-to-subframe nut, first install the nut until snug while using the hex holding feature. Final tighten the nut using a socket and a torque wrench.

To install, reverse the removal procedure.



2. Check wheel alignment. Adjust as necessary. For additional information, refer to [Section 204-00](#).
-

Bushing —Stabilizer Bar

Special Tool(s)

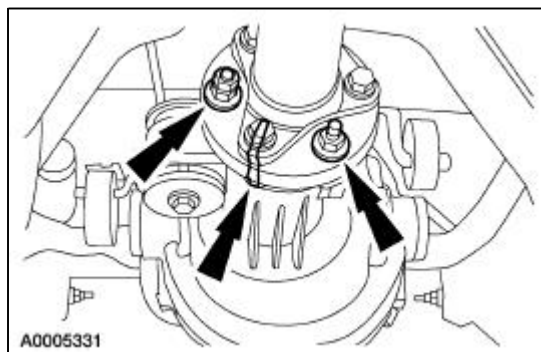


Removal

⚠ CAUTION: Suspension fasteners are critical parts because they affect the performance of vital components and systems and their failure can result in major service expense. A new part with the same part number must be installed if installation is necessary. Do not use a new part of lesser quality or substitute design. Torque values must be used as specified during reassembly to make sure of correct retention of these parts.

1. Remove both wheel and tire assemblies. For additional information, refer to [Section 204-04](#).
2. Remove the muffler and heat shield. For additional information, refer to [Section 309-00](#).
3. **⚠ CAUTION:** The driveshaft-to-pinion flange bolts, nuts and weighted nuts must be installed in the same locations from which they were removed.

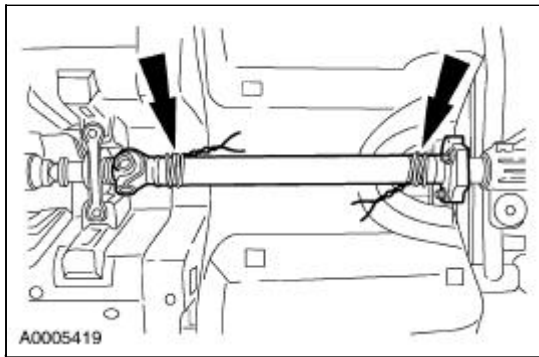
Mark the pinion flange, the driveshaft flexible coupling and each of the three driveshaft-to-pinion flange bolts, nuts and weighted nuts with different color paint so that the driveshaft and differential may be realigned during installation.



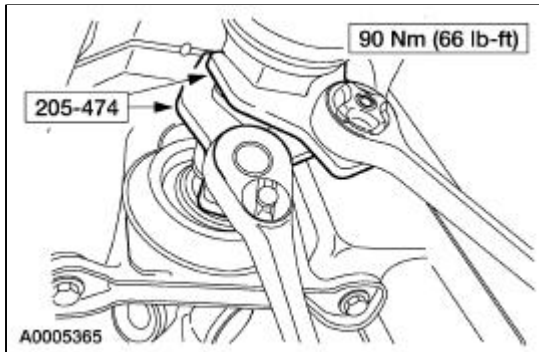
4. **⚠ CAUTION:** Do not remove the flex coupling on the driveshaft flange. Make sure to remove only the driveshaft-to-pinion flange bolts and nuts.

Remove the three driveshaft-to-pinion flange bolts and nuts.

5. Support the driveshaft at the center and rear.



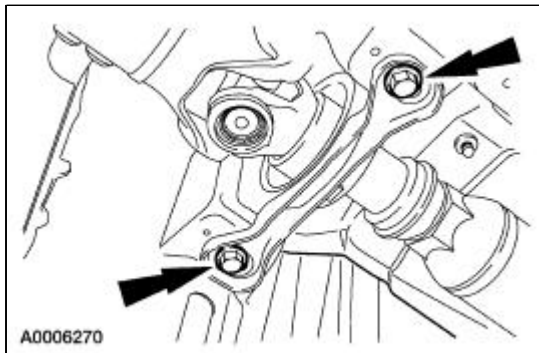
6. Loosen the driveshaft yoke adjuster nut.




7. **NOTE:** There are shims between the center bearing mounting bracket and the body.


NOTE: The shims must be installed in their original locations.

Remove the bolts and the shims.



8. Position the special tool 014-00765, or equivalent, under the rear subframe (5R003).

9.  **WARNING:** Do not smoke or carry lighted tobacco or open flame of any type when working on or near any fuel-related components. Highly flammable mixtures are always present and may be ignited. Failure to follow these instructions can result in personal injury.

 **CAUTION:** Do not allow the subframe to hang from the shock absorbers. The shock absorbers can be damaged. Always keep the subframe supported on the special tool.

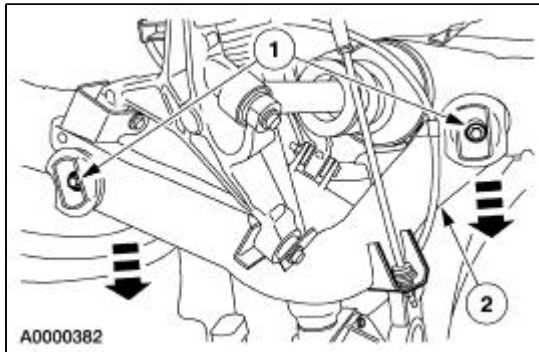
Lower the rear subframe.

1. **NOTE:** Paint or otherwise mark the relative position of the subframe retaining bolts to the subframe bushings for assembly reference.

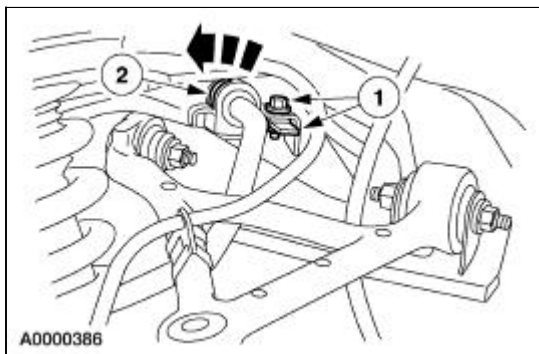
Remove the four subframe bolts.

2.  **CAUTION:** To avoid damaging the fuel tank filler hose, do not lower the subframe more than specified.

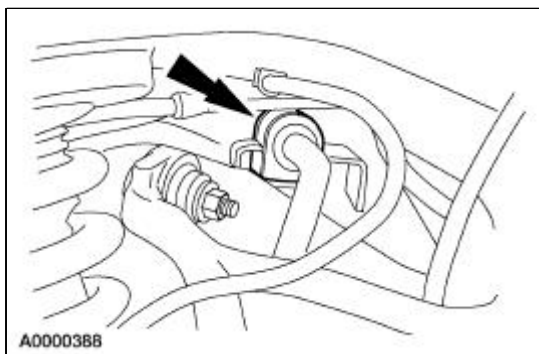
Carefully lower the subframe approximately 56.25 mm (2.25 in) using the special tool 014-00765.



10. Remove the stabilizer bar bracket.
 1. Remove the bolt and nut.
 2. Remove the bracket.



11. Remove the stabilizer bar bushing.

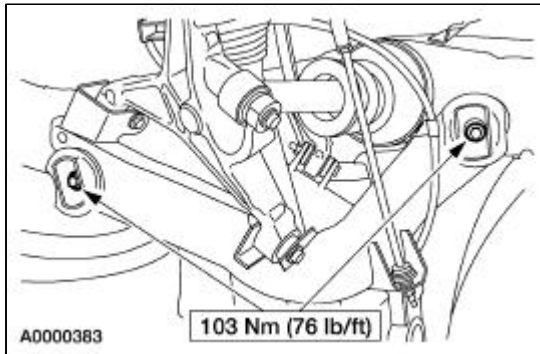
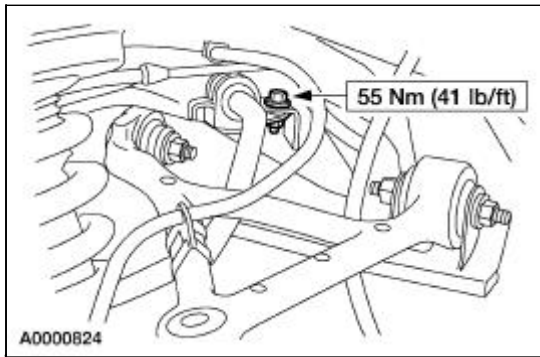


Installation

1. **NOTE:** If the stabilizer bar bushings are badly worn or have no grease, install new bushings. Do not grease the bushings.

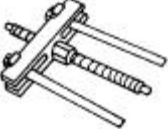

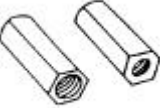
NOTE: Make sure the subframe-to-body bolts are installed in the same position on the subframe bushings as they were before removal.

To install, reverse the removal procedure.




Knuckle


Special Tool(s)

 ST1516-A	Hub Remover/Replacer 204-069 (T81P-1104-C)
 ST1517-A	Metric Hub Remover Adapter 205-237 (T86P-1104-A1)
 ST1518-A	Metric Hub Remover Adapters 204-085 (T83P-1104-BH)

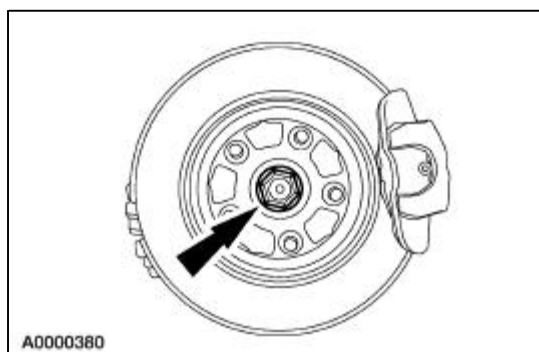
Removal

 **CAUTION:** Suspension fasteners are important parts because they affect performance of vital components and systems and their failure can result in major service expense. A new part with the same part number must be installed if installation is necessary. Do not use a new part of lesser quality or substitute design. Torque values must be used as specified during reassembly to make sure of correct retention of these parts.

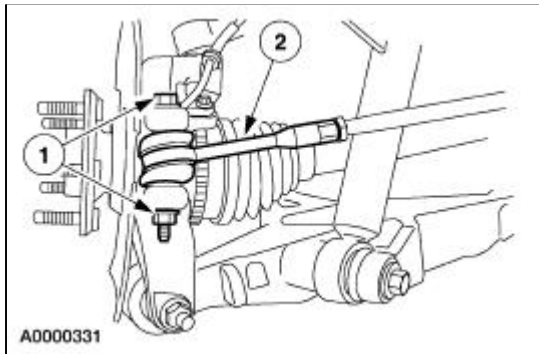
1. Remove the rear brake disc. For additional information, refer to [Section 206-04](#).

2.  **CAUTION:** The wheel hub retainer (4B477) is a one time use item and a new retainer must be installed when removed. Failure to do so can cause the retainer to come loose during vehicle operation resulting in loss of vehicle control.

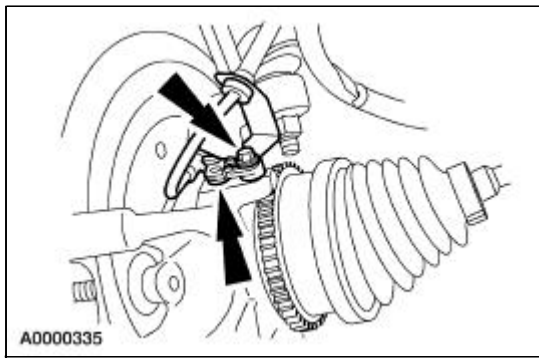
Remove and discard the wheel hub retainer.



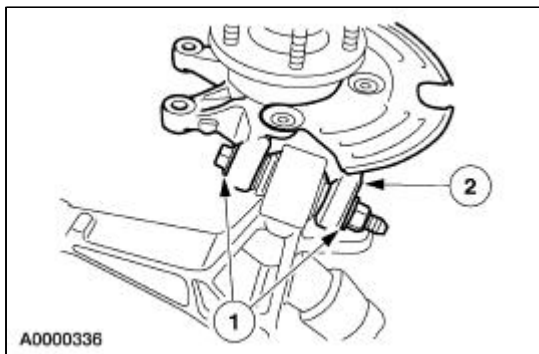
3. Disconnect the toe link from the knuckle.
 1. Remove and discard the nut and bolt.
 2. Disconnect the toe link.




4. Remove the bolt and disconnect the ABS sensor.

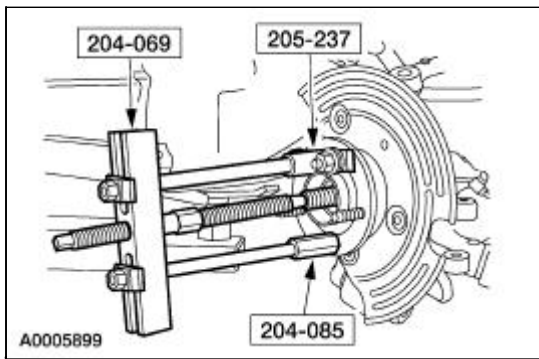


5. Disconnect the suspension lower arm from the knuckle.
 1. Remove the nut and bolt. Discard the nut.
 2. Disconnect the suspension lower arm and bushing.



6.  **CAUTION: Support the axle shaft after removing it from the hub (1109). Failure to do so can damage the axle shaft.**

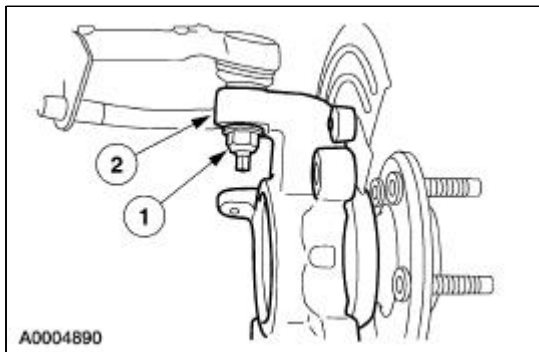
Using the special tools, separate the axle shaft from the hub. Support the axle shaft.



7. Remove the knuckle.
 1. **NOTE:** To remove the nut, first loosen the nut, then use the hex holding feature to remove the nut while holding the ball joint.

Remove and discard the suspension upper arm ball joint nut.

2. Remove the knuckle.



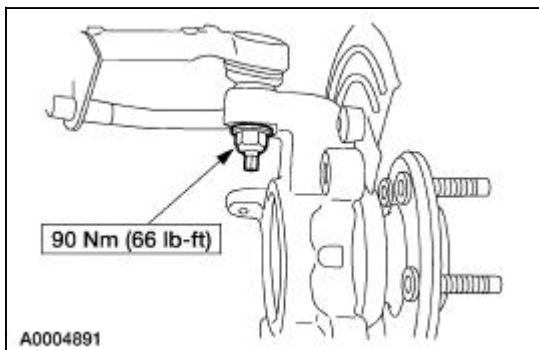
8. Remove the hub. For additional information, refer to [Hub](#) in this section.

Installation

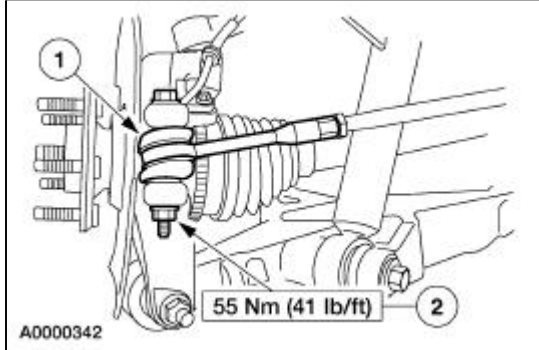
⚠ CAUTION: Do not tighten the suspension lower arm fasteners until the suspension is at curb height. Failure to do so can cause severe damage to the bushings resulting in poor ride quality and handling.

1. Install the hub. For additional information, refer to [Hub](#) in this section.
2. **NOTE:** To install the nut, first install the nut until snug using the hex holding feature. Final tighten the nut using a torque wrench and a socket.

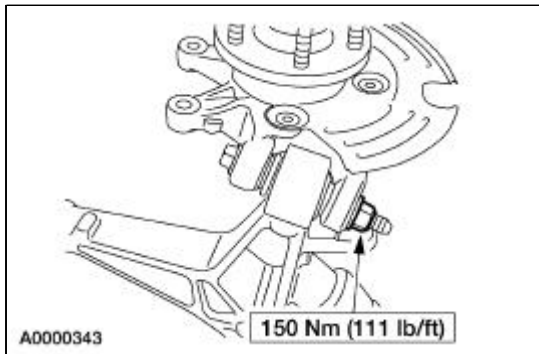
Position the knuckle on the suspension upper arm ball joint stud and install a new nut.



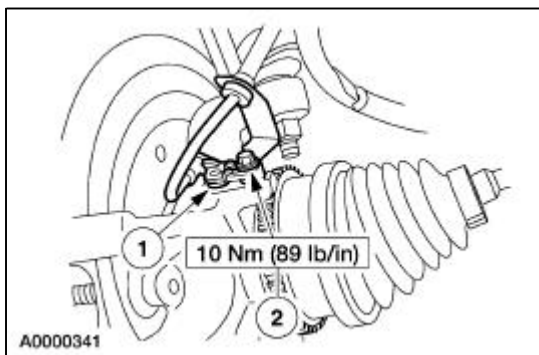
3. Install the toe link.
 1. Position the toe link onto the knuckle.
 2. Install a new bolt and nut.



4. Install the axle shaft into the hub. Make sure the splines on the shaft line up with the splines in the hub.
5. Position the knuckle onto the suspension lower arm and install a new bolt and nut. Tighten the nut.

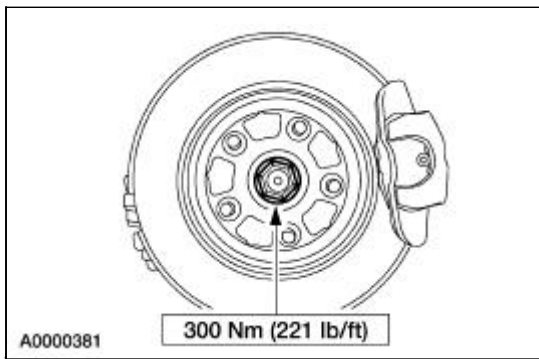


6. Install the ABS sensor.
 1. Install the sensor.
 2. Install the bolt.



7. Install the rear brake disc. For additional information, refer to [Section 206-04](#).
8. **NOTE:** Lower the vehicle and apply the parking or service brakes before tightening the wheel hub retainer.

Install a new wheel hub retainer.



9. Install the wheel and tire. For additional information, refer to [Section 204-04](#).
-

Shock Absorber and Spring Assembly

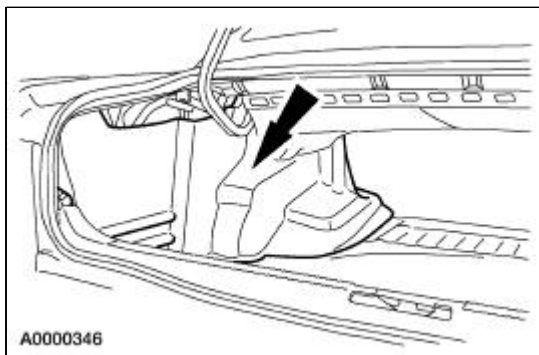
Removal

⚠ WARNING: All vehicles are equipped with gas-pressurized rear shock absorbers which will extend unassisted. Do not apply heat or flame to the shock absorbers during removal or component service. Failure to do so may cause personal injury.

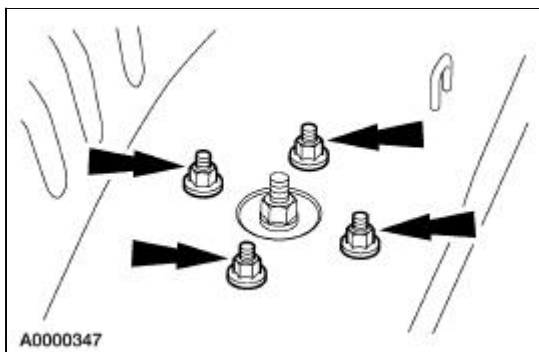
⚠ CAUTION: Suspension fasteners are critical parts because they affect performance of vital components and systems and their failure can result in major service expense. A new part with the same part number must be installed if installation is necessary. Do not use a new part of lesser quality or substitute design. Torque values must be used as specified during reassembly to make sure of correct retention of these parts.

NOTE: Shock absorber and spring removal is the same for both sides. The left side is shown.

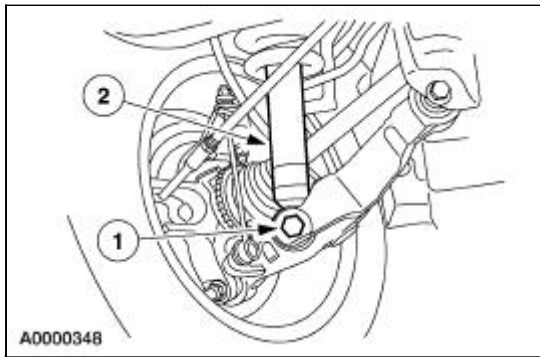
1. Open the luggage compartment lid.
2. Position the trim cover aside.



3. Remove and discard the nuts.



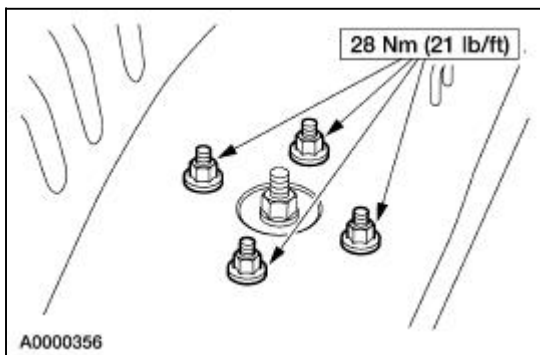
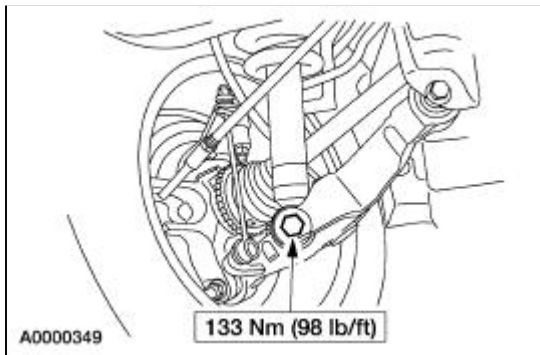
4. Raise the vehicle on a hoist. For additional information, refer to [Section 100-02](#).
5. Remove the shock absorber and spring assembly.
 1. Remove and discard the bolt.
 2. Remove the shock absorber and spring assembly.



Installation

1. **NOTE:** The fasteners retaining the shock absorber and spring assembly are of a torque prevailing design. New fasteners must be used.

To install, reverse the removal procedure.



Shock Absorber and Spring Assembly

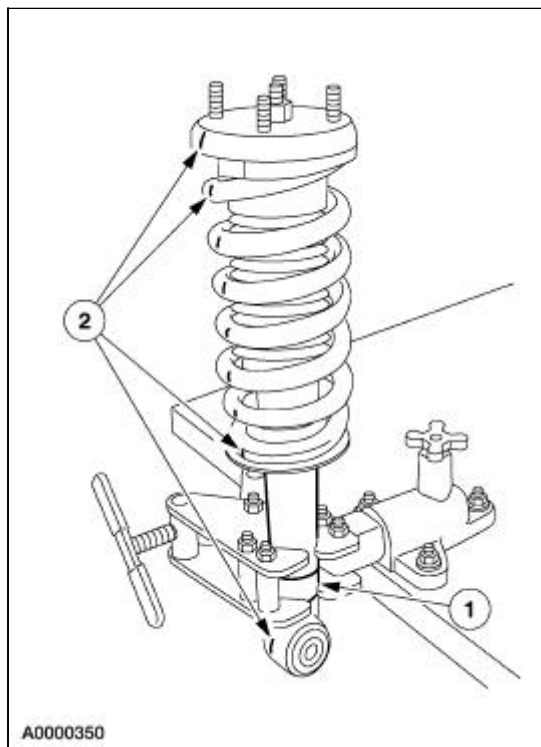
Disassembly

⚠ WARNING: All vehicles are equipped with gas pressurized shock absorbers which will extend unassisted. Do not apply heat or flame to the shock absorbers during removal or component servicing. Failure to follow these instructions may result in personal injury.

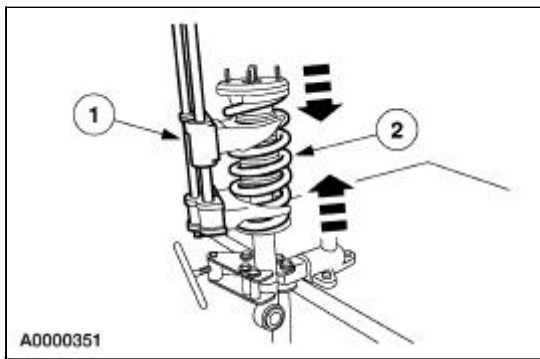
⚠ WARNING: The shock absorber and spring assembly is under extreme load. Do not attempt to disassemble the shock absorber and spring assembly without using a spring compressor. Failure to follow these instructions may result in personal injury.

⚠ CAUTION: Suspension fasteners are critical parts because they affect performance of vital components and systems and their failure can result in major service expense. A new part with the same part number must be installed if installation is necessary. Do not use a new part of lesser quality or substitute design. Torque values must be used as specified during reassembly to make sure of correct retention of these parts.

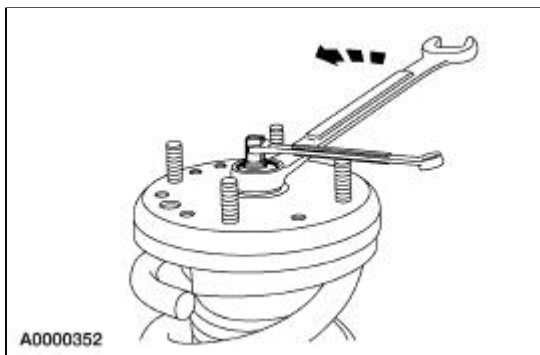
1. Remove the shock absorber and spring assembly. For additional information, refer to [Shock Absorber and Spring Assembly](#) in this section.
2. Mount and mark the shock absorber and spring assembly.
 1. Position the shock absorber and spring assembly in an appropriate vise.
 2. Mark the upper mount, spring and shock absorber for assembly reference.



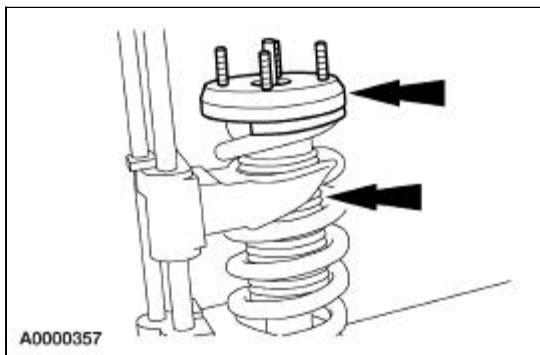
3. Compress the spring.
 1. Install an appropriate spring compressor.
 2. Compress the spring.



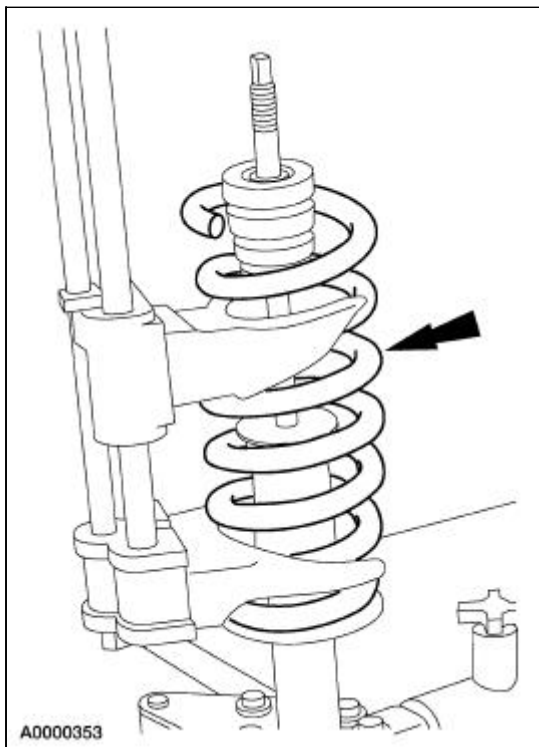
4. While holding the shock absorber rod, remove the nut.



5. Remove the upper mount and dust boot as an assembly.



6. Carefully remove the spring and the spring compressor.



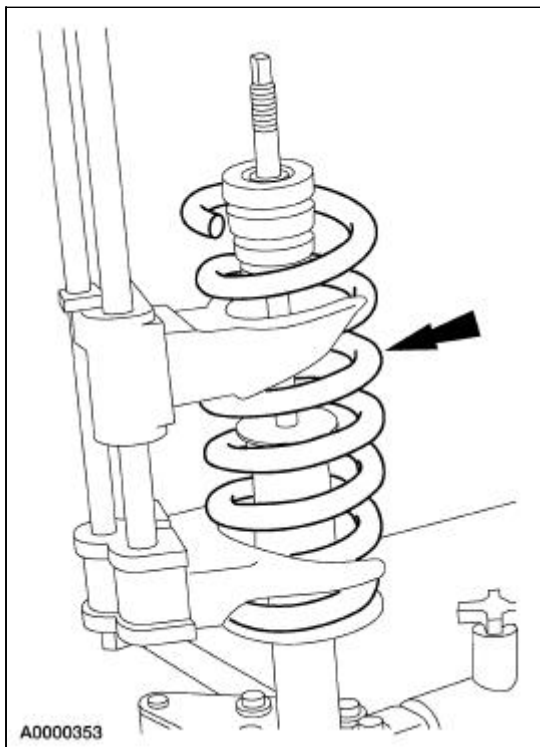
Assembly

NOTE: If a new shock absorber, spring or upper mount is installed, the new part should be marked in the same place the old part is marked to make sure the assembly is correctly aligned.

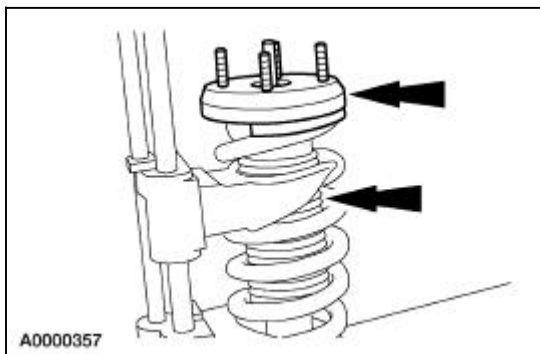
1. Inspect the lower and upper spring seats for damage.
2. Inspect the spring insulator for wear or damage. Install a new insulator if necessary.
3. **NOTE:** Install a new spring with the correct part number only. Refer to the vehicle certification (VC) label for the correct spring code. Refer to [Section 100-01](#) to convert the spring code to a part number.

Inspect the spring for nicked or scratched paint. If the paint is nicked or scratched, install a new spring.

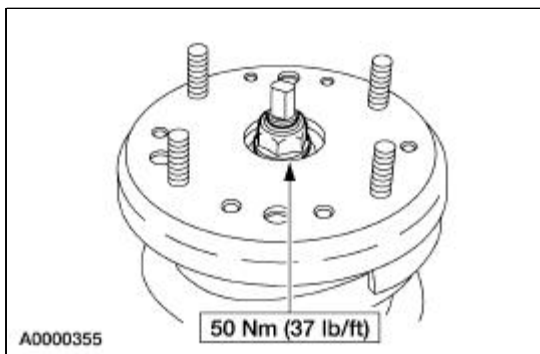
4. Install the spring and the spring compressor on the shock absorber.



5. Position the upper mount and dust boot on the spring. Make sure the marks made during disassembly, Step 2, are aligned.



6. Install a new nut.



7. Remove the spring compressor.
8. Remove the shock absorber and spring assembly from the vise.
9. Install the shock absorber and spring assembly. For additional information, refer to [Shock](#)

[Absorber and Spring Assembly](#) in this section.

General Specifications

Item	Specification
Wheel stud and wheel nuts (metric)	M12x1.5-19 mm hex
Maximum tire balance weight	140 g (5.0 oz) per wheel 70 g (2.5 oz) per flange
Wheel bolt circle runout	0.65 mm (0.02 in)
Tire Inflation	
Tires	See safety certification sticker located on driver door jamb or tire inflation placard on the passenger door jamb.
Tire Tread Depth	
P215/60R16 94H	8.6 mm (0.34 in)
P215/60R16 94V	8.4 mm (0.33 in)
215/60R16 95W	8.1 mm (0.32 in)
235/50R17 95V	8.4 mm (0.33 in)
245/45R17 95W	7.6 mm (0.30 in)
Wheels	
Painted aluminum	16x7J
Bright machined aluminum	16x7J
Bright polished aluminum	16x7J
Painted aluminum	17x7.5J
Wheel offset	60 mm (2.4 in)
Wheel bolt circle runout	0.65 mm (0.02 in)
Cleaners — Wheel	
Metal Surface Cleaner F4AZ-19A536-RA	WSE-M5B392-A
Custom Bright Metal Cleaner 8A-19522-A	ESR-M5B194-B
Repair Compound	
Aluminum Wheel Repair Compound	ESA-M4G280-A

Wheel Rim Runout

Max. radial runout	Max. lateral runout
0.64 mm (0.02 in)	0.89 mm (0.03 in)

Tire Runout Specifications

Max. radial runout	Max. lateral runout
1 mm (0.04 in)	2 mm (0.08 in)


Torque Specifications


Description	Nm	lb-ft
Wheel nuts	135	100


Wheels and Tires

Part # - 1007-	Color/Style	Wheel Size	No. of Bolts	Bolt Circle Diameter	Offset	Tire Usage
-	Steel or aluminum mini-spare	16 X 4	5	107.95 mm (4.31 in)	40	T145/80R16 105
-	Silver sparkle, forged aluminum/9 spoke	16 X 7	5	107.95 mm (4.31 in)	60	P215/60R16 94H or 215/60R16 95W
-	Bright machined, forged aluminum/5 spoke	16 X 7	5	107.95 mm (4.31 in)	60	P215/60R16 V rated or 215/60R16 95W
-	Bright polished forged aluminum/5 spoke	16 X 7	5	107.95 mm (4.31 in)	60	P215/60R16 94H or P215/60R16 94V or 215/60R16 95W
-	Silver gray cast aluminum/5 spoke	17 X 7.5	5	107.95 mm (4.31 in)	60	P235/50R17 95V or 245/45R17 95W


Safety Precautions


 **WARNING:** Never run the engine with one wheel off the ground, for example, when changing a tire. The wheel(s) resting on the ground can cause the vehicle to move.


 **WARNING:** The tire and wheel must always be correctly matched. It is very important to determine the size of each component before any assembly operations commence. Failure to adhere to these instructions can result in an explosive separation and cause serious bodily injury or death.


 **WARNING:** Aftermarket aerosol tire sealants are extremely flammable. Always question the customer to make sure these products have not been used.

 **WARNING:** Aftermarket wheel assemblies may not be compatible with the vehicle. Use of incompatible wheel assemblies can result in equipment failure and possible injury. Use only approved wheel assemblies.

 **WARNING:** Use only wheels and wheel nuts that have been designed for current model year Ford vehicles. Aftermarket wheels or wheel nuts may not fit or function correctly, and can cause personal injury or damage the vehicle.

 **WARNING:** Always wear safety goggles or a face shield when performing any work with tire and wheel assemblies.

 **CAUTION:** Do not clean aluminum wheels with steel wool, abrasive-type cleaners or strong detergents. Use Custom Bright Metal Cleaner 8A-19522-A or equivalent meeting Ford specification ESR-M5B194-B.

 **CAUTION:** Reduce the air pressure as much as possible by pushing the valve core plunger in prior to removing the valve core. Avoid working in a position in which the face or body is directly over a tire in which there is pressure.

When carrying out any inspection or repair procedures on wheels (1007) and tires, follow the preceding safety precautions.

Wheels and Tires



WARNING: Do not mix different types of tires, such as radial, bias, or bias-belted, on the same vehicle except in emergencies (temporary spare usage). Vehicle handling can be seriously affected and can result in loss of control.

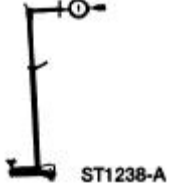
If the vehicle is equipped with uni-directional tires, mount the tires on the vehicle only in accordance with the manufacturer's instructions for direction of rotation printed on the side wall.

Original equipment uni-directional full-size spare tires can be operated with rotation counter to the directional arrow on the tire sidewall, but will perform best when rotating with the directional arrow on the sidewall.

Factory-installed tires and wheels are designed to operate satisfactorily with loads up to and including full-rated load capacity when inflated to recommended inflation pressures.

Wheels and Tires

Special Tool(s)

 <p>ST1238-A</p>	Radial Runout Gauge 418-F123 (007-0056A) or Equivalent
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Inspection and Verification



WARNING: Never run the engine with one wheel off the ground, for example, when changing a tire. The wheel(s) resting on the ground can cause the vehicle to move.



WARNING: Do not balance the wheels and tires while they are mounted on the vehicle. Possible tire disintegration or differential failure can result, causing personal injury and extensive component damage. Use off-vehicle wheel and tire balancer only.

Be sure to follow the warnings when performing inspection and verification.

Road Test

Verify the customer concern by performing a road test on a smooth road. If any vibrations are apparent, go to [Section 100-04](#).

To maximize tire performance, inspect for signs of incorrect inflation and uneven wear, which can indicate a need for balancing, rotation, or front suspension alignment.

Correct tire pressure and driving techniques have an important influence on tire life. Heavy cornering, excessively rapid acceleration and unnecessary sharp braking increases tire wear.

New tires must follow the recommended:

- tire sizes.
- speed rating.
- load range.
- tire construction type.

Use of any other tire size or type can seriously affect:

- ride.
- handling.

- speedometer/odometer calibration.
- vehicle ground clearance.
- tire clearance between the body and chassis.
- wheel bearing life.
- brake cooling.

New wheels need to be installed when:

- bent.
- cracked.
- dented.
- heavily corroded.
- leaking.
- they have elongated wheel hub bolt holes.
- they have excessive lateral or radial runout.

Wheel and tire assemblies are attached by five wheel nuts.

It is mandatory to use only the tire sizes recommended on the tire chart attached to the vehicle. Larger or smaller tires can damage the vehicle, affect durability, and require changing the speedometer calibration. Make sure wheel size and offsets match those recommended for the tire in use.

1. Inspect for signs of uneven wear that can indicate a need for balancing, rotation, front suspension alignment, damaged tie-rod, or steering components.
2. Check tires for:
 - cuts.
 - stone bruises.
 - abrasions
 - blisters.
 - embedded objects.
3. Tread wear indicators are molded into the bottom of the tread grooves. Install a new tire when the indicator bands become visible.

Symptom Chart

Symptom Chart

Condition	Possible Sources	Action
<ul style="list-style-type: none"> ● Tires Show Excess Wear on Edge of Tread 	<ul style="list-style-type: none"> ● Underinflated tires. ● Vehicle overloaded. ● High-speed cornering. 	<ul style="list-style-type: none"> ● ADJUST air pressure in tires. ● RETURN vehicle — NOTIFY customer of overload condition. ● RETURN vehicle — NOTIFY customer of

	<ul style="list-style-type: none"> ● Incorrect wheel alignment. ● Incorrect tire rotation intervals. 	<p>cause of condition.</p> <ul style="list-style-type: none"> ● SET toe to specification. REFER to Section 204-00. ● ADVISE customer of condition. ROTATE tires.
<ul style="list-style-type: none"> ● Tires Show Excess Wear in Center of Tread 	<ul style="list-style-type: none"> ● Tires overinflated. 	<ul style="list-style-type: none"> ● ADJUST air pressure.
<ul style="list-style-type: none"> ● Other Excessive Tire Wear Problems 	<ul style="list-style-type: none"> ● Incorrect tire pressure. ● Loose or leaking shock absorbers. ● Front end out of alignment. ● Front wheel bearings out of adjustment. ● Loose, worn or damaged suspension components. ● Wheel and tire assembly out of balance. ● Excessive lateral or radial runout of wheel or tire. ● Incorrect tire rotation intervals. 	<ul style="list-style-type: none"> ● ADJUST pressure. ● TIGHTEN or INSTALL new shock absorbers as necessary. ● ALIGN front end. REFER to Section 204-00. ● REFER to Section 204-00 for inspection procedure. ● REFER to Section 204-00. ● BALANCE wheel and tire assembly. ● REFER to Component Tests in this section. ● ADVISE customer of condition. ROTATE tires.
<ul style="list-style-type: none"> ● Wobble or Shimmy 	<ul style="list-style-type: none"> ● Damaged wheel bearings. ● Loose or damaged suspension components. ● Bent wheel. ● Damaged tire. ● Loose wheel nuts. 	<ul style="list-style-type: none"> ● REFER to Section 204-00. ● REFER to Section 204-00. ● INSTALL a new wheel as necessary. ● INSTALL a new tire as necessary. ● TIGHTEN to specification.
<ul style="list-style-type: none"> ● High-Speed Shake 	<ul style="list-style-type: none"> ● Wheel hub face/pilot/bolt circle runout. ● Tires/wheels. ● Wheel bearings. ● Suspension/steering linkage. ● Engine. ● Transmission. ● Brake discs/imbalance. 	<ul style="list-style-type: none"> ● REFER to Section 100-04.
<ul style="list-style-type: none"> ● Vehicle Vibration 	<ul style="list-style-type: none"> ● Driveline — engine. ● Tires. 	<ul style="list-style-type: none"> ● REFER to Section 100-04.

Component Tests

Tire and Wheel Runout

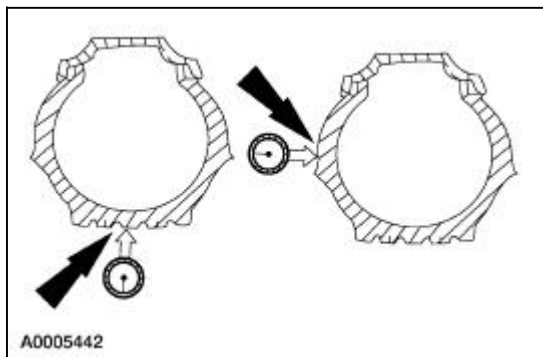
Excessive radial and lateral runout of a wheel and tire assembly can cause roughness, vibration, wheel tramp, tire wear, and steering wheel tremor.

Before checking runout, and to avoid false readings caused by temporary flat spots in the tires, check runout only after the vehicle has been driven far enough to warm the tires.

The extent of the runout is measured with the radial runout gauge. All measurements are made on the vehicle with the tires inflated to recommended inflation pressures and with the front wheel bearings adjusted to specifications.

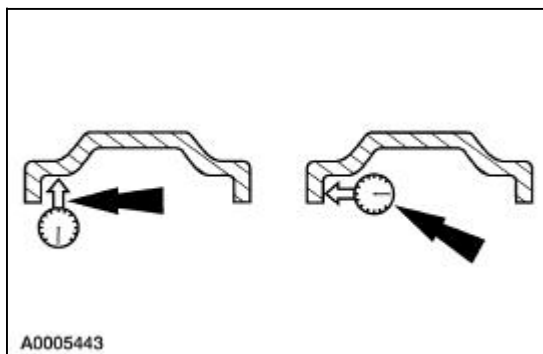
Tire Runout

Measure radial and lateral tire runout at the positions shown in the illustration. Runout should not exceed specifications.



Wheel Runout

Measure radial and lateral wheel runout at the positions shown in the illustration. Runout should not exceed specifications. Note that the tire has been removed.



Wheel Leaks




WARNING: Wheel repairs that use welding or peening are not approved. An inner tube is not an acceptable repair for leaking wheels (1007) or tires.

If the air pressure in a tire mounted on an aluminum wheel is found to be low, carry out the following procedure before considering installation of a new wheel.

1. Remove the wheel and tire assembly and inspect the wheel for structural damage. If none exists, go to Step 2. If the wheel is damaged, install a new wheel.
2. With the tire mounted on the wheel, locate the air leak using a water bath or equivalent method, and mark the location. Check the complete wheel for possible additional leaks. When the leaks are marked, dismount the tire, marking valve location on the tire for correct indexing.
3. On the tire side of the wheel, thoroughly clean the leaking area with an appropriate cleaner (Metal Surface Cleaner F4AZ-19A536-RA or equivalent meeting Ford specification WSE-M5B392-A) or use sandpaper of approximately 80-grit to remove all contamination. Using the sandpaper, score the surface of the leaking area to improve adhesion of the sealer. If the valve stem is close to the area, remove it.
4. Use a clean cloth to remove all cleaner and sanding dust.
5. **NOTE:** Do not use a torch containing oxyacetylene.

Heat the prepared area with a Heat Gun or a propane torch. Apply Aluminum Wheel Repair Compound meeting Ford specification ESA-M4G280-A or equivalent over the prepared area using a liberal flow and wiping action. Repair is most effective when heat is applied to the brake side of the rim, and the sealer is melted by heat in the metal.

6. Apply only enough heat to melt the sealer, then remove the heat source. After repairing the leak, allow the wheel to cool until it can be handled safely.
7.  **CAUTION:** Use caution when mounting the tire so as not to damage the sealer.

Index and assemble the wheel and tire. Inflate the tire to the recommended pressure as indicated on the tire pressure decal.

8. Repeat Step 2 to verify repair.
 9. When the repair is completed, balance the assembly and install it on the vehicle.
-

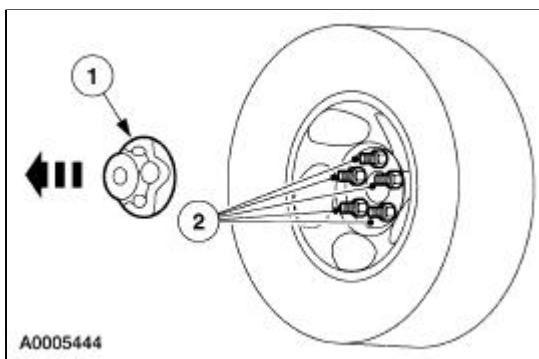
Wheel and Tire

Removal

1.  **CAUTION: Do not use heat to loosen a seized wheel nut (1012). Heat can damage the wheel and wheel bearings.**


Loosen the wheel nuts.

1. Remove the hub cap.
2. With the weight of the vehicle on the tires, loosen the wheel nuts.



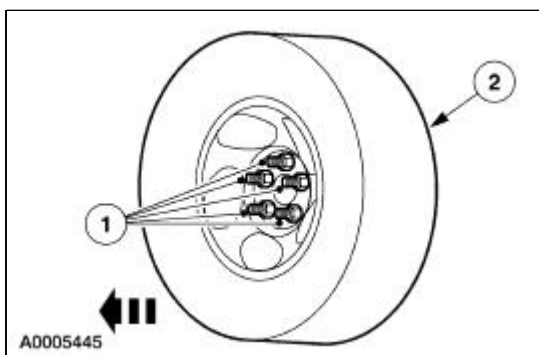
2.  **CAUTION: Never use the differential housing as a lifting point.**

Raise and support the vehicle. For additional information, refer to [Section 100-02](#).


3.  **CAUTION: Do not use heat to loosen a seized wheel because heat can damage the wheel and the wheel bearings. If the wheel cannot be removed by hand, use a wheel puller to remove the seized wheel.**

Remove the wheel and tire assembly.

1. Remove the wheel nuts.
2. Remove the wheel and tire assembly, using a side-to-side rocking motion.



Installation

1.  **WARNING: When a wheel is installed, always remove any corrosion, dirt or foreign material present on the mounting surfaces of the wheel and the surface of the wheel hub,**

brake drum or brake disc that contacts the wheel. Installing wheels without correct metal-to-metal contact at the wheel mounting surfaces can cause the wheel nuts to loosen and the wheel to come off while the vehicle is in motion, causing loss of control.

NOTE: If there is significant corrosion of the nut or stud threads, lubricate the threads with a drop of oil prior to installation.

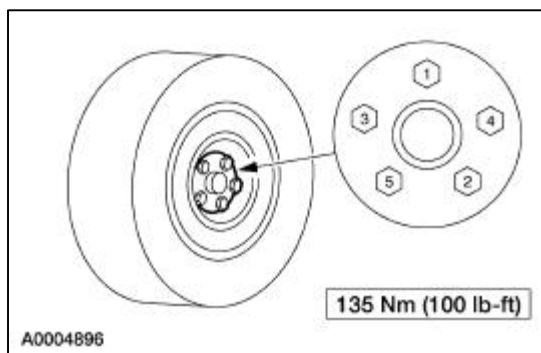
NOTE: When the wheel nuts are used to attach the mini-spare, and are correctly installed, the cone seat of the nut body will be in contact with the cone seat of the wheel. The washer on the nut will not be in contact with the wheel and will spin freely.

Clean the wheel and the wheel hub mounting surface.

2. Install the wheel and tire assembly.
 1. Position the wheel and tire assembly.
 2. Install the wheel nuts hand-tight, then lower the vehicle.

3.  **CAUTION: Failure to tighten the wheel nuts in a star pattern can result in high brake disc runout, which will speed up the development of brake roughness, shudder and vibration.**

Tighten the wheel nuts to specification in a star-pattern sequence.



General Specifications

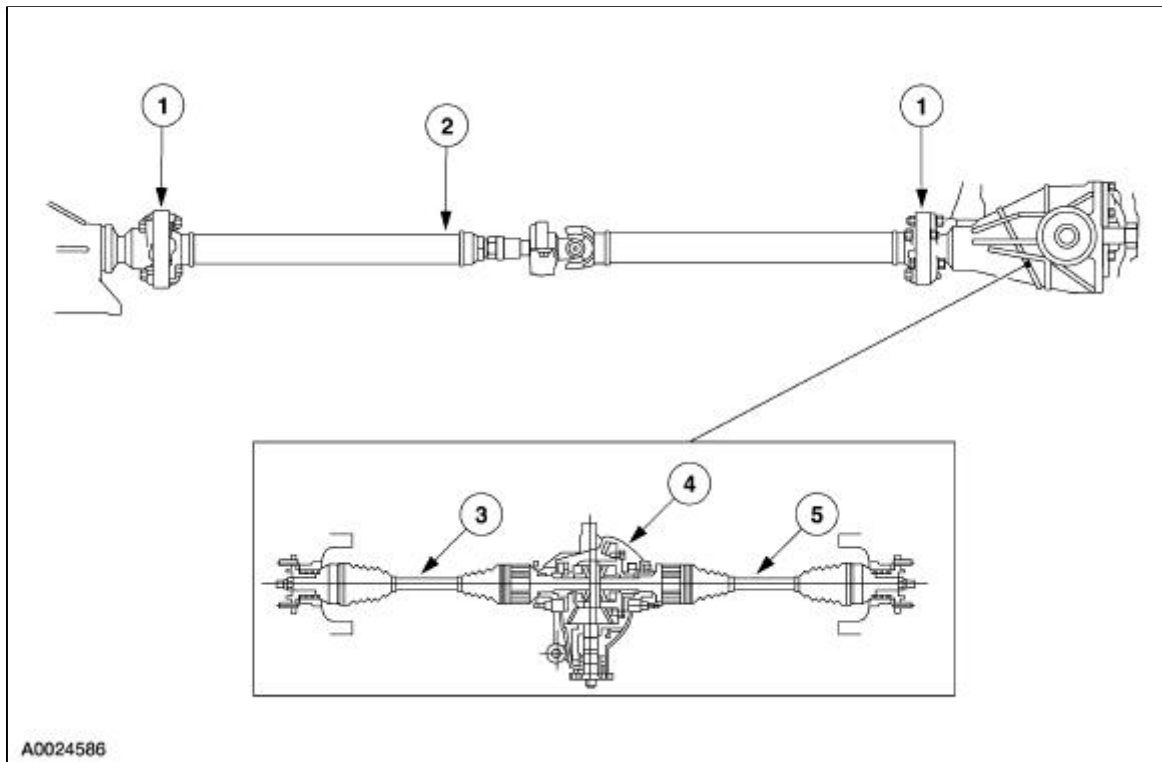
Item	Specification
SAE 75W-140 Synthetic Rear Axle Lubricant F1TZ-19580-B (in Canada CXY-75W140-16)	WSL-M2C192-A
Driveshaft Slip-Yoke	
Premium Long-Life Grease XG-1-C	ESA-M1C75-B
Capacities	
Rear axle	1.4L (3.0 pts)
Sealant	
Threadlock and Sealer E0AZ-19554-AA (in Canada CXC-76)	WSK-M2G351-A5
Stud and Bearing Mount E0AZ-19554-BA (in Canada CXC-70)	WSK-M2G349-A1

Driveshaft Angle Specifications

Transmission to Front Driveshaft	Front Driveshaft to Rear Driveshaft	Rear Driveshaft to Rear Axle Drive Pinion
(+1.0 degree) to (-0.0 degree)	(-0.4 degree) to (-1.4 degree)	(+1.0 degree) to (-0.0 degree)

Driveline System

Driveline Component Locations



A0024586

Item	Part Number	Description
1	4684	Flex coupling
2	4602	Driveshaft assembly
3	3B436	Halfshaft (RH)
4	4010	Rear axle housing
5	3B437	Halfshaft (LH)

The driveline transfers engine torque to the drive wheels. Power is transmitted through the transmission to the driveshaft (4602) and then to the axle which is connected to the halfshafts.

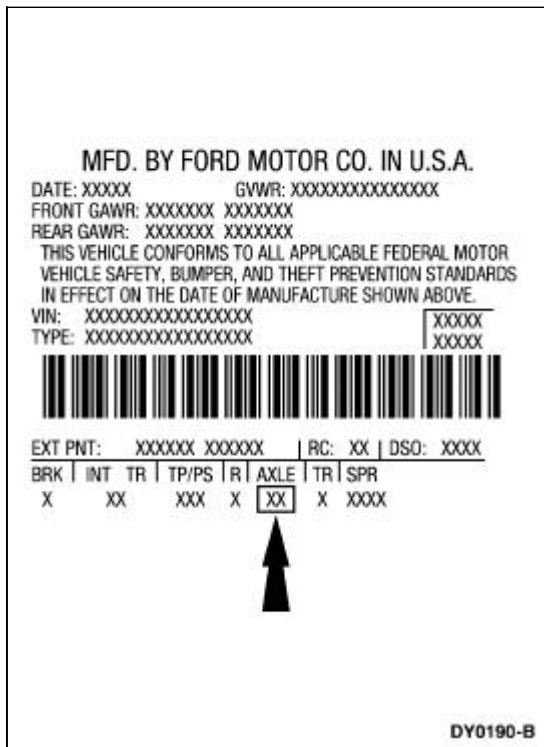
For additional information on the halfshaft, refer to [Section 205-05](#).

For additional information on the driveshaft, refer to [Section 205-01](#).

For additional information on the rear axle, refer to [Section 205-02](#).

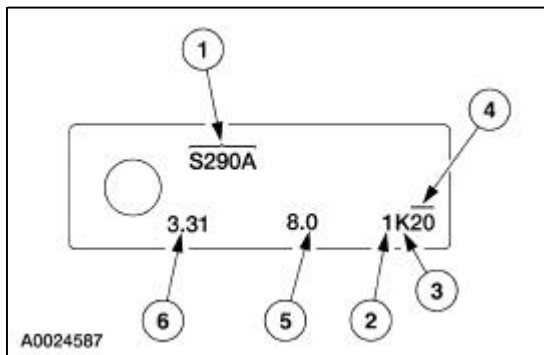
The engine angle is built into the engine mounts. If the engine angle is out of specification, the engine mounts must be inspected for damage. For additional information, refer to [Section 303-00](#).

Vehicle Certification (VC) Label Example



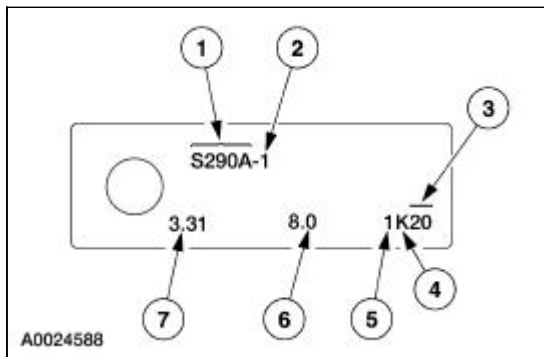
The vehicle certification (VC) label is located in the driver door jamb. The axle code is on the VC label. For additional information on the VC label, refer to [Section 100-01](#).

Axle Identification Tag



Item	Description
1	Plant code
2	Build year
3	Build month
4	Build day
5	Ring gear diameter (inch)
6	Axle ratio

Axle Identification Tag Denoting Interchangeability Affected Internally



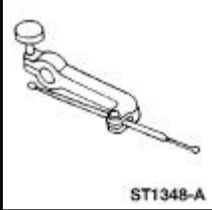
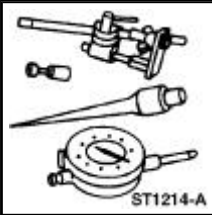
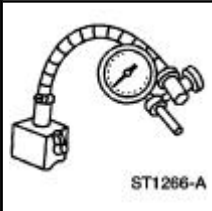
Item	Description
1	Plant code
2	Denotes interchangeability affected internally
3	Build day
4	Build month
5	Build year
6	Ring gear diameter (inch)
7	Axle ratio

⚠ CAUTION: The axle identification tag is the official identifier. Do not damage the tag. Always reinstall the tag after removing it for axle inspection/repair.

The plant code denotes a particular axle design and specific ratio. In addition, the plant code will not change as long as that particular axle assembly never undergoes an external design modification. If, however, an internal design modification takes place during the production life of the axle and that internal modification affects parts interchangeability, a dash and numerical suffix is added to the plant code. This means that, as an assembly, both axles are interchangeable; however, internally they are different. Therefore, each requires different internal parts at the time of repair.

Driveline System

Special Tool(s)

 <p>ST1348-A</p>	Gauge, Clutch Housing 308-021 (T75L-4201-A)
 <p>ST1214-A</p>	Dial Indicator Gauge with Holding Fixture 100-002 (TOOL-4201-C) or equivalent
 <p>ST1266-A</p>	Dial Indicator Gauge with Holding Fixture 100-D002 (D78P-4201-B) or equivalent

Inspection and Verification

Certain axle and driveline trouble symptoms are also common to the engine, transmission, wheel bearings, tires, and other parts of the vehicle. For this reason, be sure that the cause of the concern is in the axle before disassembling, adjusting or repairing the axle. For additional information, refer to [Section 100-04](#).

Certain driveshaft vibration symptoms are common to the accessory drive components, the engine, transmission or tires. Be sure the cause of the concern is the driveshaft before repairing or installing a new driveshaft. For additional information, refer to [Section 100-04](#).

Noise Acceptability

A gear-driven unit will produce a certain amount of noise. Some noise is acceptable and audible at certain speeds or under various driving conditions such as a newly paved blacktop road. Slight noise is not detrimental to the operation of the axle and is considered normal.

Flex Coupling Inspection

Check for visible reinforcing cords and signs of tearing, cracking or wear. If the flex couplings show signs of damage, inspect the rear axle mounts for cracking and tearing.

Driveshaft Center Universal Joint (U-Joint) Inspection

Place the vehicle on a frame hoist and rotate the driveshaft (4602) by hand. Check for rough operation or seized U-joint. The U-joint is not serviceable. If required, install a new complete driveshaft assembly. For additional information, refer to [Section 205-01](#).

Driveshaft Center Bearing

Rotate the driveshaft by hand. If the bearing shows signs of roughness or is noisy, install a new bearing assembly.

Analysis of Leakage

Clean up the leaking area enough to identify the exact source. An axle leak can be caused by the following:

- Axle lubricant level is too high.
- Worn or damaged axle shaft seals.
- Differential housing is cracked.
- Flange yoke seal is worn or damaged.
- Pinion flange is scored or damaged.
- Axle cover is not sealed.
- Vent is plugged.

Make sure the axle lubricant level for both nodular iron and aluminum housings is 3-5 mm (1/8-3/16 inch) below the bottom of the fill hole.

Axle Vent

NOTE: If a plugged vent cannot be cleared, install a new vent.

A plugged vent will cause excessive seal lip wear due to internal pressure buildup. If a leak occurs, check the vent. Make sure the vent hose is not kinked. Remove the hose from the vent nipple and clear the hose of any foreign material. While the hose is removed, pass a length of mechanics wire or a small diameter Allen wrench in and out of the vent to clean it. Connect the hose when done.

Flange Yoke Seal

Leaks at the axle drive pinion seal originate for the following reasons:

- Damaged seal.
- Worn seal journal surface.

Any damage to the seal bore (dings, dents, gouges, or other imperfections) will distort the seal casing and allow leakage past the outer edge of the axle drive pinion seal.

The axle drive pinion seal can be torn, cut, or gouged if it is not installed carefully. The spring that holds the axle drive pinion seal against the pinion flange may be knocked out and allow leakage past the lip.

Metal chips trapped at the sealing lip can cause oil leaks. These can cause a wear groove on the pinion flange and pinion seal wear.

A new pinion flange must be installed if any of these conditions exist.

If a seal leak occurs, install a new seal and check the vent and the vent hose to make sure they are clean and free of foreign material.

Differential Seals

Stub shaft pilot bearing housing seals are susceptible to the same kinds of damage as axle drive pinion seals if incorrectly installed. The seal bore must be clean and the lip handled carefully to avoid cutting or tearing it. The seal journal surface must be free of nicks, gouges and rough surface texture.

For additional information on differential seals, refer to [Section 205-02](#).

Analysis of Vibration

Few vibration conditions are caused by the rear axle. On a vibration concern, follow the diagnosis procedure in [Section 100-04](#) unless there is a good reason to suspect the axle.

Tires



WARNING: Do not balance the wheels and tires while they are mounted on the vehicle. Possible tire disintegration/differential/halfshaft failure can result, causing personal injury/extensive component damage. Use an off-vehicle wheel and tire balancer only.

Most vibration in the rear end is caused by tires or driveline angle.

Vibration is a concern with modern, high-mileage tires if they are not "true" both radially and laterally. They are more susceptible to vibration around the limits of radial and lateral runout of the tire and wheel assembly. They also require more accurate balancing. Wheel and tire runout checks, truing and balancing are normally done before axle inspection. For additional information, refer to [Section 204-04](#).

Driveline Angle

Driveline angularity is the angular relationship between the engine crankshaft (6303), the driveshaft and the rear axle pinion. Factors determining driveshaft center bearing height, rear axle and engine/transmission mounts.

An incorrect driveline (pinion) angle can often be detected by the driving condition in which the vibration occurs.

- A vibration during coasting from 72 to 56 km/h (45 to 35 mph) is often caused by a high axle pinion angle.
- A vibration during acceleration from 56 to 72 km/h (35 to 45 mph) may indicate a low pinion angle.

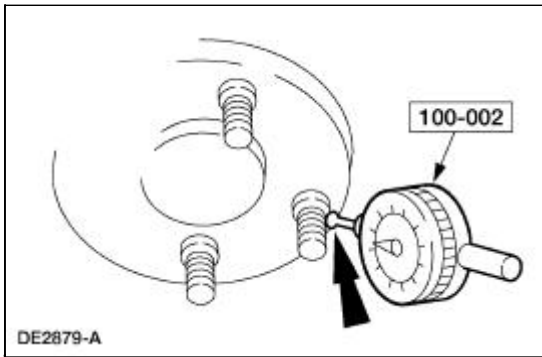
When these conditions exist, check the driveline angles.

If the tires and driveline angle are not the cause, carry out the NVH tests to determine if the concern is caused by a condition in the axle. For additional information, refer to [Section 100-04](#).

Wheel Hub Flange Bolt Circle Runout

NOTE: The brake discs must be removed to carry out all runout measurements.

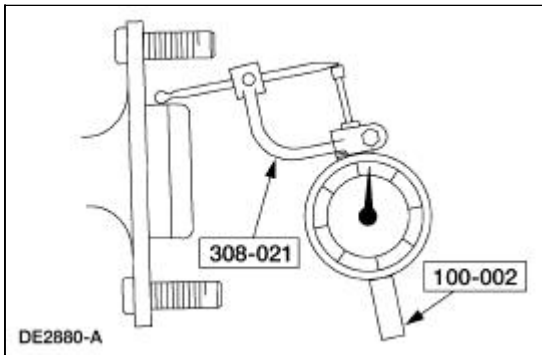
1. Position the special tool perpendicular to the wheel hub bolt, as close to the hub face as possible. Zero the indicator to allow the pointer to deflect either way.



2. Rotate the hub until the next bolt is contacted. Record the measurement and continue until each bolt is checked. The difference between the maximum and minimum contact readings will be the total wheel hub bolt pattern runout. The runout must not exceed 0.38 mm (0.015 inch).

Pilot Runout

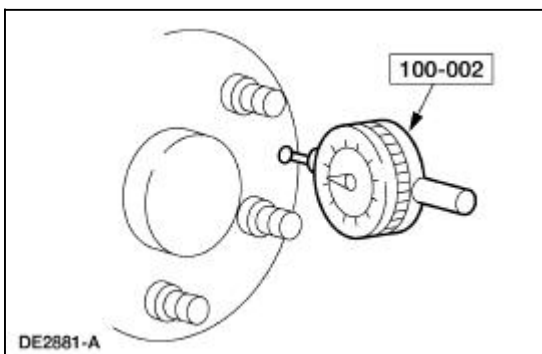
1. Position the special tools as close to the hub face as possible. Zero the indicator to allow the pointer to deflect either way.



2. Rotate the hub one full turn and note the maximum and minimum readings. The difference between the maximum and minimum readings will be the total pilot runout. Pilot runout must not exceed 0.15 mm (0.006 inch).

Wheel Hub Face Runout

1. Position the special tool on the wheel hub face, as close to the outer edge as possible. Zero the indicator to allow the pointer to deflect either way.



2. Rotate the hub one full turn and note the maximum and minimum readings. The difference between the maximum and minimum readings will be the total face runout. The runout must not exceed 0.254 mm (0.010 inch).

Drive Pinion Stem and Pinion Flange

Check the pinion flange runout when all other checks have failed to show the cause of vibration.

One cause of excessive pinion flange runout is incorrect installation of the axle drive pinion seal. Check to see if the spring on the seal lip has been dislodged before installing a new ring gear and pinion.

Halfshafts, Rear Wheel

NOTE: Install new constant velocity (CV) joints only if disassembly and inspection reveals unusual wear. For additional information, refer to [Section 205-05](#).

NOTE: While inspecting the boots, watch for indentations ("dimples") in the boot convolutions. Indentations must be removed.

- Inspect the boots for evidence of cracks, tears or splits.
- Inspect the underbody for any indication of grease splatter near the boots outboard and inboard locations. This is an indication of boot/clamp damage.

Component Tests

Driveline Vibration

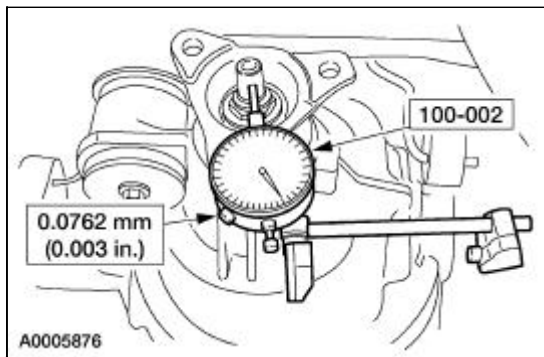
Driveline vibration exhibits a higher frequency and lower amplitude than does high-speed shake. Driveline vibration is directly related to the speed of the vehicle and is usually noticed at various speed ranges. Driveline vibration can be perceived as a tremor in the floorpan or is heard as a rumble, hum or boom. Driveline vibration can exist in all drive modes, but may exhibit different symptoms depending upon whether the vehicle is accelerating, decelerating, floating or coasting. Check the driveline angles if the vibration is particularly noticeable during acceleration or deceleration, especially at lower speeds. Driveline vibration can be duplicated on a hoist. When carrying out an on-hoist test, the suspension lower arms must be supported with jack stands to make sure the halfshafts maintain the correct ride height. The brakes may need to be applied lightly in order to simulate road resistance.

Pinion Flange Runout Check



CAUTION: Pinion bearing preload must be reset if the pinion nut has been loosened or removed for pinion flange reindexing or new component installation.

1. Raise and support the vehicle. For additional information, refer to [Section 100-02](#).
2. Remove the driveshaft. For additional information, refer to [Section 205-01](#).
3. Check the pinion flange for damage.



4. Check the runout using the special tool. Rotate the pinion until the runout is obtained. If the runout is still more than 0.0762 mm (0.003 inch), install a new gearset.
 5. If excessive runout is still evident after installation of a new pinion flange, install a new ring and pinion. Repeat the above checks until the runout is within specifications.
 6. Install the driveshaft. For additional information, refer to [Section 205-01](#).
-

Torque Specifications

Description	Nm	lb-ft
Driveshaft length adjustment nut	78	58
Flex coupling bolts	81	60
Center bearing bolts	43	32

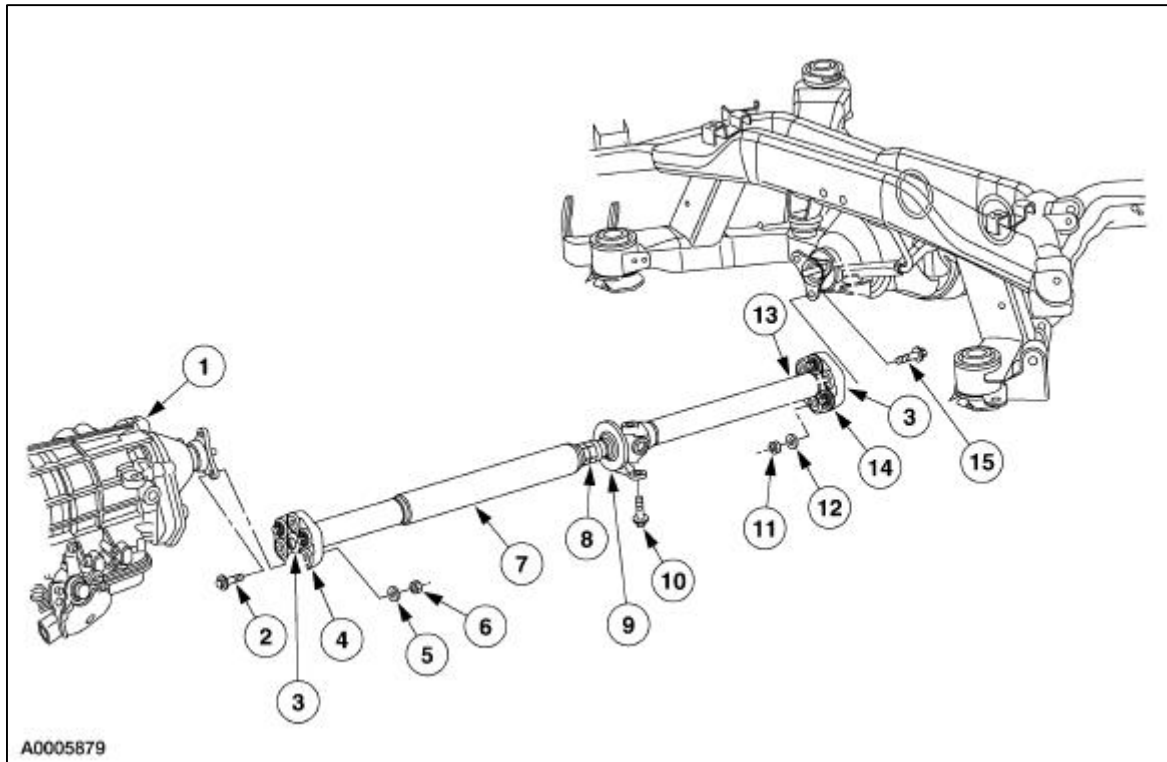
General Specifications

Item	Specification
Premium Long-Life Grease XG-1-C	ESA-M1C75-B
Threadlock 262 E2FZ-19554-B	WSK-M2G351-A6

Balance Nuts

Part Number	Color	Weight (grams)
XW4Z-4613-AA	Red	1.23
XW4Z-4613-AA	Silver	2.75
XW4Z-4613-AA	Green	5.6
XW4Z-4613-AA	Black	4.0

Driveshaft



A0005879

Item	Part Number	Description
1	7000	Transmission
2	W705098-S301	Bolt
3	4635	Alignment bushing
4	4684	Flex coupling
5	W705019-S100	Washer
6	W705575-S301	Nut
7	4817	Shaft assembly, front
8	4N273	Nut, length adjustment
9	4A499	Center bearing and bracket assembly
10	N897487-S56	Bolt
11	W705575-S301	Nut
12	W704773-S301	Washer
13	4602	Shaft assembly, rear
14	4684	Flex coupling
15	W704773	Bolt

⚠ CAUTION: All driveshaft assemblies (4602) are balanced. If undercoating the vehicle, protect the driveshaft to prevent overspray of any undercoating material.

The driveshaft is a two-piece design. A single center U-joint and a slip yoke connect the front shaft

assembly (4817) and the rear shaft assembly (4602). The front and rear shaft assemblies are separable at the slip yoke. However, the slip yoke has no blind spline or index marks so it is imperative to index-mark the assemblies before separation to prevent an imbalance condition. The driveshaft uses new design flex couplings (4684) at each end of the shaft that takes the place of traditional U-joints. The driveshaft has alignment bushings (4635) at each end of the shaft. These bushings align the driveshaft with the pilot stems on the transmission flange and the axle pinion flange. Only remove the flex couplings from the driveshaft if it is necessary to install new flex couplings/alignment bushings. Always install new alignment bushings and flex couplings as a pair.

The driveshaft, has traditional balance weights attached (spot-welded) by the manufacturer. The final driveshaft balance occurs with the complete drivetrain assembly at vehicle assembly by attaching weighted color-coded nuts to the axle flex coupling bolts. For this reason, the rear flex coupling bolts are longer than the front transmission flex coupling bolts. Always install the driveshaft flex coupling bolts with the head of the bolt seated against the flange, and the nuts seated against the flex coupling.

To adjust the driveshaft angle, selective thickness spacers sit between the body and the center support-bearing bracket. Driveshaft angle specification is one degree or less. If the driveshaft angle is above one degree, damage to the alignment bushings and flex couplings will occur.

Universal Joints

The single center U-joint is:

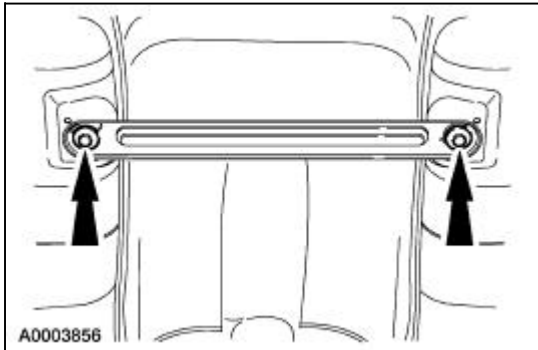
- a lubed-for-life design that requires no periodic lubrication.
 - equipped with nylon thrust washers, located at the base of each bearing cup, which control end play, position the needle bearings and improve grease movement.
 - staked to the yoke and not removable.
-

Driveshaft

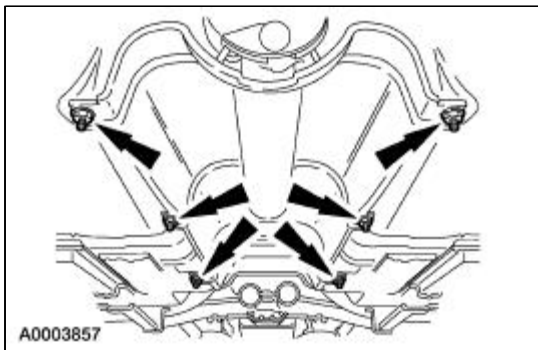
Refer to [Section 205-00](#) .


Runout and Balance

1. Raise and support the vehicle. For additional information, refer to [Section 100-02](#).
2. Remove the body brace.

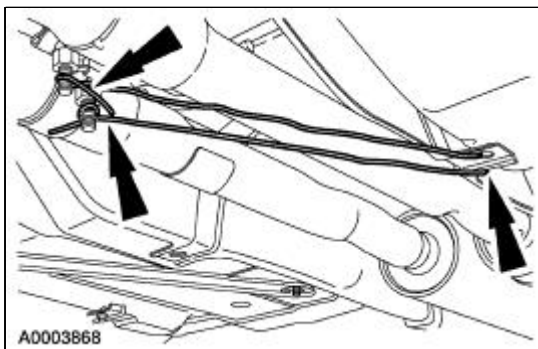



3. Remove the bolts retaining the heat shield to the vehicle.



4.  **WARNING:** Personal injury can result if the heat shield contacts the driveshaft during the balancing procedure. Secure the heat shield away from the driveshaft.

Move the heat shield forward and secure it with a wire.



5. Remove the rear wheel and tire assemblies. For additional information, refer to [Section 204-04](#).
6.  **WARNING:** Tighten the wheel nuts to prevent them from coming loose during the

balancing procedure and causing personal injury.

Install and tighten the wheel nuts. For additional information, refer to [Section 204-04](#).

7. Lower the vehicle.
8. Open the hood to provide additional cooling.
9. Turn off the traction control, if so equipped.
10. Have an assistant get in the driver seat.
11. Raise the vehicle.

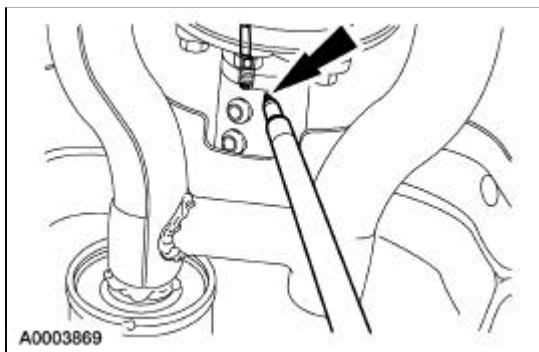
12.  **CAUTION: Do not exceed 70 mph.**

Have the assistant accelerate to the speed where the imbalance is most noticeable.

13.  **WARNING: Keep hands, hair, head and clothing clear of rotating parts and hot exhaust components.**

NOTE: The marker will contact the heavy side of the rotating driveshaft.

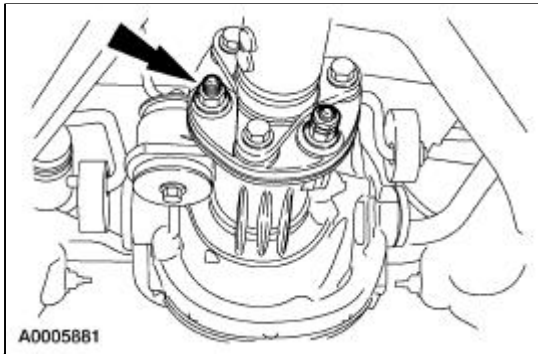
Insert a suitable marker into a 305-mm (12-inch) long piece of plastic pipe. Using the heat shield lip as a brace, move the scribe towards the driveshaft, in an area clear of the balance weld weights, until it just contacts and marks the driveshaft.



14. Have the assistant stop accelerating and shut off the engine.
15. With the driveshaft stationary, observe the mark on the driveshaft. A partial mark (less than 360 degrees) indicates the presence of an imbalance. A 360-degree mark indicates that there is no imbalance or that the pressure applied to the marker was too great. Proceed as follows if the mark indicates an imbalance. Otherwise, reinstall all components.
16. Locate the bolt in the flex coupling opposite the mark. Install a 2.75-gram weighted nut onto this bolt. This is the light side of the driveshaft. Refer to the following chart for balance nut weight and color code information.

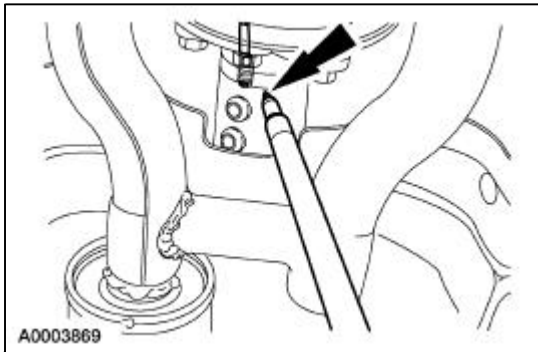
Balance Nuts


Part Number	Color	Weight (grams)
XW4Z-4613-AA	Red	1.23
XW4Z-4613-AA	Silver	2.75
XW4Z-4613-AA	Green	5.6



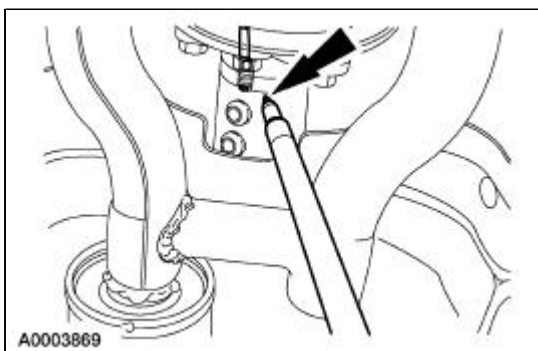
17.  **WARNING: Keep hands, hair, head and clothing clear of rotating parts and hot exhaust components.**

Repeat the marking procedure Steps 12 and 13.



18. Have the assistant stop accelerating and shut off the engine.
19. With the driveshaft stationary, observe the mark on the driveshaft. If the new mark is 360-degrees, reinstall all components and road test the vehicle. If the vibration is still apparent, remove the 2.75-gram weighted nut, install a 5.6-gram weighted nut in its place, and proceed as follows.
20.  **WARNING: Keep hands, hair, head and clothing clear of rotating parts and hot exhaust components.**

Repeat the marking procedure Steps 12 and 13.

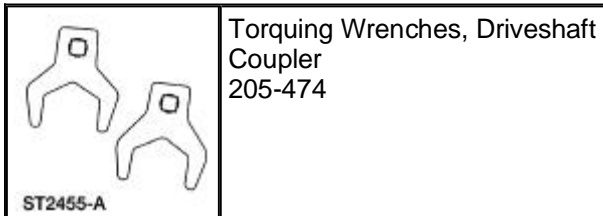


21. Have the assistant stop accelerating and shut off the engine.


22. With the driveshaft stationary, observe the mark on the driveshaft. If the new mark is 360-degrees, reinstall all components and road test the vehicle. If the vibration is still apparent, move the weighted nut to the adjacent bolts and repeat the marking procedure. If the condition does not improve, install a new driveshaft assembly. Retest using the marker and weighted nuts as necessary. When the best possible condition is met, reinstall all components and road test the vehicle.
-

Driveshaft


Special Tool(s)




Removal

 **CAUTION:** Only remove the flex couplings (4684) from the driveshaft (4602) if it is necessary to install new flex couplings/alignment bushings (4635). Install new alignment bushings and flex couplings as a pair. Balance the driveshaft with the flex couplings installed.

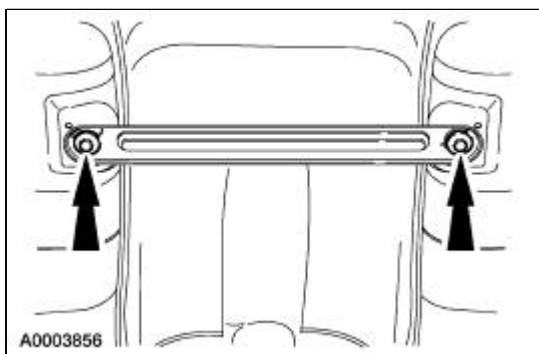
1. Raise and support the vehicle. For additional information, refer to [Section 100-02](#).

2.  **WARNING:** The normal operating temperature of the exhaust system is very high. Never attempt to remove any part of the system until it has cooled. Be especially careful when working around the catalytic converters. The temperature of the converter rises to a high level after only a few minutes of engine operation. Failure to follow these instructions can result in personal injury.


 **CAUTION:** Do not allow the full weight of the exhaust to bear against the exhaust pipe manifold flanges. This will damage the flanges, and create exhaust leaks.

Remove the muffler and extension pipe assembly. For additional information, refer to [Section 309-00](#).

3. Remove the body brace.

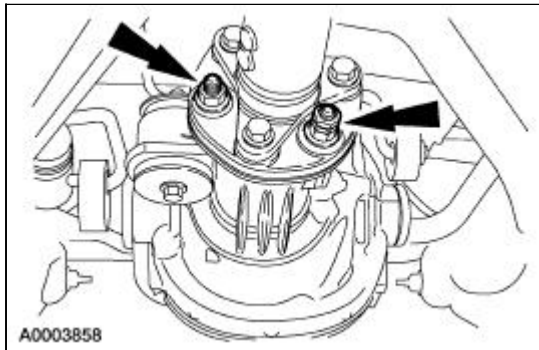



4. Remove the 8 retainers and the heat shield.

5.  **CAUTION:** To ensure assembly in the exact same location, index-mark the bolt, nut, washer, flex coupling and pinion flange with paint or marker. Using a different color paint

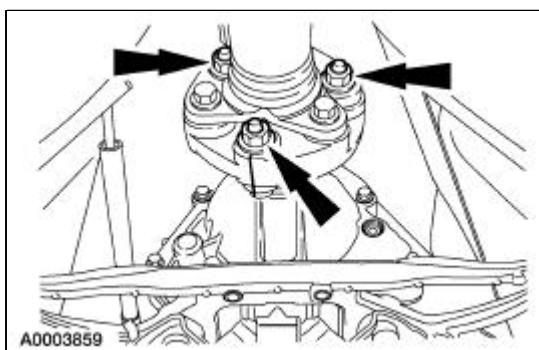
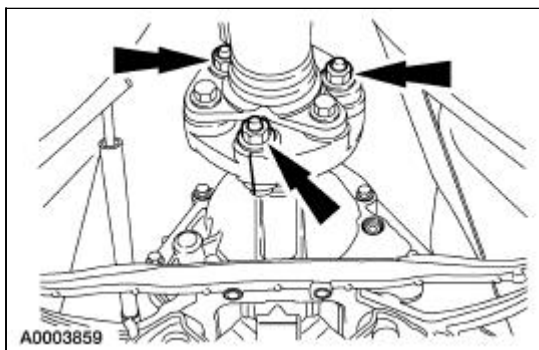
or marker, index-mark the second bolt, nut and washer that retain the driveshaft and flex coupling to the pinion flange. Do not index-mark the third bolt, nut, and washer that retain the driveshaft and flex coupling to the pinion flange. These fasteners are balance weights. Always assemble them in their original positions. Failure to do so can cause driveshaft NVH.


Index-mark the components.



6.  **CAUTION:** To ensure assembly in the exact same location, index-mark the bolt, nut, washer, flex coupling and transmission flange with paint or marker. Using a different color paint or marker, index-mark the second bolt, nut and washer that retain the driveshaft and flex coupling to the transmission flange. Do not index-mark the third bolt, nut, and washer that retain the driveshaft and flex coupling to the transmission flange. These fasteners are balance weights. Always assemble them in their original positions. Failure to do so can cause driveshaft NVH.

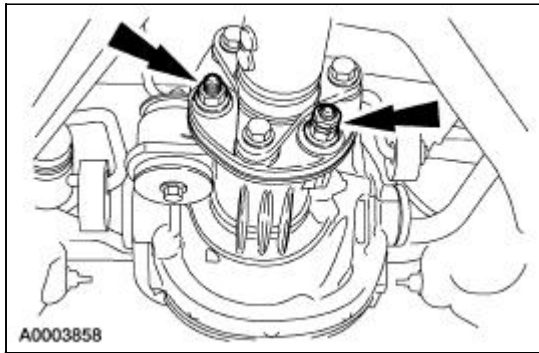
Index-mark the components.



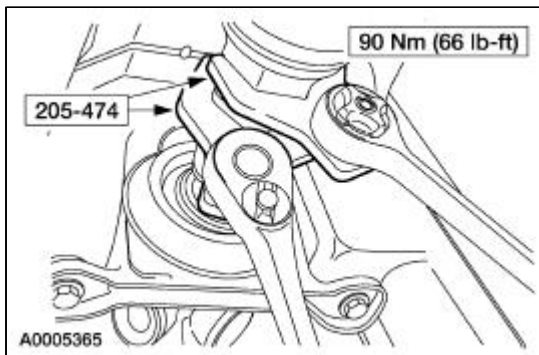
7.  **CAUTION:** Do not remove the bolts retaining the flex coupling to the driveshaft.

NOTE: The bolt heads are serrated. Hold the bolt and loosen the nut.

Remove the three nuts, washers and bolts.



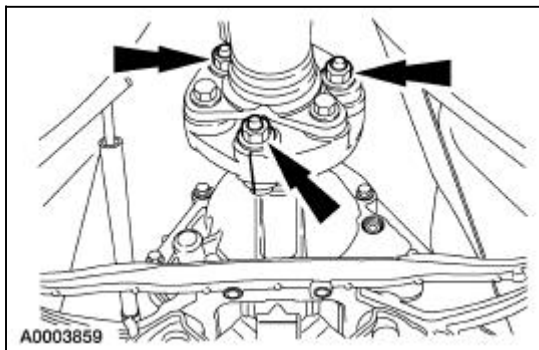
8. Using the special tools, loosen the nut.



9.  **CAUTION:** Do not remove the bolts retaining the flex coupling to the driveshaft.

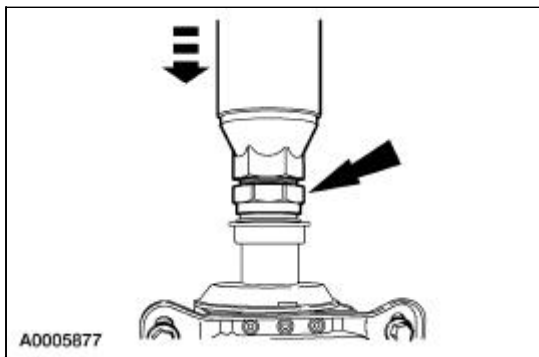
NOTE: The bolt heads are serrated. Hold the bolt and loosen the nut.

Remove the three nuts, washers and bolts.



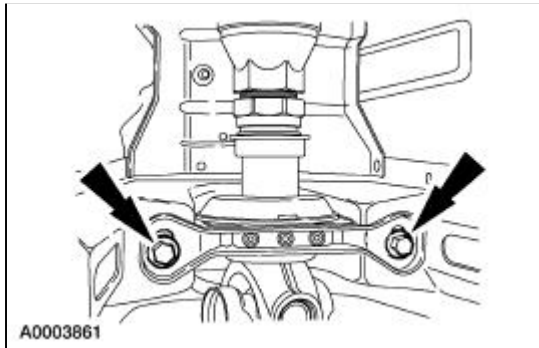
10. Slide the front shaft assembly rearward.

- Tighten the nut to prevent separation of the front and rear shaft assemblies.



11. **⚠ CAUTION:** To ensure assembly in the exact same location, index-mark one bolt and the selective spacer(s) with paint or marker. Do not index-mark the other bolt and the selective spacer(s) on the opposite end of the mount. These parts maintain the driveshaft driveline angle. Always assemble them in their original positions. Failure to do so can cause driveshaft NVH.

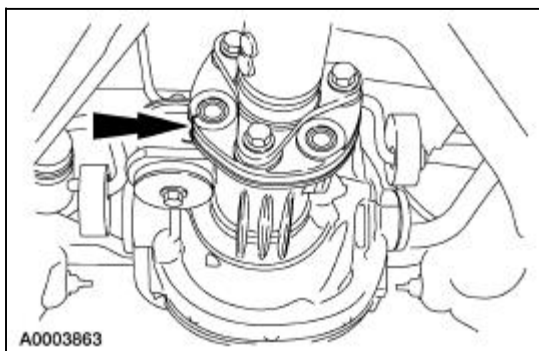
Remove the bolts and spacers, and the driveshaft assembly.



Installation

1. Add one gram of grease to both alignment bushing cavities.
 - Use Premium Long-Life Grease XG-1-C or equivalent meeting Ford specification ESA-M1C75-B.
2. **⚠ CAUTION:** Align the index marks or driveshaft NVH can occur.

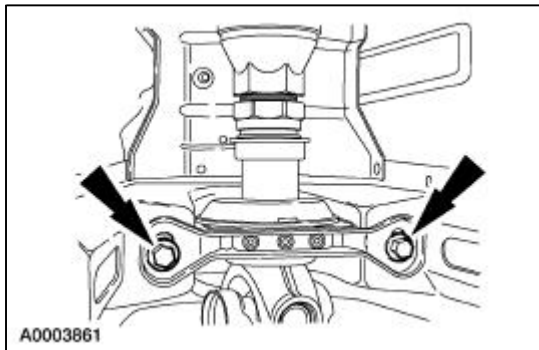
Align the index marks, and position the alignment bushing on the pinion flange piloting stem.



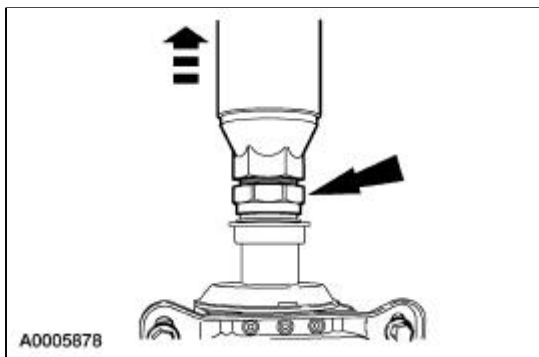
3. **⚠ CAUTION:** Install the selective spacers and bolts in their original positions.

NOTE: Do not tighten the bolts at this time.

Install the spacers and the bolts hand tight.

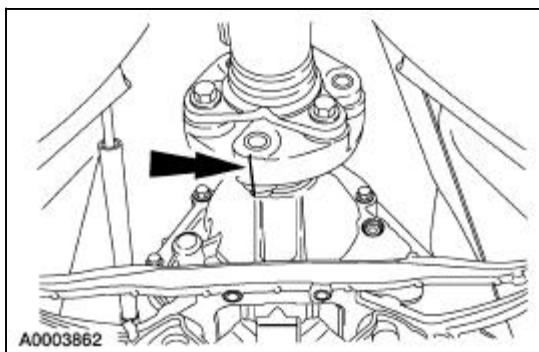



4. Loosen the nut and slide the front shaft assembly forward.



5.  **CAUTION:** Align the index marks or driveshaft NVH can occur.

Align the index marks, and position the alignment bushing on the transmission flange piloting stem.

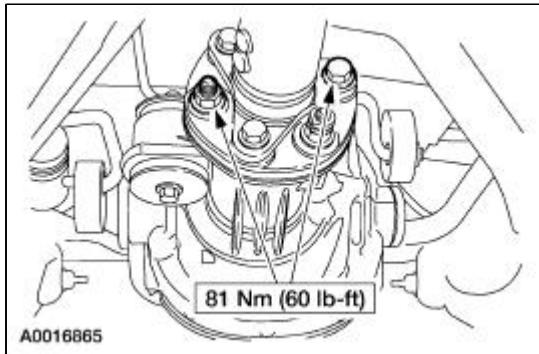
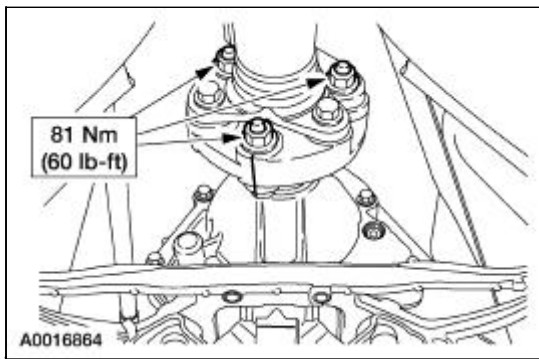



6.  **CAUTION:** Install the bolts, washers and nuts in their original positions or driveshaft NVH can occur. Install the driveshaft flex coupling bolts with the head of the bolt seated against the flange, and the nuts seated against the flex coupling. Install the short bolts in the front and the long bolts in the rear.

NOTE: The bolt heads are serrated. Hold the bolt and tighten the nut.

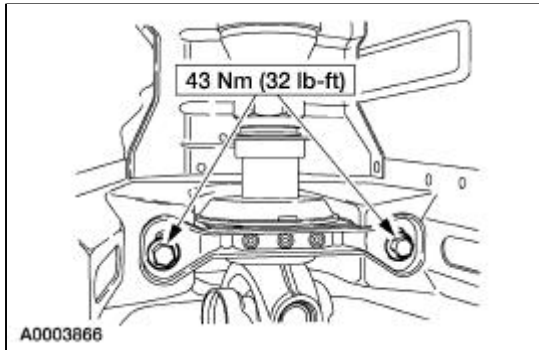
Install the bolts, washers and nuts.

- Coat the nut and bolt threads with Threadlock 262 E2FZ-19554-B or equivalent meeting Ford specification WSK-M2G351-A6.

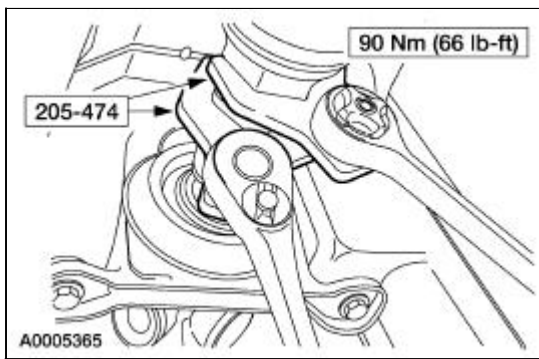


7.  **CAUTION:** Tighten the bolts evenly to avoid twisting the bracket.

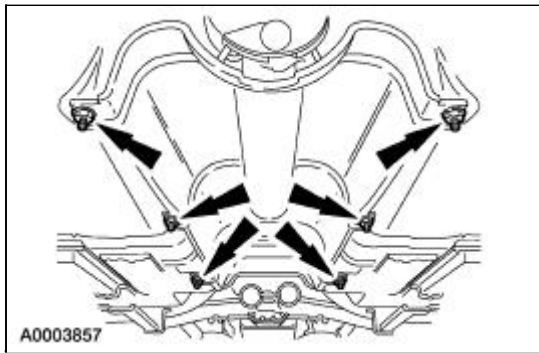
Tighten the bolts.




8. Using the special tools, tighten the nut.



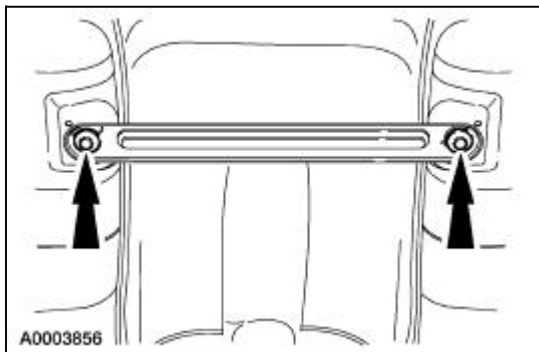
9. Install the heat shield.



10.  **CAUTION: Do not allow the full weight of the exhaust to bear against the exhaust pipe manifold flanges. This will damage the flanges, and create exhaust leaks.**

Install the muffler and extension pipe assembly. For additional information, refer to [Section 309-00](#).

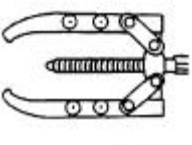


11. Install the body brace.




12. Lower the vehicle.
-

Center Bearing

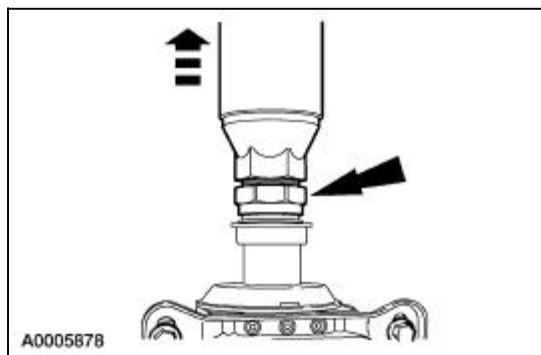
Special Tool(s)

 ST1260-A	2-Jaw Puller 205-D026 (D80L-1002-L) or Equivalent
 ST1368-A	Bearing Pulling 205-D064 (D84L-1123-A) or Equivalent
 ST2454-A	Driveshaft Alignment Bushing Remover Tube 205-D073 or Equivalent

Disassembly

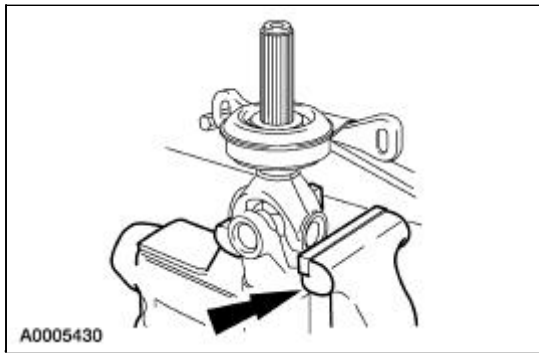
1. Remove the driveshaft (4602). For additional information, refer to [Driveshaft](#) in this section.
2.  **CAUTION: The slip yoke has no blind spline or index marks. Index-mark the assemblies before separation to prevent an imbalance condition.**

Loosen the nut and separate the front (4817) and rear shaft (4602) assemblies.

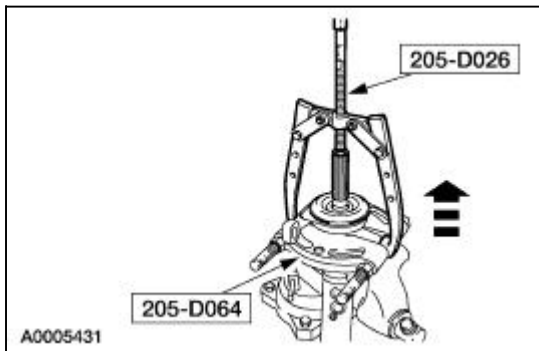


3.  **CAUTION: Do not clamp on the driveshaft tube as a fracture can result.**

Position and clamp the driveshaft at the weld yoke.

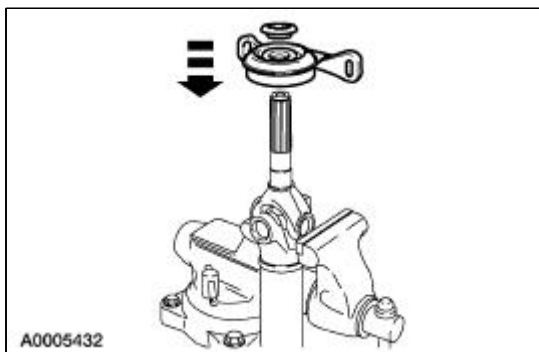


4. Using the special tools, remove the retaining ring and the center bearing and bracket assembly (4A499).

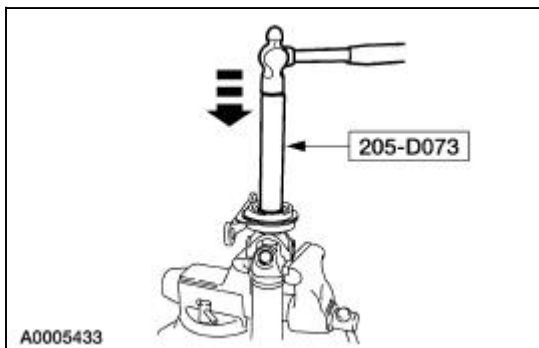


Assembly

1. Position the center bearing and bracket assembly and the retaining ring on the yoke.



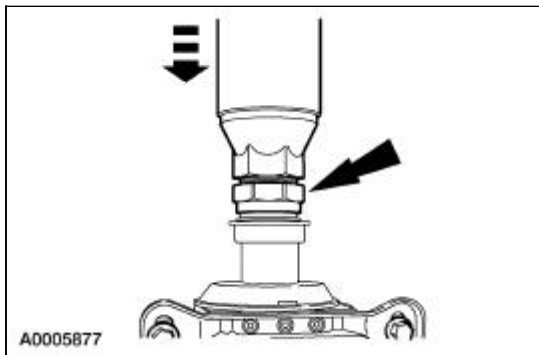
2. Using the special tool, drive the retaining ring and bearing assembly until fully seated on the yoke.



3.  **CAUTION: Align the index marks or driveshaft imbalance can occur.**

Assemble the front and rear shaft assemblies.





- Hand-tighten the nut to prevent separation of the front and rear shaft assemblies.



4. Install the driveshaft. For additional information, refer to [Driveshaft](#) in this section.
-

Driveshaft Alignment Bushing

Special Tool(s)

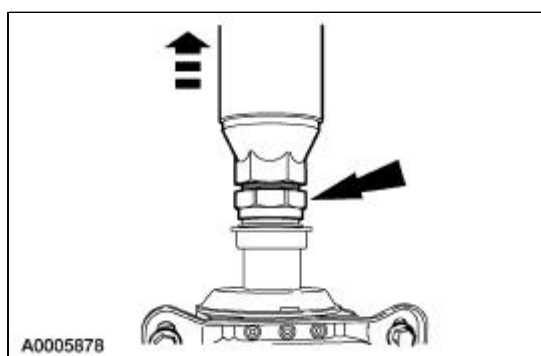
 ST1144-A	Blind Hole Puller Set 303-DS005 (D80L-100A) or Equivalent
 ST2454-A	Driveshaft Alignment Bushing Remover Tube 205-D073 or Equivalent
 ST1255-A	Handle 205-153 (T80T-4000-W)
 ST1508-A	Driveshaft Alignment Bearing Installer 205-D074 or Equivalent

Disassembly

1. Remove the driveshaft (4602). For additional information, refer to [Driveshaft](#) in this section.

2.  **CAUTION: The slip yoke has no blind spline or index marks. Index-mark the assemblies before separation to prevent an imbalance condition.**

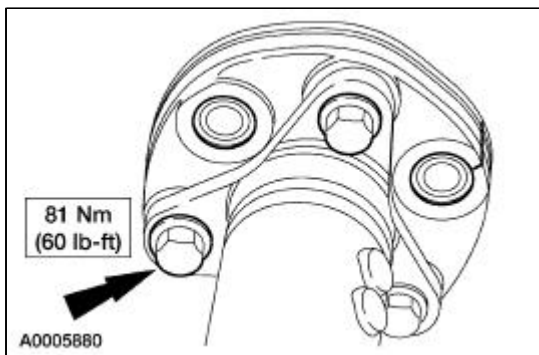
Loosen the nut and separate the front (4817) and rear shaft (4602) assemblies.



3. **NOTE:** The bolt heads are serrated. Hold the bolt and loosen the nut.

Remove the nuts and bolts and the flex coupling (4684).

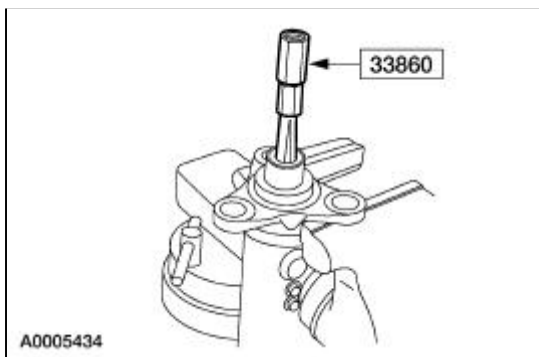
- Discard the flex coupling. Retain the nuts and bolts.



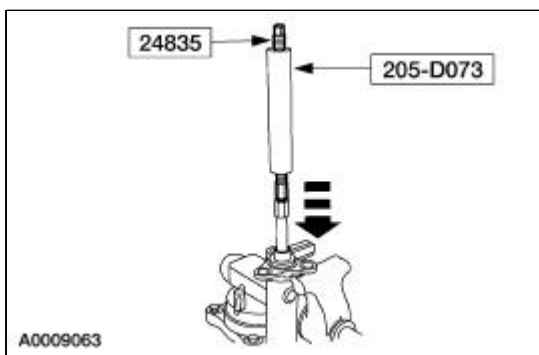
4.  **CAUTION:** Do not clamp the vise on the driveshaft tube as a fracture can result.

Position the driveshaft end yoke in the vise jaws.

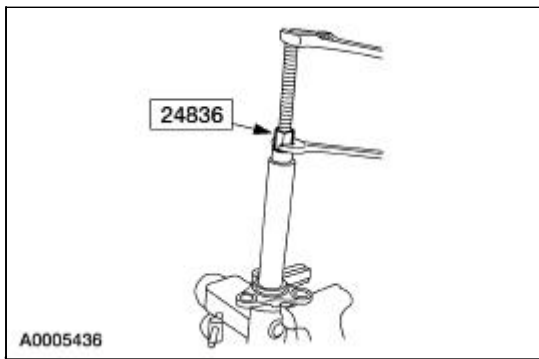
5. Insert the special tool inside the alignment bushing and expand the collet.



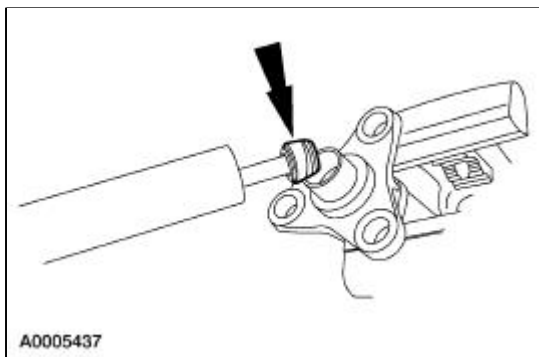
6. Install the special tools.



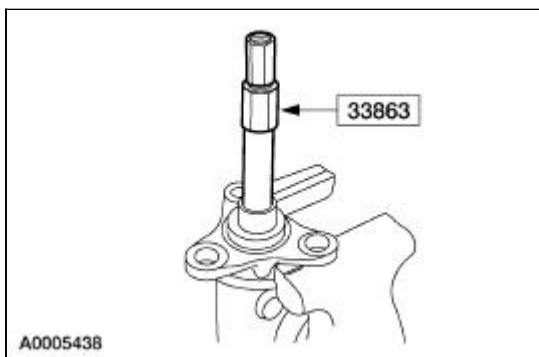
7. Hold the forcing screw, and tighten the forcing screw nut until removing the alignment bushing inner core.



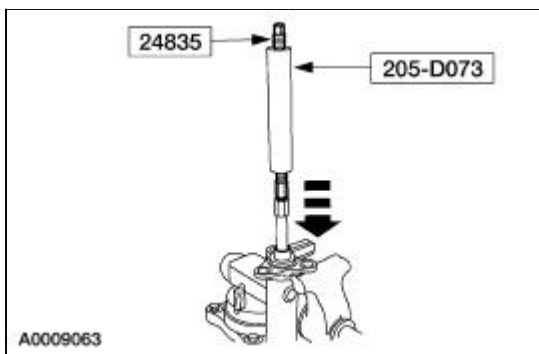
8. Discard the alignment bushing inner core.



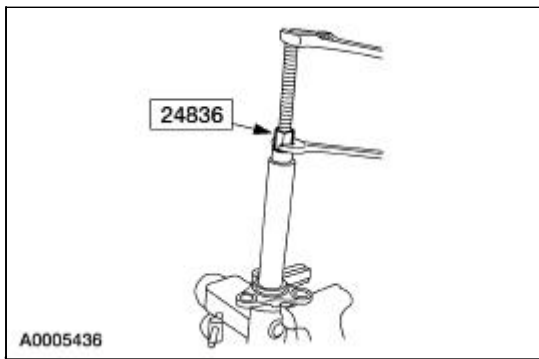
9. Insert the special tool and adjust it to seat behind the bushing shell.



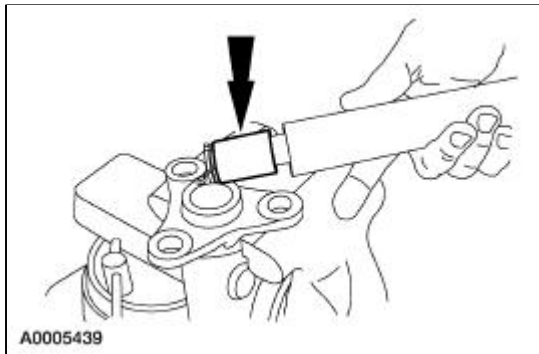
10. Install the special tools.



11. Hold the forcing screw, and tighten the forcing screw nut until removing the alignment bushing outer shell.



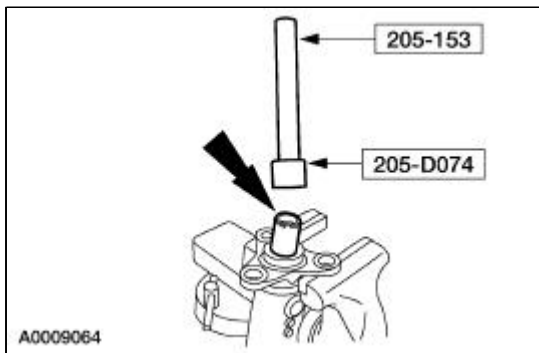
12. Discard the alignment bushing outer shell.



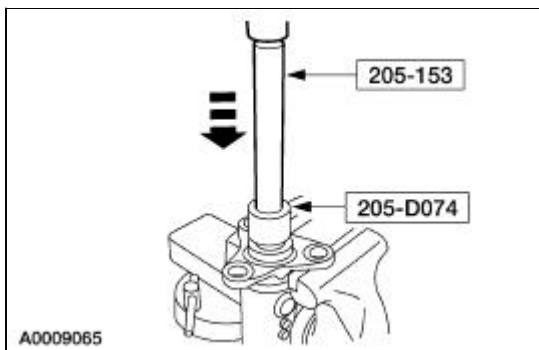
Assembly


1. **NOTE:** Install the alignment bushing (4635) with the seal facing outward.

Using the special tools, align the bushing with the driveshaft.




2. Using the special tools, drive the alignment bushing until the tool contacts the end yoke.

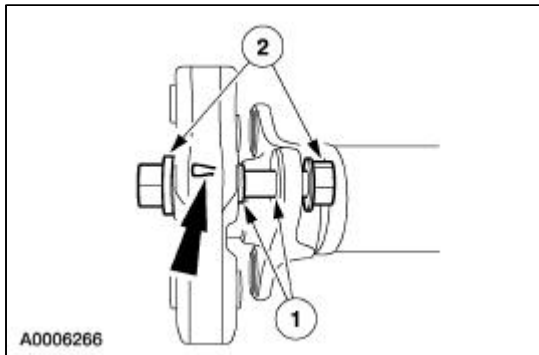


3.  **CAUTION:** There are six bushings in each flex coupling. Three of the bushings protrude from one side of the flex coupling and three protrude from the other side. The arrows on the side of the flex coupling point toward the protruding end of the bushing. When installing the flex coupling, the protruding end of the bushing must seat in the driveshaft flange counterbore or damage will occur to the flex coupling during driveshaft operation.

Install the flex coupling.

1. Position the protruding end of the bushing against the driveshaft flange.
2.  **CAUTION:** The bolt heads must seat against the driveshaft flange and the nuts against the flex coupling.

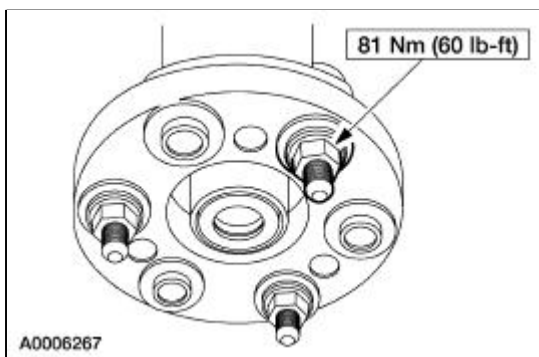
Install the three bolts and nuts.



4. **NOTE:** The bolt heads are serrated. Hold the bolt and tighten the nut.

Tighten the nuts.

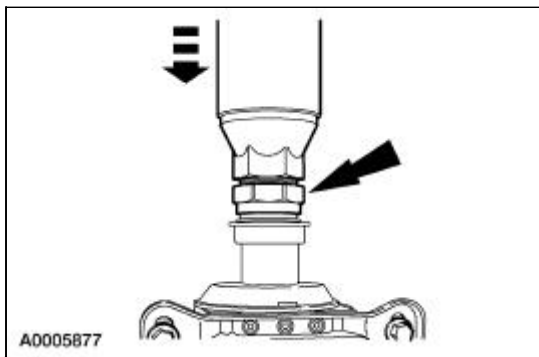
- Coat the bolt threads with Threadlock 262 E2FZ-19554-B or equivalent meeting Ford specification WSK-M2G351-A6.




5.  **CAUTION:** Align the index marks or driveshaft imbalance can occur.

Assemble the front and rear shaft assemblies.

- Hand-tighten the nut to prevent separation of the front and rear shaft assemblies.



6.  **CAUTION:** Add one gram of Premium Long-Life Grease XG-1-C or equivalent meeting Ford specification ESA-M1C75-B to both alignment bushing cavities before installing the driveshaft.

Install the driveshaft (4602). For additional information, refer to [Driveshaft](#) in this section.

General Specifications

Description	mm	Inches
Clearance, Tolerance and Adjustments		
Maximum runout of backface of ring gear	0.0762	0.003
Maximum differential case runout	0.076	0.003
Maximum aluminum carrier spread	0.762	0.030
Backlash between ring gear and pinion teeth	0.203-0.330	0.008-0.013
Preferred backlash	0.254	0.010
Maximum backlash variation between teeth	0.1016	0.004
Maximum radial runout of rear axle pinion flange in assembly	0.25 TIR	0.010 TIR
Available drive pinion bearing adjustment shim in steps of: 0.0254 mm (0.001 inch) 8.8-inch axle	0.254-0.965	0.010-0.038
Lubricant deflector to differential housing cover	5.08-6.35	0.200-0.250

Lubricant Capacities

Liters	Pints
1.4	3.0 ¹

¹ Use SAE 75W140 Synthetic Rear Axle Lubricant F1TZ-19580-B or equivalent meeting Ford specification WSL-M2C192-A. Fill the rear axle 3-5 mm (1/8-3/16 inch) from the bottom of filler hole.

General Specifications

Item	Specification
Lubricants/Sealants	
Premium Long-Life Grease XG-1-C	ESA-M1C75-B
Threadlock® and Sealer E0AZ-19554-AA	WSK-M2G315-A5
SAE 75W-140 Synthetic Rear Axle Lubricant F1TZ-19580-B	WSL-M2C192-A
Silicone Rubber D6AZ-19562-AA	ESB-M4G92-A
Stud and Bearing Mount E0AZ-19554-BA	WSK-M2G349-A1
Pipe Sealant with Teflon® D8AZ-19554-A	WSK-M2G350-A2
SAE 5W-30 Super Premium Motor Oil XO-5W30-QSP	WSS-M2C153-G

Torque Specifications

Description	Nm	lb-ft	lb-in
Bearing cap bolt	105	77	—
Differential pinion shaft lock bolt	30	22	—
Ring gear bolt ^a	105	77	—
Differential housing cover retaining bolt	32	24	—
Filler plug	34	25	—
Rear differential front lower insulator nut	70	52	—
Rear axle differential front lower insulator nuts and bolts	70	52	—
Rear axle differential rear insulator bolt	103	76	—
Driveshaft yoke adjuster nut	90	66	—
Pinion bearing preload — (drive pinion collapsible spacer) used bearings ^b	0.9-1.16	—	8-10
Bearing preload tool torque	2.8		25
New bearings	1.8-3.2	—	16-28

^a Use Stud and Bearing Mount E0AZ-19554-BA or equivalent meeting Ford specification WSK-M2G349-A1.

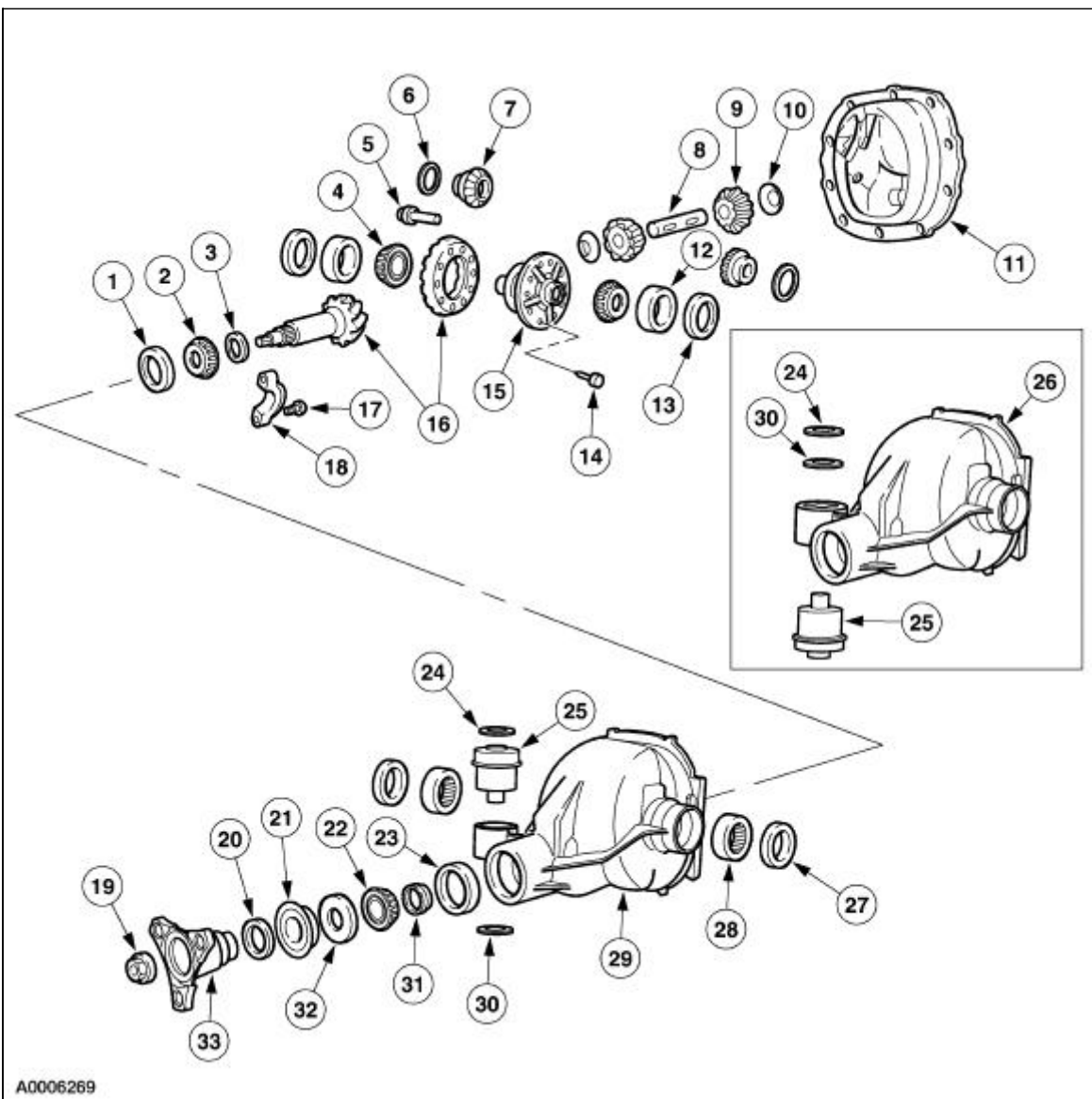
^b With pinion flange yoke seal.

Rear Drive Axle and Differential

The rear axle assembly contains the following features:

- integral-type housing hypoid gear design has the centerline of pinion set below the centerline of ring gear.
- hypoid ring gear and pinion which consists of a 203-mm (8.0-inch) diameter ring gear and an overhung drive pinion which is supported by two opposed tapered roller bearings.
- pinion bearing preload is maintained by a drive pinion collapsible spacer on the pinion shaft and adjusted by the pinion nut.
- rear axle housing (4010) assembly which consists of a cast aluminum center section and a cast-aluminum rear differential housing cover (4033).
- differential housing cover which uses a silicone sealant rather than a gasket.
- aluminum rear axle housing that must be spread in order to remove the differential case (4204).
- differential case which is a one-piece design with two openings to allow for assembly of internal components and lubricant flow.
- differential pinion shaft (4211) which is retained by a threaded differential pinion shaft lock bolt assembled to the differential case.
- differential case which is mounted in the rear axle housing between two opposed differential bearings (4221).
- differential bearings which are retained in the rear axle housing by removable bearing caps.
- differential bearing preload and ring gear backlash are adjusted by differential bearing shims (4067) located between the differential bearing cup (4222) and the rear axle housing.
- the use of a pinion depth gauge is required for correct differential ring gear and pinion adjustment.
- the halfshafts are held in the differential case by a driveshaft bearing retainer circlip (3Z498) that is located on the inboard CV joint stub shaft pilot bearing housing (4B413). When each halfshaft is installed, the driveshaft bearing retainer circlip engages a step in the differential side gear (4236).

Rear Axle-8.0-Inch Ring Gear



A0006269

Item	Part Number	Description
1	4628	Rear axle pinion bearing cup
2	4630	Pinion bearing
3	4663	Drive pinion bearing adjustment shim
4	4221	Differential bearing
5	4241	Differential pinion shaft lock bolt
6	4228	Differential side gear thrust washer
7	4236	Differential side gear
8	4211	Differential pinion shaft
9	4215	Differential pinion gear
10	4230	Differential pinion thrust washer
11	4033	Differential housing cover
12	4222	Differential bearing cup
13	4067	Differential bearing shim
14	4216	Rear axle ring gear case bolt

15	4204	Differential case
16	4209	Ring gear and pinion
17	56187-S	Bolt
18	—	Differential bearing cap (part of 4010)
19	389546-S100	Pinion nut
20	4859	Drive pinion oil seal deflector
21	4676	Rear axle drive pinion seal
22	4621	Pinion bearing
23	4616	Differential drive pinion bearing cup
24	4067	Front mount shim
25	4B424	Rear axle differential front lower insulator
26	4010	Rear axle housing (aluminum)
27	4B416	Inboard CV joint stub shaft pilot bearing housing seal
28	4B413	Inboard CV joint stub shaft pilot bearing housing
29	4010	Rear axle housing (nodular iron)
30	4B431	Rear axle differential front lower insulator cap
31	4662	Differential drive pinion collapsible spacer
32	4670	Rear axle drive pinion shaft oil slinger
33	4851	Rear axle pinion flange

The rear drive axle operates as follows:




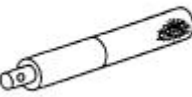


- The rear axle drive pinion receives power from the engine through the transmission and driveshaft (4602).
 - The pinion gear rotates the differential case when engaged with the ring gear, which is bolted to the differential case outer flange.
 - Inside the differential case, two differential pinion gears (4215) are mounted on a differential pinion shaft which is pinned to the differential case.
 - These differential pinion gears are engaged with the differential side gears to which the halfshafts are splined.
 - As the differential case turns, it rotates the halfshafts and rear wheels.
 - When it is necessary for one wheel and halfshaft to rotate faster than the other, the faster turning differential side gear causes the differential pinion gears to roll on the slower turning differential side gear. This allows differential action between the two halfshafts.
-

Rear Drive Axle and Differential

Refer to [Section 205-00](#) .

Stub Shaft Pilot Bearing and Seal

Special Tool(s)

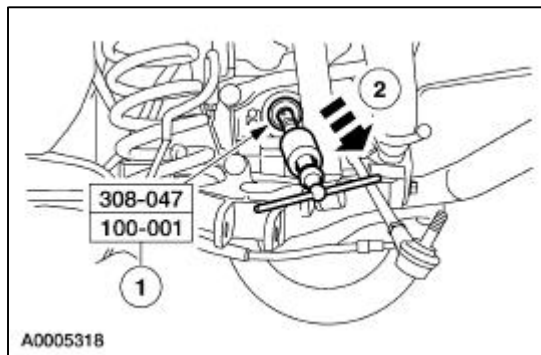
 ST1200-A	Bearing Cup Remover 308-047 (T77F-1102-A)
 ST2258-A	Differential Seal Protector 205-461
 ST1676-A	Differential Seal Replacer 205-293 (T89P-4850-A)
 ST1326-A	Handle 205-153 (T80T-4000-W)
 ST1185-A	Impact Slide Hammer 100-001 (T50T-100-A)
 ST1721-A	Needle Bearing Replacer 205-288 (T89P-1244-A)

Removal

1. Remove the halfshaft assembly. For additional information, refer to [Section 205-05](#).
2. **NOTE:** If only a new inboard CV joint stub shaft pilot bearing housing seal (4B416) is to be installed, engage the bearing cup puller tangs on the inboard CV joint stub shaft pilot bearing housing seal.

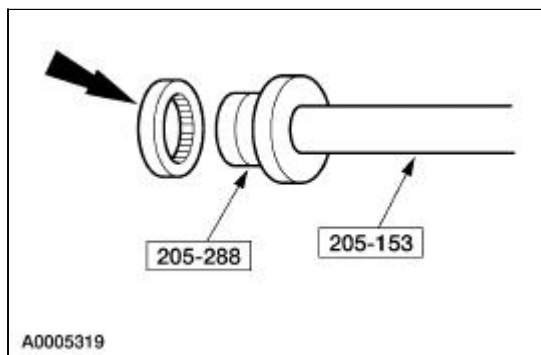
Remove the inboard CV joint stub shaft pilot bearing housing seal and inboard CV joint stub shaft pilot bearing (4B413).

1. Install the special tool with the tangs firmly engaged on the inboard CV joint stub shaft pilot bearing housing.
2. Remove the inboard CV joint stub shaft pilot bearing housing seal and inboard CV joint stub shaft pilot bearing.

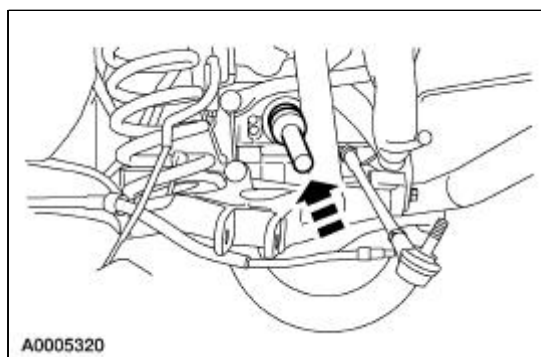


Installation

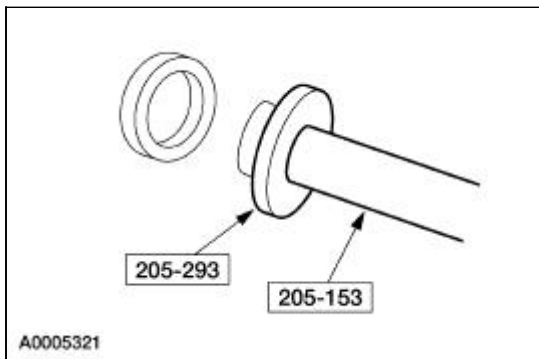
1. Lubricate the new inboard CV joint stub shaft pilot bearing with SAE 75W140 Synthetic Rear Axle Lubricant F1TZ-19580-B or equivalent meeting Ford specification WSL-M2C192-A. Place the inboard CV joint stub shaft pilot bearing onto the special tools.



2. Install the inboard CV joint stub shaft pilot bearing into the rear axle housing bore.

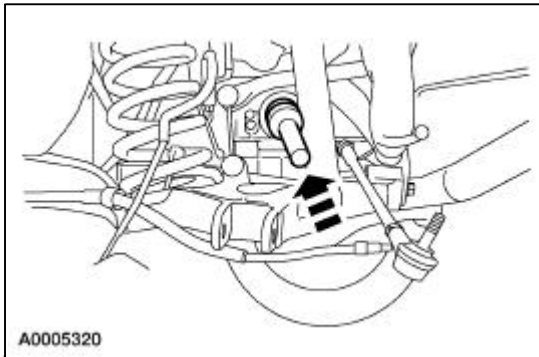


3. Lubricate the lip of the inboard CV joint stub shaft pilot bearing housing seal with Premium Long-Life Grease XG-1-C or equivalent meeting Ford specification ESA-M1C75-B. Place the inboard CV joint stub shaft pilot bearing housing seal onto the special tools.



4. **⚠ CAUTION:** Installation of the inboard CV joint stub shaft pilot bearing housing seal or inboard CV joint stub shaft pilot bearing without the correct tool can result in an early inboard CV joint stub shaft pilot bearing housing seal or pilot bearing failure. If the inboard CV joint stub shaft pilot bearing becomes cocked in the bore during installation, remove it and install a new one.

Carefully align the inboard CV joint stub shaft pilot bearing housing seal with the housing bore and install the inboard CV joint stub shaft pilot bearing housing seal.






5. **⚠ CAUTION:** Use special tool 205-461 to avoid damaging seal with CV joint stub shaft.
- ⚠ CAUTION:** Inspect the inboard CV joint seal journal for rust or nicks/scratches prior to installing the halfshaft. Polish the seal journal with fine crocus cloth, if required.

Install the halfshaft. For additional information, refer to [Section 205-05](#).

Drive Pinion Flange

Special Tool(s)

 ST2458-A	Holding Tool, Drive Pinion Flange 205-478
 ST1734-A	Installer, Drive Pinion Flange 205-479
 ST2452-A	Remover, Output Flange 307-408

Removal

1.  **CAUTION: Do not allow the calipers to hang from the brake hoses.**

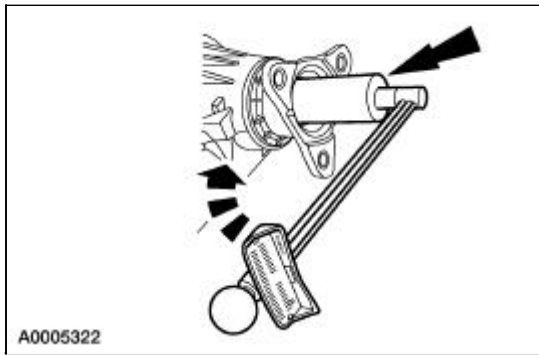
NOTE: Remove the rear wheels and the brake calipers to prevent drag during the drive pinion bearing preload adjustment.


Remove and secure the rear brake calipers aside. For additional information, refer to [Section 206-04](#).

2.  **CAUTION: Do not disconnect the driveshaft before referring to [Section 205-01](#).**

Disconnect and position the driveshaft out of the way. For additional information, refer to [Section 205-01](#).

3. Install a Nm (inch/pound) torque wrench on the pinion nut and record the torque necessary to maintain rotation of the drive pinion gear (4209) through several revolutions.

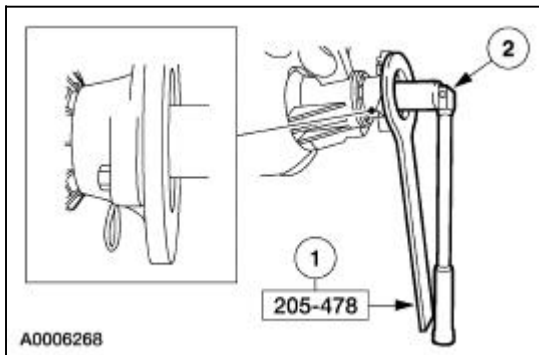


4.  **CAUTION:** After removing the pinion nut, discard it. Use a new nut for installation.

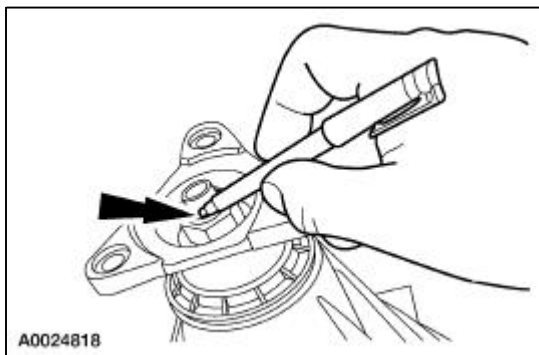
NOTE: Make sure to insert the cotter key on the special tool as shown.

Remove the pinion nut.

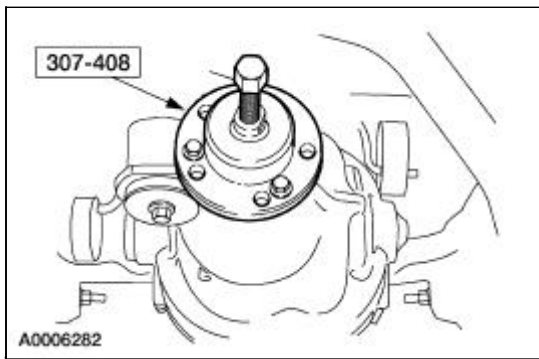
1. Install the special tool.
2. Install a suitable breaker bar and remove the nut.



5. Mark the pinion flange in relation to the drive pinion stem to ensure correct alignment during installation.



6. Using the special tool, remove the pinion flange.



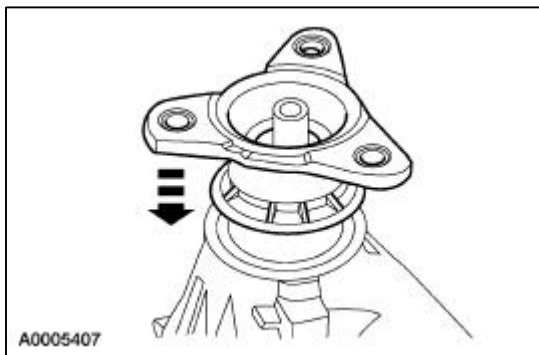
Installation

1. Lubricate the pinion flange splines.
 - Use SAE 75W140 Synthetic Rear Axle Lubricant F1TZ-19580-B or equivalent meeting Ford specification WSL-M2C192-A.

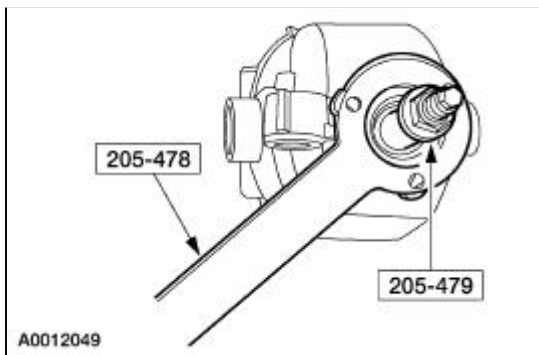
2.  **CAUTION:** Inspect the pinion flange seal journal for rust or nicks/scratches prior to installing the pinion flange. Polish the seal journal with fine crocus cloth, if required.


NOTE: Disregard the alignment marks if installing a new pinion flange.

Align the pinion flange with the drive pinion shaft.



3. Using the special tools, install the pinion flange.



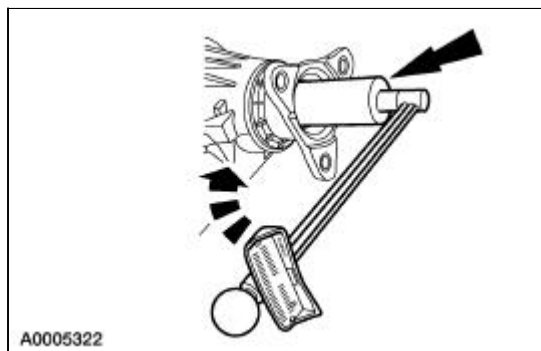
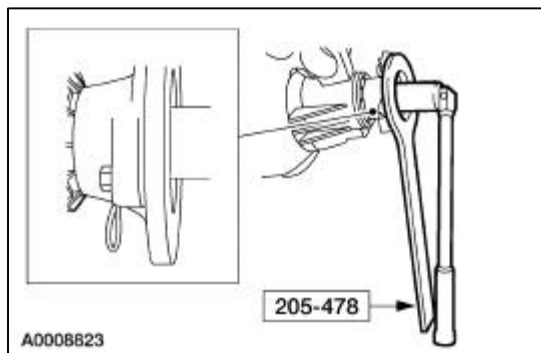
4.  **CAUTION:** Do not under any circumstance loosen the pinion nut to reduce preload. If it is necessary to reduce preload, install a new collapsible spacer and new pinion nut.

NOTE: Always install a new pinion nut.

NOTE: Make sure to insert the cotter key on the special tool as shown.

Use the special tool to hold the pinion flange while tightening the pinion nut.

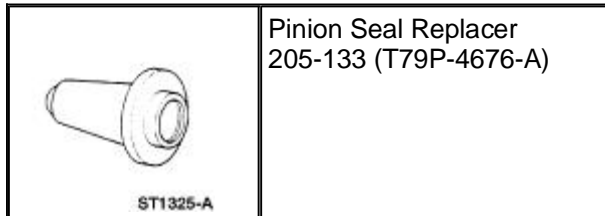
- Rotate the pinion occasionally to make sure the differential pinion bearings (4630) (4621) seat correctly. Take frequent differential pinion bearing torque preload readings by rotating the pinion with a Nm (inch/pound) torque wrench.
- If the preload recorded prior to disassembly is lower than the specification for used bearings, then tighten the pinion nut to specification. If the preload recorded prior to disassembly is higher than the specification for used bearings, then tighten the pinion nut to the original reading as recorded.
- Refer to the torque specification for pinion bearings in the Specifications portion of this section.



5. Connect the driveshaft. For additional information, refer to [Section 205-01](#).
 6. Install the rear brake calipers. For additional information, refer to [Section 206-04](#).
 7. Install the rear wheel and tire assemblies. For additional information, refer to [Section 204-04](#).
-

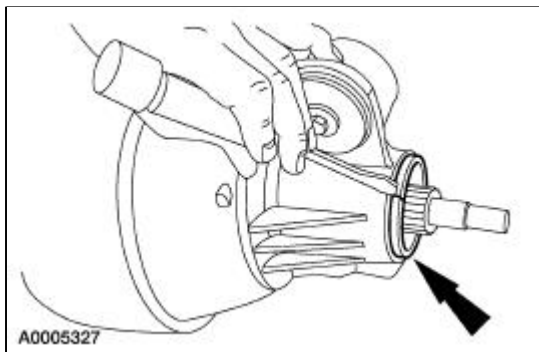
Pinion Seal

Special Tool(s)

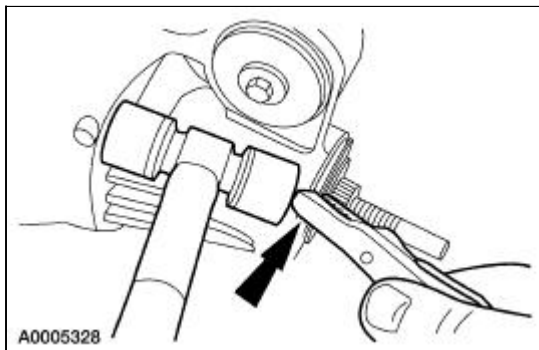


Removal


1. Remove the pinion flange (4851). For additional information, refer to [Drive Pinion Flange](#) in this section.
2. Force up the metal flange of the rear axle drive pinion seal (4676).



3. Strike the pliers with a hammer to remove the rear axle drive pinion seal.

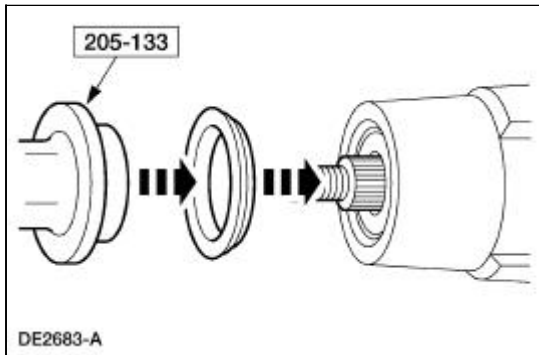


Installation

1. Lubricate the lips of the new rear axle drive pinion seal.
 - Use Premium Long-Life Grease XG-1-C or equivalent meeting Ford specification ESA-M1C75-B.
2.  **CAUTION:** Installation without the correct tool can result in early seal failure.

 **CAUTION:** If the rear axle drive pinion seal becomes misaligned during installation, remove it and install a new one.

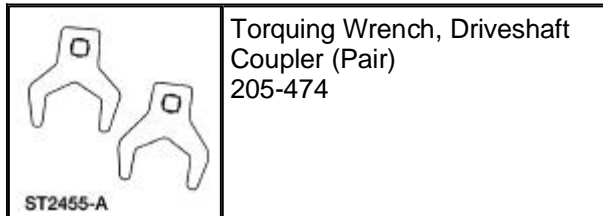
Using the special tool, install the rear axle drive pinion seal.



3. Install the pinion flange. For additional information, refer to [Drive Pinion Flange](#) in this section.
-


Axle Housing

Special Tool(s)

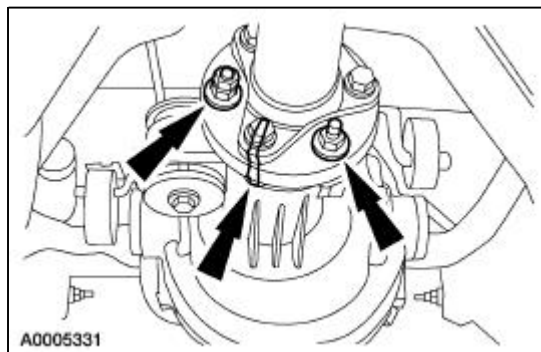


Removal and Installation

1. Remove the halfshafts. For additional information, refer to [Section 205-05](#).
2. Remove the heat shield underbody. For additional information, refer to [Section 309-00](#).

3.  **CAUTION: The driveshaft-to-pinion flange bolts, nuts and weighted nuts must be installed in the same locations from which they were removed.**

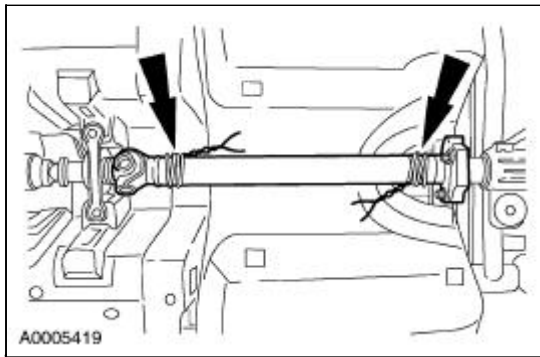
Mark the pinion flange, the driveshaft flexible coupling and each of the three driveshaft-to-pinion flange bolts, nuts and weighted nuts with different color paint so that the driveshaft and differential may be realigned during installation.



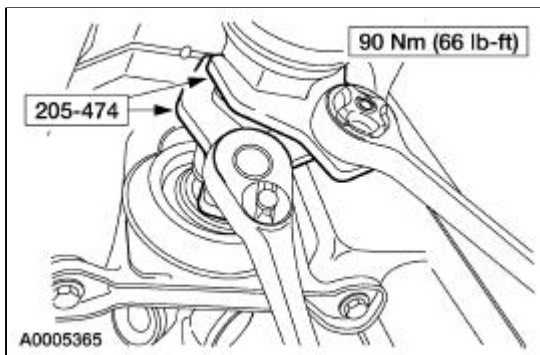
4.  **CAUTION: Do not remove the flex coupling on the driveshaft flange. Make sure to remove only the driveshaft-to-pinion flange bolts and nuts.**

Remove the three driveshaft-to-pinion flange bolts and nuts.

5. Support the driveshaft at the center and rear.



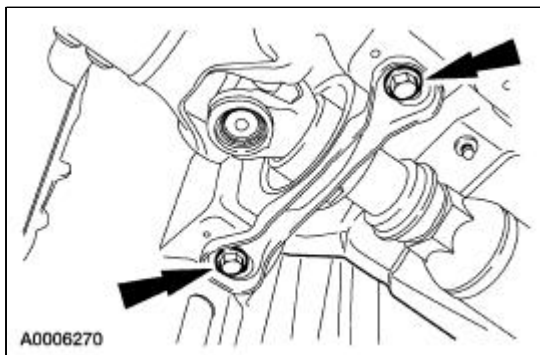
6. Loosen the driveshaft yoke adjuster nut.



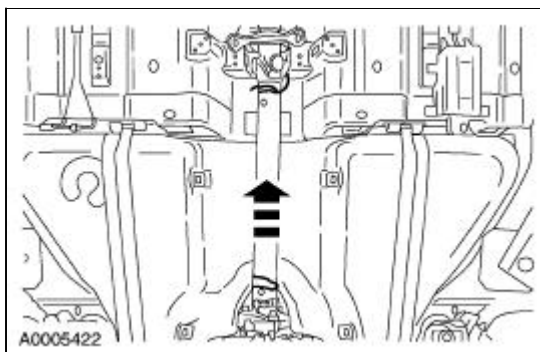
7. **NOTE:** There are shims between the center bearing mounting bracket and the body.

NOTE: The shims must be installed in their original locations.

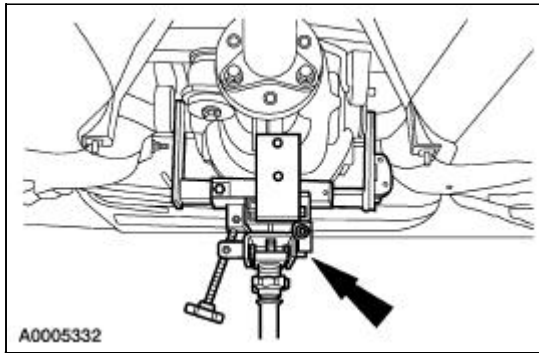
Remove the bolts and the shims.



8. Slide the rear driveshaft to the full forward position and tighten the adjuster nut.

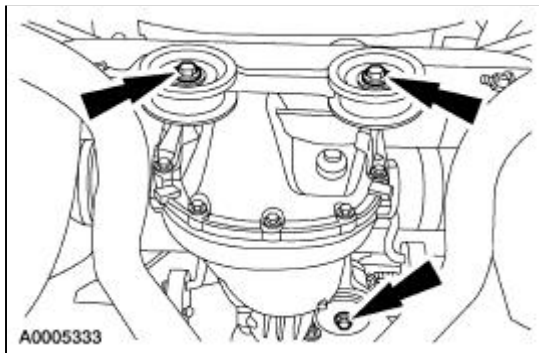


9. Position a suitable jack under the axle housing.



10. **NOTE:** The front mount has a nut and shim on the top.

Remove the three mounting bolts.





11. Lower the axle housing assembly from the vehicle.

12. To install, reverse the removal procedure.

- Make sure to position the shim on the front mount before raising the axle housing into position.

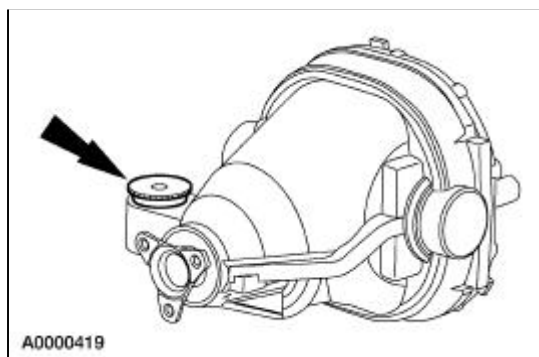
Axle Housing Bushing

Special Tool(s)

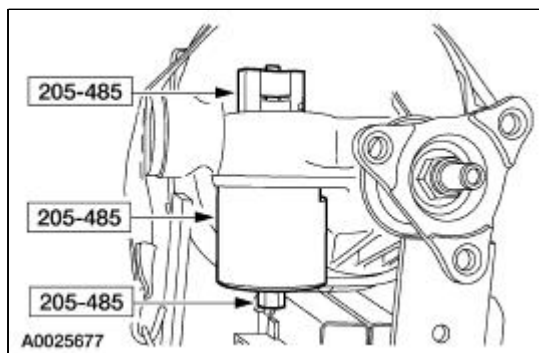
 <p>ST2252-A</p>	Bushings Replacer 204-091 (T85T-5638-A2)
 <p>ST2543-A</p>	Remover/Installer, Differential Bushings 205-485

Removal

1. Remove the axle housing assembly from the vehicle. For additional information, refer to [Axle Housing](#) in this section.
2. Remove the rear axle differential front upper insulator (4B424).

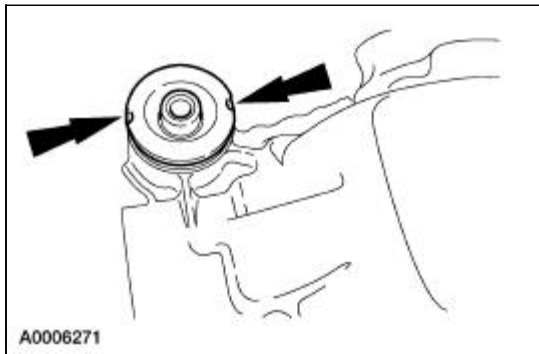


3. Using the special tools, remove the front axle differential front lower insulator (4B431).

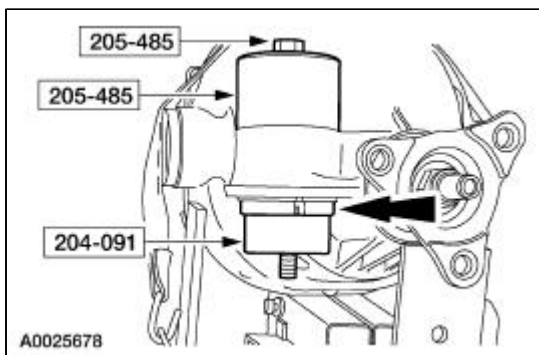


Installation

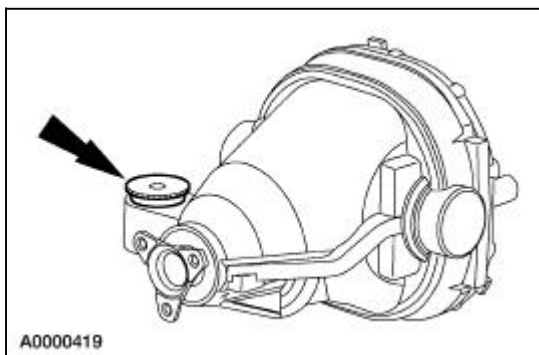
1. Insert the rear axle differential front lower insulator and make sure that the notches are aligned forward and aft.



2. Using the special tools, install the rear axle differential front lower insulator.





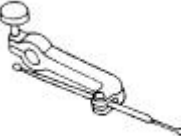


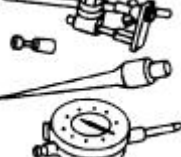

3. Install the rear axle differential front upper insulator.

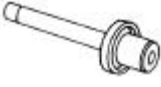


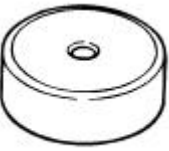

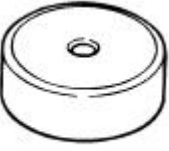

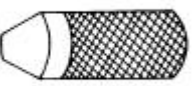


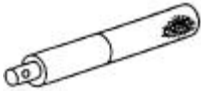



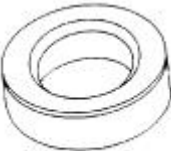


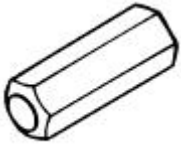
4. Install the rear axle housing. For additional information, refer to [Axle Housing](#) in this section.
-








Axle —Aluminum

Special Tool(s)


 ST2026-A	2-Jaw Puller 205-D072 (D97L-4221-A) or equivalent
 ST1165-A	Preload Gauge, Bearing 205-S337 (T93P-4220-AR)
 ST1348-A	Gauge, Clutch Housing 308-021 (T75L-4201-A)
 ST1678-A	Installer, Drive Pinion Bearing Cup 205-054 (T71P-4616-A)
 ST1183-A	Dial Indicator Gauge 100-D005 (D78P-4201-G) or equivalent
 ST1214-A	Dial Indicator Gauge with Holding Fixture 100-002 (TOOL-4201-C) or equivalent
 ST1259-A	Spreader, Differential Carrier 205-001 (TOOL-4000-E) or equivalent
	Installer, Differential Side Bearing 205-010 (T57L-4221-A2)

 <p>ST1375-A</p>	
 <p>ST2458-B</p>	<p>Holding Tool, Drive Pinion Flange 205-478</p>
 <p>ST2452-A</p>	<p>Remover, Output Flange 307-408</p>
 <p>ST1743-A</p>	<p>Depth Gauge/Aligner, Depth Pinion 205-477</p>
 <p>ST1431-A</p>	<p>Adapter for 205-S127 205-110 (T76P-4020-A10)</p>
 <p>ST1743-A</p>	<p>Depth Gauge, Drive Pinion 205-476</p>
 <p>ST1434-A</p>	<p>Gauge Tube, Drive Pinion 205-336 (T93P-4020-A)</p>
 <p>ST1432-A</p>	<p>Adapter for 205-S127 205-111 (T76P-4020-A11)</p>
	<p>Adapter for 303-224 (Handle) 205-153 (T80T-4000-W)</p>

 <p>ST1326-A</p>	
 <p>ST1186-A</p>	<p>Holding Fixture, Transmission 307-003 (T57L-500-B)</p>
 <p>ST1344-A</p>	<p>Spreader, Differential Housing (Plate) 205-335 (T93P-4000-A)</p>
 <p>ST1676-A</p>	<p>Installer, Drive Pinion Inner Bearing Cup 205-480</p>
 <p>ST1349-A</p>	<p>Gauge, Differential Bearing 205-338 (T93P-4222-A)</p>
 <p>ST1310-A</p>	<p>Remover, Bearing 205-055 (T71P-4621-B)</p>
 <p>ST1734-A</p>	<p>Installer, Drive Pinion Flange 205-479</p>
 <p>ST1744-A</p>	<p>Protector, Drive Pinion Thread 205-460</p>
	<p>Remover, Drive Pinion Inner Bearing Cup 205-481</p>

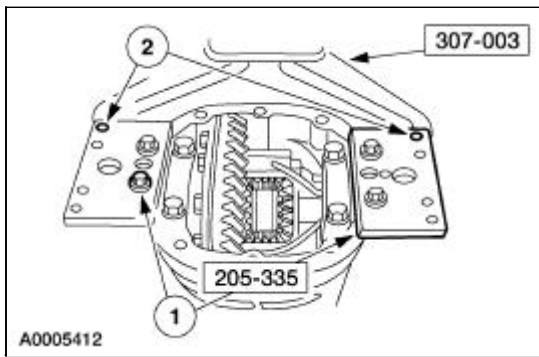
 <p>ST2320-A</p>	
 <p>ST2320-A</p>	<p>Remover, Drive Pinion Outer Bearing Cup 205-482</p>
 <p>ST1350-A</p>	<p>Gauge, Differential Bearing 205-339 (T93P-4222-B)</p>
 <p>ST1429-A</p>	<p>Adapter for 205-S127 205-109 (T76P-4020-A9)</p>
 <p>ST1254-A</p>	<p>Plate, Bearing/Oil Seal 205-090 (T75L-1165-B)</p>
 <p>ST1725-A</p>	<p>Step Plate 205-D061 (D83T-4205-C2) or equivalent</p>
 <p>ST1367-A</p>	<p>Installer, Drive Pinion Bearing Cone 205-005 (T53T-4621-C)</p>

Disassembly

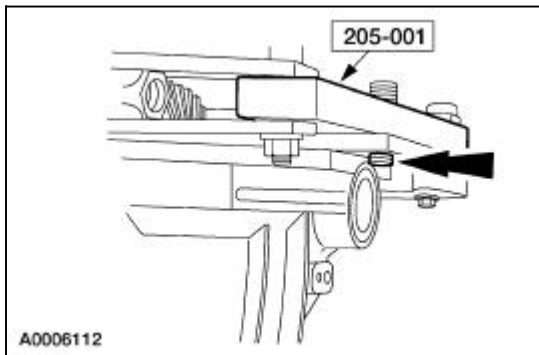
1. Remove the differential housing cover.
2.  **CAUTION: Extreme care must be taken not to damage aluminum rear axle housing (4010) while carrying out these procedures.**

Mount the rear axle housing on the Transmission Holding Fixture.

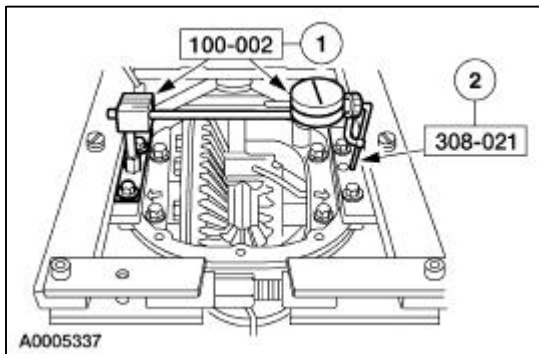
1. Attach the special tools to the rear axle housing with four cover bolts.
2. Attach the Differential Housing (Plates) Spreader to the Transmission Holding Fixture with two 3/8 inch x 1-1/2 inch bolts.



3. Install the Differential Carrier Spreader onto the Differential Housing (Plates) Spreader Adapters with the spreader pins aligned with the holes in the Housing Spreader Adapters.



4. Assemble the special tools.
 1. Install the Dial Indicator Gauge.
 2. Attach the Clutch Housing Gauge Adapter to the Dial Indicator Gauge with the tip positioned in the spreader adapter hole.

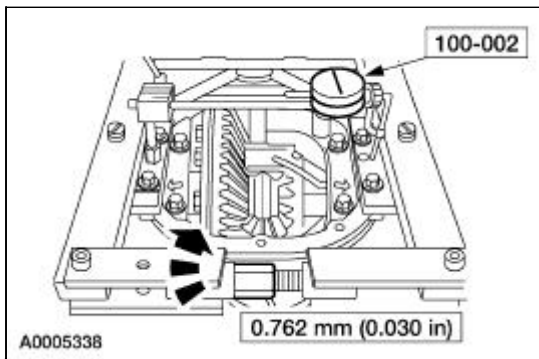


5.  **CAUTION: Overspreading can damage the rear axle housing.**

NOTE: Tighten and loosen the housing spreader adapter screw to normalize the Differential Housing (Plates) Spreader prior to the final Dial Indicator Gauge reading.

Adjust the dial indicator to zero and tighten the housing spreader screw until the rear axle housing is spread to specification.

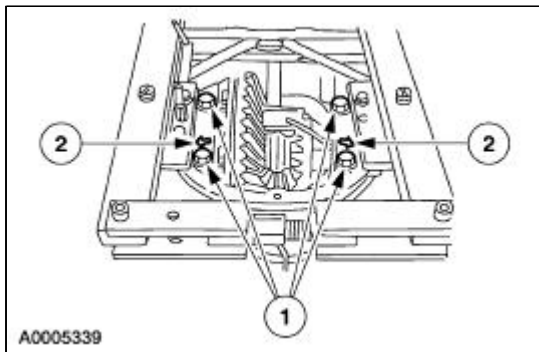
- Remove the Dial Indicator Gauge.



6. **NOTE:** Mark the position of the bearing caps as arrows may not be visible. The bearing caps must be installed in their identical locations and positions.

Remove the differential bearing caps.

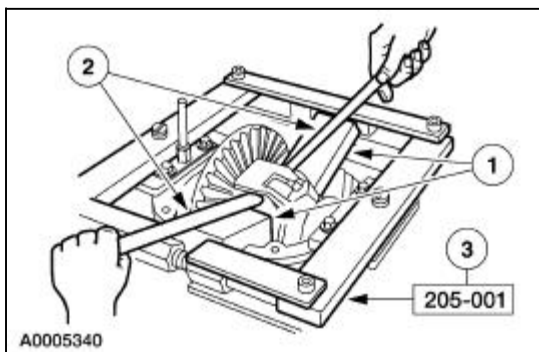
1. Remove the bearing cap retaining bolts.
2. Remove the differential bearing caps.



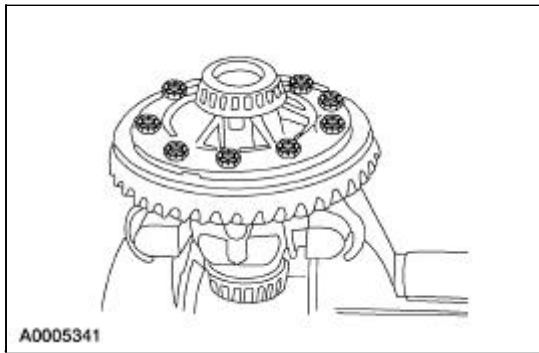
7. **⚠ CAUTION: Wood blocks must be used to avoid rear axle housing damage.**

Remove the differential case (4204).

1. Position wood blocks on top and bottom of the differential (4026).
2. Pry the differential case and the differential bearing shims (4067) out of the rear axle housing.
3. Remove the special tool.

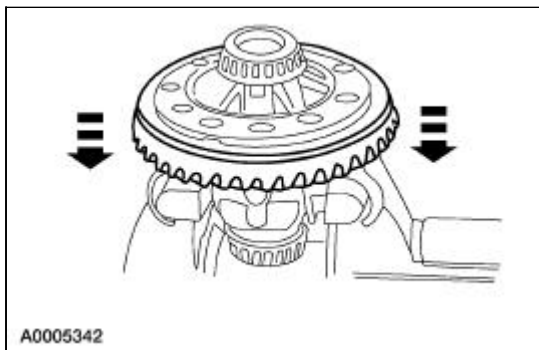


8. Remove the 10 ring gear bolts.

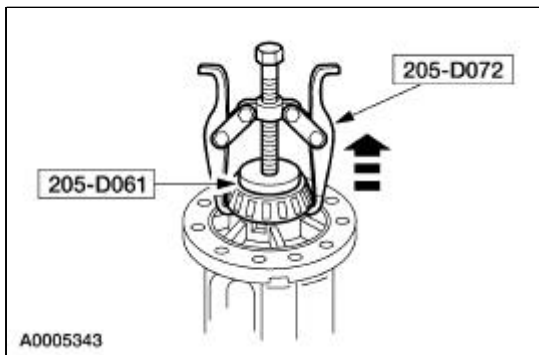


9.  **CAUTION:** Care should be taken not to damage the bolt hole threads.

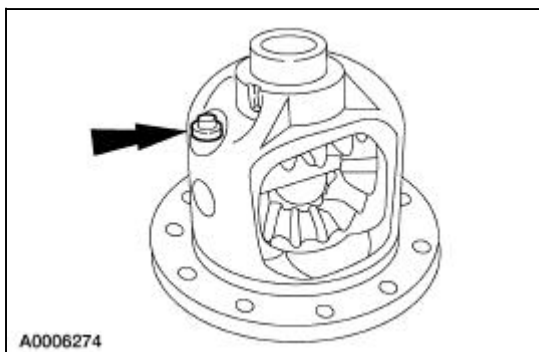
Insert a punch in the bolt holes and drive the ring gear off.



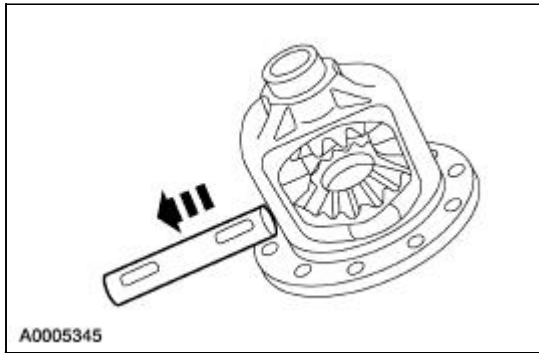
10. Using the special tools, remove the differential bearing (4221).
● Repeat for the other side.



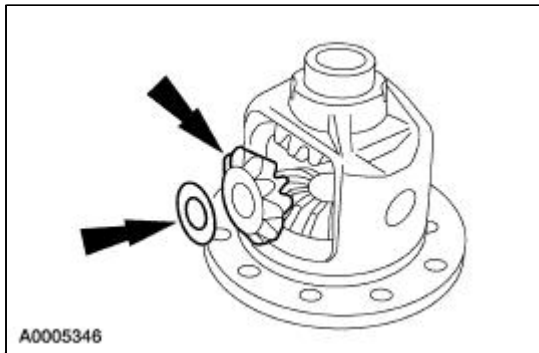
11. Remove the differential pinion shaft lock bolt.



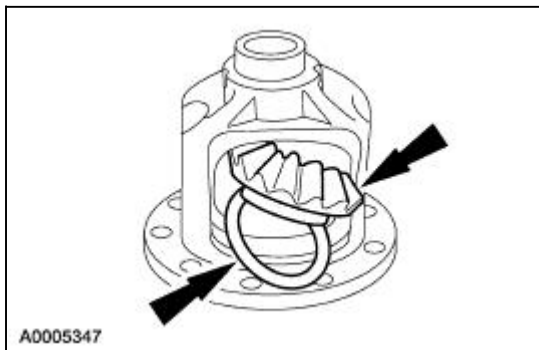
12. Remove the differential pinion shaft.



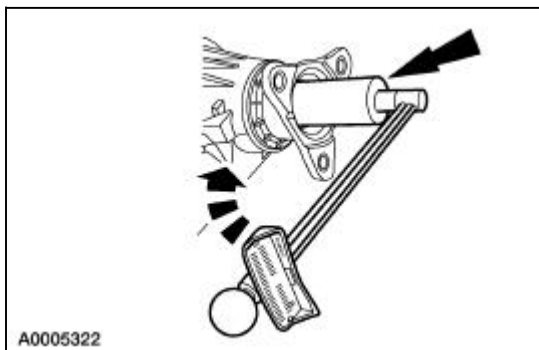
13. Remove the differential gears.



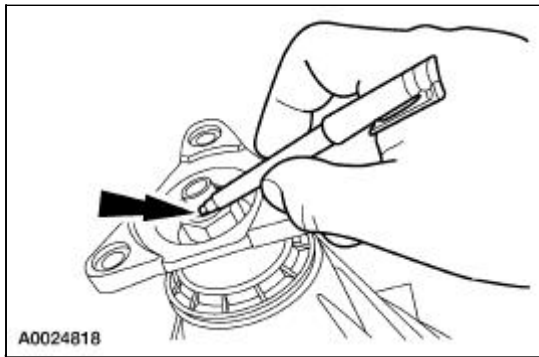
14. Remove the differential side gears.



15. Install a Nm (inch/pound) torque wrench on the pinion nut and record the torque necessary to maintain rotation of the drive pinion gear (4209) through several revolutions.



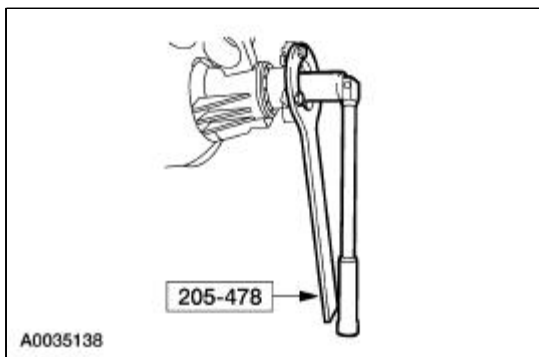
16. Mark the pinion flange in relation to the drive pinion stem to make sure of correct alignment during installation.



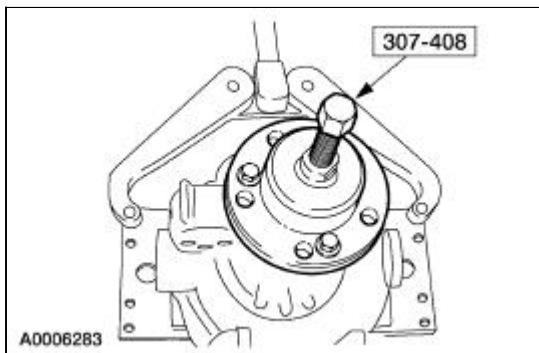
17.  **CAUTION:** After removing the pinion nut, discard it. Use a new nut for installation.

Remove the pinion nut.

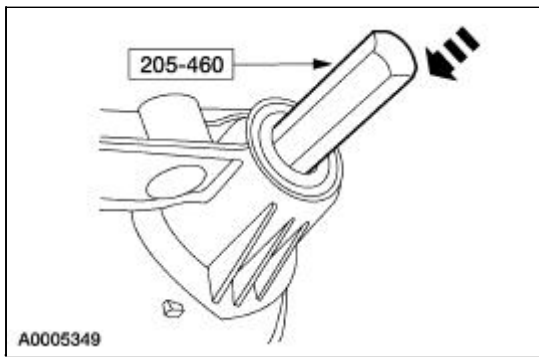
- Install the special tool.
- Install a suitable breaker bar and remove the nut.



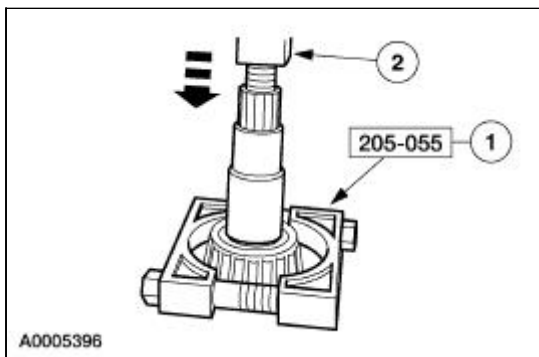
18. Using the special tool, remove the pinion flange.



19. Install the special tool and, with a soft-faced hammer, drive the pinion out of the front bearing cone and remove it through the rear of the housing.
- Remove the rear axle drive pinion shaft oil slinger (4670), the rear axle drive pinion seal (4676) and the collapsible spacer.

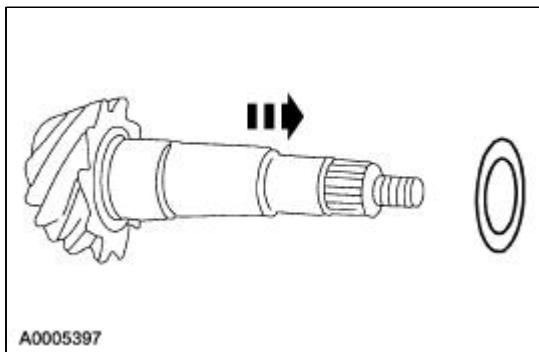


20. Remove the front pinion bearing.
 1. Position the special tool under the pinion bearing.
 2. Using a press, remove the pinion bearing.

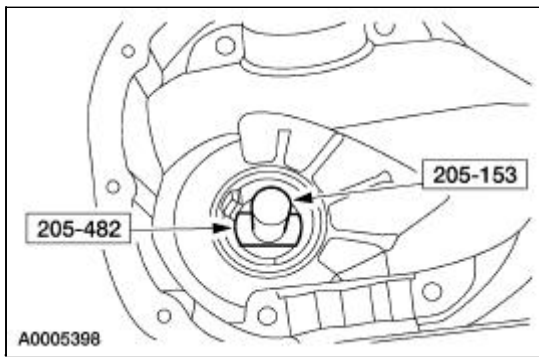


21. **NOTE:** Measure the drive pinion bearing adjustment shim (4663), which is found under the differential pinion bearing, with a micrometer and record the thickness. (Use this as a reference to compare the shim gauge reading prior to installing the differential pinion bearing.)

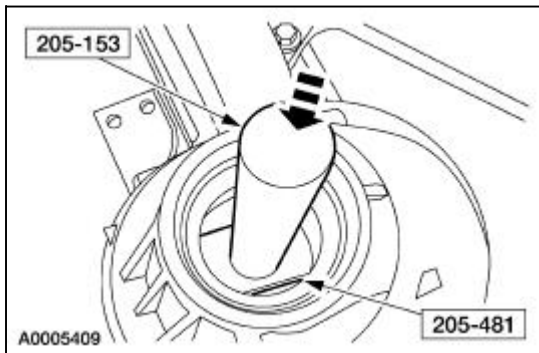
Remove the drive pinion bearing adjustment shim.



22. If required, remove damaged rear axle pinion bearing cup (4616) from the rear axle housing using the special tools.



23. If required, remove rear axle pinion bearing cup (4628) from the rear axle housing using the special tools.

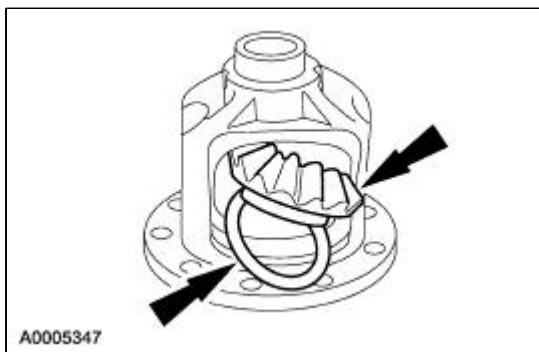


Assembly

All vehicles

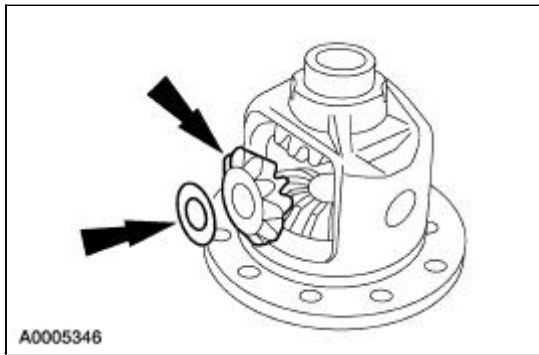
1.  **CAUTION:** Lubricate the differential side gear thrust washers with Premium Long-Life Grease XG-1-C or equivalent meeting Ford specification ESA-M1C75-B prior to installation.

Install the differential side gears in the differential case.



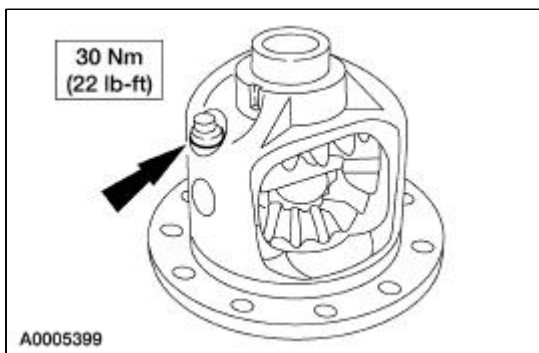
2.  **CAUTION:** Lubricate the differential pinion thrust washers with Premium Long-Life Grease XG-1-C or equivalent meeting Ford specification ESA-M1C75-B prior to installation.

Install the differential pinion gears with the differential pinion thrust washers in the differential case.

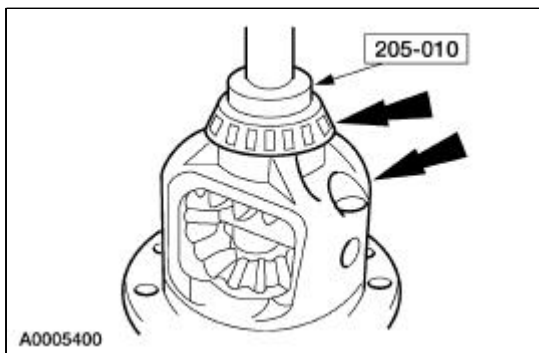


3. **NOTE:** If a new pinion shaft lock bolt is unavailable, coat the threads with Threadlock® and Sealer E0AZ-19554-AA or equivalent meeting Ford specifications WSK-M2G351-A5 prior to installation.

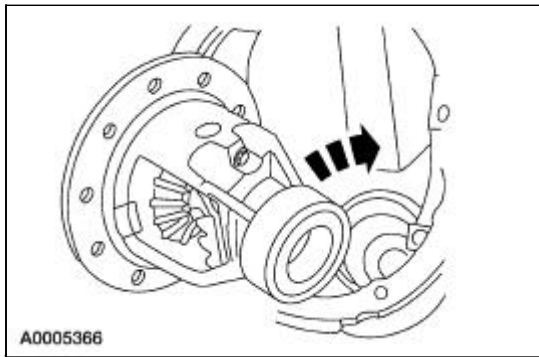
Install the differential pinion shaft and install a new differential pinion shaft lock bolt.



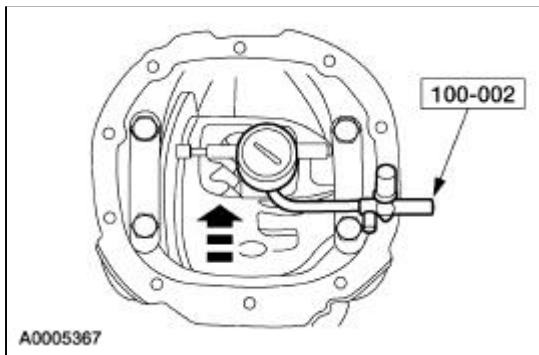
4. Use the special tool to install the differential bearing on the differential case. Repeat for the other side.



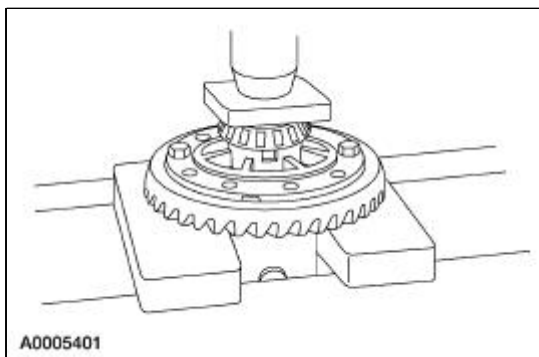
5. Install the differential case without the ring gear.
 - Rotate the differential case to correctly seat the differential bearings.



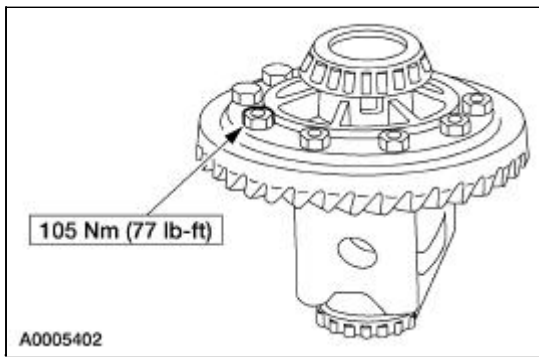
6. Check the differential case flange runout using the special tool.
 - If the runout is within specification, install a new ring gear and pinion. If the runout exceeds specification, the ring gear is true and the concern is due to either a damaged differential case or differential bearings.
 - Inspect the differential bearings. If the differential bearings are not damaged, install a new differential case and the differential bearings.
 - Recheck the runout with the new differential case and differential bearings.



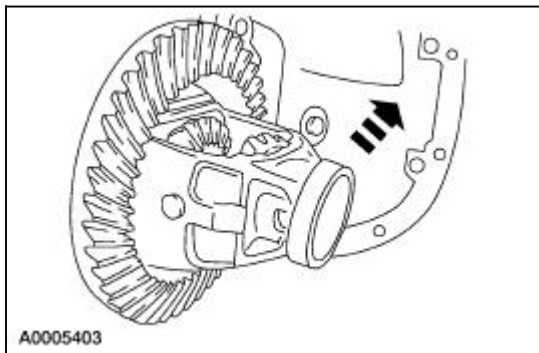
7. Remove the differential case.
8. Press the ring gear on the differential case.
 - Start two of the ring gear bolts through the differential case and into the ring gear to make sure the ring gear bolt holes align with the differential case bolt holes correctly.



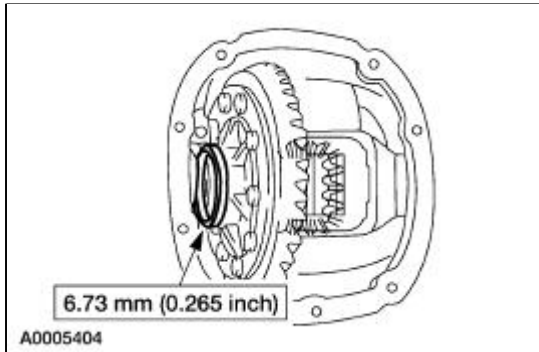
9. Install the ring gear bolts.
 - Apply Stud and Bearing Mount E0AZ-19554-BA or equivalent meeting Ford specification WSK-M2G349-A1 to the ring gear bolts.



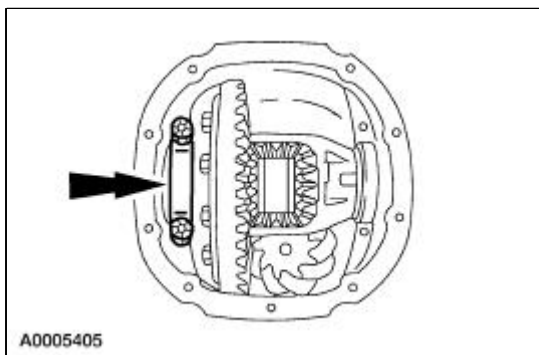
10. With the pinion removed, place the differential case/gear subassembly with the differential bearing and the rear axle pinion bearing cups in the rear axle housing.



11. Install a differential bearing shim of the thickness shown on the LH side of the differential case.

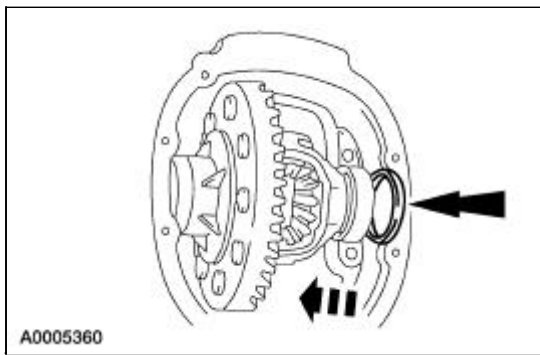


12. Install the LH bearing cap finger-tight.

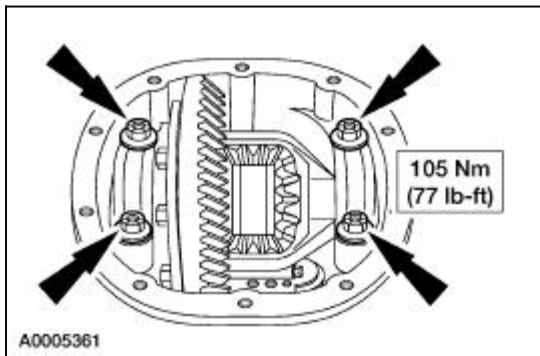


13. **NOTE:** Apply pressure toward the left side to fully seat the differential bearing cup (4222).

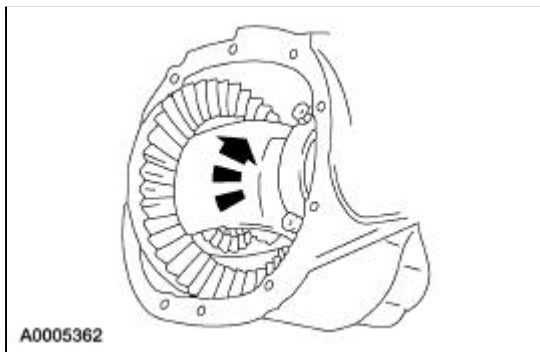
Install progressively larger differential bearing shims on the RH side until the largest differential bearing shim selected can be assembled with a slight drag feel.



14. Install the RH bearing cap.
 - Tighten both bearing caps to specification.

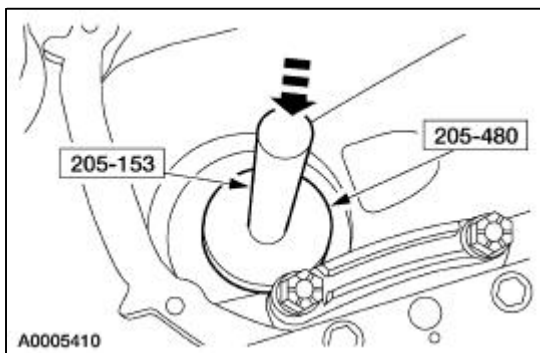


15. Rotate the differential assembly to make sure it rotates freely.

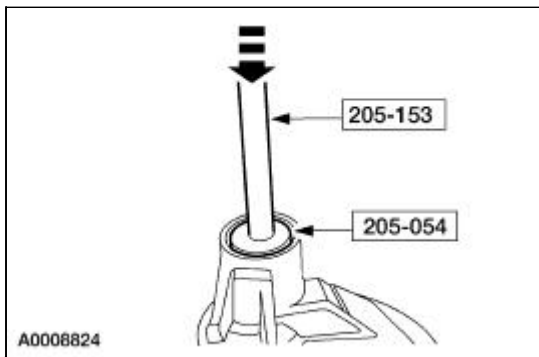


Pinion bearing cup installation with special tools 205-153, 205-480, and 205-054

16. Install a new inner rear axle pinion bearing cup in the rear axle housing.



17. Install a new outer rear axle pinion bearing cup in the rear axle housing.

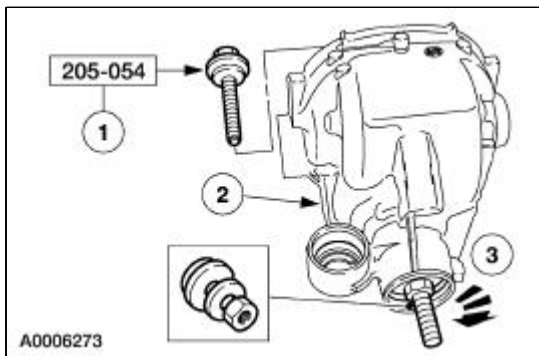


Pinion bearing cup installation with special tool 205-054

18. **NOTE:** Coat the new rear axle pinion bearing cup with SAE 5W-30 Super Premium Motor Oil XO-5W30-QSP or equivalent meeting Ford specification WSS-M2C153-G.

Install the pinion bearing cup.

1. Position the rear axle pinion bearing cup on the special tool.
2. Position the bearing cup replacer in the rear axle housing.
3. Tighten the special tool to fully seat the rear axle pinion bearing cup in the bore.

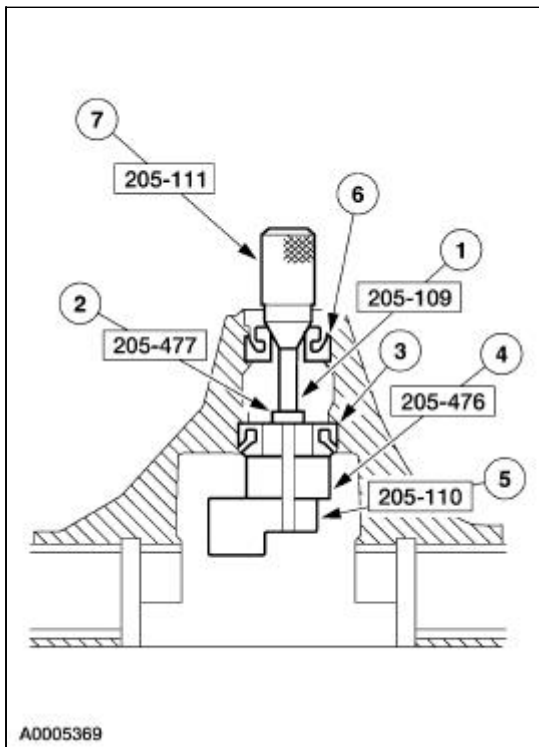


All vehicles

19. **NOTE:** A drive pinion bearing adjustment shim is used between the pinion bearing and the pinion head. The drive pinion bearing adjustment shim compensates for machining variations in the differential pinion and the pinion bearings. The correct drive pinion bearing adjustment shim size will locate the pinion for correct tooth contact with the ring gear. Selecting the correct drive pinion bearing adjustment shim can be done using a pinion depth gauge set.

NOTE: Apply a light film of SAE 75W-140 High Performance Rear Axle Lubricant F1TZ-19580-B or equivalent meeting Ford specification WSL-M2C192-A on the front differential pinion bearing and the rear differential pinion bearing assemblies.

Install the special tools.

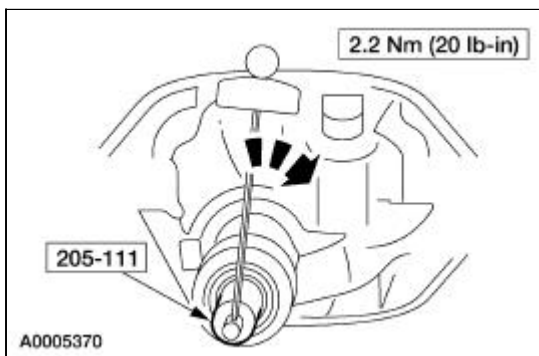


A0005369

Item	Part Number	Description
1	205-109	Adapter for 205-S127 (T76P-4020-A9)
2	205-477	Gauge aligner, depth pinion
3	4630	Rear (inner) pinion bearing
4	205-476	Gauge disc, drive pinion
5	205-110	Gauge block (1.7 inch thick) (T76P-4020-A10)
6	4621	Front (outer) pinion bearing
7	205-111	Adapter for 205-S127 (T76P-4020-A11)

20. **NOTE:** This step duplicates pinion bearing preload.

Thread the Handle onto the Screw and tighten to the specification shown.

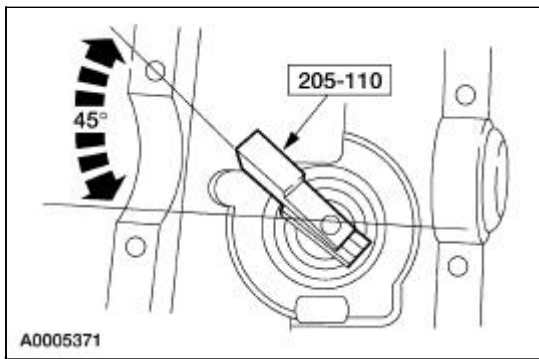


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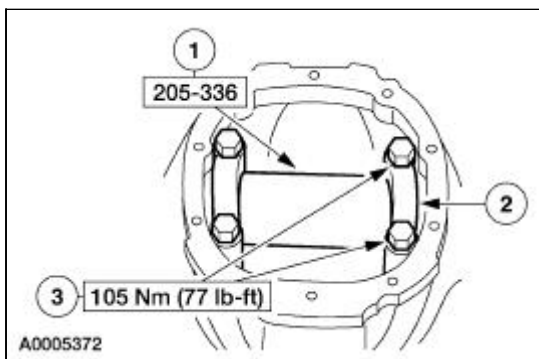
21. **NOTE:** The special tool must be offset to obtain an accurate reading.

NOTE: Rotate the special tool several half turns to correctly seat the pinion bearings.

Position the special tool 45 degrees as shown.



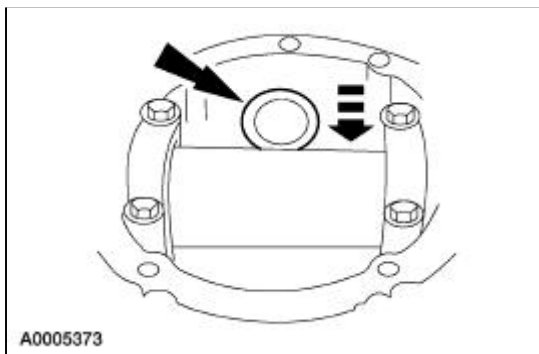
22. Install the special tool.
1. Position the special tool on the differential bearing seat of the rear axle housing.
 2. Install the differential bearing caps.
 3. Install the differential bearing cap bolts and tighten to specification.



23. **NOTE:** A slight drag should be felt for the correct shim selection.

NOTE: Use a shim to determine shim thickness.

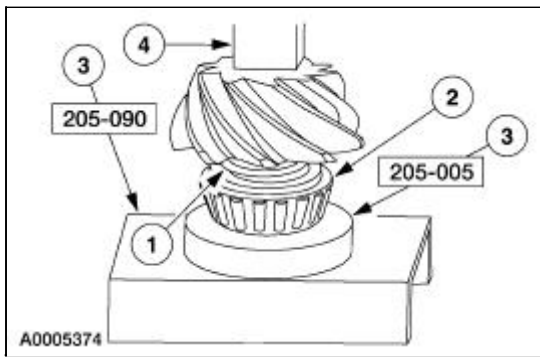
Select and check the correct shim size.



24. Remove the special tool.
25. **NOTE:** The same pinion bearings and drive pinion bearing adjustment shim used in the drive pinion shim selection procedure must be used in the final axle assembly.

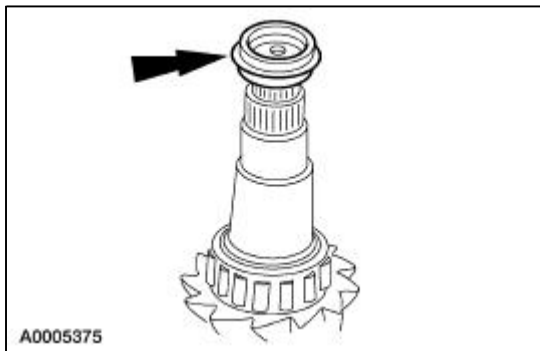
Install the rear pinion bearing.

1. Position the drive pinion bearing adjustment shim on the pinion stem.
2. Position the pinion bearing on the pinion stem.
3. Position the special tool on the pinion stem.
4. Using a press, firmly seat the drive pinion bearing adjustment shim and pinion bearing on the pinion stem.

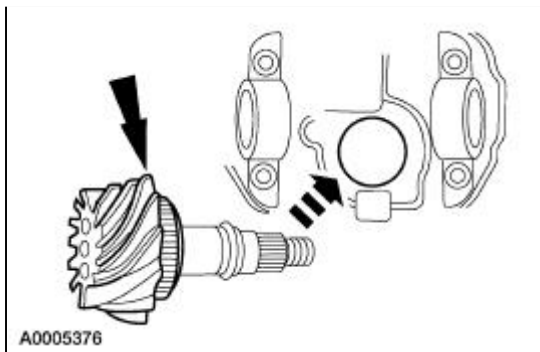


26. Install the front pinion bearing, the rear axle drive pinion shaft oil slinger and the rear axle drive pinion seal in the differential housing.
27. **NOTE:** Make sure the splines on the pinion stem are free of burrs. If burrs are evident, remove using a fine crocus cloth, working in a rotational motion.

Place a new drive pinion collapsible spacer on the pinion stem against the pinion stem shoulder.



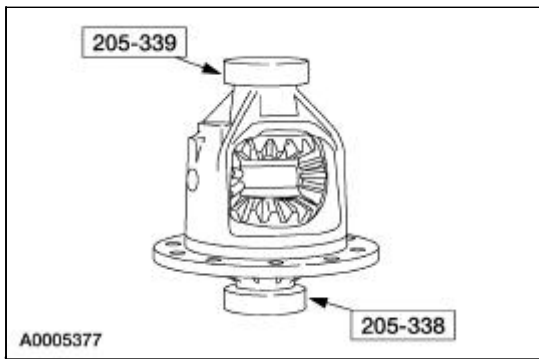
28. Install the drive pinion and the new drive pinion collapsible spacer into the rear axle housing.



29. **⚠ CAUTION:** Take extreme care not to damage aluminum rear axle housing while carrying out these procedures.

⚠ CAUTION: Master bearings are marked LH and RH and must be installed as shown.

Remove the differential bearings and install the special tools on the differential case.

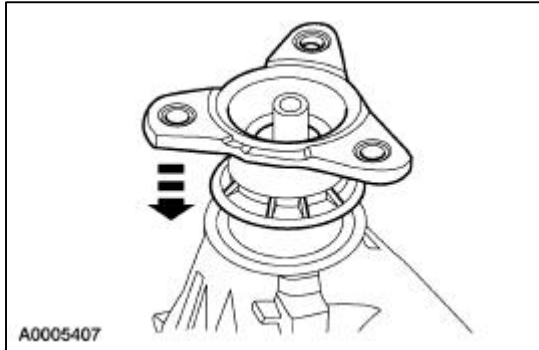


30. **NOTE:** Lubricate the rear axle pinion flange splines. Use SAE 75W-140 High Performance Rear Axle Lubricant F1TZ-19580-B or equivalent meeting Ford specification WSL-M2C192-A.

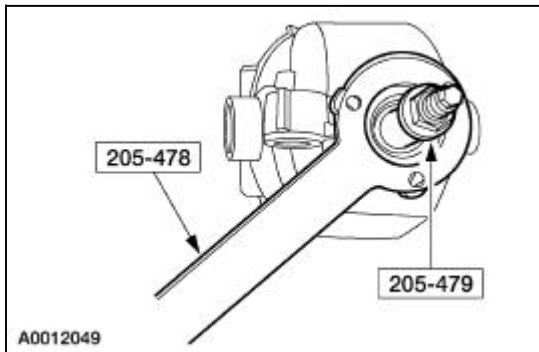
Install the rear axle pinion flange.

- **NOTE:** Disregard the scribe marks if a new rear axle pinion flange is being installed.

Align the rear axle pinion flange with the drive pinion shaft.



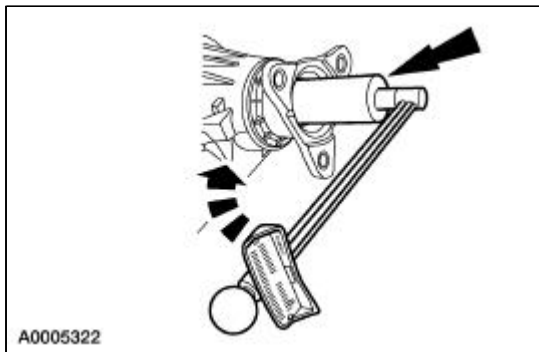
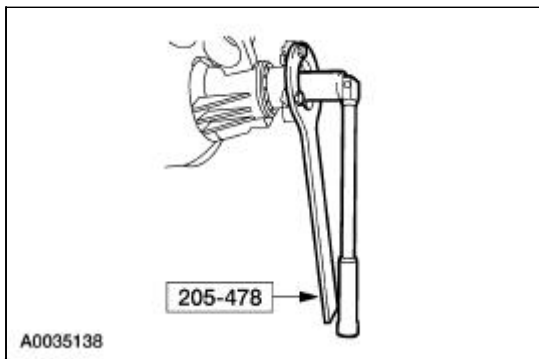
31. With the drive pinion in place in the rear axle housing, install the rear axle pinion flange using the special tools.



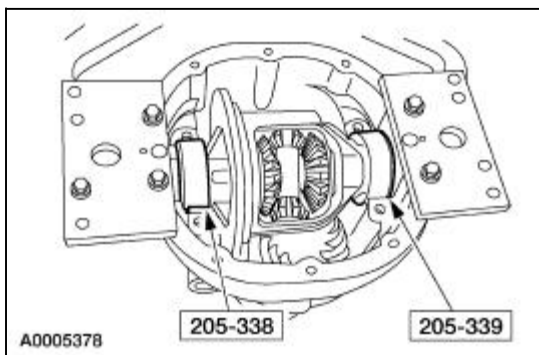
32.  **CAUTION:** Do not under any circumstance loosen the pinion nut to reduce preload. If it is necessary to reduce preload, install a new collapsible spacer (4662) and new pinion nut.

Use the special tool to hold the pinion flange while tightening the new pinion nut.

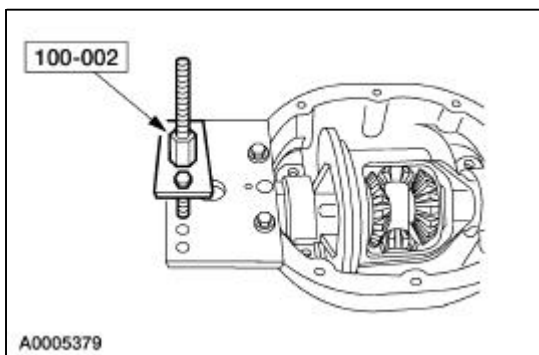
- Rotate the pinion occasionally to make sure the differential pinion bearings (4630) (4621) seat correctly. Take frequent differential pinion bearing torque preload readings by rotating the pinion with a Nm (inch/pound) torque wrench.
- Refer to the torque specification for pinion bearings in the Specifications portion of this section.



33. Place the differential case and the special tools into the rear axle housing.



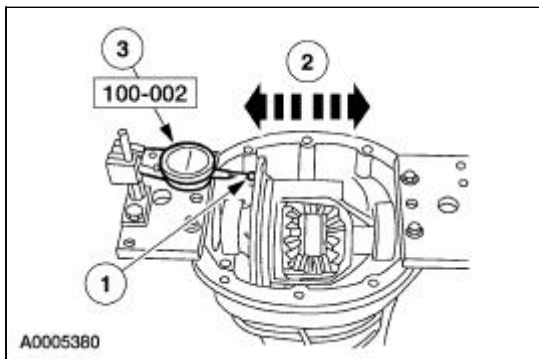
34. Position the special tool on the outside mounting hole.



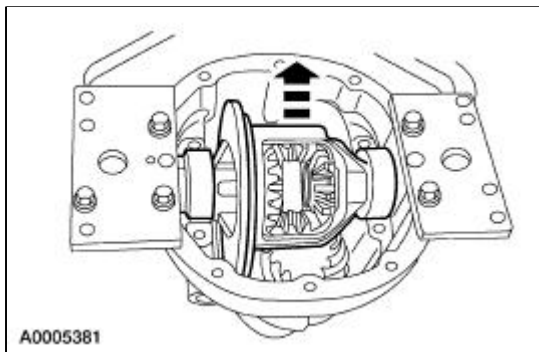
35. **NOTE:** Repeat this step until a consistent reading is obtained.

Measure the total end play.

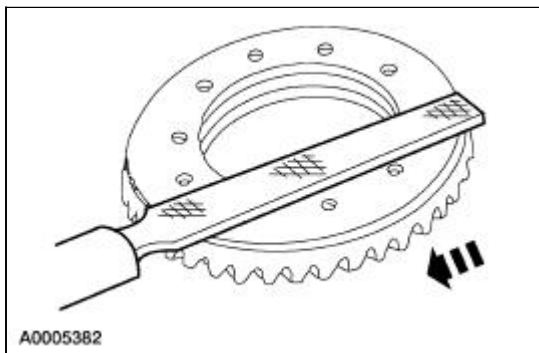
1. Attach the special tool with the indicator tip positioned on the machined surface of the differential case flange.
2. Move the differential case to the left and the right (as far as possible).
3. Record the reading on the differential bearing shim selection procedure line A.



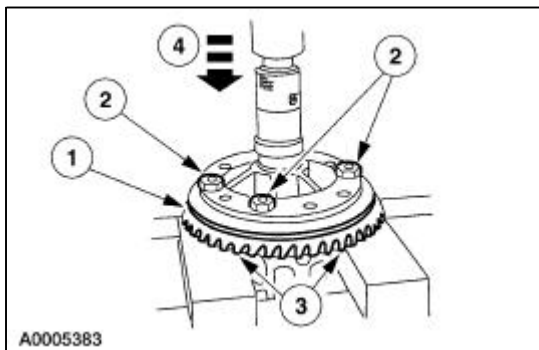
36. Remove the special tool and the differential case from the rear axle housing.



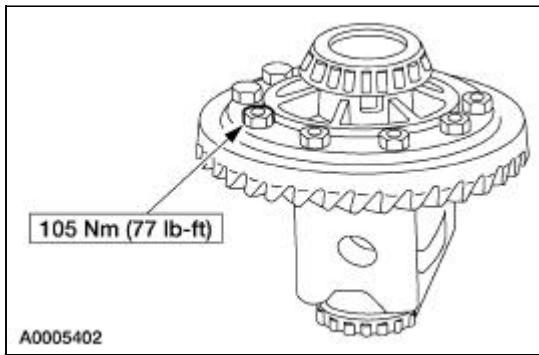
37. Draw-file the differential ring gear mounting surface to remove any nicks or burrs.



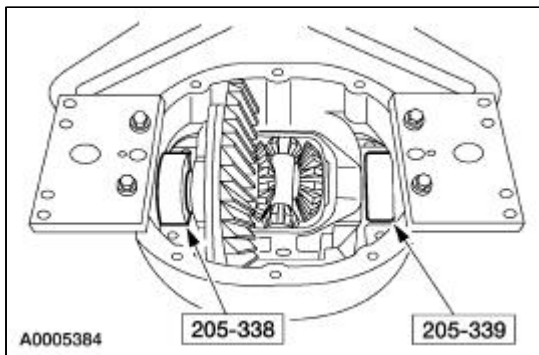
38. Install the ring gear.
1. Place the ring gear onto the differential case.
 2. Hand start three bolts to align the holes in the ring gear and the differential case.
 3. Place the differential case and ring gear onto the press bed blocks with the ring gear teeth facing down.
 4. Press the ring gear into place.



39. Install the remaining ring gear bolts and tighten to specification.



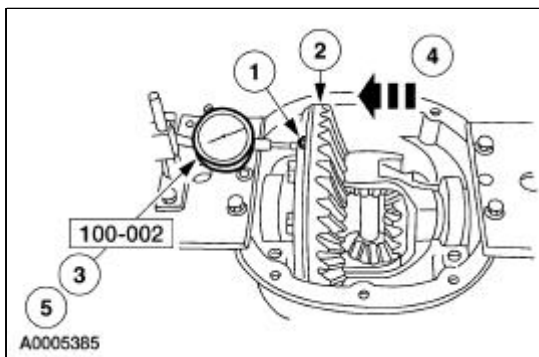
40. Place the differential case, special tools and the ring gear into the rear axle housing.



41. **NOTE:** The ring gear bolt heads inside the rear axle housing may interfere. If so, remove three to five bolts to provide clearance.

Measure the end play.

1. Attach the special tool with the indicator tip positioned on the machined surface of the differential case flange.
2. Rock the ring gear to allow full mesh with the pinion gear.
3. With the gears in full mesh, set the special tool to zero.
4. Move the differential case as far as possible to the left and note the reading.
5. Record the reading on the differential bearing shim selection procedure line B.



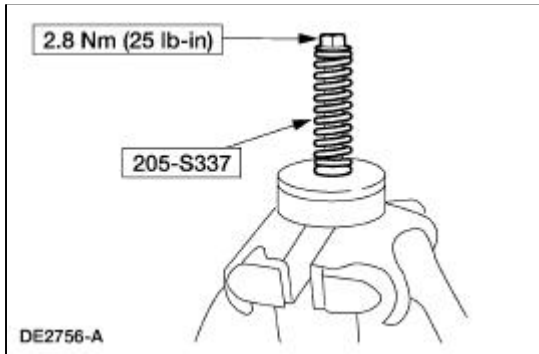
42. Remove the special tool and the differential case from the rear axle housing.

43. **NOTE:** The stand height of both differential bearing assemblies must be measured prior to installation.

Install the special tool.

1. Place the bearing preload gauge base in a soft-jawed vise with the bearing mounting surface above the vise jaws.

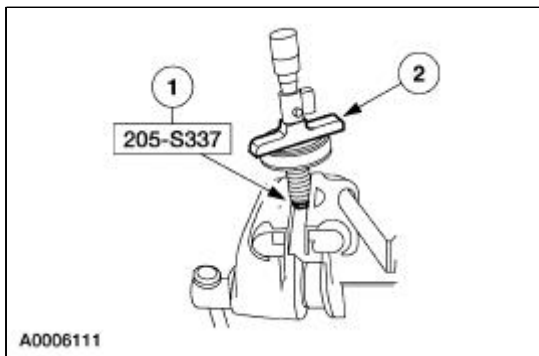
2. Position the differential bearing assembly on the bearing preload tool base.
3. Attach the bolt, spring, washers and spacer.
4. Tighten the bolt to specification shown.



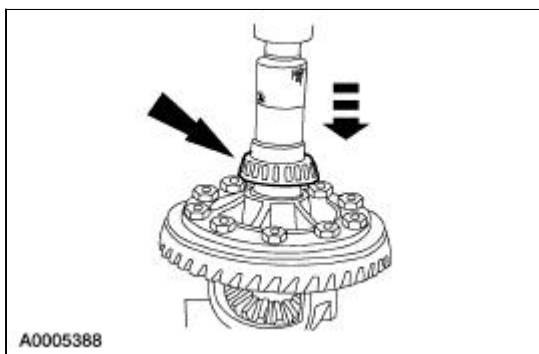
44. **NOTE:** Mark the differential bearing assemblies left and right before measuring.

Measure the differential bearing stand height.

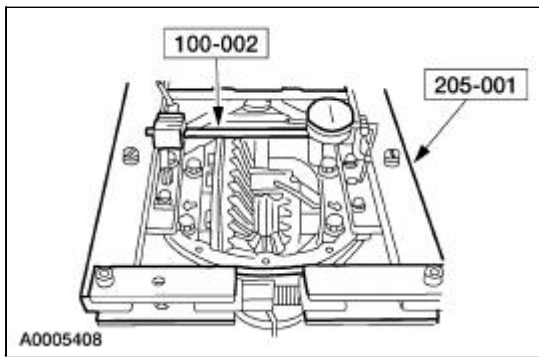
1. Invert the special tool and clamp the bolt head in a vise.
2. Position a depth micrometer flat on the differential bearing assembly.



45. Measure the stand height of both differential bearing assemblies and record on the differential bearing shim selection procedure line D.
46. Press the left and right differential bearing on the differential case.



47. Install the special tools.

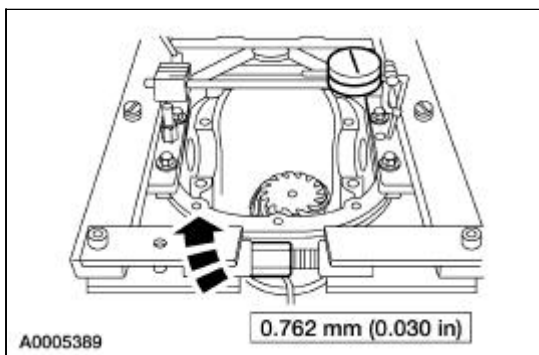


48.  **CAUTION: Overspreading can damage the rear axle housing.**

NOTE: Tighten and loosen the housing spreader adapter screw to normalize the Housing Spreader Adapters prior to the final Dial Indicator reading.

Adjust the Dial Indicator Gauge to zero and tighten the Differential Carrier Spreader screw to spread the rear axle housing to specification.

- Remove the Dial Indicator Gauge.

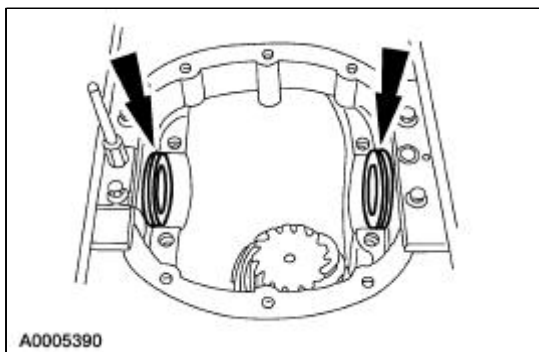


49. **NOTE:** Apply a light coating of Premium Long-Life Grease XG-1-C or equivalent meeting Ford specification ESA-M1C75-B to the differential bearing shim to help hold in place.

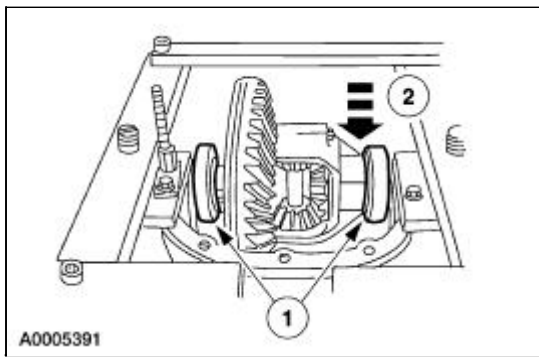
NOTE: Select the correct size differential bearing shims by using the differential bearing shim selection chart.

Install the differential bearing shims.

- Place the differential bearing shims in the rear axle housing.

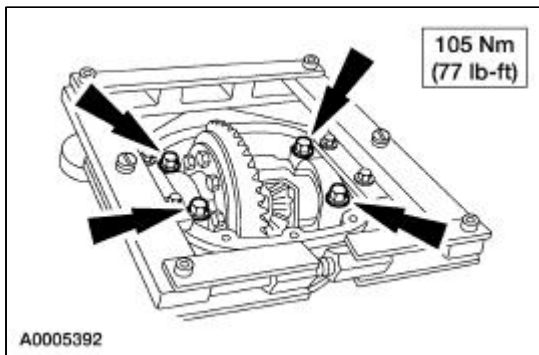


50. Install the differential case.
1. Position the differential bearing cups on the differential bearings.
 2. Lower the differential case in place between the differential bearing shims.

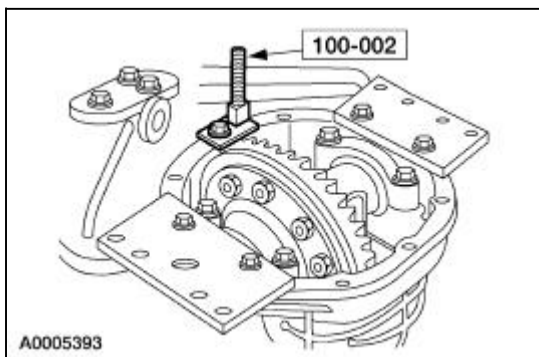


51. **NOTE:** Tighten the bearing cap bolts prior to releasing the housing spreader.

Install the bearing caps in their original positions and tighten the bolts to specification.



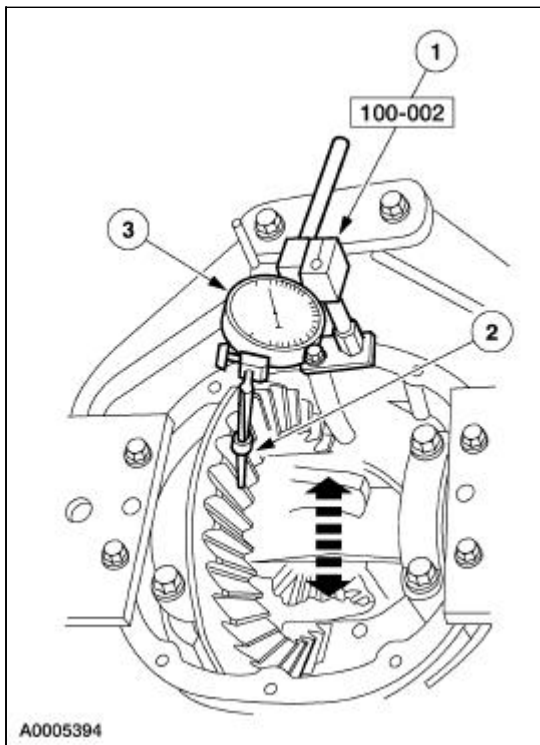
52. Remove the Differential Carrier Spreader and move the Dial Indicator Gauge to the 12 o'clock position.



53. **NOTE:** Measure the ring gear backlash at four places to obtain a consistent reading.

Measure the backlash.

1. Attach the special tool.
2. Position the indicator needle centrally on a drive tooth.
3. Zero the indicator.
 - Turn the ring gear without turning the pinion gear. Record the indicator reading.



54. If the backlash is not to specification, correct by increasing the thickness of one differential bearing shim and decreasing the thickness of the other differential bearing shim by the same amount. Refer to the following tables.

Differential Bearing Shim Selection Chart

8.0-inch Aluminum Axle	Example	Actual
Line A End play without ring gear	0.498	
Line B End play with ring gear (ring gear side)	-0.245	
Line C Subtract Line B from Line A, also record on Line C, below	0.253	

8.0-inch Aluminum Axle	Left Differential Bearing Height		Right Differential Bearing Height	
	Example	Actual	Example	Actual
Master bearing height	0.8695	0.8695	0.8695	0.8695
Line D Actual bearing height	-0.8478		-0.8491	
Line E Difference	0.0217		0.0204	

8.0-inch Aluminum Axle	Left Side		8.0-inch Aluminum Axle	Right Side	
	Example	Actual		Example	Actual
Line B End play Line E Bearing height	0.2450 +0.0217	+	Line C End play Line E Bearing height	0.2530 +0.0204	+
TOTAL Lines B and E Backlash (subtract)	0.2667 -0.0060	-0.006	TOTAL Lines C and E Backlash/preload (add)	0.2734 +0.020	+0.020
Initial thickness ^a	0.2607		Initial thickness	0.2934	

Final shim thickness — left	0.261		Final shim thickness — right	0.293	
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^a Round off initial thickness to the nearest shim thickness as in example for final shim thickness.

Backlash Change Required		Thickness Change Required	
mm	Inch	mm	Inch
0.025	0.001	0.050	0.002
0.050	0.002	0.050	0.002
0.076	0.003	0.101	0.004
0.101	0.004	0.152	0.006
0.127	0.005	0.152	0.006
0.152	0.006	0.203	0.008
0.177	0.007	0.254	0.010
0.203	0.008	0.254	0.010
0.228	0.009	0.304	0.012
0.254	0.010	0.355	0.014
0.279	0.011	0.355	0.014
0.304	0.012	0.406	0.016
0.330	0.013	0.457	0.018
0.355	0.014	0.457	0.018
0.381	0.015	0.508	0.020

Differential Shim Size Chart — 4067 —

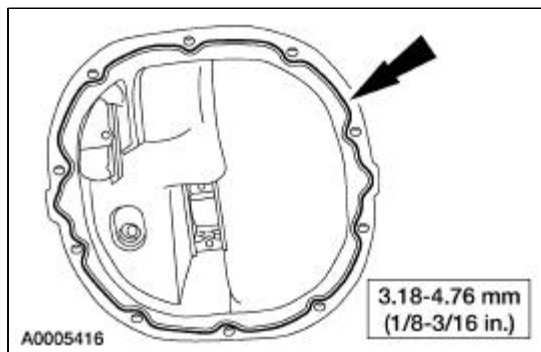
Numbers of Stripes and Color Code	Dimension A	
	mm	Inch
2—C-COAL	7.7978-7.8105	0.3070-0.3075
1—C-COAL	7.7470-7.7597	0.3050-0.3055
5—BLU	7.6962-7.7089	0.3030-0.3035
4—BLU	7.6454-7.6581	0.3010-0.3015
3—BLU	7.5946-7.6073	0.2990-0.2995
2—BLU	7.5458-7.5565	0.2970-0.2975
5—PINK	7.4422-7.4549	0.2930-0.2935
4—PINK	7.3914-7.4041	0.2910-0.2915
3—PINK	7.3406-7.3533	0.2890-0.2895
2—PINK	7.2898-7.3025	0.2870-0.2875
1—PINK	7.2390-7.2517	0.2850-0.2855
5—GRN	7.1882-7.2009	0.2830-0.2835
4—GRN	7.1374-7.1501	0.2810-0.2815
3—GRN	7.0866-7.0993	0.2790-0.2795
2—GRN	7.0358-7.0485	0.2770-0.2775
1—GRN	6.9850-6.9977	0.2750-0.2755

5—WH	6.9342-6.9469	0.2730-0.2735
4—WH	6.8834-6.8961	0.2710-0.2715
3—WH	6.8326-6.8453	0.2690-0.2695
2—WH	6.7818-6.7945	0.2670-0.2675
1—WH	6.7310-6.7437	0.2650-0.2655
5—YEL	6.6802-6.6929	0.2630-0.2635
4—YEL	6.6294-6.6421	0.2610-0.2615
3—YEL	6.5786-6.5913	0.2590-0.2595
2—YEL	6.5278-6.5405	0.2570-0.2575
1—YEL	6.4770-6.4897	0.2550-0.2555
5—ORNG	6.4262-6.4389	0.2530-0.2535
4—ORNG	6.3754-6.3881	0.2510-0.2515
3—ORNG	6.3246-6.3373	0.2490-0.2495
2—ORNG	6.2738-6.2865	0.2470-0.2475
1—ORNG	6.2223-6.2357	0.2450-0.2455
2—RED	6.1722-6.1849	0.2430-0.2435
1—RED	6.1214-6.1341	0.2410-0.2415

55.  **CAUTION: Make sure the machined surfaces on both the rear axle housing and the differential housing cover are clean and free of oil before installing the new silicone sealant. The inside of the rear axle (4001) must be covered when cleaning the machined surface to prevent contamination.**

If the backlash is within specification, install the differential housing cover.


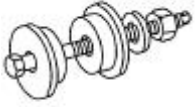


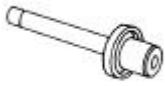


- Apply a new continuous bead of sealant to the differential housing cover. Use Silicone Rubber D6AZ-19562-AA or equivalent meeting Ford specifications ESB-M4G92-A.

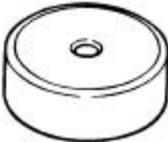

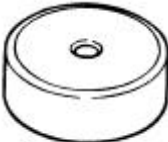

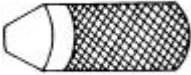
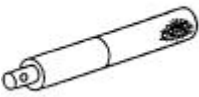

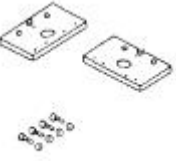



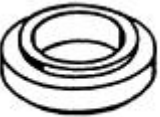

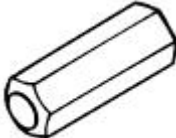



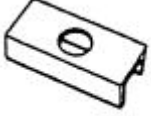
56. Install the rear axle. For additional information, refer to [Axle Housing](#) in this section.
57. Refill the rear axle (4001).
- Fill the rear axle 3-5 mm (1/8-3/16 inch) from the bottom of the filler hole with SAE 75W-140 High Performance Rear Axle Lubricant F1TZ-19580-B or equivalent meeting Ford specification WSL-M2C192-A.



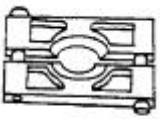
Axle —Nodular Iron

Special Tool(s)

 <p>ST2026-A</p>	<p>2-Jaw Puller 205-D072 (D97L-4221-A) or Equivalent</p>
 <p>ST1678-A</p>	<p>Installer, Drive Pinion Bearing Cup 205-054 (T71P-4616-A)</p>
 <p>ST1183-A</p>	<p>Dial Indicator Gauge 100-D005 (D78P-4201-G) or Equivalent</p>
 <p>ST1214-A</p>	<p>Dial Indicator Gauge with Holding Fixture 100-002 (TOOL-4201-C) or Equivalent</p>
 <p>ST1375-A</p>	<p>Installer, Differential Side Bearing Replacer 205-010 (T57L-4221-A2)</p>
 <p>ST2458-B</p>	<p>Holding Tool, Drive Pinion Flange 205-478</p>
 <p>ST2452-A</p>	<p>Remover, Output Flange 307-408</p>
	<p>Depth Gauge/Aligner, Depth Pinion</p>

 <p>ST1743-A</p>	<p>205-477</p>
 <p>ST1431-A</p>	<p>Adapter for 205-S127 205-110 (T76P-4020-A10)</p>
 <p>ST1743-A</p>	<p>Depth Gauge, Drive Pinion 205-476</p>
 <p>ST1434-A</p>	<p>Gauge Tube, Drive Pinion 205-336 (T93P-4020-A)</p>
 <p>ST1432-A</p>	<p>Adapter for 205-S127 205-111 (T76P-4020-A11)</p>
 <p>ST1326-A</p>	<p>Adapter for 303-224 (Handle) 205-153 (T80T-4000-W)</p>
 <p>ST1186-A</p>	<p>Holding Fixture, Transmission 307-003 (T57L-500-B)</p>
 <p>ST1344-A</p>	<p>Spreader, Differential Housing (Plate) 205-335 (T93P-4000-A)</p>
	<p>Installer, Drive Pinion Inner Bearing Cup 205-480</p>

 <p>ST1676-A</p>	
 <p>ST1367-A</p>	<p>Installer, Drive Pinion Bearing Cone 205-005 (T53T-4621-C)</p>
 <p>ST1734-A</p>	<p>Installer, Drive Pinion Flange 205-479</p>
 <p>ST1744-A</p>	<p>Protector, Drive Pinion Thread 205-460</p>
 <p>ST2320-A</p>	<p>Remover, Drive Pinion Inner Bearing Cup 205-481</p>
 <p>ST2320-A</p>	<p>Remover, Drive Pinion Outer Bearing Cup 205-482</p>
 <p>ST1429-A</p>	<p>Adapter for 205-S127 205-109 (T76P-4020-A9)</p>
 <p>ST1254-A</p>	<p>Plate, Bearing/Oil Seal 205-090 (T75L-1165-B)</p>
	<p>Installer, Differential Shim 205-220 (T85L-4067-AH) 15-098</p>

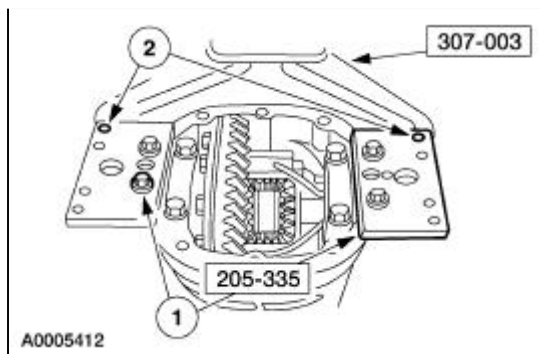
 <p>ST1485-A</p>	
 <p>ST1725-A</p>	<p>Step Plate 205-D061 (D83T-4205-C2) or Equivalent</p>
 <p>ST1310-A</p>	<p>Remover, Bearing 205-055 (T71P-4621-B)</p>

Disassembly

1. Remove the differential housing cover.
2. **NOTE:** The Differential Housing (Plate) Spreader is used here to give the rear axle housing stability. Do not spread the rear axle housing.

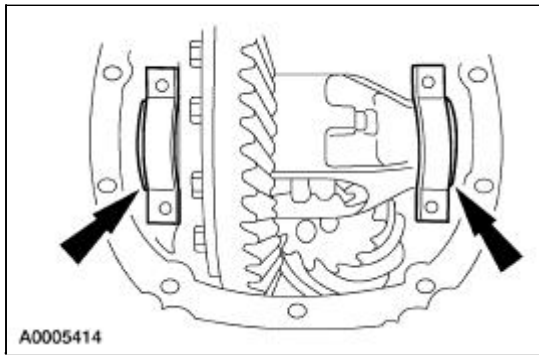
Mount the rear axle housing on the Transmission Holding Fixture.

1. Attach the Differential Housing (Plate) Spreader to the rear axle housing with four cover bolts.
2. Attach the Differential Housing (Plate) Spreader to the Transmission Holding Fixture with two 3/8 inch x 1-1/2 inch bolts.

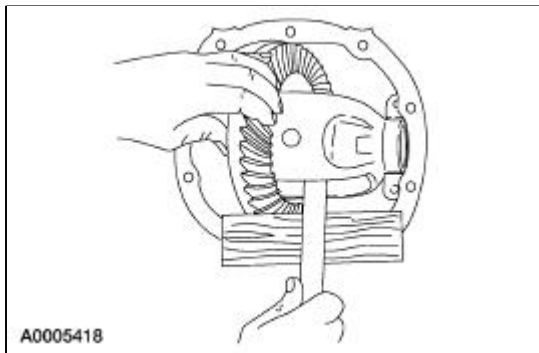


3. **NOTE:** Mark the position of the bearing caps as arrows may not be visible. The bearing caps must be installed in their identical locations and positions.

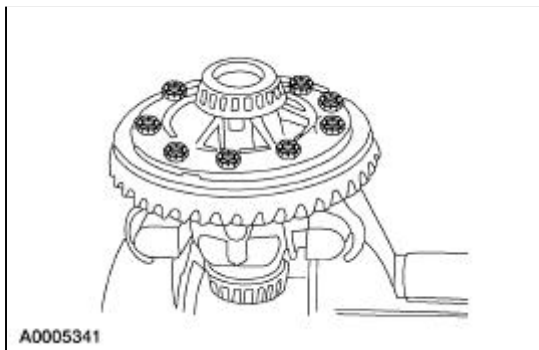
Remove the differential bearing caps.



4. Remove the differential case (4204).

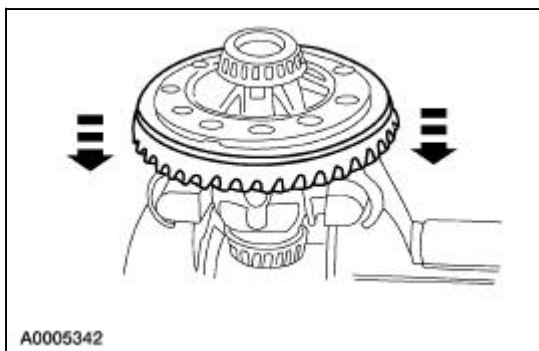


5. Remove the 10 ring gear bolts.



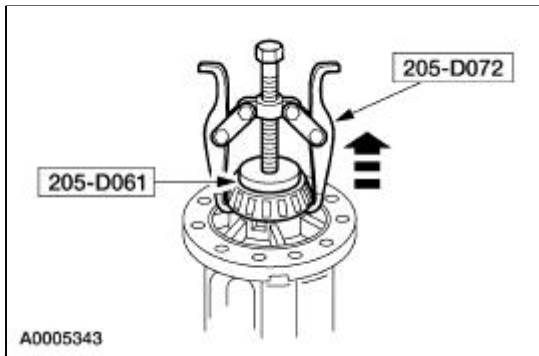
6.  **CAUTION:** Care should be taken not to damage the bolt hole threads.

Insert a punch in the bolt holes and drive the ring gear off.

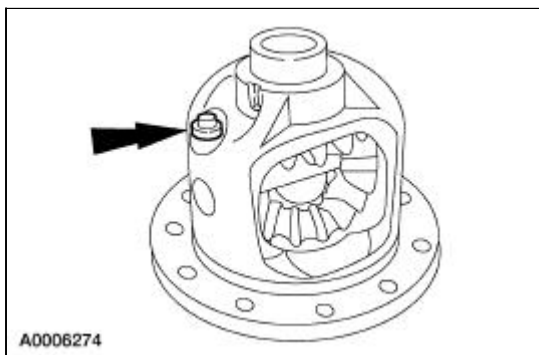


7. Using the special tools, remove the differential bearing (4221).

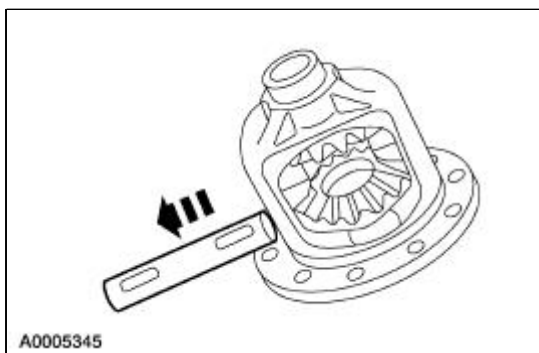
- Repeat for the other side.



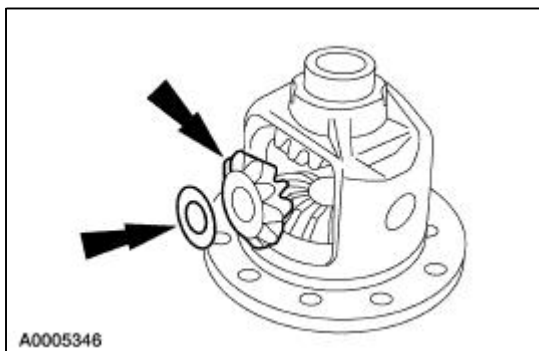
8. Remove the differential pinion shaft lock bolt.



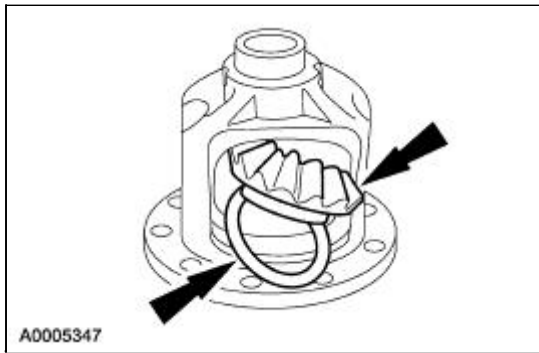
9. Remove the differential pinion shaft.



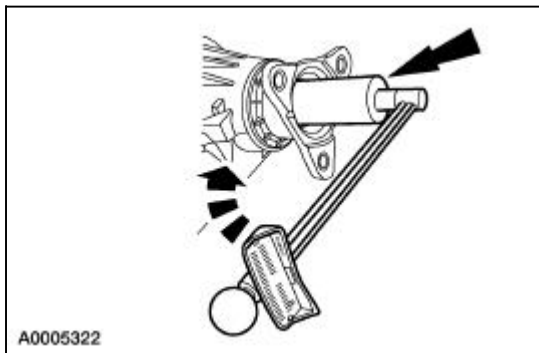
10. Remove the differential gears.



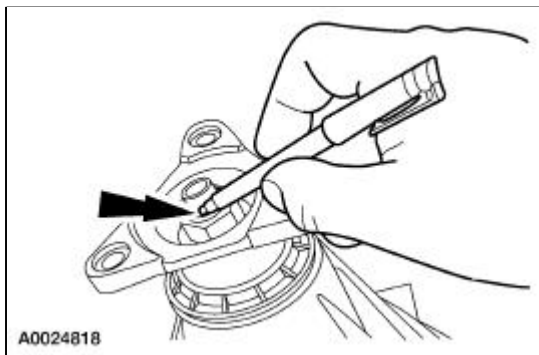
11. Remove the differential side gears.



12. Install a Nm (inch/pound) torque wrench on the pinion nut and record the torque necessary to maintain rotation of the drive pinion gear (4209) through several revolutions.



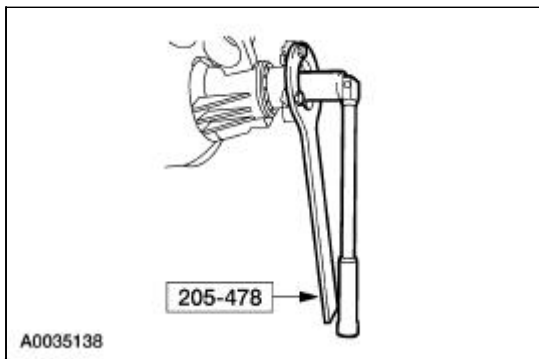
13. Mark the pinion flange in relation to the drive pinion stem to make sure of correct alignment during installation.



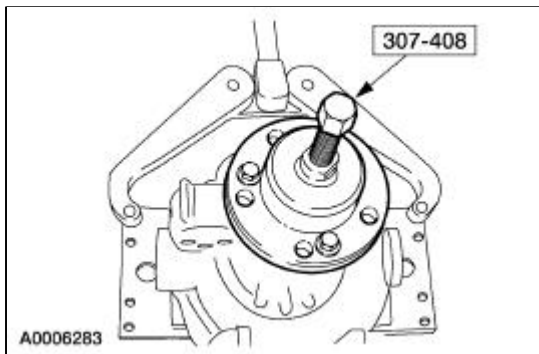
14.  **CAUTION: After removing the pinion nut, discard it. Use a new nut for installation.**

Remove the pinion nut.

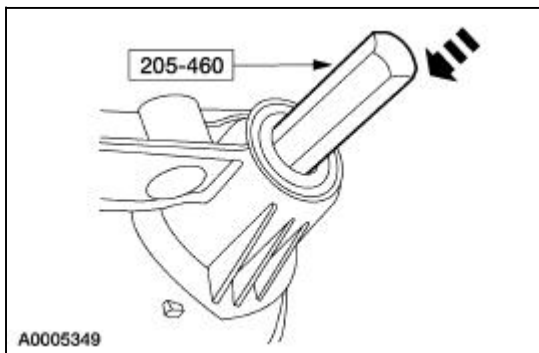
- Install the special tool.
- Install a suitable breaker bar and remove the nut.



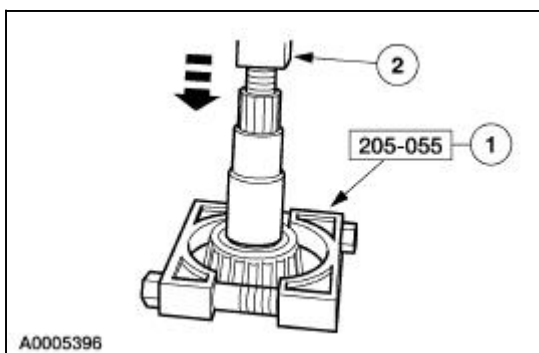
15. Using the special tool, remove the pinion flange.



16. Install the special tool and, with a soft-faced hammer, drive the pinion out of the front bearing cone and remove it through the rear of the housing.
- Remove the rear axle drive pinion shaft oil slinger (4670), the rear axle drive pinion seal (4676) and the collapsible spacer.

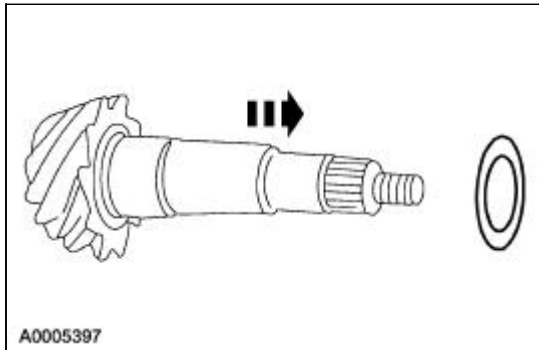


17. Remove the front pinion bearing.
1. Position the special tool under the pinion bearing.
 2. Using a press, remove the pinion bearing.

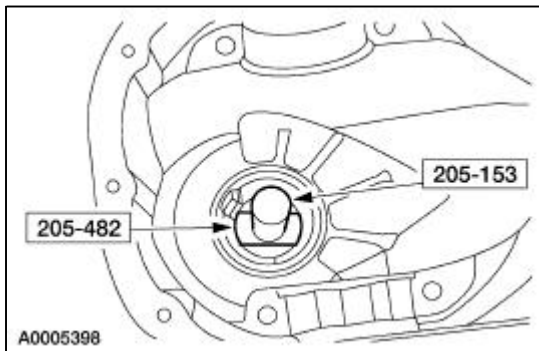


18. **NOTE:** Measure the drive pinion bearing adjustment shim (4663), which is found under the differential pinion bearing, with a micrometer and record the thickness (use this as a reference to compare the shim gauge reading prior to installing the differential pinion bearing).

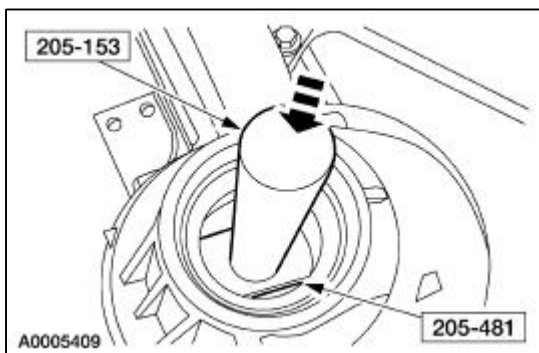
Remove the drive pinion bearing adjustment shim.



19. Remove damaged rear axle pinion bearing cup (4616) from the rear axle housing using the special tools.



20. Remove damaged rear axle pinion bearing cup (4628) from the rear axle housing using the special tools.

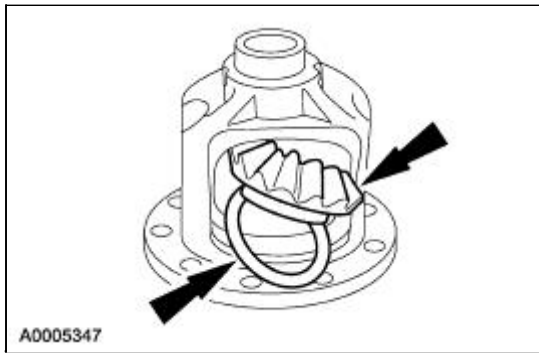


Assembly

All vehicles

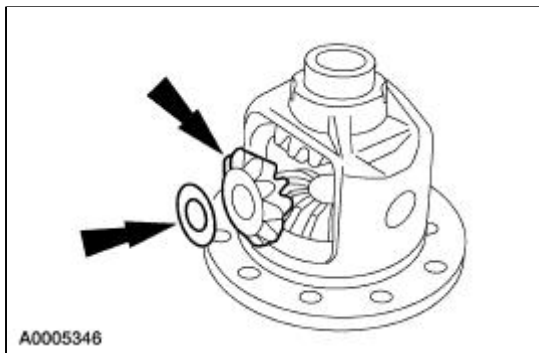
1.  **CAUTION:** Lubricate the differential side gear thrust washers with Premium Long-Life Grease XG-1-C or equivalent meeting Ford specification ESA-M1C75-B prior to installation.

Install the differential side gears in the differential case.



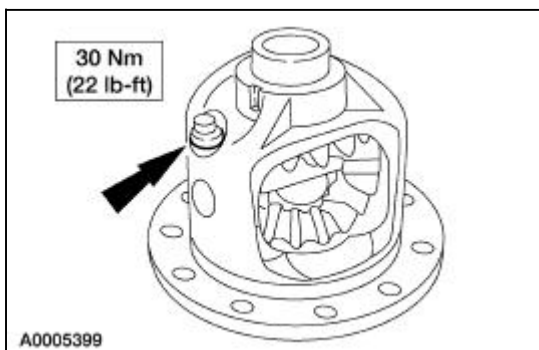
2.  **CAUTION:** Lubricate the differential pinion thrust washers with Premium Long-Life Grease XG-1-C or equivalent meeting Ford specification ESA-M1C75-B prior to installation.

Install the differential pinion gears with the differential pinion thrust washers in the differential case.

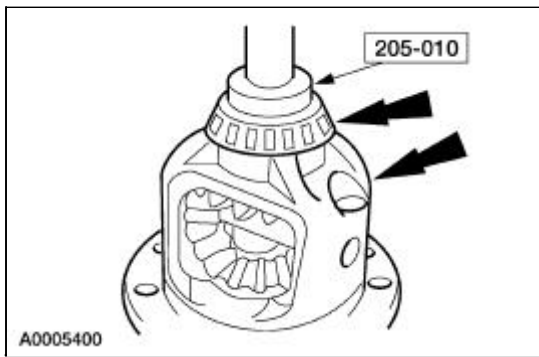


3. **NOTE:** If a new pinion shaft lock bolt is unavailable, coat the threads with Threadlock® and Sealer E0AZ-19554-AA or equivalent meeting Ford specifications WSK-M2G351-A5 prior to installation.

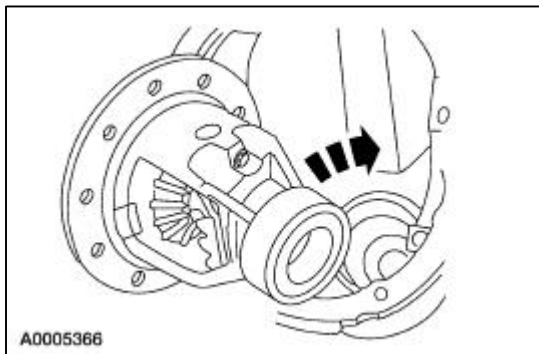
Install the differential pinion shaft and install a new differential pinion shaft lock bolt.



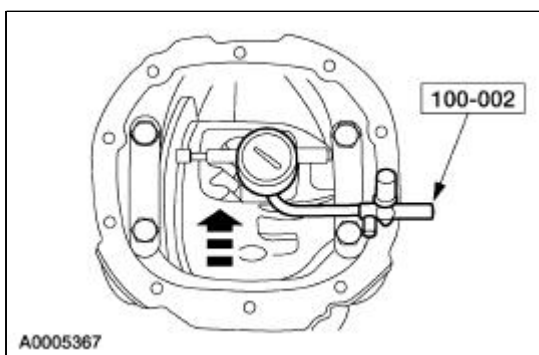
4. Use the special tool to install the differential bearing on the differential case. Repeat for the other side.



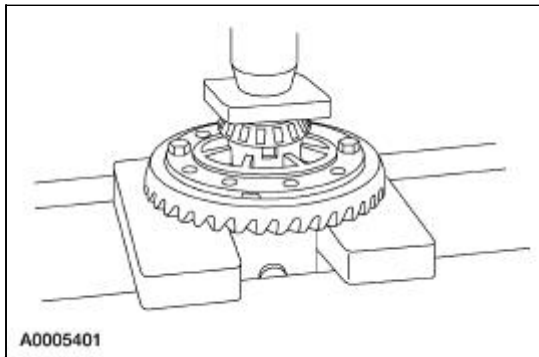
5. Install the differential case without the ring gear.
 - Rotate the differential case to correctly seat the differential bearings.



6. Check the differential case flange runout using the special tool.
 - If the runout is within specification, install a new ring gear and pinion. If the runout exceeds specification, the ring gear is true and the concern is due to either a damaged differential case or differential bearings.
 - Inspect the differential bearings. If the differential bearings are not damaged, install a new differential case and the differential bearings.
 - Recheck the runout with the new differential case and differential bearings.

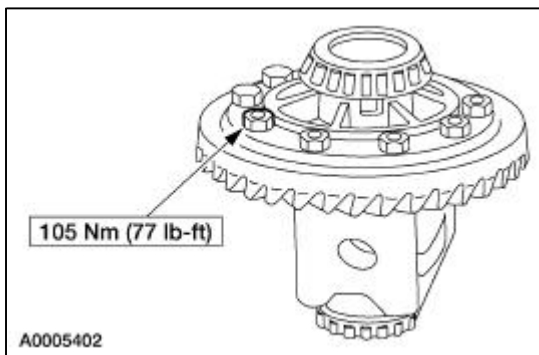


7. Remove the differential case.
8. Press the ring gear on the differential case.
 - Start two of the ring gear bolts through the differential case and into the ring gear to make sure the ring gear bolt holes align with the differential case bolt holes correctly.



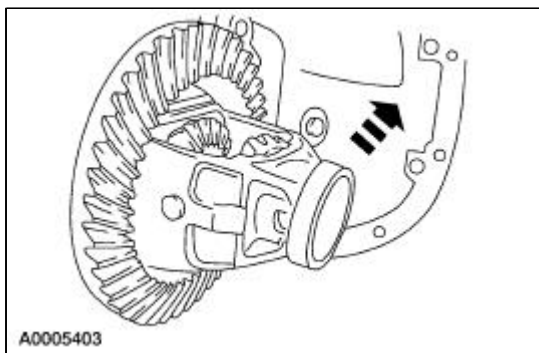
9. Install the ring gear bolts.

- Apply Stud and Bearing Mount E0AZ-19554-BA or equivalent meeting Ford specification WSK-M2G349-A1 to the ring gear bolts.

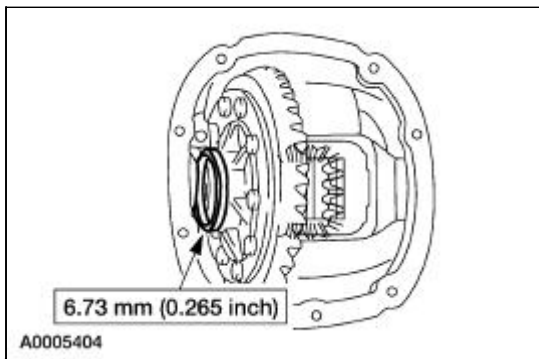


10. **NOTE:** If the ring gear runout check (carried out before disassembly) exceeds specification, the cause may be a warped ring gear, a damaged differential case or loss of differential bearing preload.

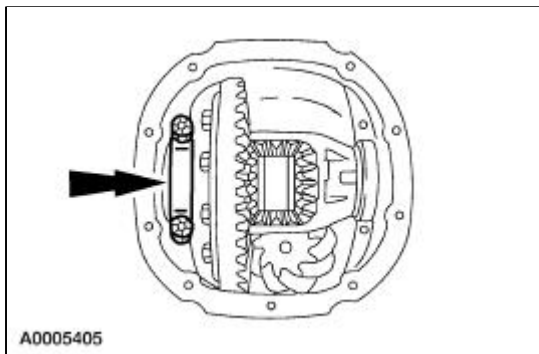
With the pinion removed, place the differential case/gear subassembly with the differential bearing and the rear axle pinion bearing cups in the rear axle housing.



11. Install a differential bearing shim of the thickness shown on the LH side of the differential case.

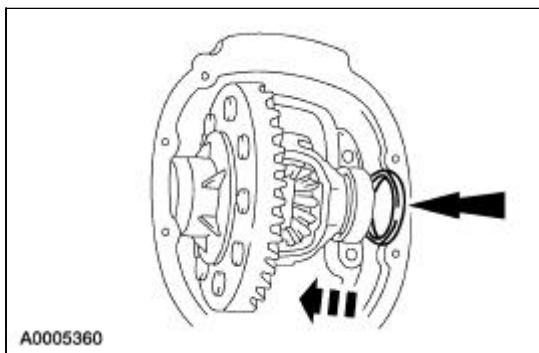


12. Install the LH bearing cap finger-tight.

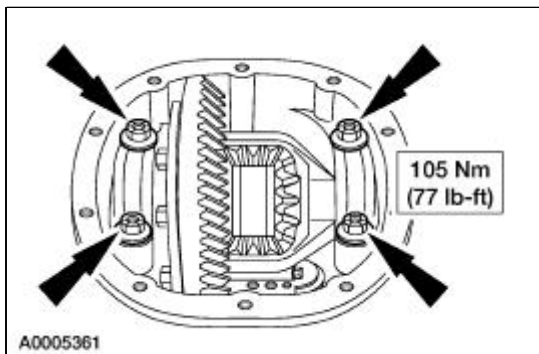


13. **NOTE:** Apply pressure toward the left side to fully seat the differential bearing cup (4222).

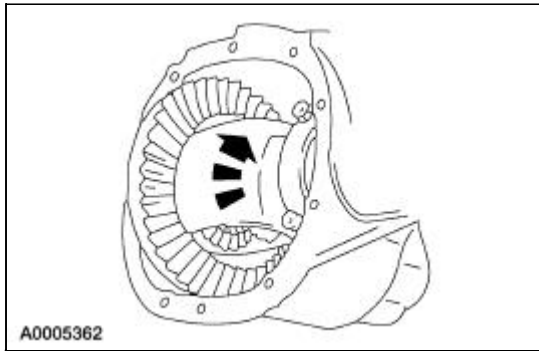
Install progressively larger differential bearing shims on the RH side until the largest differential bearing shim selected can be assembled with a slight drag feel.



14. Install the RH bearing cap.
- Tighten both bearing caps to specification.



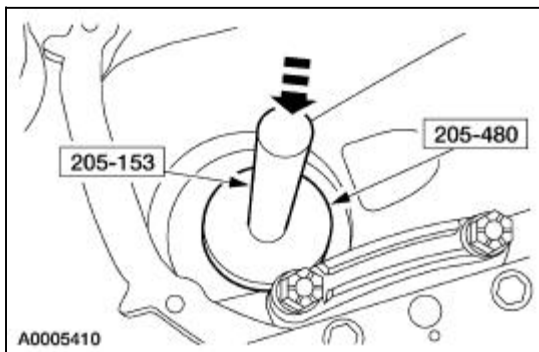
15. Rotate the differential assembly to make sure it rotates freely.



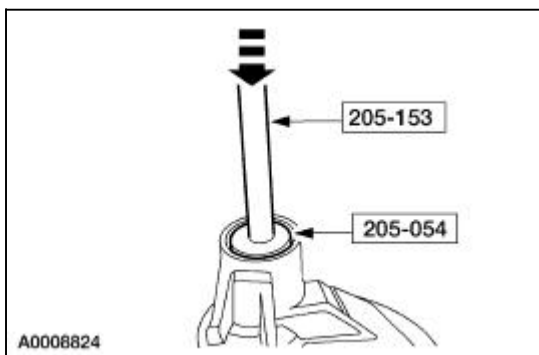
16. Remove the differential case.

Pinion bearing cup installation with special tool 205-153, 205-480, and 205-054

17. Install a new inner rear axle pinion bearing cup in the rear axle housing.



18. Install a new outer rear axle pinion bearing cup in the rear axle housing.

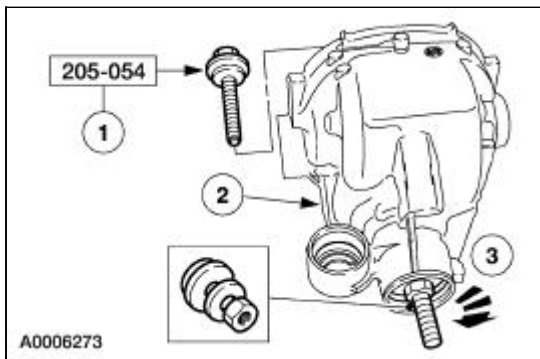


Pinion bearing cup installation with special tool 205-054

19. **NOTE:** Coat the new rear axle pinion bearing cup with SAE 5W-30 Super Premium Motor Oil XO-5W30-QSP or equivalent meeting Ford specification WSS-M2C153-G.

Install the pinion bearing cup.

1. Position the rear axle pinion bearing cup on the special tool.
2. Position the bearing cup replacer in the rear axle housing.
3. Tighten the special tool to fully seat the rear axle pinion bearing cup in the bore.

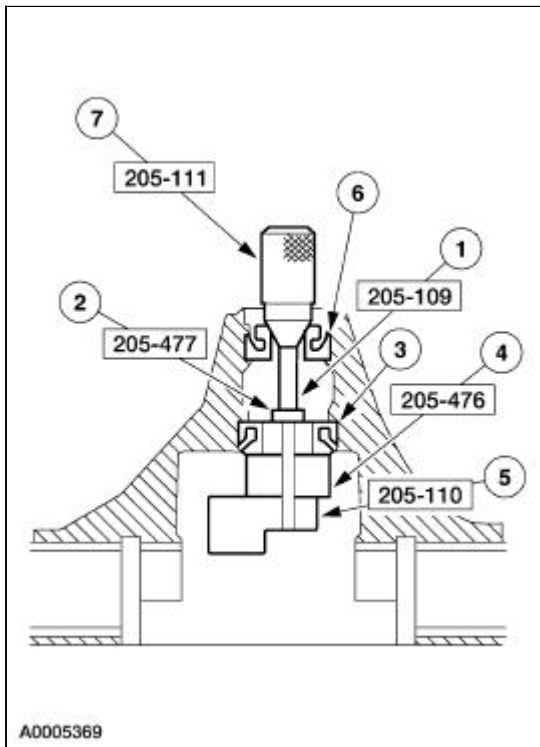


All vehicles

20. **NOTE:** A drive pinion bearing adjustment shim is used between the pinion bearing and the pinion head. The drive pinion bearing adjustment shim compensates for machining variations in the differential pinion and the pinion bearings. The correct drive pinion bearing adjustment shim size will locate the pinion for correct tooth contact with the ring gear. Selecting the correct drive pinion bearing adjustment shim can be done using a pinion depth gauge set.

NOTE: Apply a light film of SAE 75W-140 High Performance Rear Axle Lubricant F1TZ-19580-B or equivalent meeting Ford specification WSL-M2C192-A on the front differential pinion bearing and the rear differential pinion bearing assemblies.

Install the special tools.

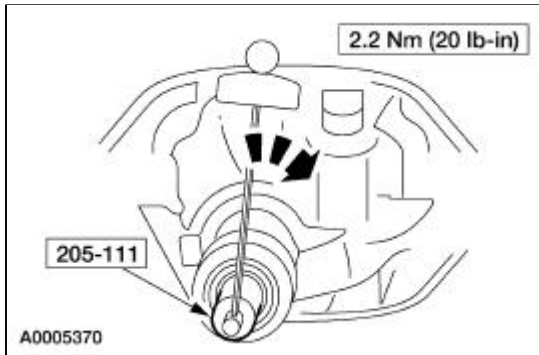


Item	Part Number	Description
1	205-109	Adapter for 205-S127 (T76P-4020-A9)
2	205-477	Gauge aligner, depth pinion
3	4630	Rear (inner) pinion bearing
4	205-476	Gauge disc, drive pinion
5	205-110	Gauge block (1.7 inch thick) (T76P-4020-A10)

6	4621	Front (outer) pinion bearing
7	205-111	Adapter for 205-S127 (T76P-4020-A11)

21. **NOTE:** This step duplicates pinion bearing preload.

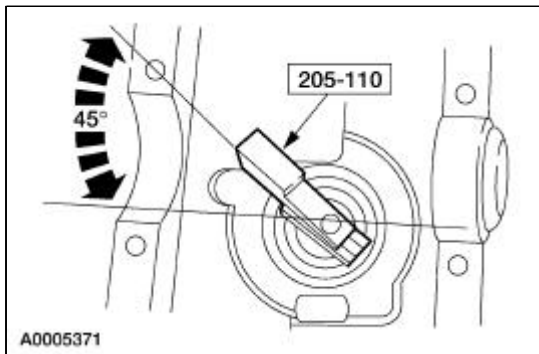
Thread the Handle onto the Screw and tighten to the specification shown.



22. **NOTE:** The special tool must be offset to obtain an accurate reading.

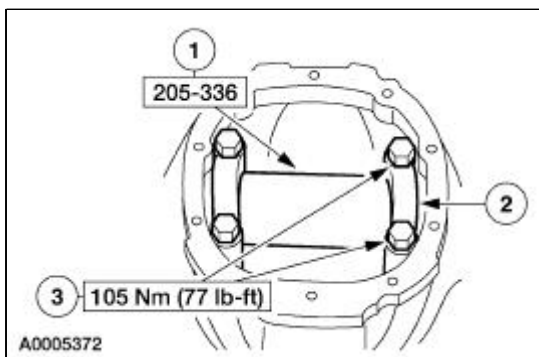
NOTE: Rotate the special tool several half turns to correctly seat the pinion bearings.

Position the special tool 45 degrees as shown.



23. Install the special tool.

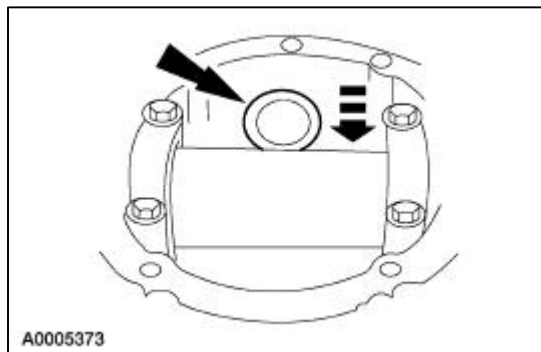
1. Position the special tool on the differential bearing seat of the rear axle housing.
2. Install the differential bearing caps.
3. Install the differential bearing cap bolts and tighten to specification.



24. **NOTE:** A slight drag should be felt for the correct shim selection.

NOTE: Use a shim to determine shim thickness.

Select and check the correct shim size.

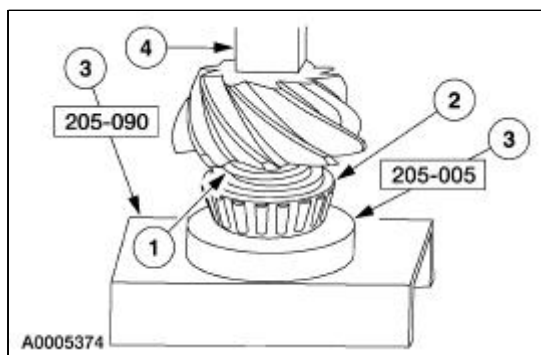


25. Remove the special tool.

26. **NOTE:** The same pinion bearings and drive pinion bearing adjustment shim used in the drive pinion shim selection procedure must be used in the final axle assembly.

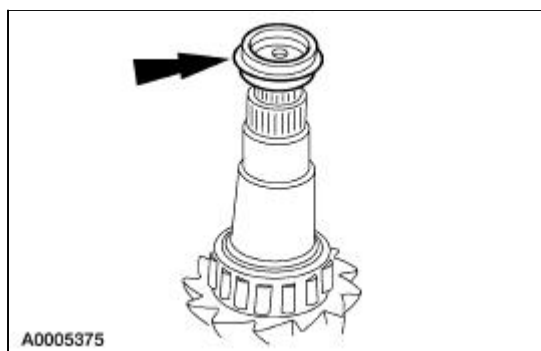
Install the inner pinion bearing.

1. Position the drive pinion bearing adjustment shim on the pinion stem.
2. Position the pinion bearing on the pinion stem.
3. Position the special tool on the pinion stem.
4. Using a press, firmly seat the drive pinion bearing adjustment shim and pinion bearing on the pinion stem.

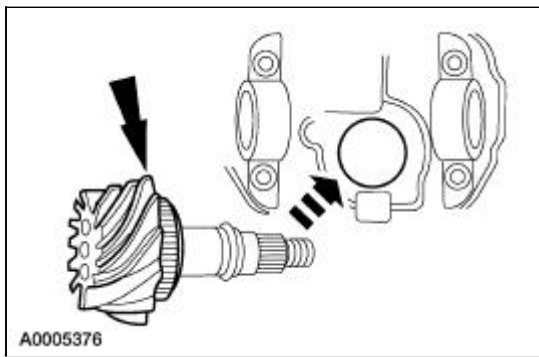


27. **NOTE:** Make sure the splines on the pinion stem are free of burrs. If burrs are evident, remove using a fine crocus cloth, working a rotational motion.

Place a new drive pinion collapsible spacer on the pinion stem against the pinion stem shoulder.



28. Install the drive pinion and drive pinion collapsible spacer into the rear axle housing.

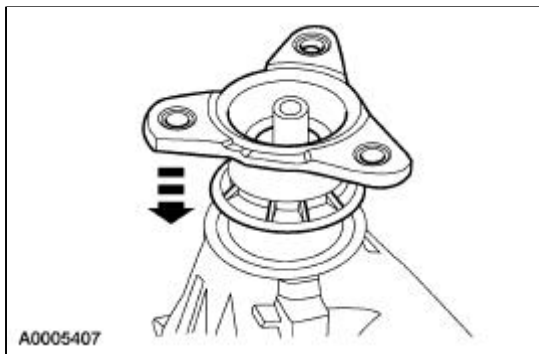


29. Install the outer pinion bearing, the rear axle drive pinion shaft oil slinger and the rear axle drive pinion seal.
30. **NOTE:** Lubricate the rear axle pinion flange splines. Use SAE 75W-140 High Performance Rear Axle Lubricant F1TZ-19580-B or equivalent meeting Ford specification WSL-M2C192-A.

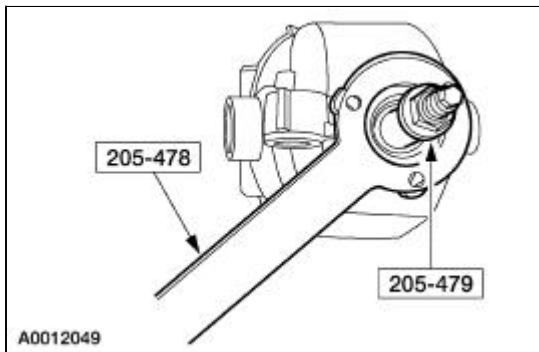
Install the rear axle pinion flange.

- **NOTE:** Disregard the scribe marks if a new rear axle pinion flange is being installed.

Align the rear axle pinion flange with the drive pinion shaft.



31. With the drive pinion in place in the rear axle housing, install the rear axle pinion flange using the special tools.



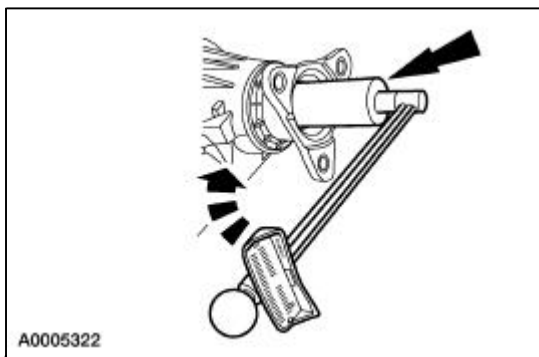
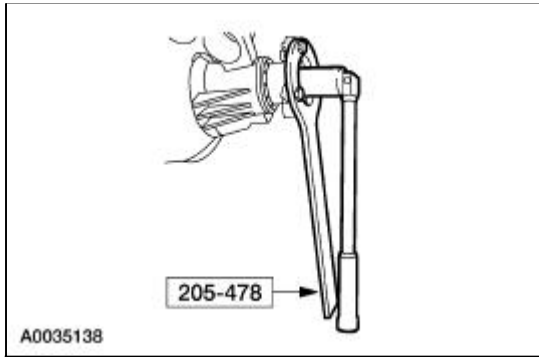
32. **CAUTION:** Do not under any circumstance loosen the pinion nut to reduce preload. If it is necessary to reduce preload, install a new collapsible spacer (4662) and pinion nut.

Use the special tool to hold the pinion flange while tightening the pinion nut.

- Rotate the pinion occasionally to make sure the differential pinion bearings (4630) (4621) seat correctly. Take frequent differential pinion bearing torque preload readings by

rotating the pinion with a Nm (inch/pound) torque wrench.

- Refer to the torque specification for new pinion bearings in the Specifications portion of this section.

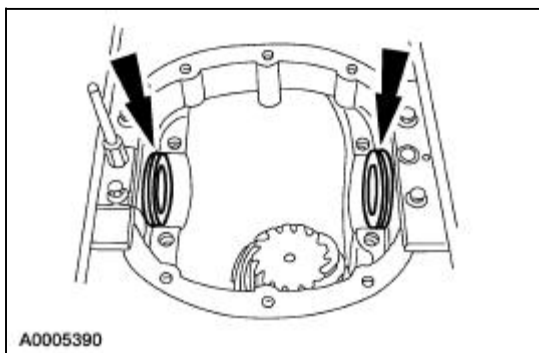


33. **NOTE:** Apply a light coating of Premium Long-Life Grease XG-1-C or equivalent meeting Ford specification ESA-M1C75-B to the differential bearing shim to help hold in place.

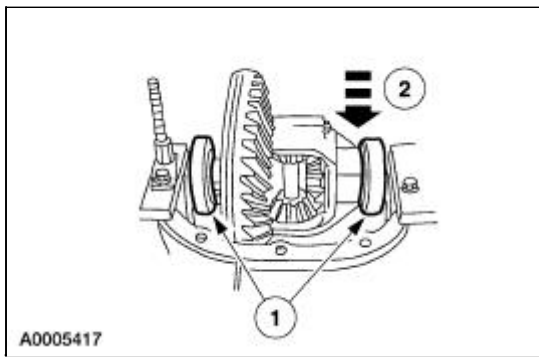
NOTE: Select the correct size differential bearing shims by using the differential bearing shim selection chart.

Install the differential bearing shims.

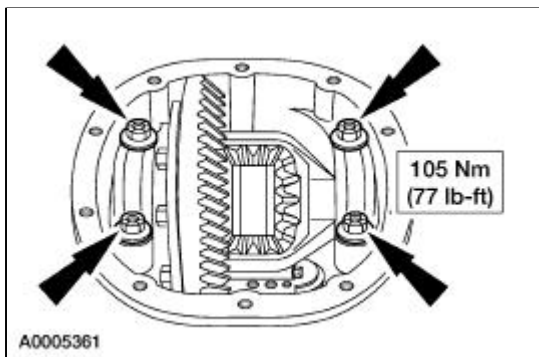
- Place the differential bearing shims in the rear axle housing.



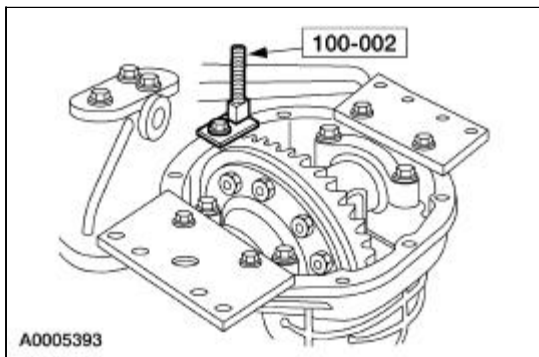
34. Install the differential case.
1. Position the differential bearing cups on the differential bearings.
 2. Lower the differential case in place between the differential bearing shims.



35. Install the bearing caps in their original positions and tighten the bolts to specification.



36. Move the Dial Indicator Gauge to the 12 o'clock position.



Measuring for backlash

37. **NOTE:** Measure the ring gear backlash at four places to obtain a consistent reading.

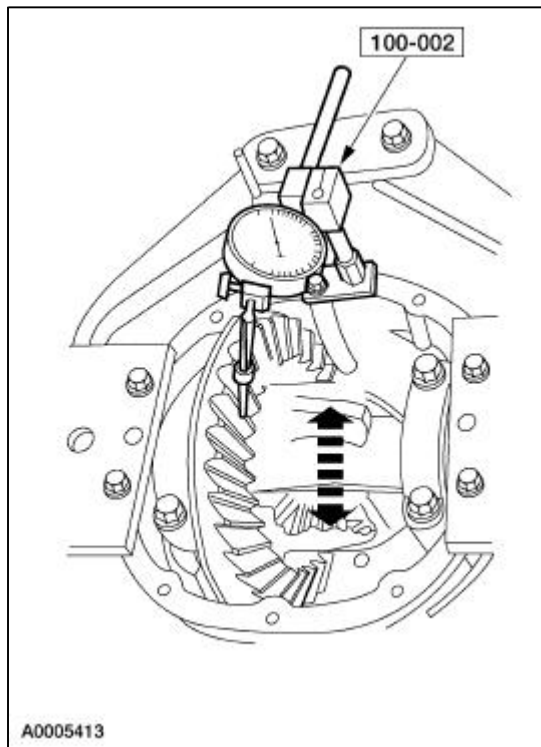
NOTE: Turn the ring gear without turning the pinion gear.

Measure the backlash.

- If the backlash is within specification, refer to Backlash within specification in this procedure.
- If a zero backlash condition occurs, refer to Zero backlash in this procedure.
- If the backlash is not within specification, refer to Backlash not within specification in this procedure.

Backlash Change Required		Thickness Change Required	
mm	Inch	mm	Inch
0.025	0.001	0.050	0.002

0.050	0.002	0.050	0.002
0.076	0.003	0.101	0.004
0.101	0.004	0.152	0.006
0.127	0.005	0.152	0.006
0.152	0.006	0.203	0.008
0.177	0.007	0.254	0.010
0.203	0.008	0.254	0.010
0.228	0.009	0.304	0.012
0.254	0.010	0.355	0.014
0.279	0.011	0.355	0.014
0.304	0.012	0.406	0.016
0.330	0.013	0.457	0.018
0.355	0.014	0.457	0.018
0.381	0.015	0.508	0.020

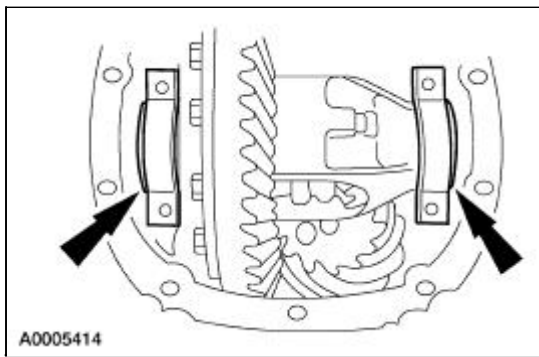


Zero backlash

38. If a zero backlash condition occurs, add 0.51 mm (0.02 in) to the RH side and subtract 0.51 mm (0.02 in) from the LH side to allow backlash indication.
- Check the backlash. Repeat Measuring ring gear backlash in this procedure.

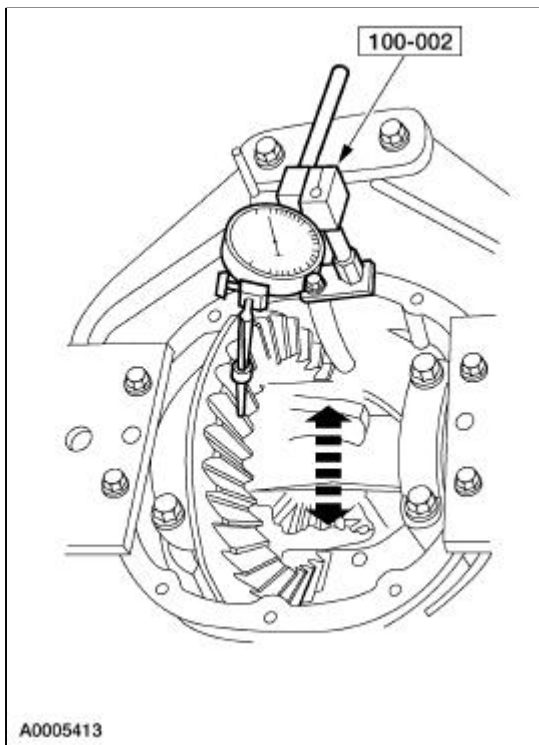
Backlash not within specification

39. To increase or decrease the backlash, remove the bearing caps and install a thicker shim or a thinner shim as shown.
- If the backlash is not within specification, correct by increasing the thickness of one differential bearing shim and decreasing the thickness of the other differential bearing shim by the same amount.



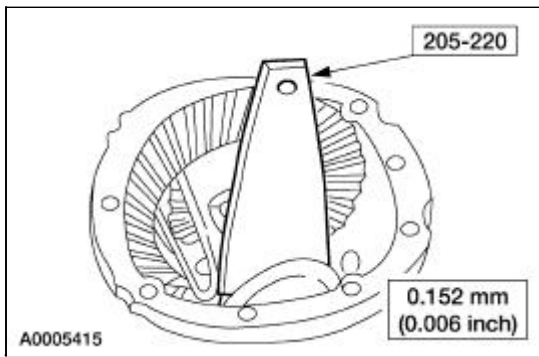
40. Rotate the differential several times to make sure the differential bearings are correctly seated.
 - Do not turn the pinion flange in order to rotate the differential.

41. Use the special tool to recheck the backlash
 - If the backlash is within specification, refer to Backlash within specification in this procedure. If the backlash is not within specification, repeat Measuring ring gear backlash in this procedure.

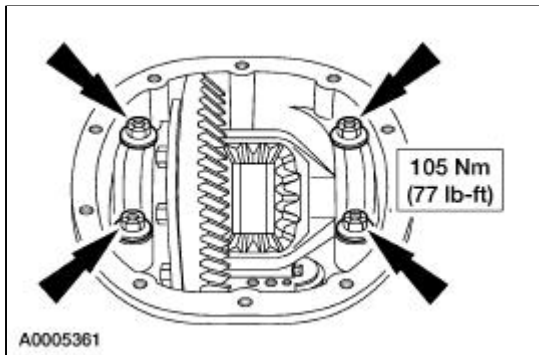


Backlash within specification

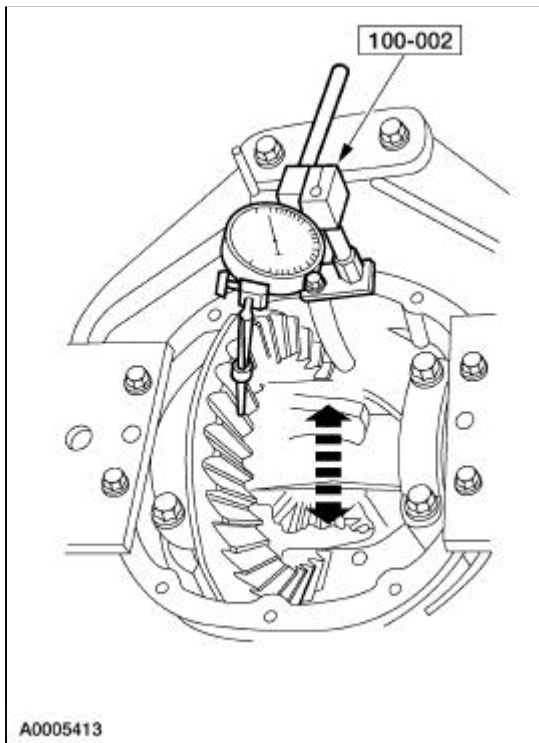
42. Remove the bearing caps and bolts.
 - To establish differential bearing preload, use the special tool to increase both left and right shim sizes by the specification shown.
 - Use the special tool to make sure that the differential bearing shims are fully seated and the assembly turns freely.




43. Install the bearing caps and bolts and tighten them to specification.



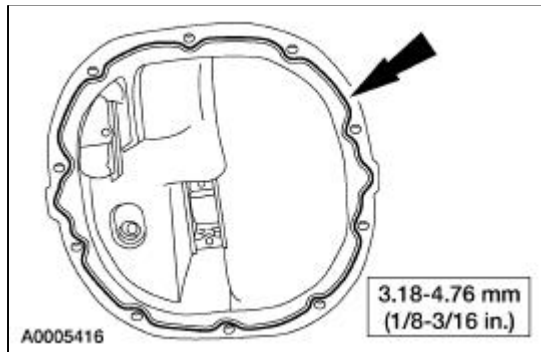
44. Use the special tool to recheck the backlash.
- For further adjustments, refer to [Section 205-00](#).



45.  **CAUTION:** Make sure the machined surfaces on both the rear axle housing and the differential housing cover are clean and free of oil before installing the new silicone sealant. The inside of the rear axle (4001) must be covered when cleaning the machined surface to prevent contamination.

Install the differential housing cover.

- Apply a new continuous bead of sealant to the differential housing cover. Use Silicone Rubber D6AZ-19562-AA or equivalent meeting Ford specifications ESB-M4G92-A.



46. Install the rear axle. For additional information, refer to [Axle Housing](#) in this section.

47. Refill the rear axle (4001).

- Fill the rear axle 3-5 mm (1/8-3/16 inch) from the bottom of the filler hole with SAE 75W-140 High Performance Rear Axle Lubricant F1TZ-19580-B or equivalent meeting Ford specification WSL-M2C192-A.
-

Torque Specifications

Description	Nm	lb-ft
Rear axle wheel hub retainer	300	221

Rear Drive Halfshafts



CAUTION: An inspection of the outer and inner boots is necessary so that if damage or grease leakage is evident, installation of a new halfshaft can take place immediately. Continued operation with damage or grease leakage will result in CV joint wear and noise due to contamination and loss of the CV joint grease.



CAUTION: Vehicles with V8 engines use a larger diameter halfshaft than vehicles with V6 engines. Do not install the smaller diameter halfshafts designed for vehicles with V6 engines on vehicles with V8 engines or vice-versa.

- The RH and LH halfshafts are different lengths, with the RH halfshaft being the longer of the two.
- Inboard and outboard CV joints connect to a splined shaft. A circlip stopper holds the cross groove inboard race assembly (inboard CV joint) together.
- An axle circlip (4B422) retains the splined inboard CV joint to the differential side gear. Install a new axle circlip every time you remove the halfshaft from the vehicle.
- A rear axle wheel hub retainer secures the side shaft assembly (interconnecting shaft and outboard CV joint) to the rear hub. Install a new rear axle wheel hub retainer every time you remove the halfshaft from the vehicle.

Halfshaft Handling



CAUTION: Never pick up or hold the halfshaft only by the inboard or outboard CV joint.

Handle all halfshaft components carefully during removal and installation procedures.

- The halfshaft assemblies are not repairable. Install a new assembly if worn/damaged.
- To separate the halfshaft from the rear hub, press the outboard CV joint from the rear hub.
- To separate the halfshaft from the differential, apply a load to the back face of the inboard CV joint assembly to overcome the axle circlip.
- Do not over-angle the CV joints.
- Damage will occur to an assembled inboard CV joint if it is over-plunged outward from the joint housing.
- Never use a hammer to remove or install the halfshafts.
- Never use the halfshaft assembly as a lever to position other components. Always support the free end of the halfshaft.
- Do not allow the boots to contact sharp edges or hot exhaust components.
- Handle the halfshaft only by the interconnecting shaft to avoid pull-apart and potential damage to the CV joints.
- Do not drop assembled halfshafts. The impact will cut the boots from the inside without evidence of external damage.

Wheel and Tire Balancing, Rear



WARNING: Do not balance the rear wheels and tires while mounted on the vehicle. Possible tire disintegration, differential or halfshaft failure can result, causing personal injury or extensive component damage. Use an off-vehicle wheel and tire balancer only.

Hoisting



CAUTION: Use a frame-contact hoist only. Vehicle or component damage can result if other types of hoists are used.

Never raise the vehicle using the halfshafts as lift points.

Undercoating and Rustproofing

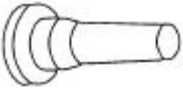


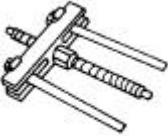


During undercoating and rustproofing procedures, protect the boots from the coating materials. Foreign materials on the rubber boots will cause extreme advanced wear.

Rear Drive Halfshafts


Refer to [Section 205-00](#) .

Halfshaft

Special Tool(s)

 ST1712-A	Differential Plug 205-294 (T89P-4850-B)
 ST2258-A	Differential Seal Protector 205-461
 ST2309-A	Halfshaft Removal Tool 205-475
 ST1516-A	Hub Remover/Replacer 204-069 (T81P-1104-C)
 ST1517-A	Metric Hub Remover Adapter 205-237 (T86P-1104-A1)
 ST1518-A	Metric Hub Remover Adapters 204-085 (T83P-1104-BH)

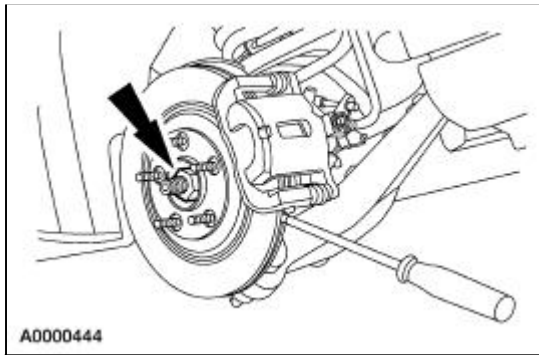
Removal

-  **CAUTION:** Do not begin this procedure unless:
 - a new rear axle wheel hub retainer is available.
 - a new axle circlip (4B422) is available.
 - you have read Halfshaft Handling in this section.

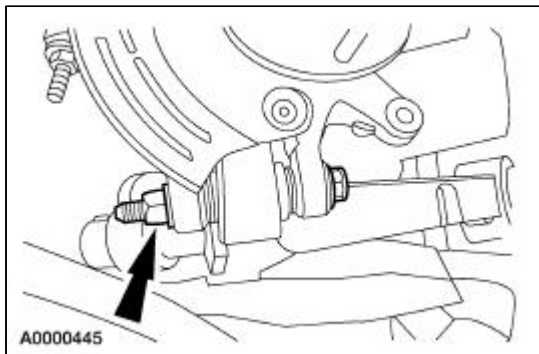
NOTE: This procedure applies to both the LH and RH halfshafts.

Raise and support the vehicle. For additional information, refer to [Section 100-02](#).

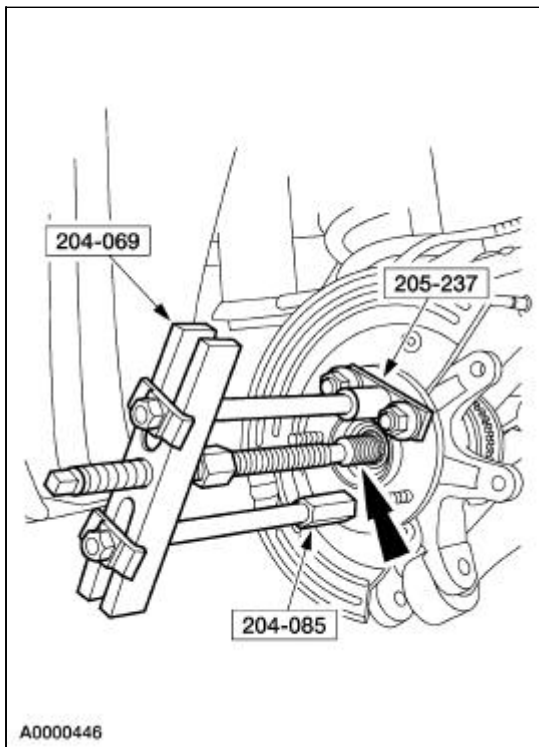
2. Remove the rear wheel and tire assembly. For additional information, refer to [Section 204-04](#).
3. Remove and discard the rear axle wheel hub retainer.



4. Remove the rear brake anti-lock sensor. For additional information, refer to [Section 206-09A](#).
5. Remove the brake disc. For additional information, refer to [Section 206-04](#).
6. Remove the nut and bolt.

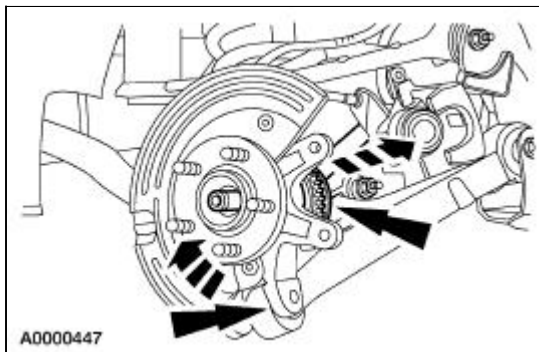


7. Using the special tools, press the outboard CV joint until it is loose in the hub.

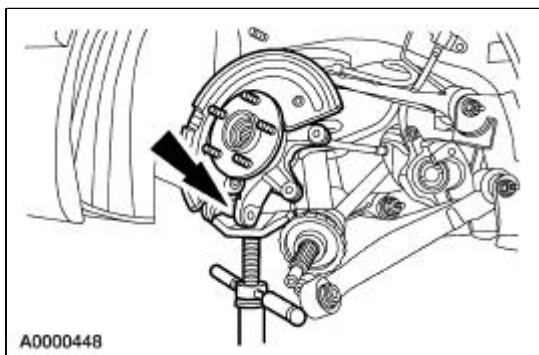



8.  **CAUTION: Do not over-angulate the outboard CV joint or damage the boot.**

While raising the knuckle, remove the CV joint from the hub.

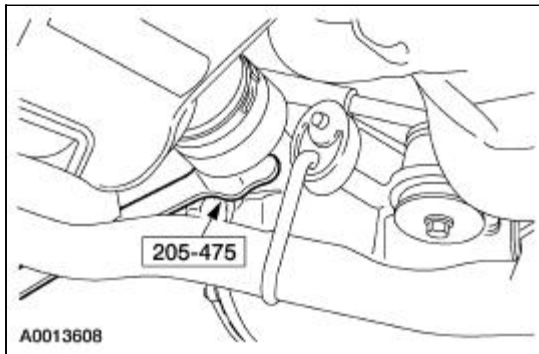


9. Position the knuckle to gain clear access for the halfshaft removal.



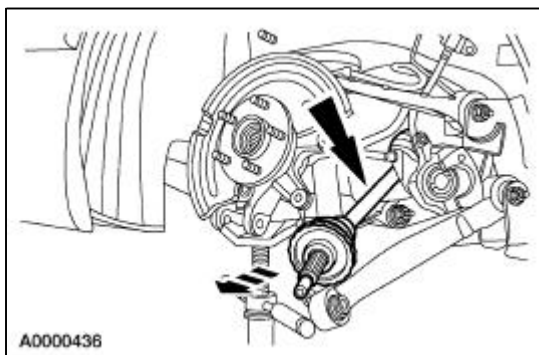
10.  **CAUTION: The crown of the tool forks must face away from the axle housing. Position the special tool correctly between the CV joint and the axle housing so as not to damage the differential seal.**

Using the special tool, exert enough pressure to overcome the axle circlip (4B422) and separate the CV joint from the differential side gear.

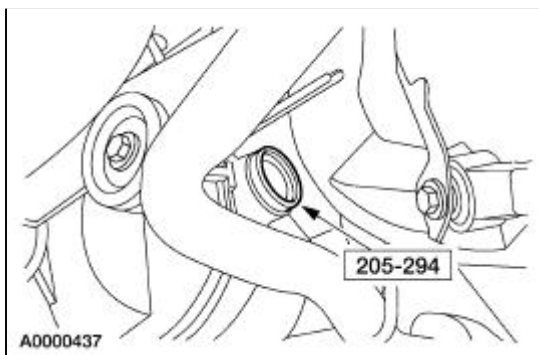


11.  **CAUTION: Do not damage the differential seal.**


Carefully remove the halfshaft with both hands.



12. Install the special tool.

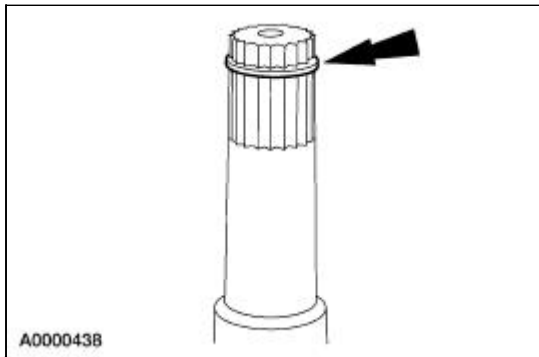


Installation

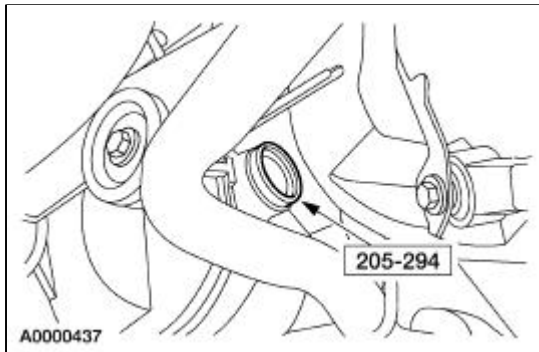
1.  **CAUTION: Vehicles with V8 engines use a larger diameter halfshaft than vehicles with V6 engines. Do not install the smaller diameter halfshafts designed for vehicles with V6 engines on vehicles with V8 engines or vice-versa.**

NOTE: This procedure applies to both the LH and RH halfshafts.

Install a new axle circlip.

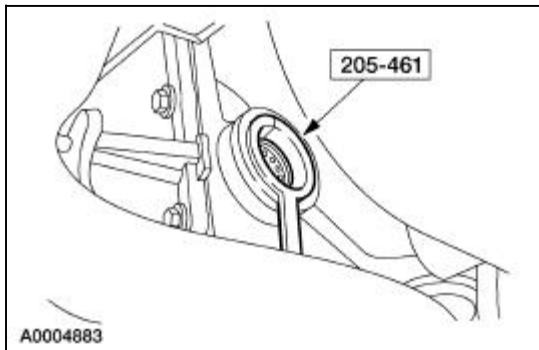


2. Remove the special tool.

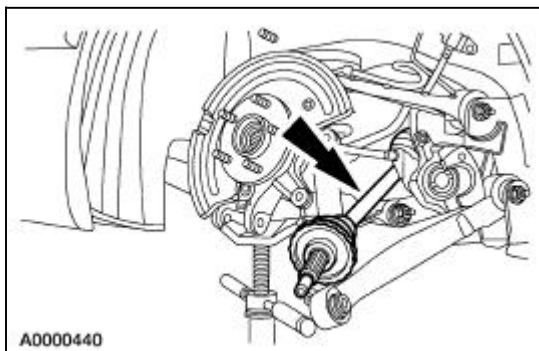


3.  **CAUTION:** Differential seal damage will occur if installing the halfshaft without the special tool installed.

Install the special tool.

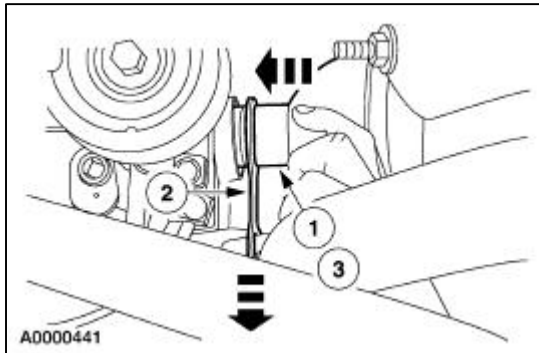


4. Position the halfshaft for installation.

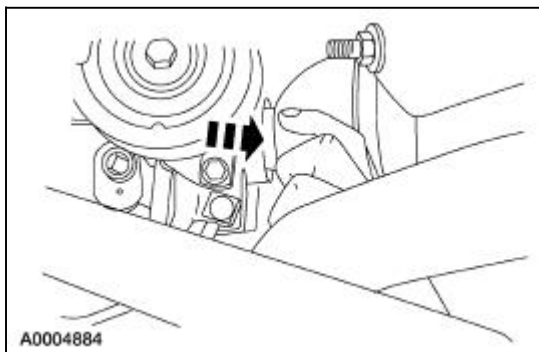


5. Seat the CV joint in the differential side gear.

1. Slide the CV joint into the axle housing until the shaft splines are past the differential seal.
2. Remove the special tool.
3. Align the CV joint and side gear splines, and slide the joint into the gear until it seats.
 - When seated, the axle circlip will lock the CV joint in the differential side gear.

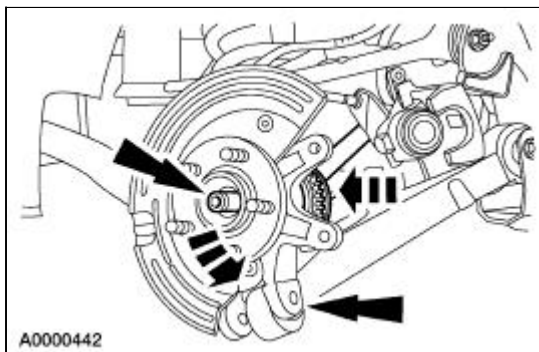


6. Check the axle circlip engagement by attempting to pull the inboard CV joint out of the differential side gear.
 - If the circlip is not seated, push the CV joint inward until the circlip is fully engaged in the differential side gear.



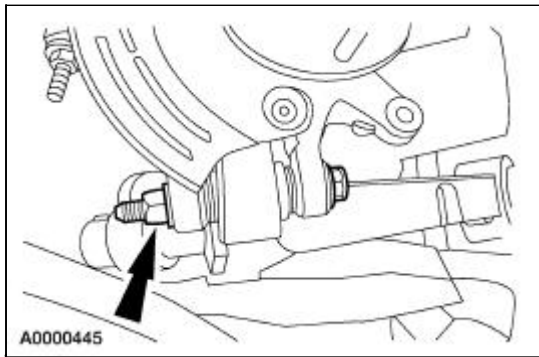
7.  **CAUTION: Do not over-angulate the outboard CV joint or damage the boot.**

While raising the knuckle, install the CV joint into the hub, then position the knuckle onto the lower control arm.

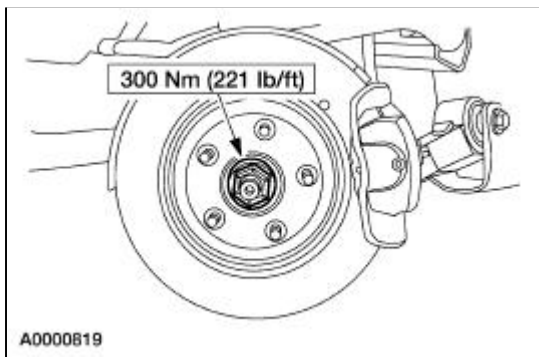


8.  **CAUTION: Position the suspension at curb ride height before tightening the bolt and nut.**

Install the bolt and nut. Refer to [Section 204-02](#) for tightening specifications.



9. Install the brakes. For additional information, refer to [Section 206-04](#).
10. Install the rear brake anti-lock sensor. For additional information, refer to [Section 206-09A](#).
11. Install the rear axle wheel hub retainer.



12. Install the rear wheel and tire assembly. For additional information, refer to [Section 204-04](#).
 13. Lower the vehicle.
-

Halfshaft Joint

Disassembly

1. The halfshaft assemblies are not repairable. Install a new assembly if worn/damaged.
-

General Specifications

Item	Specification
Brake pads lining wear limit—front (above backing plate or rivets)	2 mm (0.08 in)
Brake pads lining wear limit—rear (above brake shoe or rivets)	1 mm (0.04 in)
Lubricant	
High Performance DOT 4 Brake Fluid	SAE-J1704-DOT 4
High Performance DOT 3 Brake Fluid C6AZ-19542-AB	ESA-M6C25-A (United States and Canada only)
High Temperature Nickel Anti-Seize Lubricant F6AZ-9L494-AA	ESE-M12A4-A
Brake disc	
Brake disc minimum thickness	Molded into the brake disc
Brake disc allowable runout on vehicle	0.102 mm (0.004 in)
Brake disc maximum thickness variation	0.01 mm (0.0004 in)

Torque Specifications

Description	Nm	lb-ft	lb-in
Brake master cylinder tube fitting, front	15-20	11-15	—
Brake master cylinder tube fitting, rear	15-20	11-15	—
Caliper bleeder screw, rear	7-13	5-10	—
Caliper bleeder screw, front	7-13	5-10	—

Brake System

Brake System, Hydraulic

This vehicle is equipped with a brake pedal-actuated hydraulic dual brake system. The system consists of the following:

- front disc brake calipers (2B120); refer to [Section 206-03](#).
- rear disc brake calipers (2553); refer to [Section 206-04](#).
- brake master cylinder (2140); refer to [Section 206-06](#).
- brake tubes and brake hoses

The ABS system will be one of the following types:

- a four wheel anti-lock control brake system (4WABS); refer to [Section 206-09A](#).
- a four wheel anti-lock control — traction control brake system; refer to [Section 206-09B](#).
- a four wheel anti-lock control — traction control and interactive vehicle dynamics (IVD); refer to [Section 206-09C](#).

The dual ABS hydraulic system is diagonally split with the LH front and RH rear making up one circuit and the RH front and LH rear making up the other circuit.

Master Cylinder, Dual

The brake master cylinder contains the following feature:

- a common plastic brake master cylinder reservoir (2K478) and low fluid level indicator combined in one assembly.

Booster, Power Brake

The power brake booster (2005) is a vacuum-operated, dual diaphragm type and is equipped with a separately serviceable power brake booster check valve (2365). Refer to [Section 206-07](#).

Brakes, Front Disc

The front disc brakes consist of the following features:

- a full-cast vented front brake disc (1125).
- hydraulically-activated pin slider-type front disc brake caliper assemblies.

Brakes, Rear Disc

The rear disc brakes consist of the following features:

- a full-cast vented rear brake disc (2C026).
- hydraulically-activated rear disc brake caliper assemblies with integral mechanically (cable) operated parking brake mechanisms.

Brake System, Parking

The parking brake system consists of the following features:

- the system is cable-actuated and controlled by a hand-operated parking brake control (2780).
- the parking brake control pulls a cable which actuates the rear disc brake calipers.
- the parking brake is self-adjusting.

Refer to [Section 206-05](#).

Brake Fluid



WARNING: Use of any other than approved DOT 4 or DOT 3 brake fluid will cause permanent damage to brake components and will render the brakes inoperative.



WARNING: Brake fluid contains polyglycol ethers and polyglycols. Avoid contact with eyes. Wash hands thoroughly after handling. If brake fluid contacts eyes, flush eyes with running water for 15 minutes. Get medical attention if irritation persists. If taken internally, drink water and induce vomiting. Get medical attention immediately.



CAUTION: Brake fluid is harmful to painted or plastic surfaces. If brake fluid is spilled onto a painted or plastic surface, immediately wash it with water.

Use clean, fresh Ford High Performance DOT 3 Motor Vehicle Brake Fluid C6AZ-19542-AB or equivalent meeting Ford specification ESA-M6C25-A (United States and Canada only). If DOT 3 is not available, use Ford High Performance DOT 4 Brake Fluid or equivalent meeting Ford specification SAE-J-1704-DOT 4.

- Do not reuse brake fluid drained or bled from the system.
- Do not use brake fluid that has been stored in an open container.
- Do not use contaminated brake fluid.

Brake Tubing



WARNING: Copper tubing must not be used in a hydraulic system. When bending brake tubing to fit underbody, be careful not to kink or crack the tube.

If a section of the brake tubing becomes damaged, install a new section of tubing the same type, size, shape and length.

Brake Hose

Install a new flexible brake hose if it shows signs of softening, cracking or other damage.

Brake System

Refer to Wiring Diagrams Section [413-01](#) for schematic and connector information.

Inspection and Verification

Preliminary Checks

NOTE: Always check the fluid level in the brake master cylinder reservoir (2K478) before carrying out the test procedures. If the fluid level is not at the correct level, fill the reservoir using the specified DOT 3 or DOT 4 brake fluid.

NOTE: Prior to carrying out any diagnosis, make certain that the brake warning indicator is functional. Refer to [Section 413-01](#).

The first indication that something may be wrong in the brake system is a change in the feeling through the brake pedal (2455). The brake warning indicator in the instrument cluster and the brake fluid level in the brake master cylinder reservoir are also indicators of system concerns.

If a wheel (1007) is locked and the vehicle must be moved, open a bleeder screw at the locked wheel to let out enough fluid to relieve the pressure. Close the bleeder screw. This bleeding operation may release the brakes but will not correct the cause of trouble. If this does not relieve the locked wheel condition, repair the locked components before proceeding.

Brake Booster

Inspect all hoses and connections. All unused vacuum connectors should be capped. Hoses and their connections should be correctly secured and in good condition with no holes, soft or collapsed areas.

Road Test

Carry out a Road Test to compare actual vehicle braking performance with the performance standards expected by the driver. The ability of the test driver to make valid comparisons and detect performance deficiencies will depend on experience.

The driver should have a thorough knowledge of brake system operation and accepted general performance guidelines in order to make good comparisons and detect performance problems.

Select a road that is reasonably smooth and level. Gravel or bumpy roads are not suitable because the surface does not allow the tires to grip the road equally. Avoid crowned roads.

A key factor in evaluating brake concerns is the deceleration rate. This varies from vehicle to vehicle and with changes in operating conditions. It is evident how well the brakes are working after just a few applications.

Avoid locking the brakes. Locked brakes are not an indicator of braking efficiency.

Visual Inspection Chart

Mechanical	Electrical
● Brake master cylinder	● Parking brake switch

<ul style="list-style-type: none"> ● Brake caliper piston ● Brake disc ● Wheel bearings ● Brake pads ● Power brake booster ● Brake pedal linkage ● Booster vacuum hose ● Tires ● Foreign material 	<ul style="list-style-type: none"> ● Damaged or corroded wiring harness ● Brake master cylinder fluid level switch
--	--

For low or spongy brake pedal concerns:

- Check and, if necessary, refill the brake master cylinder reservoir.
- Bleed the brake system and retest the brake pedal feel.

For slow or incomplete brake pedal return concern:

- Inspect for binding, damage, incorrect installation or interference at the brake pedal.
- Check the power brake booster for binding, damage and incorrect installation.

Vibration When Brakes Are Applied

For vibration concerns when brakes are applied, carry out the following procedure.

Visually inspect:

- The suspension condition and tire pressure.
- Suspension bushings and ball joints.

Correct as necessary.

1. Verify and isolate the concern. Brake roughness can be felt in:

- the steering wheel.
- the seat.
- the brake pedal.

2. After verifying the concern, check for related concerns in the:

- On-Line Automotive Service Information System (OASIS).
- Technical Service Bulletins.

3. Check wheel bearing end-play and correct as necessary.

4. **NOTE:** Begin at the front of the vehicle unless the vibration has been isolated to the rear.

Remove the tire and wheel.


5. Remove the brake caliper.

6. Measure and record the brake disc thickness. If the thickness before machining is not greater than 0.6 mm (0.024 in) above the minimum thickness specification molded into the brake disc,

install a new brake disc. Do not machine a new brake disc.

7. For vehicles with a two-piece hub and brake disc assembly:

- Match-mark before disassembly.
- Remove the brake disc.
- Using a die grinder with a mild abrasive disc (Scotch Brite® type), remove any rust or corrosion from the hub and brake disc mounting surfaces.
- Align match-marks and reinstall the brake disc on the hub.

8.  **CAUTION: Do not use a bench lathe to machine brake discs.**

NOTE: The depth of cut must be between 0.10 and 0.20 mm (0.004 and 0.008 in). Lighter cuts will cause heat and wear. Heavier cuts will cause poor brake disc surface finish.

Using a hub-mount brake lathe, machine the brake discs. Follow the manufacturer's instructions. After machining, make sure the brake disc still meets the thickness specification.

9. Using a dial indicator, verify that the brake disc lateral runout is now within vehicle specification.
10. Remove metal chips.
11. Remove the brake lathe hub adapter.
12. Remove any remaining metal chips from the machining operation.
13. For vehicles with a two-piece hub and brake disc assembly:
- Remove the brake disc from the hub.
 - Remove any remaining metal chips from hub and brake disc mounting surfaces and from the ABS sensor.
 - Apply High Temperature Nickel Anti-Seize Lubricant F6AZ-9L494-AA or equivalent meeting Ford specification ESE-M12A4-A to the mounting surfaces.
 - Using the match-marks, mount the brake disc on the hub.
14. Install the caliper and check brake operation.

Symptom Chart

Symptom Chart

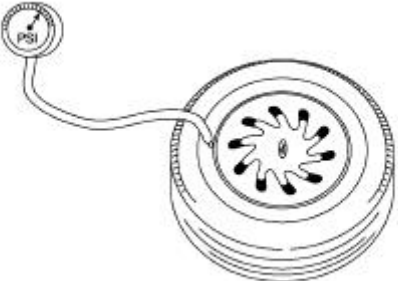
Condition	Possible Sources	Action
<ul style="list-style-type: none">● The Brakes Pull or Drift	<ul style="list-style-type: none">● Tire air pressure.● Wheel alignment.● Brake pads.● Brake components.● Suspension component.	<ul style="list-style-type: none">● GO to Pinpoint Test A.

<ul style="list-style-type: none"> ● The Red Brake Warning Indicator Is Always On - Parking Brake 	<ul style="list-style-type: none"> ● Park brake switch. ● Circuit. ● Front Electronic Module (FEM). ● Instrument cluster module (IC). ● Telltale/indicator. 	<ul style="list-style-type: none"> ● GO to Pinpoint Test B .
<ul style="list-style-type: none"> ● The Red Brake Warning Indicator Is Always On - Low Brake Fluid Level 	<ul style="list-style-type: none"> ● Brake fluid level switch. ● Circuit. ● Front Electronic Module (FEM). ● Instrument cluster module (IC). ● Telltale/indicator. 	<ul style="list-style-type: none"> ● GO to Pinpoint Test C .
<ul style="list-style-type: none"> ● The Pedal Goes Down Fast 	<ul style="list-style-type: none"> ● Brake fluid level. ● Air in system. ● Brake master cylinder. 	<ul style="list-style-type: none"> ● FILL the brake master cylinder reservoir. BLEED the system. ● BLEED the system. ● CARRY OUT the brake master cylinder component test in this section.
<ul style="list-style-type: none"> ● The Pedal Eases Down Slowly 	<ul style="list-style-type: none"> ● Air in system. ● Brake master cylinder. 	<ul style="list-style-type: none"> ● BLEED the system. REFER to Bleeding in this section. ● CARRY OUT the brake master cylinder component test in this section.
<ul style="list-style-type: none"> ● Brakes Lock Up During Light Brake Pedal Force 	<ul style="list-style-type: none"> ● Disc brake component. ● Parking brake component. ● Anti-lock brake control system. 	<ul style="list-style-type: none"> ● GO to Pinpoint Test D .
<ul style="list-style-type: none"> ● Excessive/Erratic Brake Pedal Travel 	<ul style="list-style-type: none"> ● Leak in hydraulic system. ● Air in system. ● Disc brake caliper. ● Brake master cylinder. 	<ul style="list-style-type: none"> ● GO to Pinpoint Test E .
<ul style="list-style-type: none"> ● Brakes Drag 	<ul style="list-style-type: none"> ● Parking brake component. ● Disc brake caliper. 	<ul style="list-style-type: none"> ● REPAIR or INSTALL new components as necessary. REFER to Section 206-05 . ● REPAIR or INSTALL a new caliper as necessary. REFER to Section 206-03 or Section 206-04 .

	<ul style="list-style-type: none"> ● Brake master cylinder. 	<ul style="list-style-type: none"> ● CARRY OUT the brake master cylinder component test in this section.
<ul style="list-style-type: none"> ● Excessive Brake Pedal Effort 	<ul style="list-style-type: none"> ● Power brake booster. ● Power brake booster check valve. ● Power brake booster hose. 	<ul style="list-style-type: none"> ● CARRY OUT the brake booster component test in this section.
<ul style="list-style-type: none"> ● Red Brake Warning Indicator Inoperative 	<ul style="list-style-type: none"> ● Circuit. ● Bulb. 	<ul style="list-style-type: none"> ● REFER to Section 413-01.
<ul style="list-style-type: none"> ● Brake Noise 	<ul style="list-style-type: none"> ● Disc brake component. 	<ul style="list-style-type: none"> ● REFER to Section 100-04.
<ul style="list-style-type: none"> ● Brake Vibration/Shudder — Occurs When Brakes Are Applied 	<ul style="list-style-type: none"> ● Uneven disc wear. ● Uneven disc brake pad transfer. ● Suspension components. 	<ul style="list-style-type: none"> ● REFER to Section 100-04.

Pinpoint Tests

PINPOINT TEST A: THE BRAKES PULL OR DRIFT

CONDITIONS	DETAILS/RESULTS/ACTIONS
A1 CHECK THE TIRE PRESSURE	
<p>1</p>  <p>A0003832</p>	<p>1</p> <p>Check for excessive wear and measure the air pressure in all four tires.</p> <ul style="list-style-type: none"> ● Are the tires good and the tire pressure within specifications? <p>→ Yes GO to A2.</p> <p>→ No ADJUST the tire pressure. ROTATE the tires front to rear. If tires are excessively worn, INSTALL new tires.</p>

A2 INSPECT THE BRAKE PADS

1



A0003837

1 Inspect the brake pads for contamination and wear concerns.

● **Are the brake pads OK?**

→ **Yes**
GO to [A3](#).

→ **No**
INSTALL new brake pads. REFER to [Section 206-03](#) (front) or [Section 206-04](#) (rear).

A3 INSPECT THE BRAKE DISCS AND HUBS

1 Inspect the brake discs and hubs for damage.

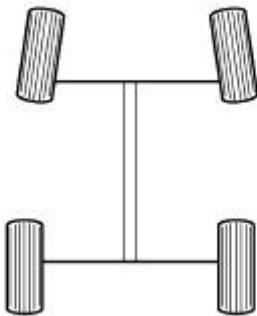
● **Are the brake discs or hubs damaged?**

→ **Yes**
REPAIR and INSTALL new brake disc or hub as necessary.

→ **No**
GO to [A4](#).

A4 CHECK THE ALIGNMENT

1



A0003835


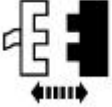

1 Check for correct camber, caster and toe-in settings. Refer to [Section 204-00](#).

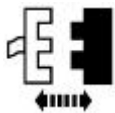
● **Is the alignment set to specification?**

→ **Yes**
INSTALL a new caliper at the affected

	<p>wheel. TEST the system for normal operation.</p> <p>→ No RESET the alignment and road test vehicle.</p>
--	---

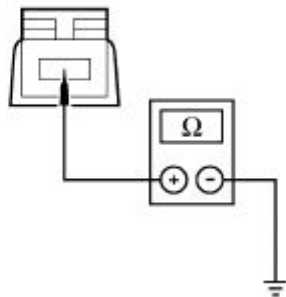
PINPOINT TEST B: THE RED BRAKE WARNING INDICATOR IS ALWAYS ON - PARKING BRAKE

CONDITIONS	DETAILS/RESULTS/ACTIONS
B1 VERIFY SYMPTOM	
	<p>1 Verify that the red brake warning indicator is never on or always on.</p> <ul style="list-style-type: none"> ● Is the indicator always on? <p>→ Yes GO to B2.</p> <p>→ No GO to B5.</p>
B2 CHECK THE PARKING BRAKE INDICATOR	
<p>1</p>  <p>3</p>  <p>Parking Brake Switch C306</p>	<p>2 Wait past prove out time.</p> <ul style="list-style-type: none"> ● Did the indicator turn off? <p>→ Yes INSTALL a new parking brake switch. TEST the system for normal operation.</p> <p>→ No GO to B3.</p>
B3 CHECK CIRCUITS 31S-RP9 (BK/GN) FOR SHORTS TO GROUND	
<p>1</p>  <p>Parking Brake Switch C306</p> <p>2</p>	



FEM Connector J1

3



A0005312

3

Measure the resistance between the parking brake connector C306, circuit 31S-RP9 (BK/GN), and ground.

- Is the resistance greater than 10,000 ohms?

→ Yes

GO to [B4](#).

→ No

REPAIR circuit 31S-RP9 (BK/GN). TEST the system for normal operation.

B4 INSTRUMENT CLUSTER DIAGNOSIS

1



1

NOTE: This pinpoint test step needs to be checked if the instrument cluster module (IC) has any DTCs and is functioning correctly, and if the telltale is OK.

Retrieve DTCs.

- Is the instrument cluster diagnosis check out OK?

→ Yes

INSTALL a new FEM. TEST the system for normal operation.

→ No

REPAIR or INSTALL a new instrument cluster and or associated circuits.

B5 RETRIEVE THE DIAGNOSTIC TROUBLE CODES (DTCs) - FEM

1

Make sure the parking brake is applied when running self-test. If the parking brake is not applied during self-test, this will cause a DTC of C1446.

2

Using recorded results from the front electronic module (FEM) self-test.

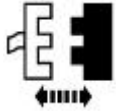
- Are any DTCs recorded?

→ **Yes**
For C1446, GO to [B6](#).

→ **No**
GO to [B11](#).

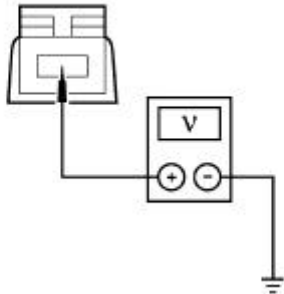
B6 CHECK CIRCUIT 31S-RP9 (BK/GN) FOR VOLTAGE

1



Parking Brake Switch C306

2



A0005310

2 Measure the voltage between parking brake switch, circuit 31S-RP9 (BK/GN) and chassis ground.

● **Is voltage greater than 10.0 volts?**

→ **Yes**
GO to [B10](#).

→ **No**
GO to [B7](#).

B7 CHECK PARKING BRAKE INDICATOR

1



3

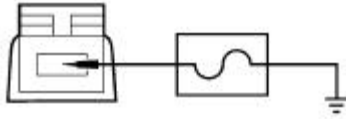


Parking Brake Switch C306

4

2 Wait past prove out time.

4 Jumper the parking brake switch connector C306, circuit 31S-RP9 (BK/GN) to chassis ground with a fused jumper wire.



A0005311

● **Did the indicator turn on?**

→ **Yes**
 INSTALL a new parking brake switch.
 TEST the system for normal operation.

→ **No**
 GO to [B8](#).

B8 CHECK CIRCUIT 31S-RP9 (BK/GN) FOR OPENS

1



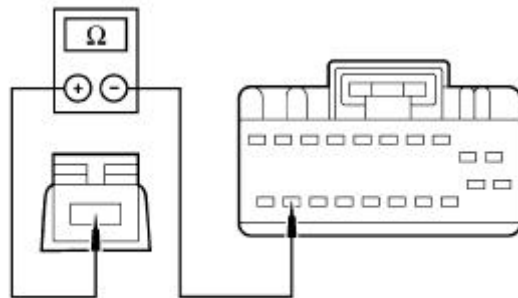
Parking Brake Switch C306

2



FEM Connector J1

3



A0005309

3 Measure the resistance between the parking brake switch, circuit 31S-RP9 (BK/GN), and FEM connector J1, pin 19, circuit 31S-RP9 (BK/GN).

● **Is resistance less than 5.0 ohms?**

→ **Yes**
 GO to [B9](#).

→ **No**
 REPAIR circuit 31S-RP9 (BK/GN). TEST the system for normal operation.

B9 INSTRUMENT CLUSTER DIAGNOSIS

1

1 **NOTE:** This pinpoint test step needs to



be checked if the instrument cluster module (IC) has any DTCs and is functioning correctly, and if the telltale is OK.

Retrieve DTCs.

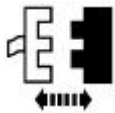
- **Is the instrument cluster diagnosis check out OK?**

→ **Yes**
INSTALL a new FEM. TEST the system for normal operation.

→ **No**
REPAIR or INSTALL a new instrument cluster or associated circuits.

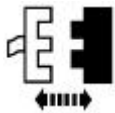
B10 CHECK CIRCUITS 31S-RP9 (BK/GN) FOR SHORTS TO B+

1



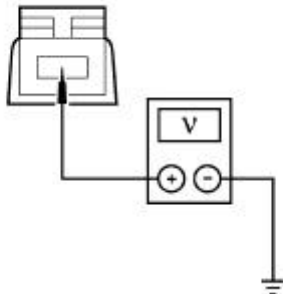
Parking Brake Switch C306

2



FEM Connector J1

3



A0005310

3 Measure the voltage between the parking brake switch, circuit 31S-RP9 (BK/GN), and chassis ground.

- **Is voltage greater than 10.0 volts?**

→ **Yes**
REPAIR circuit 31S-RP9 (BK/GN). TEST the system for normal operation.

→ **No**
INSTALL a new FEM. TEST the system for normal operation.

B11 INSTRUMENT CLUSTER DIAGNOSIS

1

1 **NOTE:** This pinpoint test step needs to be checked if the instrument cluster module (IC) has any DTCs and is functioning correctly, and if the telltale is



OK.


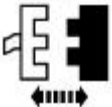
Retrieve DTCs.

- **Is the instrument cluster diagnosis check out OK?**

→ **Yes**
INSTALL a new FEM. TEST the system for normal operation.

→ **No**
REPAIR or INSTALL a new instrument cluster or associated circuits.

PINPOINT TEST C: THE RED BRAKE WARNING INDICATOR IS ALWAYS ON - LOW BRAKE FLUID LEVEL

CONDITIONS	DETAILS/RESULTS/ACTIONS
C1 VERIFY SYMPTOM	
	<p>1 Verify that the red brake warning indicator is never on or always on.</p> <ul style="list-style-type: none"> ● Is the indicator always on? <p>→ Yes GO to C2.</p> <p>→ No GO to C5.</p>
C2 CHECK FOR FAULTY LOW BRAKE FLUID LEVEL SENSOR	
<p>1</p>  <p>3</p>  <p>Low Brake Fluid Level Sensor C124</p>	<p>2 Wait past prove out time.</p> <ul style="list-style-type: none"> ● Did the indicator turn off? <p>→ Yes INSTALL a new low brake fluid level sensor. TEST the system for normal operation.</p>

→ **No**
GO to [C3](#).

C3 CHECK FOR FAULTY FEM

1



2



Low Brake Fluid Level Sensor

3



FEM Connector J3

● **Did the indicator turn off?**

→ **Yes**
GO to [C4](#).

→ **No**
GO to [C5](#).

C4 CHECK CIRCUIT 8–GC7 (WH/RD) FOR SHORTS TO GROUND

1



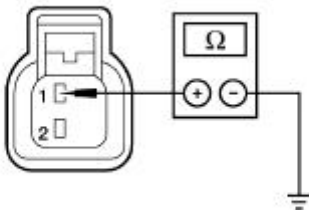
Low Brake Fluid Level Sensor C124

2



FEM Connector J3

3



A0003836

3 Measure the resistance between the low brake fluid level sensor connector C124, circuit 8–GC7 (WH/RD) and chassis ground.

● **Is resistance greater than 10.0 ohms?**

- **Yes**
INSTALL a new FEM. TEST the system for normal operation.
- **No**
REPAIR circuit 8–GC7 (WH/RD). TEST the system for normal operation.

C5 INSTRUMENT CLUSTER DIAGNOSIS

1



- 1 **NOTE:** This pinpoint test step needs to be checked if the instrument cluster module (IC) has any DTCs and is functioning correctly, and if the telltale is OK.

Retrieve DTCs.

- 2 Use recorded results from the front electronic module (FEM) self-test.

- **Is the instrument cluster diagnosis check out OK?**

- **Yes**
INSTALL a new FEM. TEST the system for normal operation.

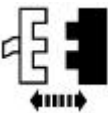
- **No**
REPAIR or INSTALL a new instrument cluster or associated circuits.

C6 CHECK LOW BRAKE FLUID LEVEL SENSOR

1

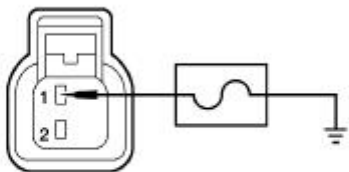


3



Low Brake Fluid Level Sensor C124

4



- 2 Wait past prove out time.

- 4 Jumper low brake fluid level sensor connector C124, circuit 8–GC7 (WH/RD) to chassis ground with a fused jumper wire.

A0003839

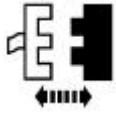
- **Did the indicator turn on?**

→ **Yes**
GO to [C7](#).

→ **No**
GO to [C8](#).

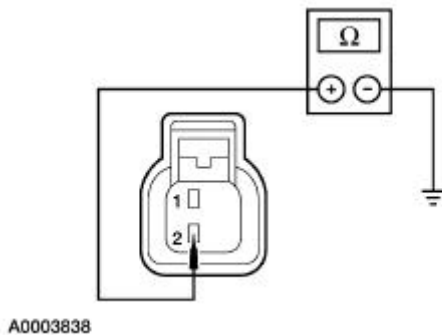
C7 CHECK CIRCUIT 31–GC7 (BK) FOR OPENS

1



Low Brake Fluid Level Sensor C124

2



2 Measure the resistance between the low brake fluid level sensor, circuit 31–GC7 (BK) and chassis ground.

● **Is resistance less than 5.0 ohms?**

→ **Yes**
INSTALL a new low brake fluid level sensor. TEST the system for normal operation.

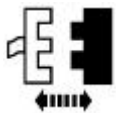
→ **No**
Repair circuit 31–GC7 (BK). TEST the system for normal operation.

C8 CHECK LOW BRAKE FLUID LEVEL PID

1



2

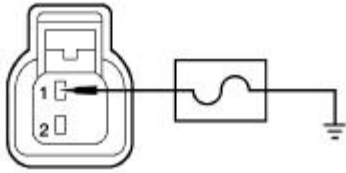


Low Brake Fluid Level Sensor C124

4

3 Access the low brake fluid level PID:
2909 Byte 1 - Bit 4.

4 View the PID while jumpering the low brake fluid level sensor connector, circuit 8–GC7 (WH/RD) to chassis ground with a fused jumper wire.



A0003839

- Did the PID read from off to on?

→ **Yes**
GO to [C10](#).

→ **No**
GO to [C9](#).

C9 CHECK CIRCUIT 8–GC7 (WH/RD) FOR OPENS

1



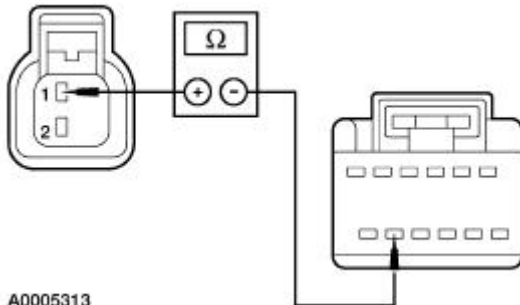
Low Brake Fluid Level Sensor C124

2



FEM Connector J3

3



A0005313


- 3 Measure the resistance between FEM connector J3, pin 11, circuit 8–GC7 (WH/RD) and the low brake fluid level sensor connector C124, circuit 8–GC7 (WH/RD).

- Is the resistance less than 5.0 ohms?

→ **Yes**
INSTALL a new FEM. TEST the system for normal operation.

→ **No**
REPAIR circuits 8–GC7 (WH/RD). TEST the system for normal operation.

C10 INSTRUMENT CLUSTER DIAGNOSIS



<p>1</p> 	<p>1 NOTE: This pinpoint test step needs to be checked if the instrument cluster module (IC) has any DTCs and is functioning correctly, and if the telltale—is OK.</p> <p>Retrieve DTCs.</p> <ul style="list-style-type: none"> ● Is the instrument cluster diagnosis check out OK? <p>→ Yes INSTALL a new FEM. TEST the system for normal operation.</p> <p>→ No REPAIR or INSTALL a new instrument cluster or associated circuits.</p>
--	---

PINPOINT TEST D: BRAKES LOCK UP DURING LIGHT BRAKE PEDAL FORCE

CONDITIONS	DETAILS/RESULTS/ACTIONS
D1 CHECK FOR BINDING OR STICKING BRAKE COMPONENTS	
	<p>1 Check brake components for binding, damage and incorrect installation at each wheel.</p> <ul style="list-style-type: none"> ● Do any of the components bind or stick? <p>→ Yes REPAIR or INSTALL new components as necessary. TEST the system for normal operation.</p> <p>→ No GO to D2.</p>
D2 CHECK THE PARKING BRAKE COMPONENTS	
	<p>1 Check the parking brake components for damage, seized condition, and incorrect adjustment. Refer to Section 206-05.</p> <ul style="list-style-type: none"> ● Are the parking brake components OK? <p>→ Yes GO to D3.</p> <p>→ No REPAIR or INSTALL new components as necessary. REFER to Section 206-05. TEST the system for normal operation.</p>
D3 INSPECT THE BRAKE PADS	
	<p>1 Inspect brake pads for contamination, excessive wear or damage. Refer to Section 206-03 for front disc brake inspection. Refer to Section 206-04 for rear disc brake inspection.</p>

	<ul style="list-style-type: none"> ● Are the brake pads OK? <p>→ Yes GO to D4.</p> <p>→ No INSTALL new brake pads as necessary. TEST the system for normal operation.</p>
D4 CHECK FOR LOOSE BRAKE COMPONENT MOUNTINGS	
	<p>1 Check for loose or damaged caliper mounting bolts.</p> <ul style="list-style-type: none"> ● Are the component mountings OK? <p>→ Yes CHECK the 4-wheel anti-lock control brake system (4WABS).</p> <p>→ No REPAIR as necessary. TEST the system for normal operation.</p>

PINPOINT TEST E: EXCESSIVE/ERRATIC BRAKE PEDAL TRAVEL

CONDITIONS	DETAILS/RESULTS/ACTIONS
E1 CHECK FOR SPONGY PEDAL	
<p>1</p>  <p>2</p> 	<p>3 Operate the brake pedal and note pedal feel.</p> <ul style="list-style-type: none"> ● Does the brake pedal feel spongy? <p>→ Yes BLEED the brake system. REFER to Bleeding— System in this section. TEST the system for normal operation.</p> <p>→ No GO to E2.</p>
E2 CHECK THE BRAKE PEDAL	
	<p>1 Inspect the brake pedal and bracket for binding, obstruction or damage.</p> <ul style="list-style-type: none"> ● Is the brake pedal OK? <p>→ Yes GO to E3.</p>

	<p>→ No REPAIR or INSTALL a new brake pedal as necessary. TEST the system for normal operation.</p>
E3 CHECK BRAKE COMPONENTS	
	<p>1 Inspect the calipers and brake pads for binding, damage, incorrect installation and contamination.</p> <p>● Are the calipers and brake pads OK?</p> <p>→ Yes GO to E4.</p> <p>→ No REPAIR or INSTALL new components as necessary. TEST the system for normal operation.</p>
E4 CHECK POWER BRAKE BOOSTER	
	<p>1 Carry out the brake booster component test.</p> <p>● Is the power brake booster OK?</p> <p>→ Yes INSTALL a new brake master cylinder. TEST the system for normal operation.</p> <p>→ No INSTALL a new power brake booster. TEST the system for normal operation.</p>

Component Tests

Brake Booster

1. Check the hydraulic brake system for leaks or insufficient fluid.
2. With the transmission (7003) in NEUTRAL, stop the engine (6007) and apply the parking brake control (2780). Apply the brake pedal several times to exhaust all vacuum in the system.
3. Apply the brake pedal and hold it in the applied position. Start the engine. If the vacuum system is operating, the brake pedal will tend to move downward under constant foot pressure. If no motion is felt, the power brake booster system is not functioning. Continue the test with the following steps.
4. Remove the vacuum booster hose (2A047) from the check valve connection. Manifold vacuum must be available at the check valve end of the vacuum booster hose with the engine at idle speed and the transmission in NEUTRAL. If the manifold vacuum is available to the power brake booster, connect the vacuum booster hose to the power brake booster check valve (2365) and repeat Steps 2 and 3 above.
5. Check and if no downward movement of the brake pedal is felt, install a new power brake booster.
6. Operate the engine a minimum of 10 seconds at fast idle. Stop the engine, and let the vehicle stand for 10 minutes. Then apply the brake pedal with approximately 89 N (20 lbs) of force. The brake pedal feel should be the same as that noted with the engine operating. If the brake pedal

feels hard (no power assist), install a new check valve and retest. If the brake pedal feels spongy, bleed the hydraulic system to remove air. Refer to Bleeding in this section.

Check Valve

The function of the power brake booster check valve is to allow manifold vacuum to enter the power brake booster and prevent the escape of vacuum in the event manifold vacuum is lost during sustained full throttle operation.

To test the function of the power brake booster check valve:

- Start and run the engine for at least 10 seconds.
- Operate the brake pedal to check for power assist.
- Disconnect the vacuum booster hose from the power brake booster. Do not remove the power brake booster check valve from the power brake booster.
- There should be enough vacuum retained in the power brake booster for at least one more power-assisted brake operation.

Brake Master Cylinder

Normal Conditions

The following conditions are considered normal.

Condition 1: During normal operation of the brake master cylinder, the fluid level in the brake master cylinder reservoir will rise during brake application and fall during release. The net fluid level (after brake application and release) will remain unchanged.

Condition 2: A trace of brake fluid will exist on the booster shell below the master cylinder mounting flange. This results from the normal lubricating action of the master cylinder bore and seal.

Condition 3: Fluid level will decrease with pad wear.

Abnormal Conditions

Changes in brake pedal feel or travel are indicators that something could be wrong in the brake system. Refer to the Symptom Chart for abnormal condition diagnosis.

Bypass Condition Test

1. Disconnect the brake lines at the brake master cylinder.
2. Plug the outlet ports of the brake master cylinder.
3. Apply the brakes. If brake pedal height cannot be maintained, the brake master cylinder has an internal leak and a new master cylinder must be installed.

Compensator Port Check

The purpose of the compensator ports in the brake master cylinder is to supply any additional brake fluid required by the system due to brake pad wear and to allow brake fluid returning from the brake lines to the brake master cylinder to enter the brake master cylinder reservoir.

The returning brake fluid will cause a slight turbulence in the brake master cylinder reservoir. Turbulence seen in the brake master cylinder reservoir upon release of the brake pedal is normal and shows that the compensating ports are not plugged.

Bleeding — System

Manual

⚠ WARNING: Use of any other than approved DOT 4 or DOT 3 brake fluid will cause permanent damage to brake components and will render the brakes inoperative.

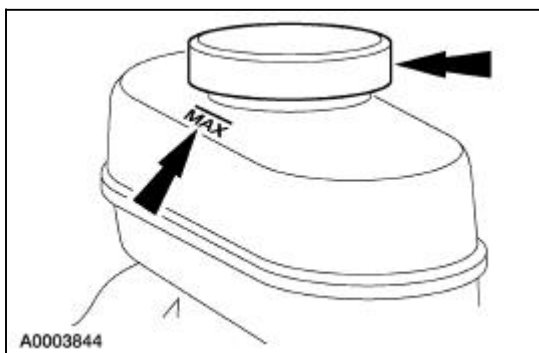
⚠ WARNING: Brake fluid contains polyglycol ethers and polyglycols. Avoid contact with eyes. Wash hands thoroughly after handling. If brake fluid contacts eyes, flush eyes with running water for 15 minutes. Get medical attention if irritation persists. If taken internally, drink water and induce vomiting. Get medical attention immediately.

⚠ CAUTION: Brake fluid is harmful to painted and plastic surfaces. If brake fluid is spilled onto a painted or plastic surface, immediately wash it with water.

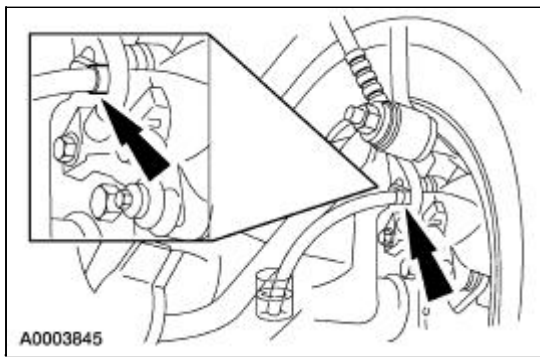
⚠ CAUTION: Do not allow the brake master cylinder reservoir to run dry during the bleeding operation. Keep the brake master cylinder reservoir filled with the specified brake fluid. Never reuse the brake fluid that has been drained from the hydraulic system.

NOTE: When any part of the hydraulic system has been disconnected for repair or installation of new components, air can get into the system and cause spongy brake pedal action. This requires bleeding of the hydraulic system after it has been correctly connected. The hydraulic system can be bled manually or with pressure bleeding equipment.

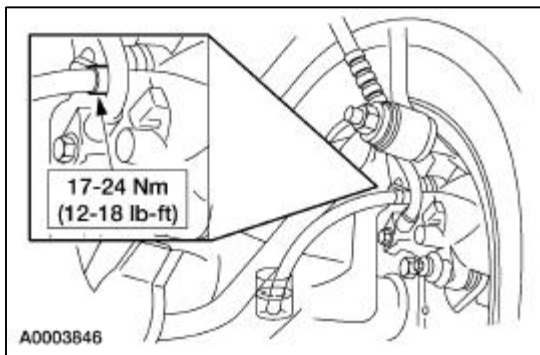
1. Connect the NGS DCL cable adapter into the vehicle data link connector (DLC) under the dash and follow the NGS instructions.
2. Clean all dirt from and remove the brake master cylinder filler cap and fill the brake master cylinder reservoir with the specified brake fluid.



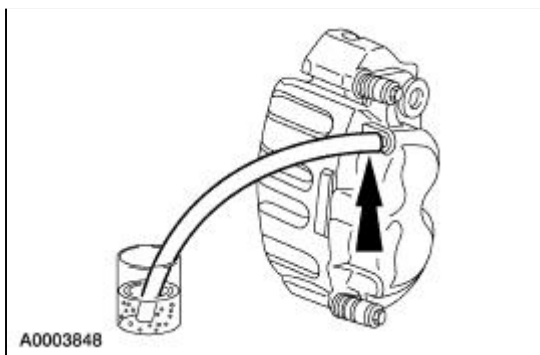
3. Place a box end wrench on the RH rear bleeder screw. Attach a rubber drain tube to the RH rear bleeder screw and submerge the free end of the tube in a container partially filled with clean brake fluid.



4. Have an assistant hold firm pressure on the brake pedal.
5. Loosen the RH rear bleeder screw until a stream of brake fluid comes out. While the assistant maintains pressure on the brake pedal, tighten the RH rear bleeder screw.
 - Repeat until clear, bubble-free fluid comes out.
 - Refill the brake master cylinder reservoir as necessary.
6. Tighten the RH rear bleeder screw.



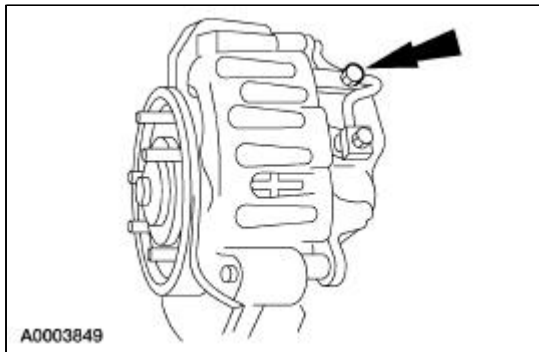
7. Repeat Steps 3, 4, 5 and 6 for the LH rear bleeder screw.
8. Place a box end wrench on the RH front disc brake caliper bleeder screw. Attach a rubber drain tube to the RH front disc brake caliper bleeder screw, and submerge the free end of the tube in a container partially filled with clean brake fluid.



9. Have an assistant hold firm pressure on the brake pedal.
10. Loosen the RH front disc brake caliper bleeder screw until a stream of brake fluid comes out. While the assistant maintains pressure on the brake pedal, tighten the RH front disc brake caliper bleeder screw.
 - Repeat until clear, bubble-free fluid comes out.

- Refill the brake master cylinder reservoir as necessary.

11. Tighten the RH front disc brake caliper bleeder screw. For additional information, refer to Specifications.



12. Repeat Steps 8, 9, 10 and 11 for the LH front disc brake caliper bleeder screw.

Pressure



WARNING: Use of any other than approved DOT 4 or DOT 3 brake fluid will cause permanent damage to brake components and will render the brakes inoperative.



WARNING: Brake fluid contains polyglycol ethers and polyglycols. Avoid contact with eyes. Wash hands thoroughly after handling. If brake fluid contacts eyes, flush eyes with running water for 15 minutes. Get medical attention if irritation persists. If taken internally, drink water and induce vomiting. Get medical attention immediately.

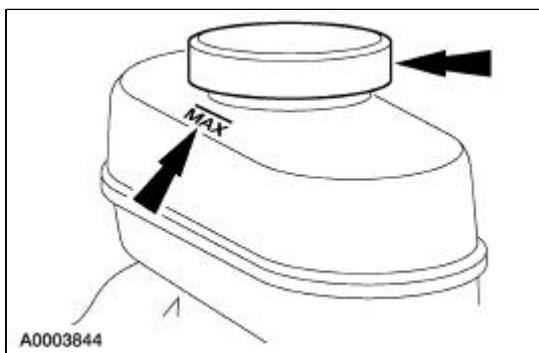


CAUTION: Brake fluid is harmful to painted and plastic surfaces. If brake fluid is spilled onto a painted or plastic surface, immediately wash it with water.



CAUTION: Do not allow the master cylinder to run dry during the bleeding operation. Keep the master cylinder reservoir filled with the specified brake fluid. Never reuse the brake fluid that has been drained from the hydraulic system.

1. Clean all dirt from and remove the brake master cylinder filler cap and fill the brake master cylinder reservoir with the specified brake fluid.

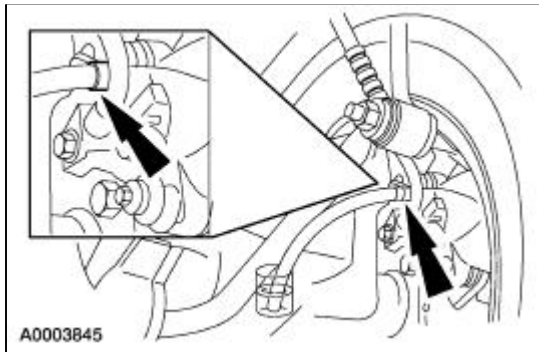


2. **NOTE:** Master cylinder pressure bleeder adapter tools are available from various manufacturers of pressure bleeding equipment. Follow the instructions of the manufacturer when installing the adapter.

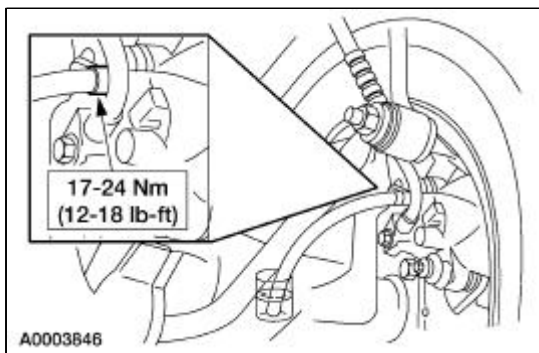
Install the bleeder adapter to the brake master cylinder reservoir, and attach the bleeder tank hose to the fitting on the adapter.

3. **NOTE:** Bleed the longest line first. Make sure the bleeder tank contains enough specified brake fluid to complete the bleeding operation.

Place a box end wrench on the RH rear bleeder screw. Attach a rubber drain tube to the RH rear bleeder screw, and submerge the free end of the tube in a container partially filled with clean brake fluid.



4. Open the valve on the bleeder tank.
5. Loosen the RH rear bleeder screw. Leave open until clear, bubble-free brake fluid flows, then tighten the RH rear bleeder screw and remove the rubber hose.



6. Continue bleeding the rear of the system, going in order from the LH rear bleeder screw to the RH front disc brake caliper bleeder screw ending with the LH front disc brake caliper bleeder screw.
 7. Close the bleeder tank valve. Remove the tank hose from the adapter, and remove the adapter.
-

Hydraulic Leak Check

1. **NOTE:** Brake fluid is water soluble and it is possible that all evidence of fluid leakage has been washed off if the vehicle has been operated in the rain or snow.

Make sure the brake master cylinder reservoir (2K478) is full.

2. Apply the brakes several times and make sure the brake pedal (2455) feel is not spongy. If necessary, bleed the system. For additional information, refer to [Bleeding— System](#) in this section.
 3. Verify that the reservoir level is dropping.
 4. If the reservoir level is dropping, inspect the brake components, fittings and lines to locate the source of the leak.
-

General Specifications

Item	Specification
Brake Disc	
Minimum thickness ^a	28.00 mm (1.12 in)
Pad	
Minimum thickness above metal backing plate or rivets	2 mm (0.079 in)
Fluid	
High Performance DOT 3 Brake Fluid C6AZ-19542-AB	ESA-M6C25-A (United States and Canada only)
High Performance DOT 4 Brake Fluid	SAE-J1704-DOT 4 (All Vehicles)
Lubricant	
Silicone Brake Caliper Grease and Dielectric Compound D7AZ-19A331-A	ESE-M1C171-A
High Temperature Nickel Anti-Seize Lubricant F6AZ-9L494-AA	ESE-M12A4-A
Rust Penetrant and Inhibitor F2AZ-19A501-A	ESR-M99C56-A
Cleaners	
Brake Parts Cleaner F6AZ-2C410-AB	—

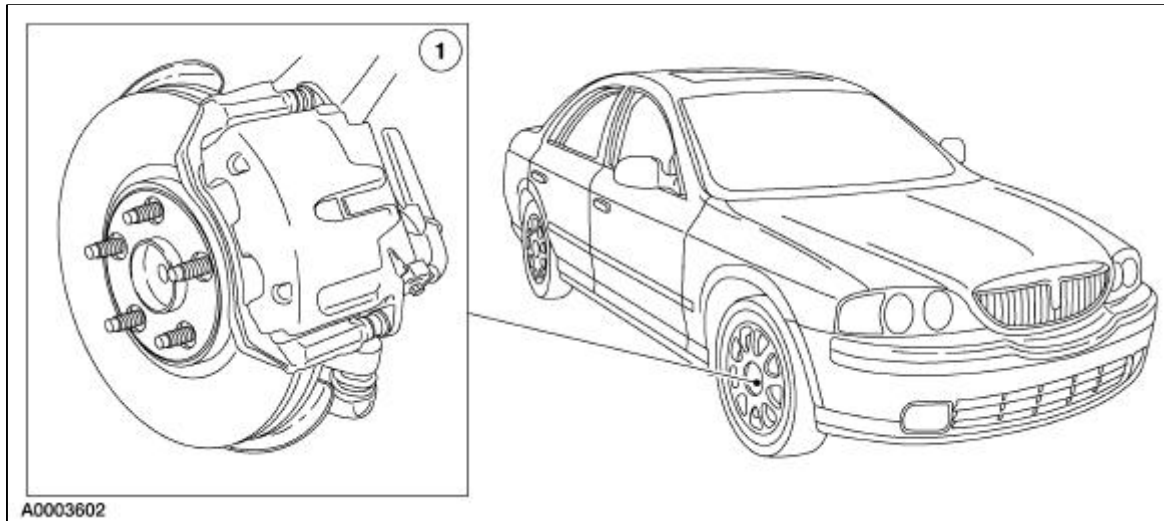
^a Minimum safe thickness is shown on each brake disc.

Torque Specifications

Description	Nm	lb-ft
Caliper bolts	35	26
Caliper flow bolt	47	35
Anchor plate bolts	103	76

Front Disc Brake

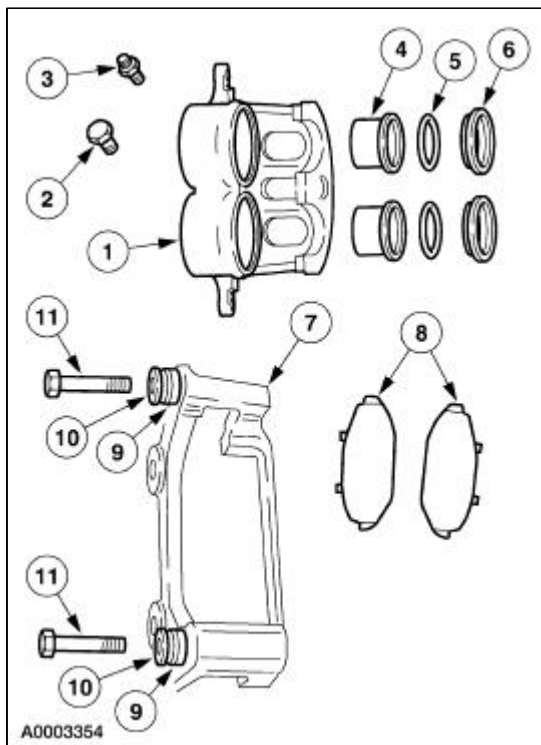
Front Disc Brake



A0003602

Item	Part Number	Description
1	2B120	Front disc brake caliper assy

Disc Brake Caliper Components



A0003354

Item	Part Number	Description
1	2B120	Disc brake caliper

2	2L126	Bleeder screw cap
3	2208	Bleeder screw
4	2196	Caliper piston
5	2B115	Piston seal
6	2207	Piston dust boot
7	2B292	Front disc brake caliper anchor plate
8	2001	Brake pads
9	2A492	Guide pin boot
10	2B296	Guide pin
11	2N386	Caliper bolt

The front disc brake caliper (2B120):

- bolts to the front disc brake caliper anchor plate (2B292), which bolts to the front wheel spindle (3105).
- is a disc brake caliper locating pin, dual piston design one piston is 38mm the other piston is 45mm.
- has a fluid inlet at the bottom of the caliper housing.

The front brake discs (1125):

- are of a ventilated full-cast design, with non-directional cooling fins.
- are serviced with the disc brake caliper and front disc brake caliper anchor plate removed.

The front brake disc shield (2K005):

- is riveted to the front wheel spindle.
- protects the front wheel bearings and inboard surface of the front brake disc.

The pads (2001):

- are housed in the front disc brake caliper anchor plate.
- are of a non-asbestos, non-metallic composition.

Brake Fluid



WARNING: Use of any other than approved DOT 4 or DOT 3 brake fluid will cause permanent damage to brake components and will render the brakes inoperative.



WARNING: Brake fluid contains polyglycol ethers and polyglycols. Avoid contact with eyes. Wash hands thoroughly after handling. If brake fluid contacts eyes, flush eyes with running water for 15 minutes. Get medical attention if irritation persists. If taken internally, drink water and induce vomiting. Get medical attention immediately.



CAUTION: Brake fluid is harmful to painted or plastic surfaces. If brake fluid is spilled

onto a painted or plastic surface, immediately wash it with water.

Use clean, fresh Ford High Performance DOT 3 Motor Vehicle Brake Fluid C6AZ-19542-AB or equivalent meeting Ford specification ESA-M6C25-A (United States and Canada only). If DOT 3 is not available, use Ford High Performance DOT 4 Brake Fluid or equivalent meeting Ford specification SAE-J-1704-DOT 4.

- Do not reuse brake fluid drained or bled from the system.
 - Do not use brake fluid that has been stored in an open container.
 - Do not use contaminated brake fluid.
-

Front Disc Brake

Refer to [Section 206-00](#) .

Pads

Removal

! WARNING: Use of any other than approved DOT 4 or DOT 3 brake fluid will cause permanent damage to brake components and will render the brakes inoperative.

! WARNING: Brake fluid contains polyglycol ethers and polyglycols. Avoid contact with eyes. Wash hands thoroughly after handling. If brake fluid contacts eyes, flush eyes with running water for 15 minutes. Get medical attention if irritation persists. If taken internally, drink water and induce vomiting. Get medical attention immediately.

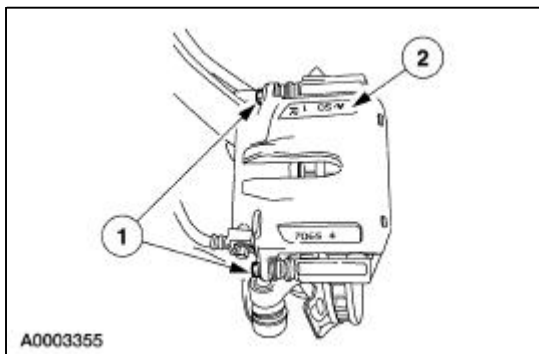
! CAUTION: Brake fluid is harmful to painted or plastic surfaces. If brake fluid is spilled onto a painted or plastic surface, immediately wash it with water.

1. Remove brake master cylinder filler cap. Check brake fluid level in brake master cylinder reservoir (2K478). Remove fluid until the reservoir is half full.
2. Raise and support the vehicle. For additional information, refer to [Section 100-02](#).
3. Remove the wheel and tire assembly. For additional information, refer to [Section 204-04](#).
4. **! CAUTION:** Do not pry in caliper sight hole to retract pistons as this can damage the pistons and boots.

! CAUTION: When removing the caliper (2B120), never allow it to hang from the brake hose. Provide a suitable support.

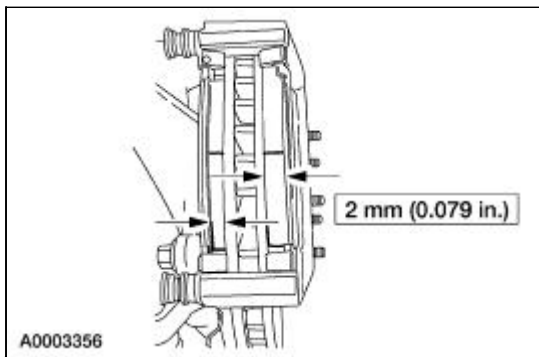
Remove the brake caliper (2B120).

1. Remove the caliper bolts.
2. Lift the caliper off the caliper anchor plate (2B292).

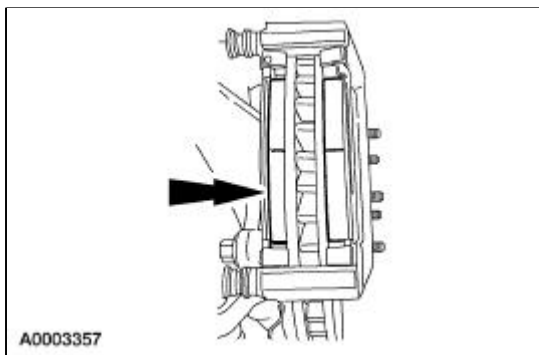


5. **! CAUTION:** Install new pads if worn to or past the specified thickness above the metal backing plate or rivets. Install new pads in complete axle sets.

Inspect the pads (2100) for wear and contamination.

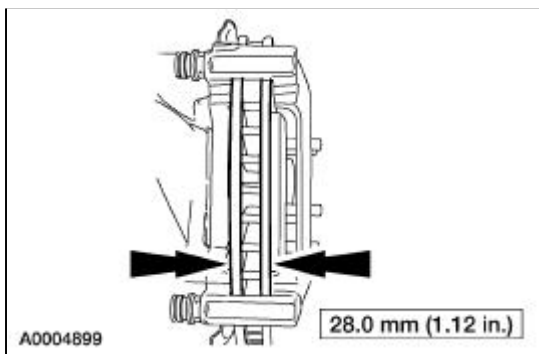


6. Remove the pads.



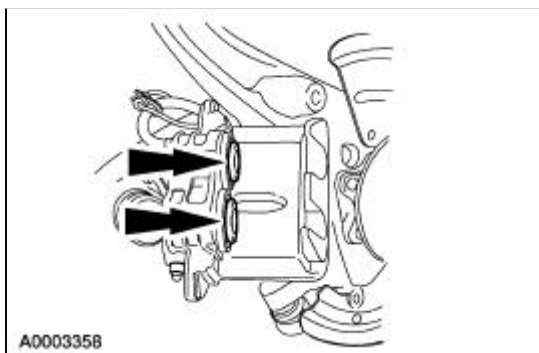
7. Measure the brake disc thickness.

- Install a new brake disc (1125) if not within specification.



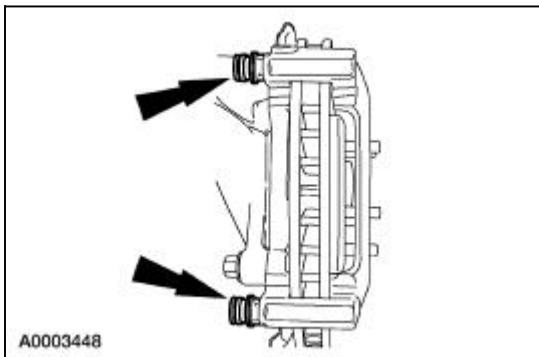
8. Inspect the caliper.

- If leaks or damaged boots are found, disassembly is required. For additional information, refer to [Caliper](#) in this section.



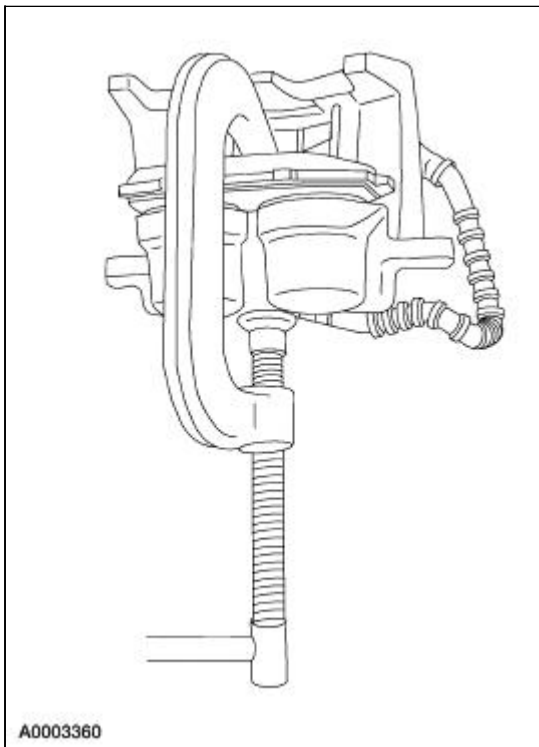
9. Inspect the anchor plate assembly.

- Check the guide pin boots for damage.
- Check the guide pins for binding and damage.
- Install new pins if worn or damaged.



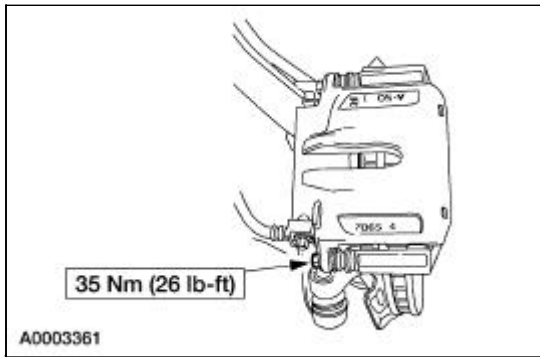
10. **NOTE:** Use a wood block or used pad to protect pistons and boots.

Compress the caliper pistons.



Installation

1. To install, reverse the removal procedure.
 - Fill the brake master cylinder reservoir with clean High Performance DOT 4 Brake Fluid or equivalent DOT 4 fluid meeting Ford specification SAE-J1704-DOT 4. If DOT 4 is not available use DOT 3 Brake Fluid (United States) C6AZ-19542-AB meeting Ford specification ESA-M6C25-A.



Caliper

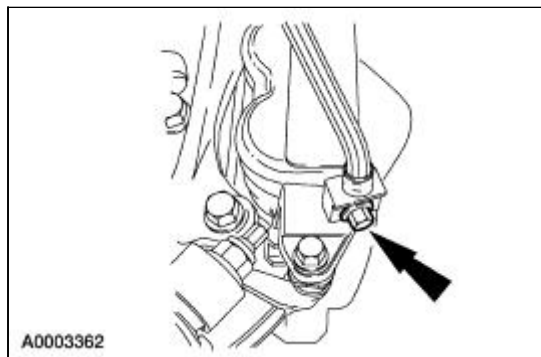
Removal

⚠ WARNING: Use of any other than approved DOT 4 or DOT 3 brake fluid will cause permanent damage to brake components and will render the brakes inoperative.

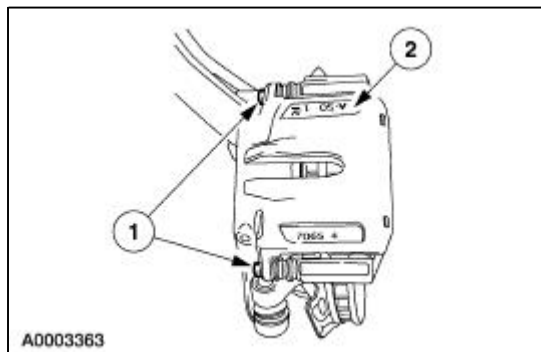
⚠ WARNING: Brake fluid contains polyglycol ethers and polyglycols. Avoid contact with eyes. Wash hands thoroughly after handling. If brake fluid contacts eyes, flush eyes with running water for 15 minutes. Get medical attention if irritation persists. If taken internally, drink water and induce vomiting. Get medical attention immediately.

⚠ CAUTION: Brake fluid is harmful to painted or plastic surfaces. If brake fluid is spilled onto a painted or plastic surface, immediately wash it with water.

1. Raise and support the vehicle. For additional information, refer to [Section 100-02](#).
2. Remove the wheel and tire assembly. For additional information, refer to [Section 204-04](#).
3. Remove the caliper flow bolt.
 - Discard the copper washers.

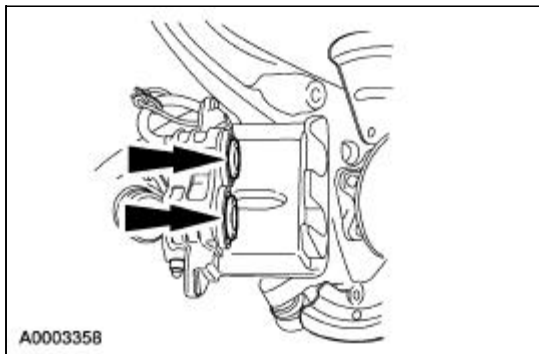


4. Remove the caliper (2B120).
 1. Remove the caliper bolts.
 2. Lift the caliper off the caliper anchor plate (2B292).



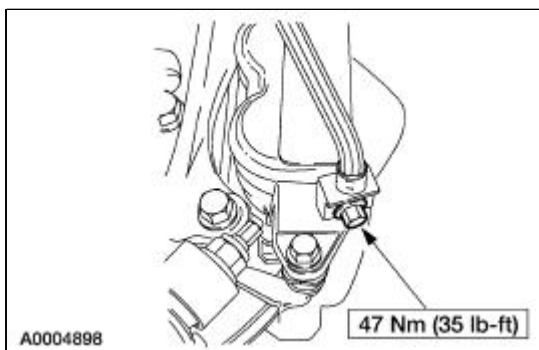
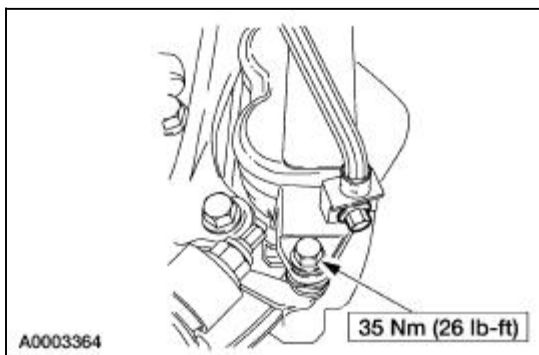
5. Inspect the caliper.

- If leaks or damaged boots are found, disassembly is required. For additional information, refer to [Caliper](#) in this section.



Installation

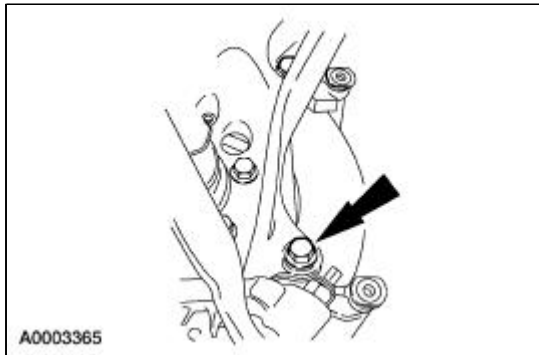
1. To install, reverse the removal procedure.
 - Install new copper washers.
 - Bleed the caliper. For additional information, refer to [Section 206-00](#).



Brake Caliper Anchor Plate

Removal

1. Remove the pads (2100). For additional information, refer to [Pads](#) in this section.
2. Remove the caliper anchor plate bolts.

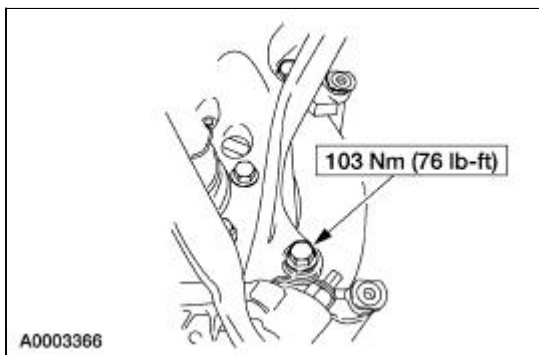


Installation

1.  **CAUTION: Use correct type and length bolts.**

To install, reverse the removal procedure.

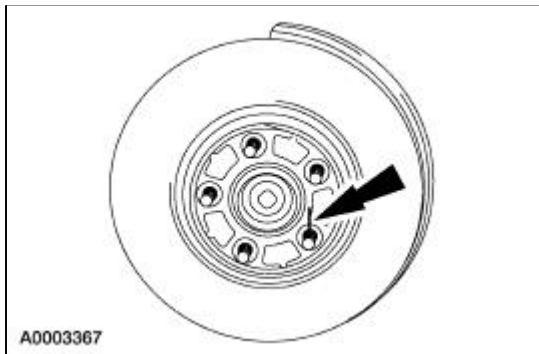
- Install new anchor plate bolts.




Disc

Removal

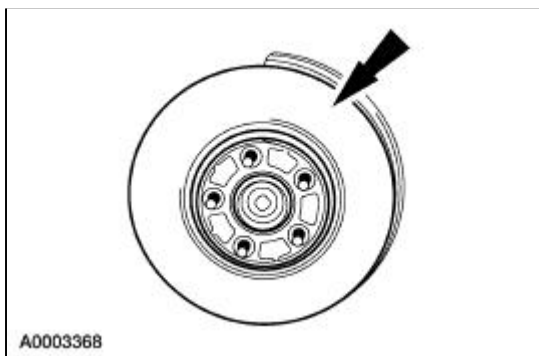
1. Remove the caliper anchor plate (2B292). For additional information, refer to [Brake Caliper Anchor Plate](#) in this section.
2. Mark the brake disc (1125) and a wheel bolt.
 - This ensures the lowest brake disc runout is maintained during reassembly.



3.  **CAUTION:** If excessive force must be used during brake disc removal, the brake disc total indicated runout (TIR) must be checked at installation. For additional information, refer to [Section 206-00](#).

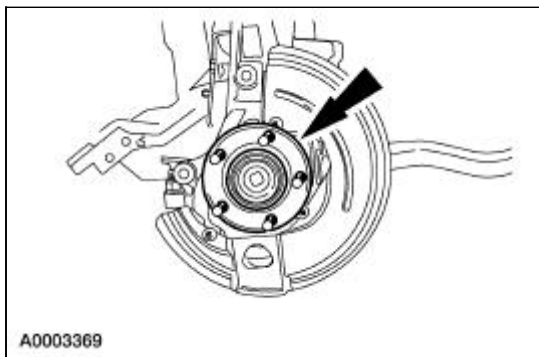
NOTE: If the brake disc cannot be removed easily, apply Rust Penetrant and Inhibitor F2AZ-19A501-A or equivalent meeting Ford specification ESR-M99C56-A on brake disc to wheel hub mating surfaces.

Remove the brake disc.

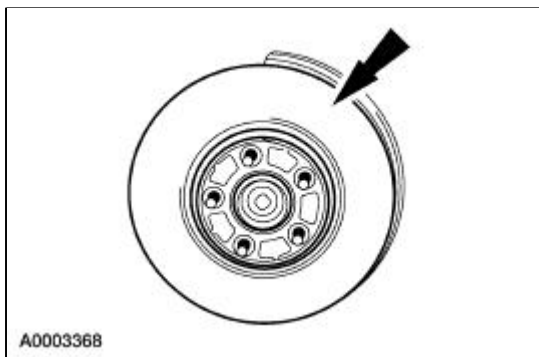


Installation

1. Clean any rust or foreign material from the brake disc and wheel hub.
 - Use Brake Parts Cleaner F6AZ-2C410-AB or equivalent to clean the brake disc and hub surfaces.
2. Apply High Temperature Nickel Anti-Seize Lubricant F6AZ-9L494-AA or equivalent meeting Ford specification ESE-M12A4-A to the hub flange.




3. Align the hub and brake disc marks and position the brake disc to the wheel hub (1104).



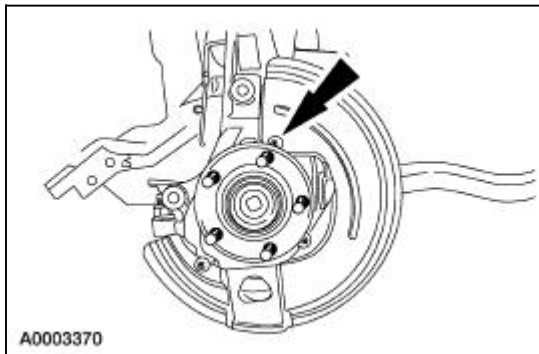
4. Install the caliper anchor plate. For additional information, refer to [Brake Caliper Anchor Plate](#) in this section.
 5. Check total indicated runout (TIR). For additional information, refer to [Section 206-00](#).
-

Shield

Removal

1. Remove the brake disc (1125). For additional information, refer to [Disc](#) in this section.
2.  **CAUTION:** Use a 5.5 mm (0.22 in) drill **DO NOT** exceed past a 6 mm (0.24 in) drill.

Drill out the shield rivets.



Installation

1. To install, reverse the removal procedure.
-

Caliper

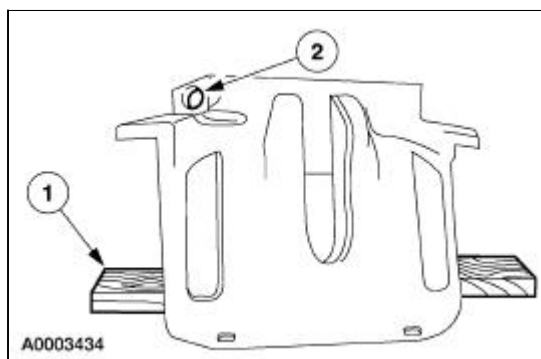
Disassembly

⚠ WARNING: Use of any other than approved DOT 4 or DOT 3 brake fluid will cause permanent damage to brake components and will render the brakes inoperative.

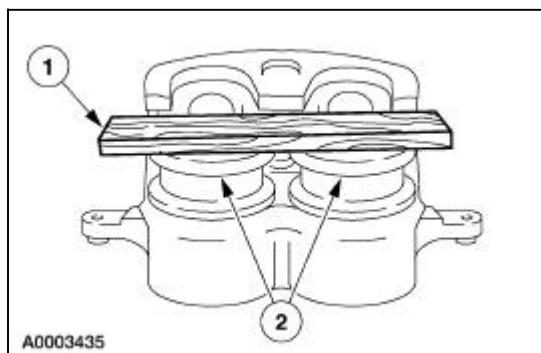
⚠ WARNING: Brake fluid contains polyglycol ethers and polyglycols. Avoid contact with eyes. Wash hands thoroughly after handling. If brake fluid contacts eyes, flush eyes with running water for 15 minutes. Get medical attention if irritation persists. If taken internally, drink water and induce vomiting. Get medical attention immediately.

⚠ CAUTION: Brake fluid is harmful to painted or plastic surfaces. If brake fluid is spilled onto a painted or plastic surface, immediately wash it with water.

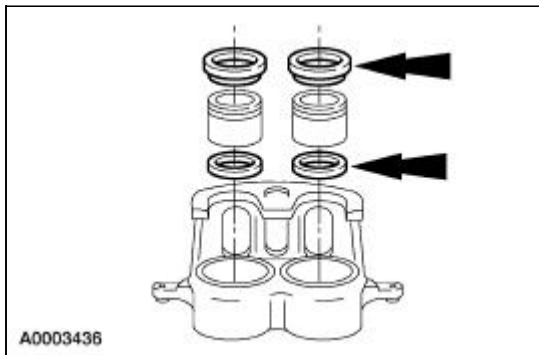
1. Remove the caliper (2B120). For additional information, refer to [Caliper](#) in this section.
2. Drain the remaining brake fluid from caliper.
3. Apply low air pressure to the fluid port in the caliper.
 1. Place a block of wood between the caliper bridge and the caliper pistons (2196).
 2. Apply low air pressure to the fluid port in the caliper and force out the caliper pistons to the block of wood.



4. Remove the caliper pistons.
 1. Remove the block of wood.
 2. Remove the caliper pistons.




5. Remove and discard the piston seals (2B115) and boots (2207).



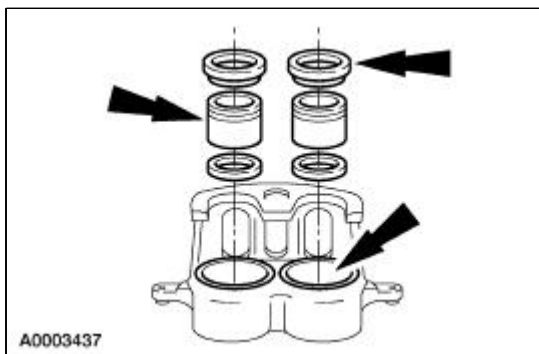
6. Remove and discard the bleed screw (2208) and cap.

Assembly

1.  **CAUTION: Do not hone the caliper bores. Caliper pistons are not available for honed caliper bores.**

Clean and inspect the caliper pistons and the caliper.

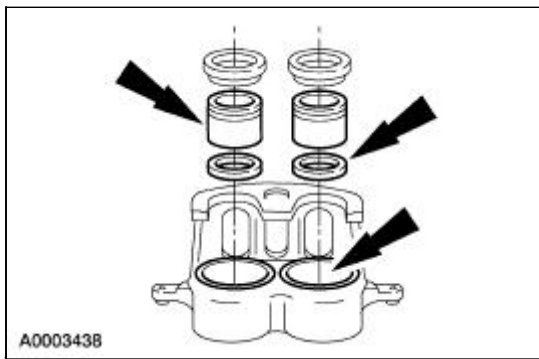
- Remove dirt and debris.
- Examine the caliper pistons for surface irregularities, scoring or wear. Install new caliper pistons if necessary.
- Clean the caliper bores with Brake Parts Cleaner F6AZ-2C410-AB. If the caliper bores are corroded or excessively scored, install a new caliper.
- Lubricate the caliper pistons and piston seals before assembly.



2.  **CAUTION: Never reuse piston seals and dust boots.**


NOTE: Never reuse brake fluid that has been drained from the hydraulic system or has been allowed to stand in an open container for an extended period of time.

Lubricate the caliper piston, piston seal and caliper bores with clean High Performance DOT 4 Brake Fluid or equivalent DOT 4 fluid meeting Ford specification SAE-J1704-DOT 4. If DOT 4 is not available use DOT 3 Brake Fluid (United States only) C6AZ-19542-AB meeting Ford specification ESA-M6C25-A.



3.  **CAUTION: Pistons are not the same diameter.**

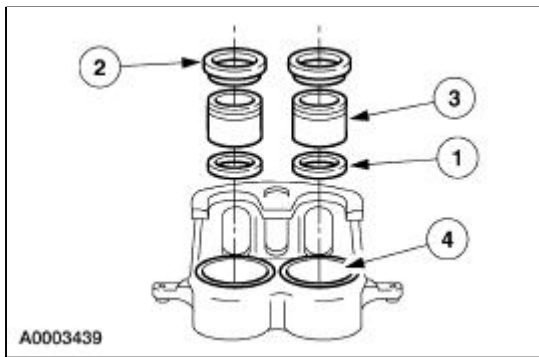
Install the caliper piston.

1. Install the piston seal.
2. Install the piston boot on the piston.
3.  **CAUTION: Be careful not to damage or dislodge the piston seal.**

Insert the caliper piston.

4.  **CAUTION: Be careful not to cock the caliper piston.**

Press the caliper piston into the bore.



4. Install a new bleed screw and cap.
 5. Install the caliper. For additional information, refer to [Caliper](#) in this section.
-

General Specifications

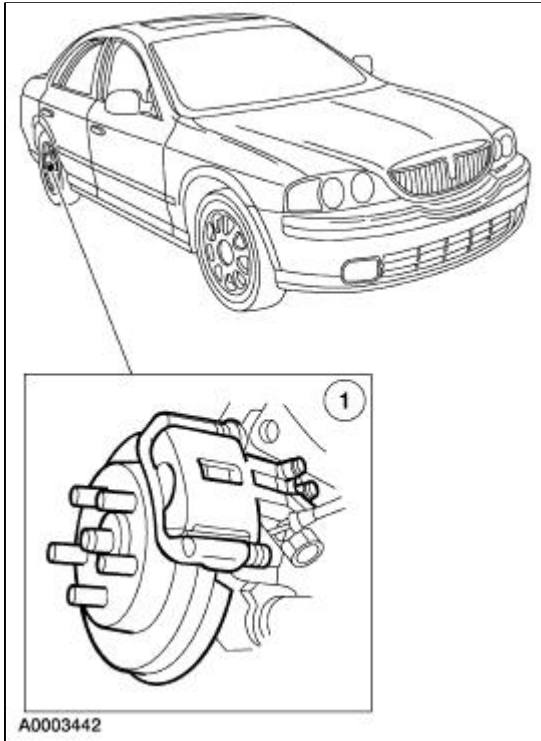
Item	Specification
Lining wear limit (from shoe surface)	1.0 mm (0.039 in)
Brake disc minimum thickness	18.50 mm (0.74 in)
Brake disc allowable runout on vehicle	0.102 mm (0.004 in)
Brake disc maximum thickness variation	0.01 mm (0.0004 in)
Fluids/Lubricants/Adhesives	
High Performance DOT 3 Brake Fluid C6AZ-19542-AB	ESA-M6C25-A (United States and Canada only)
High Performance DOT 4 Brake Fluid	SAE-J-1704-DOT 4 (All Vehicles)

Torque Specifications

Description	Nm	lb-ft
Caliper flow bolt	48	36
Support bracket bolts	103	76
Caliper bolts	33	25

Rear Disc Brake

Rear Disc Brake



Item	Part Number	Description
1	2B120	Rear disc brake caliper assy

The rear disc brake system consists of:

- solid, full-cast rear brake disc (1125).
- hydraulically activated rear disc brake caliper (2B120).

Brake Fluid

⚠ WARNING: Use of any other than approved DOT 4 or DOT 3 brake fluid will cause permanent damage to brake components and will render the brakes inoperative.

⚠ WARNING: Brake fluid contains polyglycol ethers and polyglycols. Avoid contact with eyes. Wash hands thoroughly after handling. If brake fluid contacts eyes, flush eyes with running water for 15 minutes. Get medical attention if irritation persists. If taken internally, drink water and induce vomiting. Get medical attention immediately.

⚠ CAUTION: Brake fluid is harmful to painted or plastic surfaces. If brake fluid is spilled onto a painted or plastic surface, immediately wash it with water.

Use clean, fresh Ford High Performance DOT 3 Motor Vehicle Brake Fluid C6AZ-19542-AB or

equivalent meeting Ford specification ESA-M6C25-A (United States and Canada only). If DOT 3 is not available, use Ford High Performance DOT 4 Brake Fluid or equivalent meeting Ford specification SAE-J-1704-DOT 4.

- Do not reuse brake fluid drained or bled from the system.
 - Do not use brake fluid that has been stored in an open container.
 - Do not use contaminated brake fluid.
-


Rear Disc Brake

Refer to [Section 206-00](#) .

Caliper

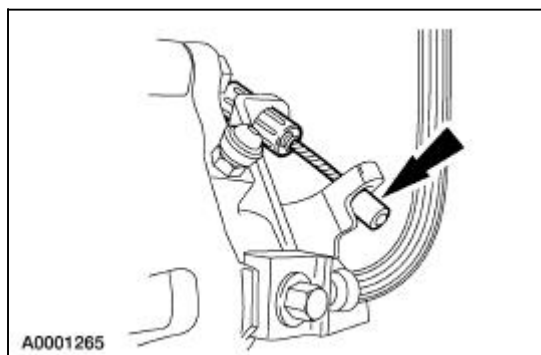
Removal

 **WARNING:** Use of any other than approved DOT 4 or DOT 3 brake fluid will cause permanent damage to brake components and will render the brakes inoperative.

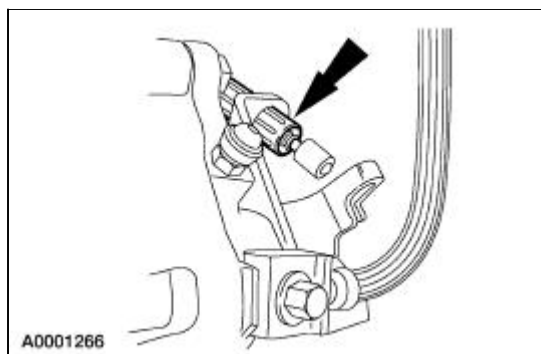
 **WARNING:** Brake fluid contains polyglycol ethers and polyglycols. Avoid contact with eyes. Wash hands thoroughly after handling. If brake fluid contacts eyes, flush eyes with running water for 15 minutes. Get medical attention if irritation persists. If taken internally, drink water and induce vomiting. Get medical attention immediately.

 **CAUTION:** Brake fluid is harmful to painted or plastic surfaces. If brake fluid is spilled onto a painted or plastic surface, immediately wash it with water.

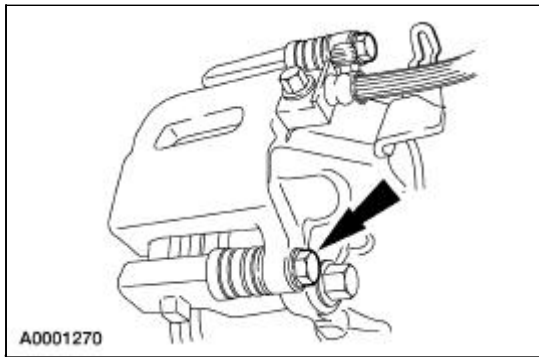
1. Raise the vehicle on a hoist. For additional information, refer to [Section 100-02](#).
2. Remove the wheel and tire assembly. For additional information, refer to [Section 204-04](#).
3. Disengage the parking brake cable end from the parking brake lever arm.



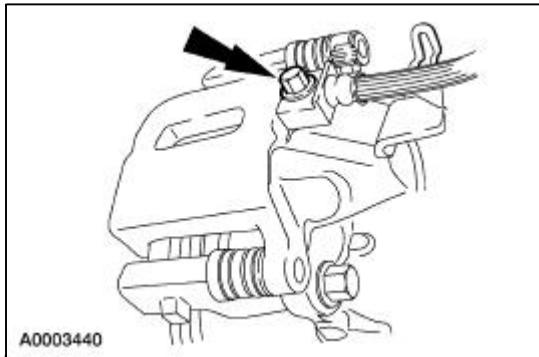
4. Remove the parking brake cable and conduit.



5. Remove the caliper bolts.

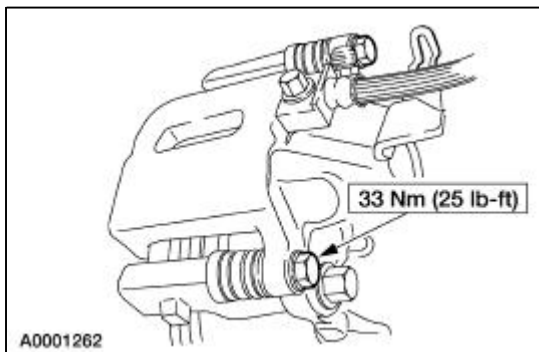
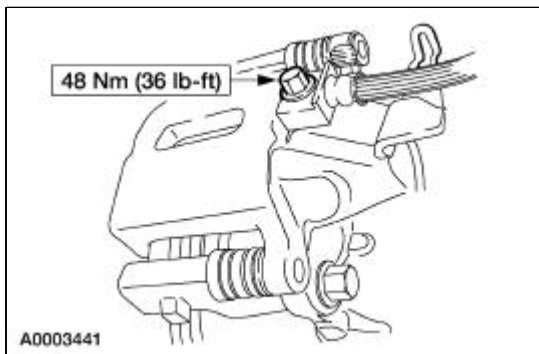


6. Remove the caliper flow bolt and remove the caliper (2B120).
 - Discard the copper washers.



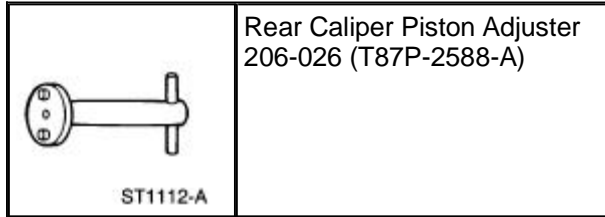
Installation

1. To install, reverse the removal procedure.
 - Use new copper washers.
 - Bleed the brake system. For additional information, refer to [Section 206-00](#).



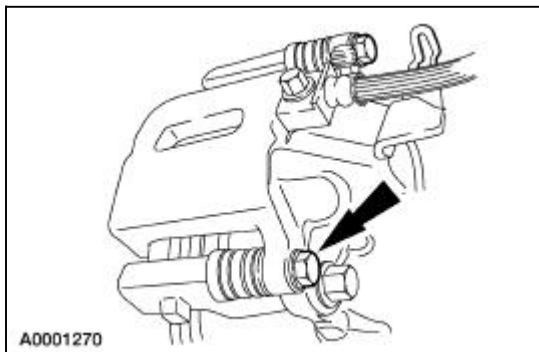
Pads

Special Tool(s)



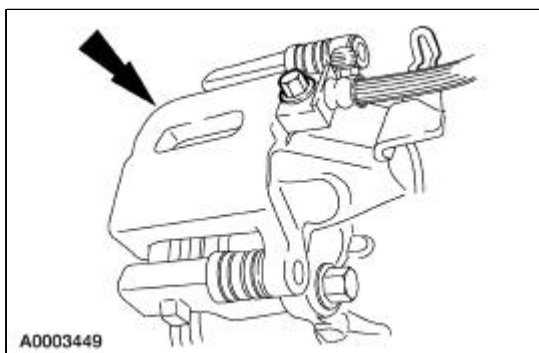
Removal

1. Raise and support the vehicle. For additional information, refer to [Section 100-02](#).
2. Remove the wheel and tire assembly. For additional information, refer to [Section 204-04](#).
3. Remove the caliper bolts.

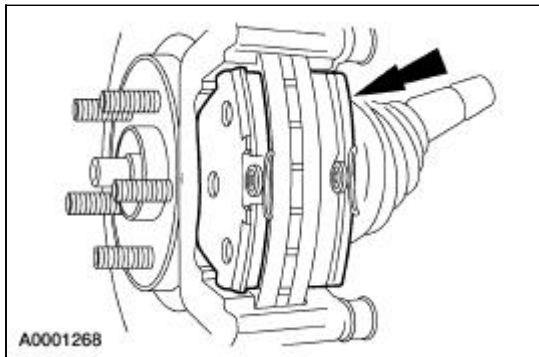


4.  **CAUTION: Do not allow the caliper to hang from the brake hose.**

Remove the caliper (2B120).

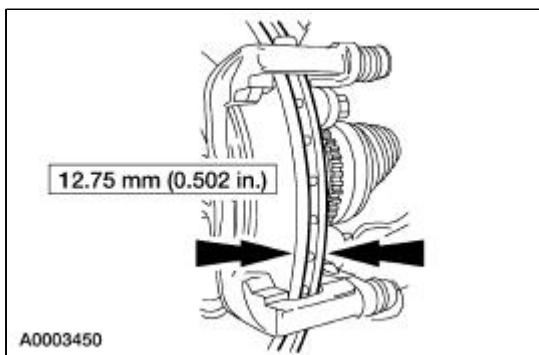


5. Remove the brake pads (2100).

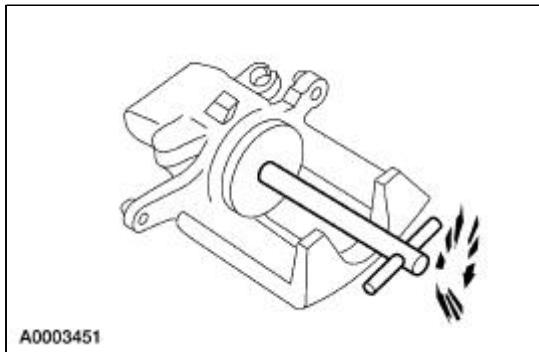


6.  **CAUTION:** Use a hub-mount brake lathe if necessary to machine the brake disc.

Measure the brake disc (1125), and resurface as necessary. Install a new brake disc if beyond specification.

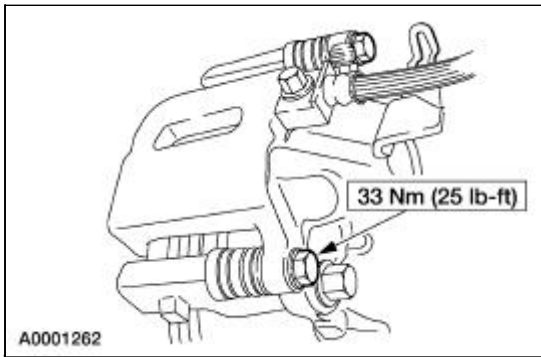


7. Compress the disc brake piston and adjuster into the disc brake caliper using Rear Caliper Piston Adjuster.



Installation

1. To install, reverse the removal procedure.

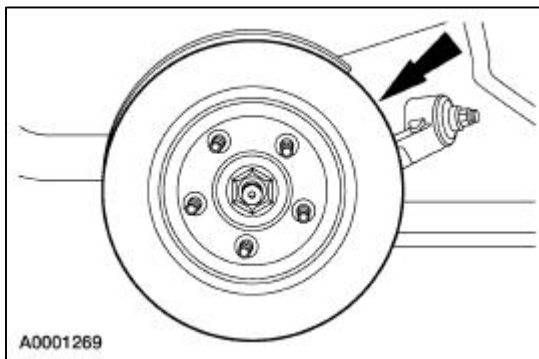


Disc

Removal

1. Remove the support bracket (2B511). For additional information, refer to [Brake Caliper Support Bracket](#) in this section.
2. **NOTE:** Remove and discard the pushnuts, if so equipped.

Remove the brake disc (1125).



Installation

1. To install, reverse the removal procedure.
-

Brake Caliper Support Bracket

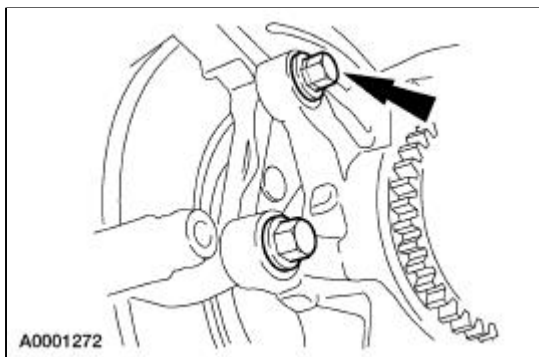
Removal

1. Raise and support the vehicle. For additional information, refer to [Section 100-02](#).
2. Remove the tire and wheel assembly. For additional information, refer to [Section 204-04](#).

3.  **CAUTION: Do not allow the caliper to hang from the brake hose**

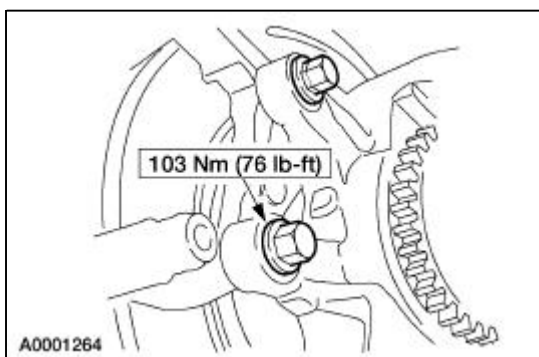
Remove brake pads (2100). For additional information, refer to [Pads](#) in this section.

4. Remove the support bracket bolts.




Installation

1. To install, reverse the removal procedure.

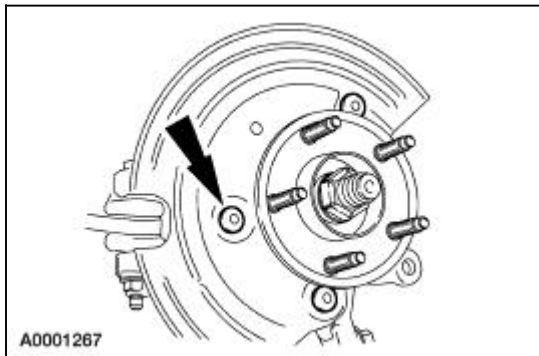


Shield

Removal

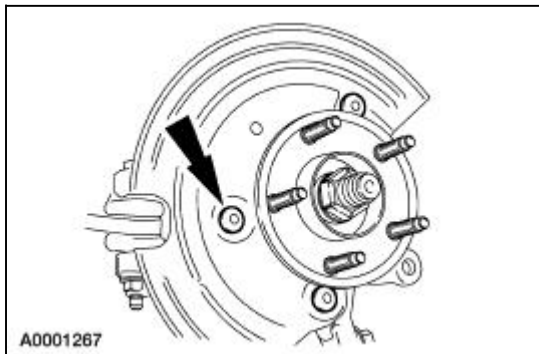
1. Remove the brake disc (1125). For additional information, refer to [Disc](#) in this section.
2.  **CAUTION:** Use a 5.5mm (0.22in) drill DO NOT exceed past a 6mm (0.24in) drill.

Drill out the shield rivets.



Installation

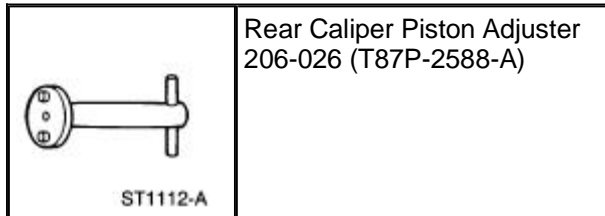
1. Install new rivets.



2. Install the brake disc. For additional information, refer to [Disc](#) in this section.


Caliper

Special Tool(s)



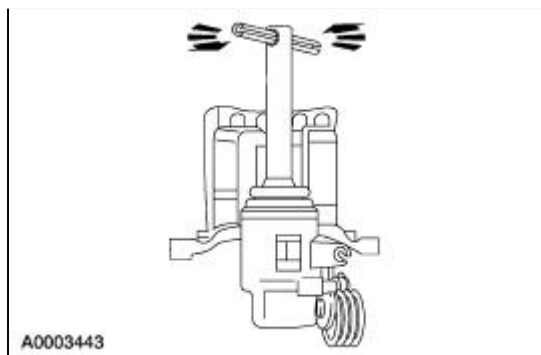
Disassembly

 **WARNING:** Use of any other than approved DOT 4 or DOT 3 brake fluid will cause permanent damage to brake components and will render the brakes inoperative.

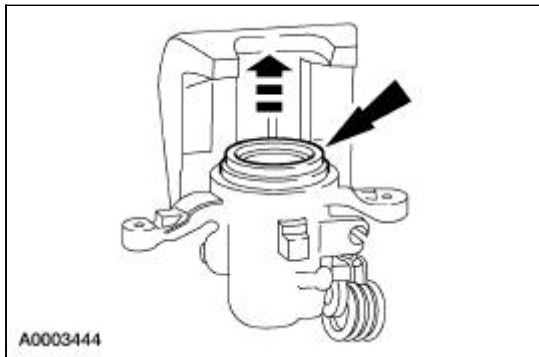
 **WARNING:** Brake fluid contains polyglycol ethers and polyglycols. Avoid contact with eyes. Wash hands thoroughly after handling. If brake fluid contacts eyes, flush eyes with running water for 15 minutes. Get medical attention if irritation persists. If taken internally, drink water and induce vomiting. Get medical attention immediately.

 **CAUTION:** Brake fluid is harmful to painted or plastic surfaces. If brake fluid is spilled onto a painted or plastic surface, immediately wash it with water.

1. Remove the brake caliper (2B120). For additional information, refer to [Caliper](#) in this section.
2. Drain the brake fluid from the brake caliper.
3. Secure the brake caliper in a vise.
4. Turn the brake piston counterclockwise with Rear Caliper Piston Adjuster.




5. Remove the brake piston from the caliper bore.



6. Remove and discard the piston dust boot and piston seal from the caliper bore.

Assembly

1.  **CAUTION: Do not reuse piston seals or dust boots. Install new seals and dust boots or damage to the vehicle can occur.**

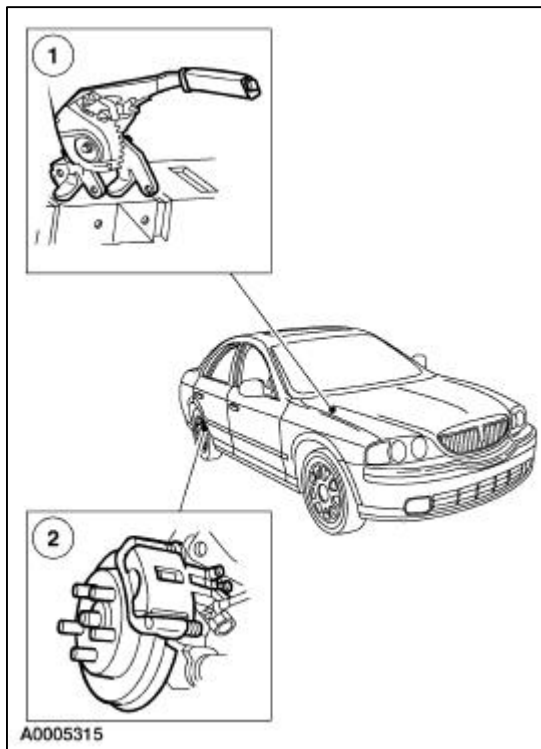
NOTE: Use new brake fluid when assembling and bleeding the brake system.

To install, reverse the disassembly procedure.

Torque Specifications

Description	Nm	lb-ft
Parking brake control bolts/nuts	30	22
Parking brake control bolts/nuts	18	13
Brake hose clip mounting bolt	12	9

Parking Brake



Item	Part Number	Description
1	2780	Parking brake control
2	2552	Rear disc brake caliper

The parking brake system is cable-actuated and controlled by an independent hand-operated parking brake control. To apply parking brake, pull parking brake control upward.

The parking brake system is an AUTO-ADJUST system. The spring in the parking brake control continuously adjusts the cable tension in the system.

Brake Warning System

A brake warning indicator:

- is located in the instrument panel.
- illuminates to signal the driver the parking brake is applied.
- remains lit when a brake malfunction has occurred.

Parking Brake

Inspection and Verification

Check the operation of the parking brake system with the vehicle on a hoist and the parking brake control fully released. Check for any damaged cables and install new components as necessary. Check the rear brake adjustment or perform brake system diagnosis.

Check the parking brake by pulling up on the parking brake control. The parking brake must hold the vehicle on an incline, set by pulling up on the parking brake control before it reaches full travel. If not as specified, check the parking brake system for correct rear brake adjustment, cable operation and parking brake control operation.

Symptom Chart

Symptom Chart

Condition	Possible Sources	Action
<ul style="list-style-type: none"> ● Parking Brake Will Not Apply 	<ul style="list-style-type: none"> ● Parking brake cable. ● Parking brake control. 	<ul style="list-style-type: none"> ● GO to Pinpoint Test A.
<ul style="list-style-type: none"> ● Parking Brake Will Not Release 	<ul style="list-style-type: none"> ● Parking brake cable. ● Parking brake control. 	<ul style="list-style-type: none"> ● GO to Pinpoint Test B.

Pinpoint Tests

PINPOINT TEST A: PARKING BRAKE WILL NOT APPLY

CONDITIONS	DETAILS/RESULTS/ACTIONS
	A1 CHECK THE PARKING BRAKE CABLE
	<p>① At the parking brake cable equalizer pull the parking brake rear cable and conduit forward.</p> <ul style="list-style-type: none"> ● Can the parking brake be operated? <p>→ Yes REPAIR the binding condition in the front parking brake cable and conduit or the parking brake control. TEST the system for normal operation.</p> <p>→ No REPAIR the binding condition in the parking brake rear cable and conduit or</p>

the caliper. TEST the system for normal operation.

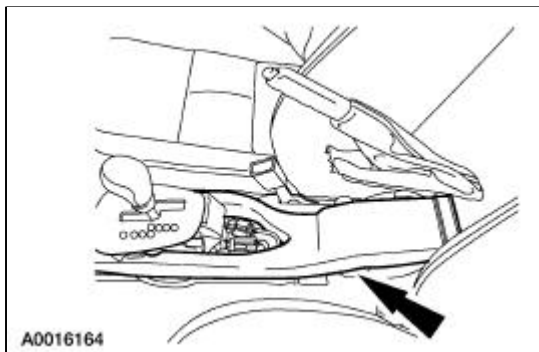
PINPOINT TEST B: PARKING BRAKE WILL NOT RELEASE


CONDITIONS	DETAILS/RESULTS/ACTIONS
B1 CHECK THE PARKING BRAKE CABLE	
	<p>1 Disconnect the parking brake cable at the parking brake lever.</p> <ul style="list-style-type: none"><li>● Does the parking brake release? <p>→ Yes REPAIR the binding condition in the parking brake cable or the parking brake control. TEST the system for normal operation.</p> <p>→ No REPAIR the binding condition in the parking brake components of the caliper. TEST the system for normal operation.</p>

Control

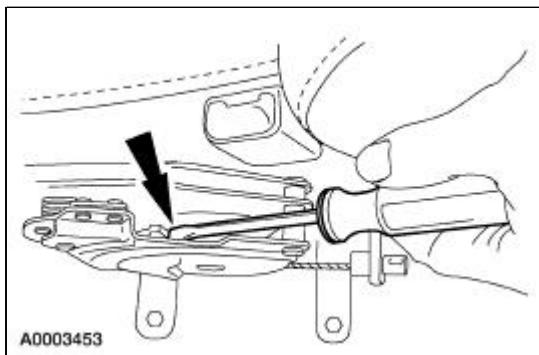
Removal

1. Position the right front seat into the full forward position.
2. Remove the console. For additional information, refer to [Section 501-12](#).
3. Remove the transfer duct.

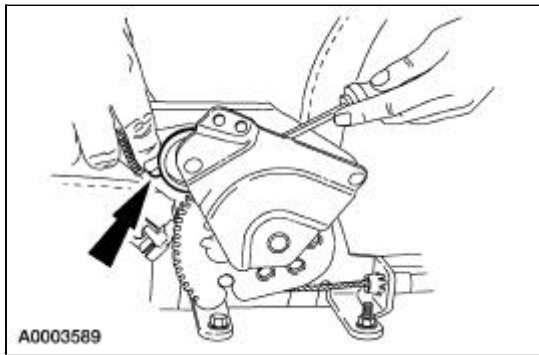


4.  **WARNING:** The parking brake control will have spring tension on the tension arm and, if released inadvertently, can cause injury. Use care when working on or around the parking brake control when the tension arm is in the locked position. Failure to follow these instructions can cause personal injury.

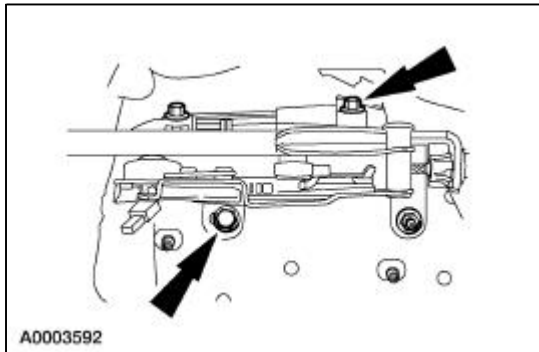
Using a screwdriver, push down on the tension arm until it is fully depressed.



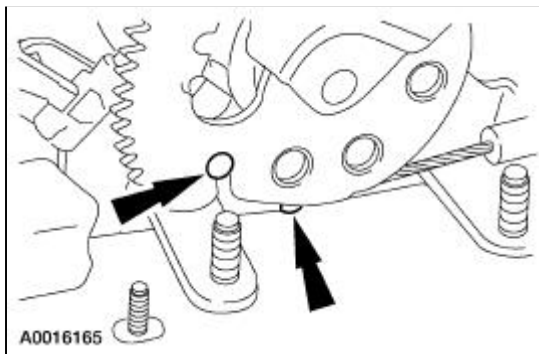
5. Move the tension arm down and release the screwdriver.



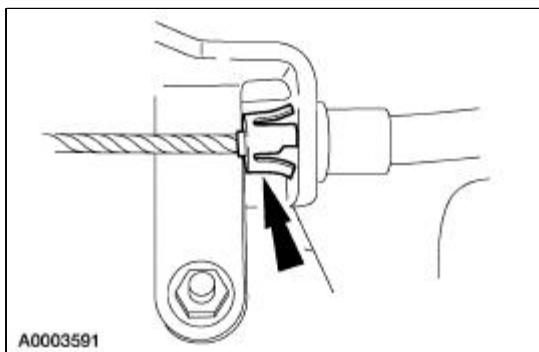
6. Remove the control retainers.
 - Disconnect the parking brake switch connector.



7. Bend the retaining tab out of the way and remove the cable anchor pin.

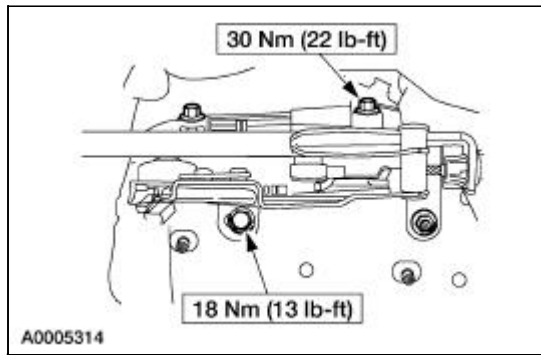


8. Using a 13mm line wrench, depress the conduit retaining prongs to remove the parking brake cable and conduit from the control. Remove the parking brake control.



Installation

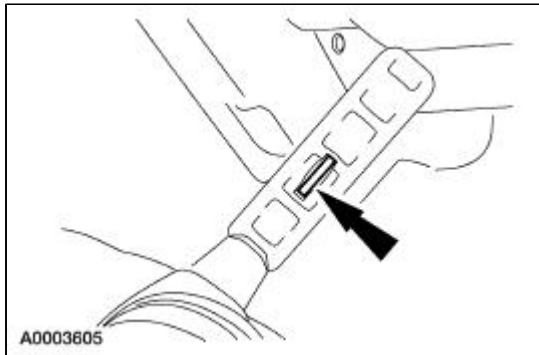
1. To install, reverse the removal procedure.



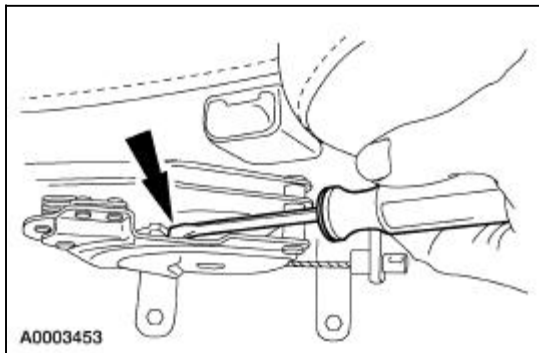
Cable and Conduit —Front

Removal

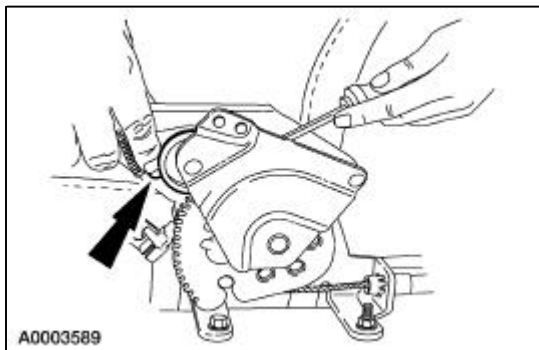
1. Remove the console. For additional information, refer to [Section 501-12](#).
2. Pull tab slide handle up.



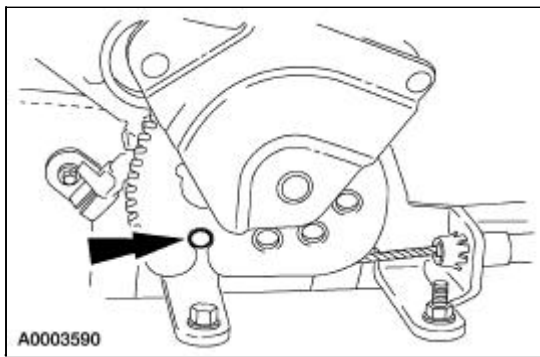
3. Using a screwdriver, push down on the tension arm until it is fully depressed.



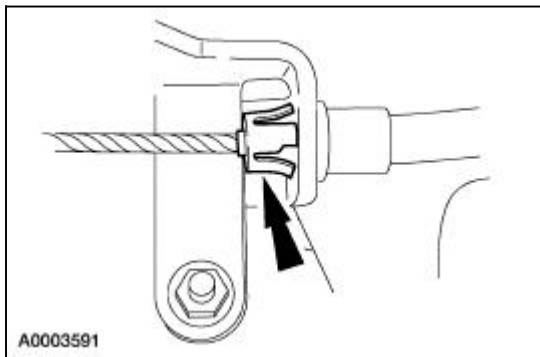
4. Move the tension arm down and release the screwdriver.



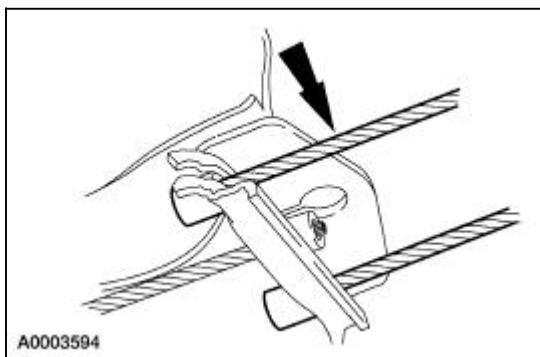
5. Remove the cable anchor pin.



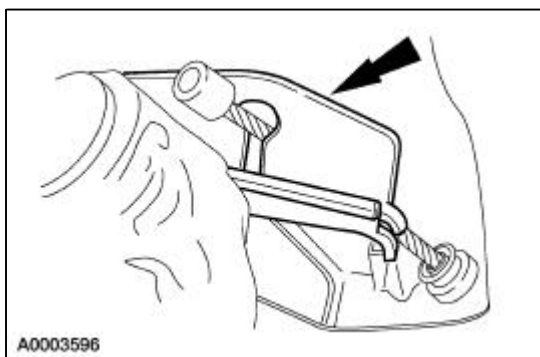
6. Using a 13mm box-end wrench, depress the conduit retaining prongs and remove the parking brake cable and conduit from the control.



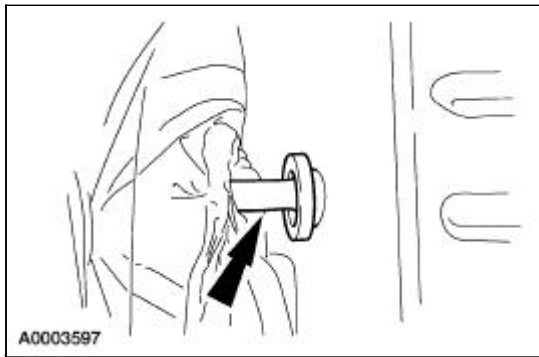
7. Raise and support the vehicle. For additional information, refer to [Section 100-02](#).
8. Disconnect the rear parking brake cables.



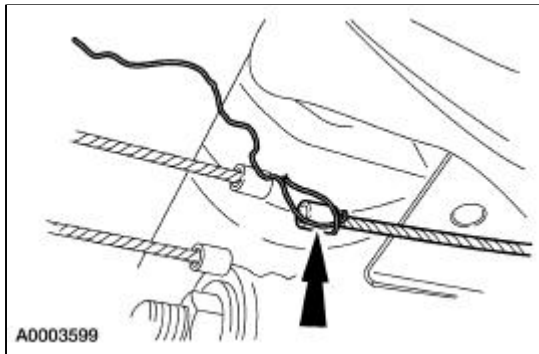
9. Remove the equalizer.



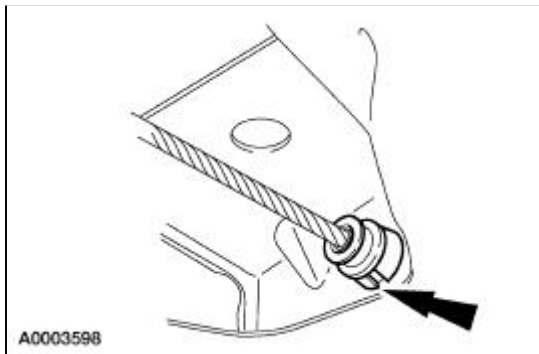
10. Snap the front cable grommet out of the floor and remove the cable.



11. Tie mechanics wire to the old cable and conduit to make installation of new cable easier.



12. Using a 13mm box-end wrench, depress the conduit retaining prongs and remove the parking brake cable and conduit.



Installation

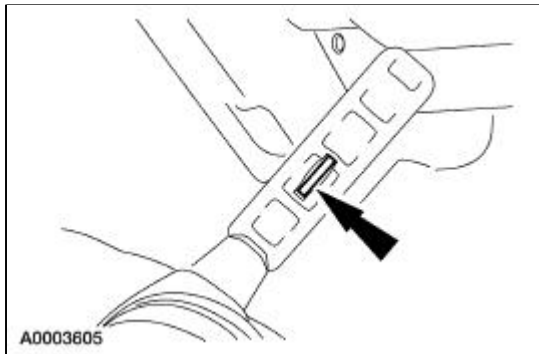
1. To install, reverse the removal procedure.
-

Cable and Conduit —Rear

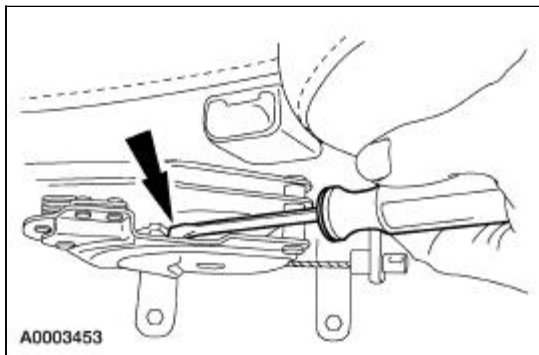
Removal

NOTE: The RH rear is shown, the LH is similar.

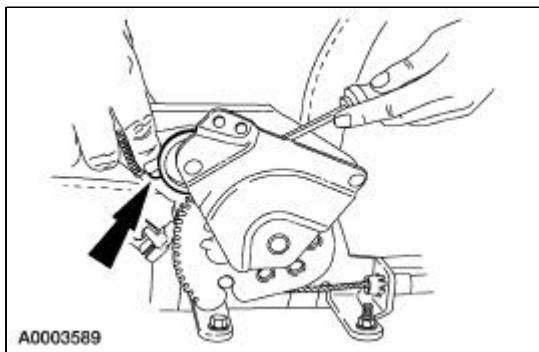
1. Remove the console. For additional information, refer to [Section 501-12](#).
2. Pull tab slide handle up.



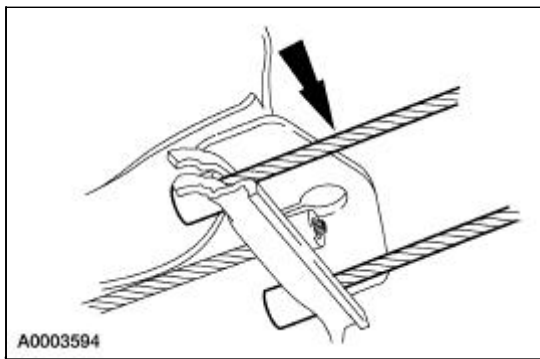
3. Using a screwdriver, push down on the tension arm until it is fully depressed.



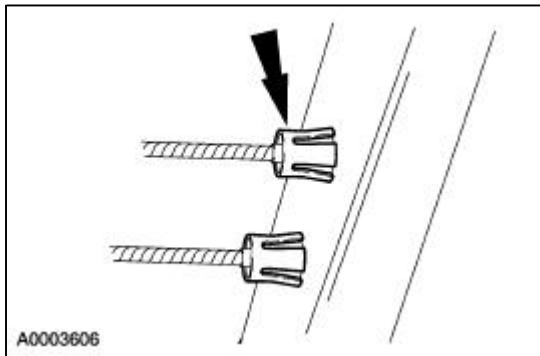
4. Move the tension arm down and release the screwdriver.



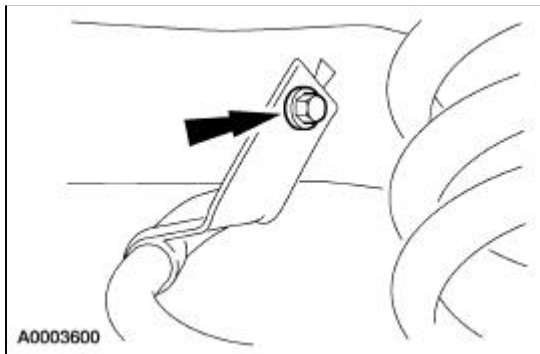
5. Disconnect the rear parking brake cables from the equalizer.



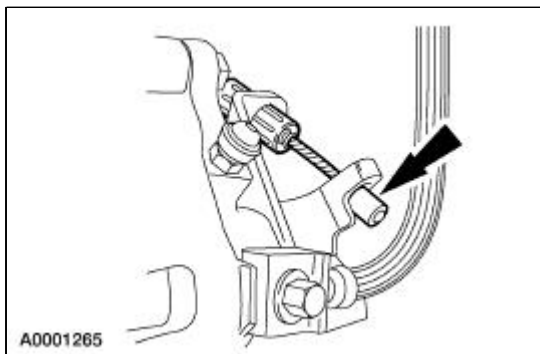
6. Using a 13mm box-end wrench, depress the conduit retaining prongs and remove the parking brake rear cable and conduit.



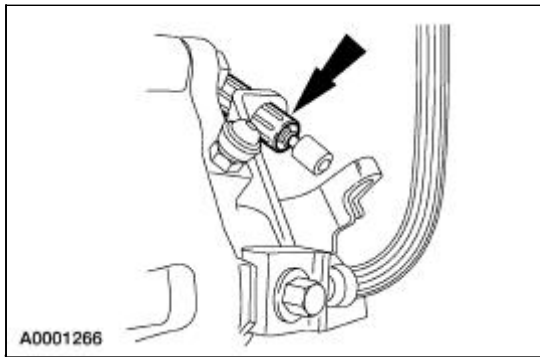
7. Remove the parking brake rear cable and conduit routing clip bolts.



8. Disconnect the parking brake rear cable and conduit from the parking brake lever.

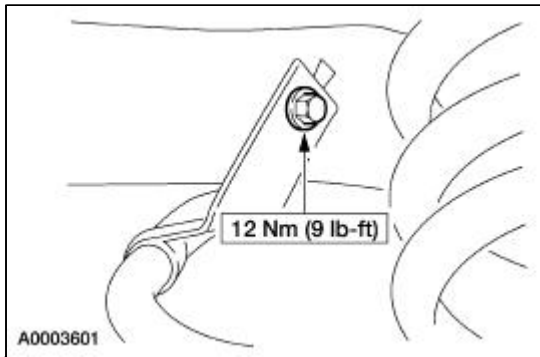


9. Using a 13mm box-end wrench, depress the conduit retaining prongs and remove the parking brake rear cable and conduit.



Installation

1. To install, reverse the removal procedure.



Bulb

For additional information, refer to [Section 413-01](#).

General Specifications

Item	Specification
High Performance DOT 3 Brake Fluid PM-1 (Canada CXC-31)	ESA-M6C25-A
High Performance DOT 4 Brake Fluid	FMVSS No. 116

Torque Specifications

Description	Nm	lb-ft
Brake master cylinder nuts	30	22
Brake pedal bracket nuts	30	22
Strut tower brace nuts	28	21
Master cylinder brake tubes	13	10
Brake pedal bracket bolts	25	18

Hydraulic Brake Actuation

This vehicle is equipped with a brake pedal actuated dual brake system. The system consists of the following:

- power brake booster (2005)
- brake master cylinder (2140)
- disc brake calipers (2B120)
- rear disc brake calipers (2553)
- brake tubes and hoses
- anti-lock brake system (ABS) components

The dual ABS hydraulic system is diagonally split, with the LH front and RH rear making up one circuit and the RH front and LH rear making up the other circuit.

Brake Fluid



WARNING: Use of any other than approved DOT 3 or DOT 4 brake fluid will cause permanent damage to brake components and will render the brakes inoperative.



WARNING: Brake fluid contains polyglycol ethers and polyglycols. Avoid contact with eyes. Wash hands thoroughly after handling. If brake fluid contacts eyes, flush eyes with running water for 15 minutes. Get medical attention if irritation persists. If taken internally, drink water and induce vomiting. Get medical attention immediately.



CAUTION: Brake fluid is harmful to painted or plastic surfaces. If brake fluid is spilled onto a painted or plastic surface, immediately wash it with water.

Use clean, fresh Ford High Performance DOT 3 Motor Vehicle Brake Fluid PM-1 (Canada CXC-31) or equivalent meeting Ford specification ESA-M6C25-A.

If DOT 3 is not available, use Ford High Performance DOT 4 brake fluid or equivalent meeting FMVSS No. 116.

- Do not reuse brake fluid drained or bled from the system.
- Do not use brake fluid that has been stored in an open container.
- Do not use contaminated brake fluid.

Brake Master Cylinder

The brake master cylinder is a dual piston type. The brake master cylinder operates as follows:

- When the brake pedal (2455) is depressed, pressure is applied by mechanical linkage to the primary and secondary piston.

- Brake master cylinder pistons apply hydraulic pressure to the two opposed hydraulic circuits.
- Brake master cylinder cannot be overhauled, install a new master cylinder only.

The brake master cylinder consists of:

- brake master cylinder reservoir (2K478)
- brake master cylinder body

Brake Master Cylinder Reservoir

NOTE: Whenever the brake master cylinder reservoir is removed from the brake master cylinder, new grommets must be installed.

The brake master cylinder reservoir:

- is mounted to the brake master cylinder.
- holds fluid supply for each brake master cylinder hydraulic piston.
- provides visual fluid level markings.
- contains the brake master cylinder fluid level sensor.

Brake Tubes and Hoses



CAUTION: Never use copper tubing. It is subject to fatigue, cracking and corrosion, which could result in brake tube failure.

If a section of brake tube is damaged, install a new section of tube the same type, size, shape and length.

When installing hydraulic brake tubing, hoses, or connectors, tighten all connections securely. After installation, bleed the brake system. For additional information, refer to [Section 206-00](#).

Hydraulic Brake Actuation

Refer to [Section 206-00](#) .

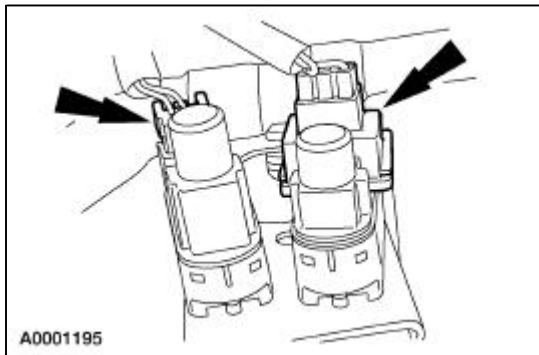
Brake Pedal And Bracket

Removal

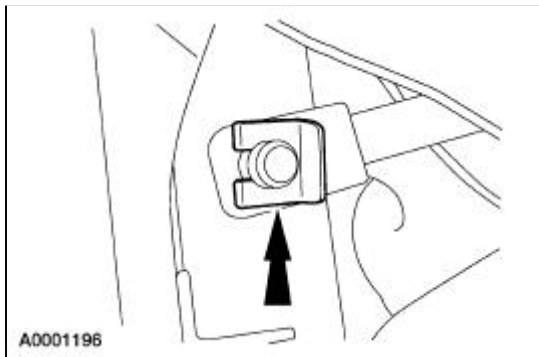
1. **NOTE:** LH shown, RH similar.

Disconnect the battery ground cable (14301). For additional information, refer to [Section 414-01](#).

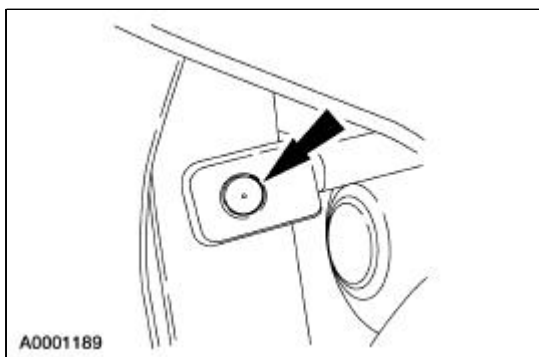
2. Disconnect the stoplight and cruise switch electrical connectors.



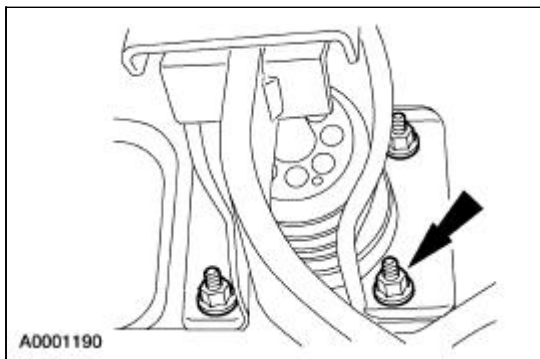
3. Remove the brake pedal pin clip.



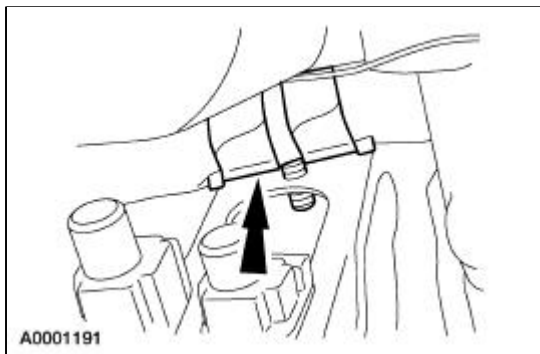
4. Remove the brake pedal pin.



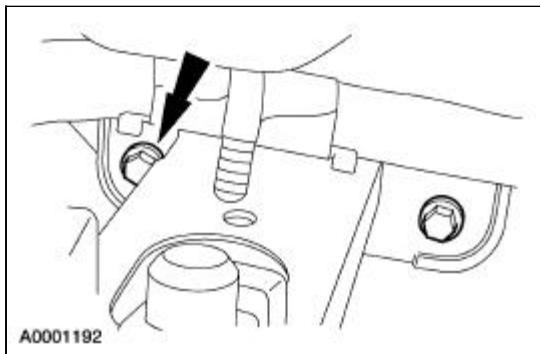
5. Remove the four brake pedal bracket nuts.



6. Remove the wiring harness pushpin.

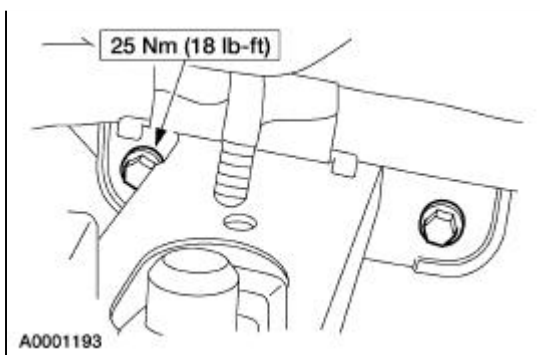


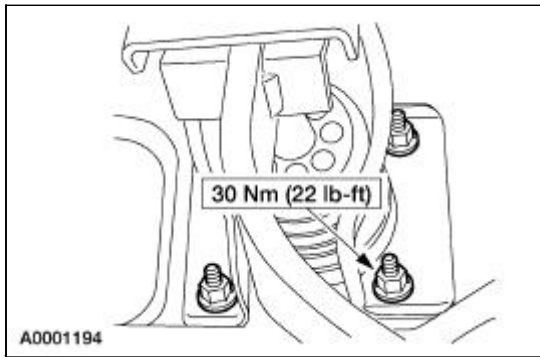
7. Remove the brake pedal bracket bolts and remove the brake pedal and bracket (2455).



Installation

1. To install, reverse the removal procedure.






Brake Master Cylinder

Removal and Installation

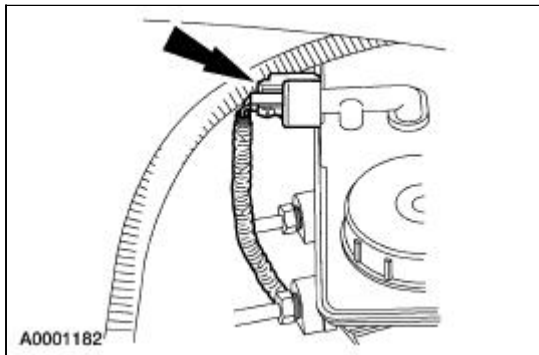
All vehicles

 **WARNING:** Use of any other than approved DOT 4 or DOT 3 brake fluid will cause permanent damage to brake components and will render the brakes inoperative.

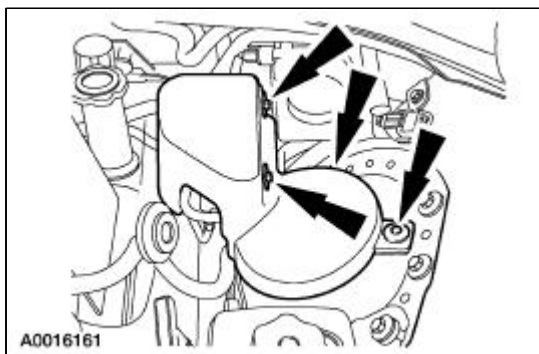
 **WARNING:** Brake fluid contains polyglycol ethers and polyglycols. Avoid contact with eyes. Wash hands thoroughly after handling. If brake fluid contacts eyes, flush eyes with water for 15 minutes. Get medical attention if irritation persists. If taken internally, drink water and induce vomiting. Get medical attention immediately.

 **CAUTION:** Brake fluid is harmful to painted or plastic surfaces. If brake fluid is spilled onto a painted or plastic surface, immediately wash it with water.

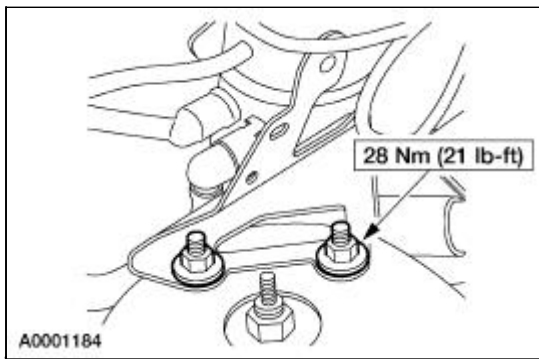
1. Disconnect the fluid level sensor connector.



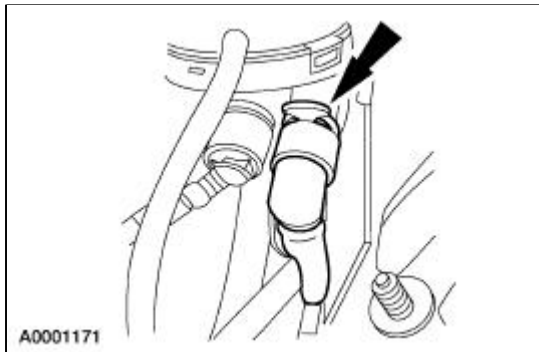
2. Remove the retainers and left upper shock mount cover.



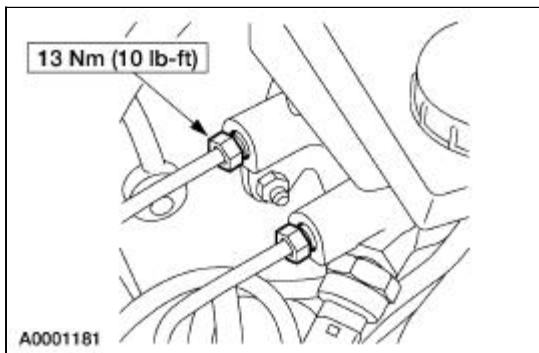
3. Remove the vapor management valve (VMV) nuts.



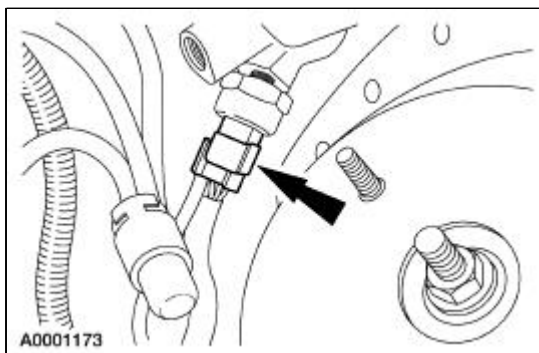
4. Disconnect the (VMV) hose and position valve aside.



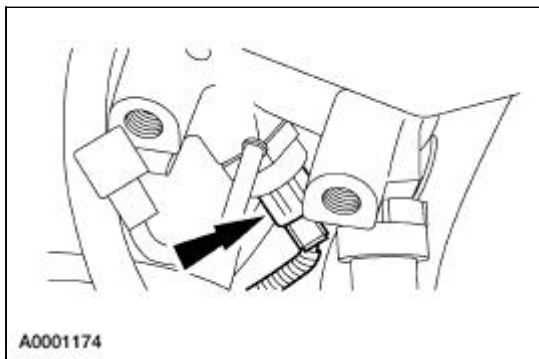
5. Disconnect the brake tubes.



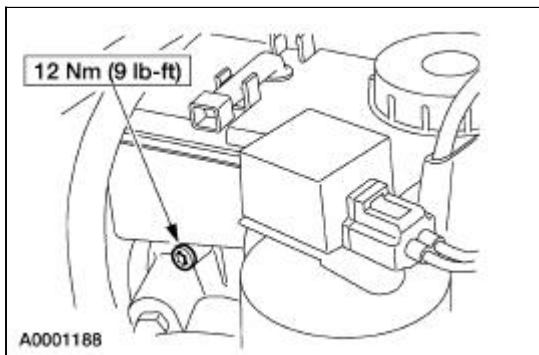
6. Disconnect the brake master cylinder IVD transducer electrical connector (as applicable).



7. Disconnect the brake master cylinder IVD transducer electrical connector (as applicable).

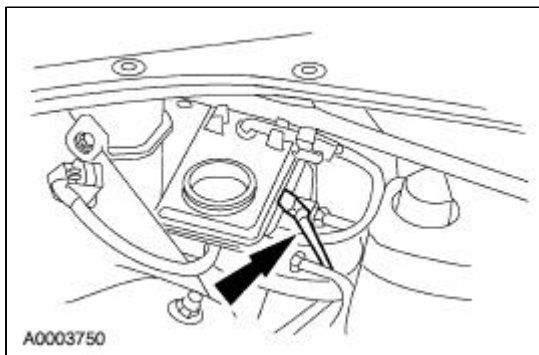


8. Use a suitable suction device to drain the brake master cylinder reservoir.
9. Remove the reservoir bolt.



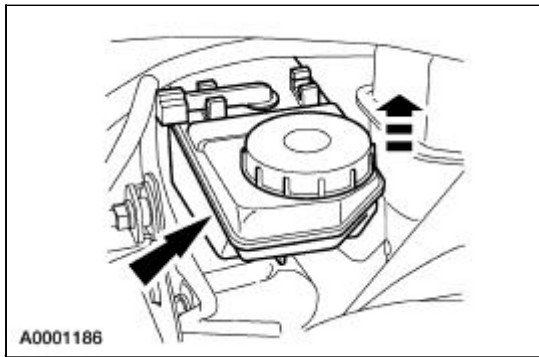
Vehicles with manual transmission

10. Remove the hose at the clutch master cylinder reservoir.

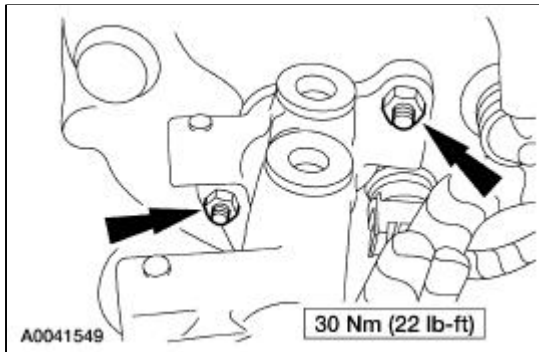


All vehicles

11. Remove the reservoir.



12. Remove the brake master cylinder nuts and remove the brake master cylinder.



13. To install, reverse the removal procedure.
 - Bleed the brake system. For additional information, refer to [Section 206-00](#).
-

Brake Fluid Reservoir

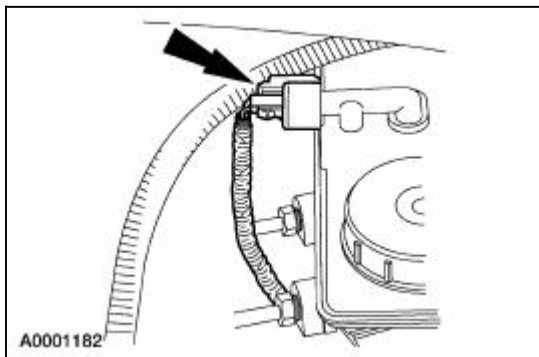
Removal and Installation

⚠ WARNING: Use of any other than approved DOT 4 or DOT 3 brake fluid will cause permanent damage to brake components and will render the brakes inoperative.

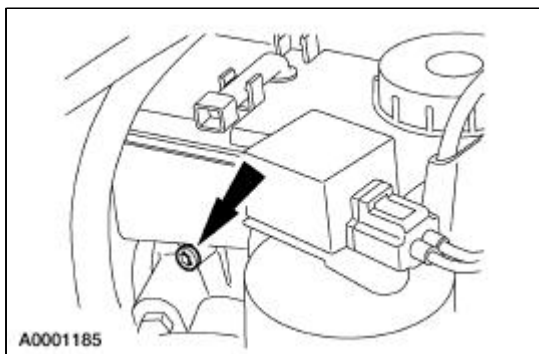
⚠ WARNING: Brake fluid contains polyglycol ethers and polyglycols. Avoid contact with eyes. Wash hands thoroughly after handling. If brake fluid contacts eyes, flush eyes with running water for 15 minutes. Get medical attention if irritation persists. If taken internally, drink water and induce vomiting. Get medical attention immediately.

⚠ CAUTION: Brake fluid is harmful to painted or plastic surfaces. If brake fluid is spilled onto a painted or plastic surface, immediately wash it with water.

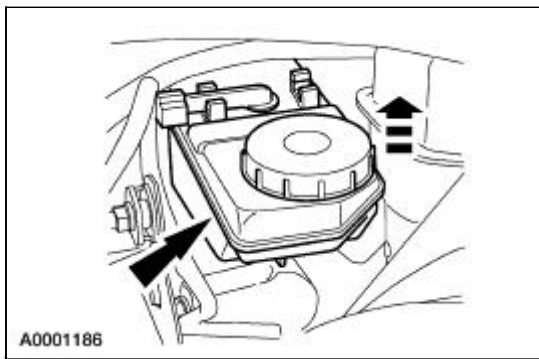
1. Disconnect the brake master cylinder fluid level sensor connector.



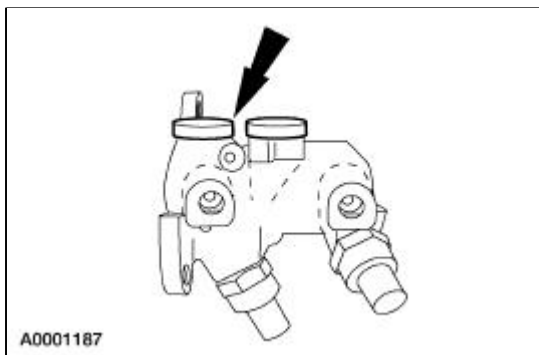
2. Use a suitable suction device to drain the brake master cylinder reservoir (2K478).
3. Remove the reservoir screw.



4. Remove the reservoir.



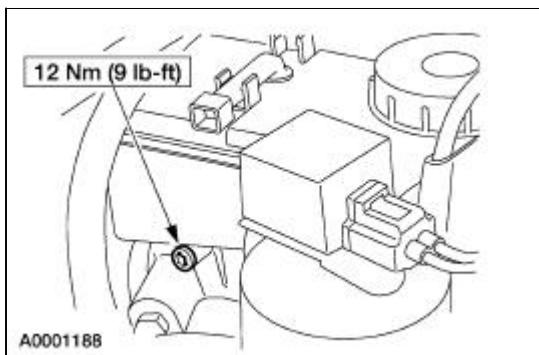
5. Remove the reservoir grommets.



6. **NOTE:** Whenever installing a new brake master cylinder reservoir, install new grommets.

To install, reverse the removal procedure.

- Use clean, fresh Ford High Performance DOT 3 Motor Vehicle Brake Fluid C6AZ-19542-AB or equivalent meeting Ford specification ESA-M6C25-A (United States and Canada only). If DOT 3 is not available, use Ford High Performance DOT 4 Brake Fluid or equivalent meeting Ford specification SAE-J-1704-DOT 4.

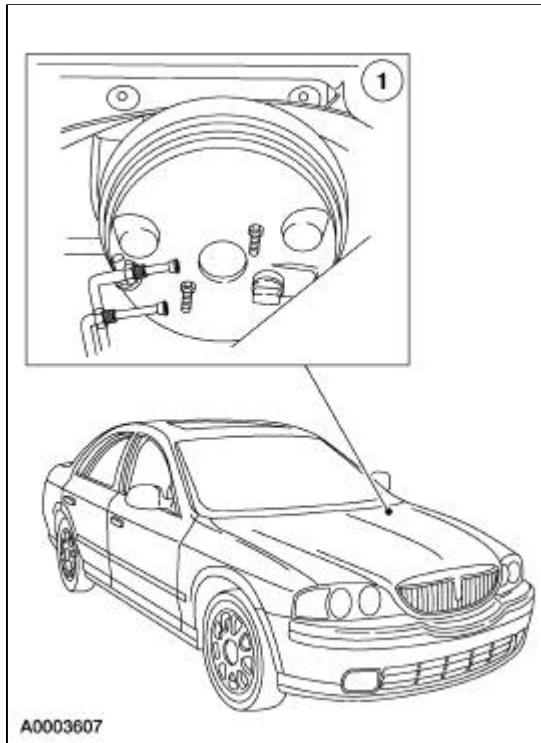


Torque Specifications

Description	Nm	lb-ft
Coolant reservoir bolts	15	11
Cowl brace end bolts	20	15
Cowl brace nuts	20	15
Power brake booster nuts	30	22
Vacuum hose bracket nut	15	11
Wiper arm nuts	35	26

Brake Booster

Power Brake Booster



Item	Part Number	Description
1	2005	Brake vacuum booster

The power brake booster (2005):

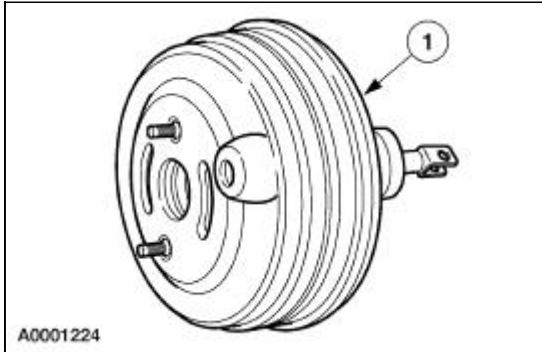
- is a dual diaphragm, vacuum assisted power brake booster.
- reduces brake pedal pressure and travel distance.
- is located on the bulkhead in the engine compartment, between the brake pedal and brake master cylinder (2140).
- is divided into separate chambers by the diaphragm.
- will not operate if vacuum is restricted or if any of the vacuum related power brake components fail.
- is installed as an assembly.

If the power assist fails, the brake system will continue to operate with increased brake pedal effort.

Hose and Check Valve

The power brake booster check valve:

- is located on the front of the power brake booster.
- is positioned between the power brake booster and the power brake booster hose.
- closes when the engine is turned off.
- in the closed position, traps engine vacuum in the power brake booster.
- retains vacuum to provide several power assisted brake applications with the engine off.



A0001224

Item	Part Number	Description
1	2005	Brake vacuum booster

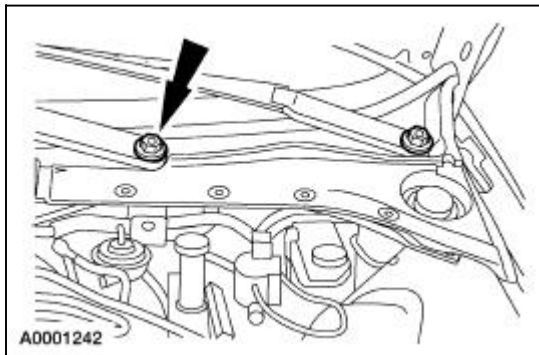
Power Brake System

Refer to [Section 206-00](#) .

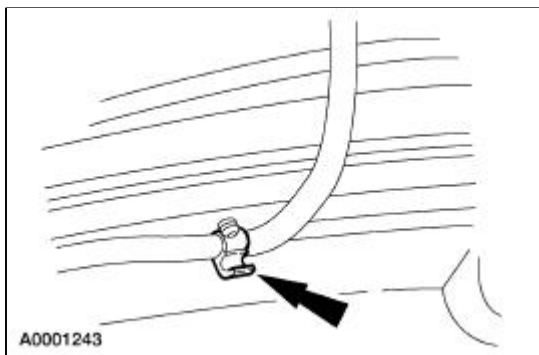
Brake Booster

Removal

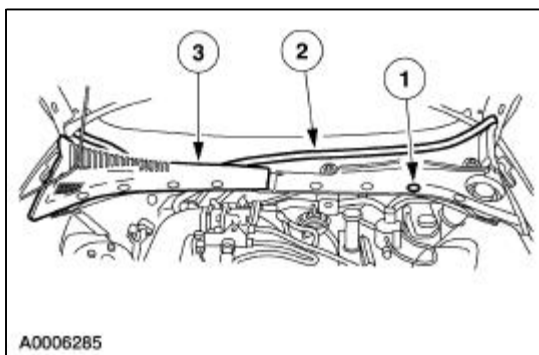
1. Remove the wiper arm nuts and remove wiper arms.



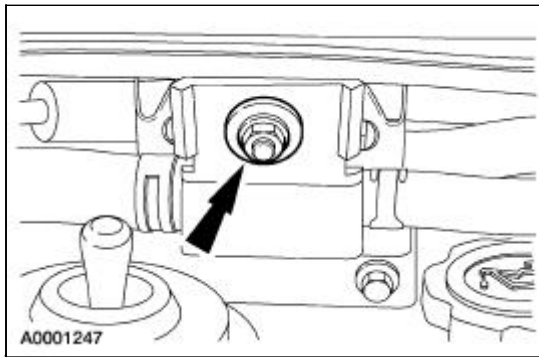
2. Disconnect the washer hose.



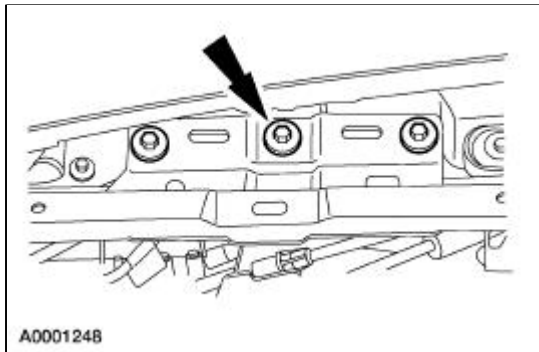
3. Remove the cowl cover.
 1. Remove the cowl cover pushpins.
 2. Remove the cowl cover rubber trim.
 3. Remove the cowl cover.



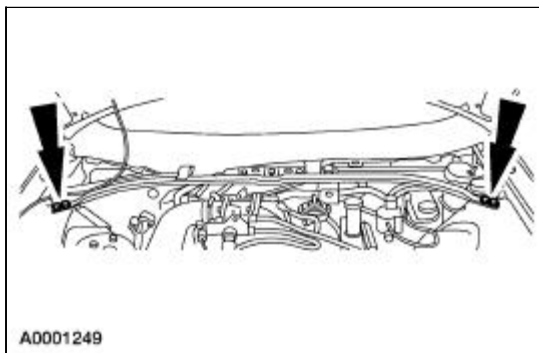
4. Remove the vacuum hose bracket nut and position bracket aside.



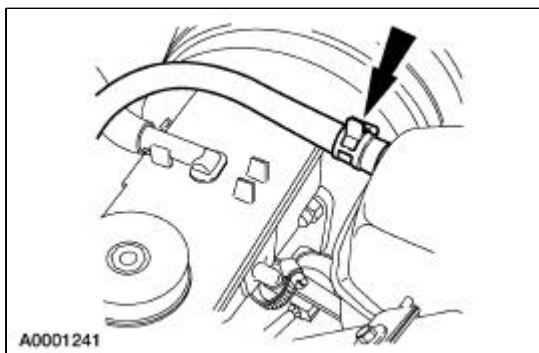
5. Remove the cowl brace center bolts.



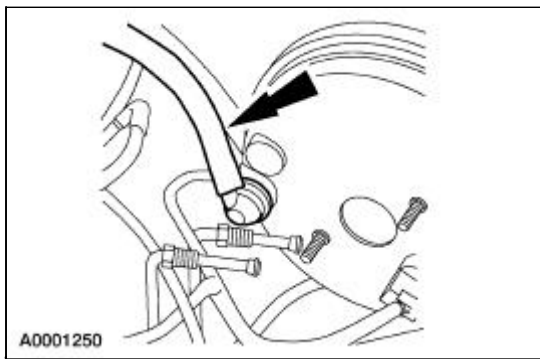
6. Remove the cowl brace end bolts and remove the bracket.



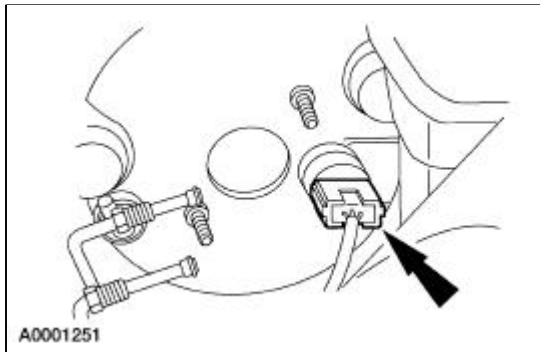
7. Disconnect the coolant reservoir return hose.



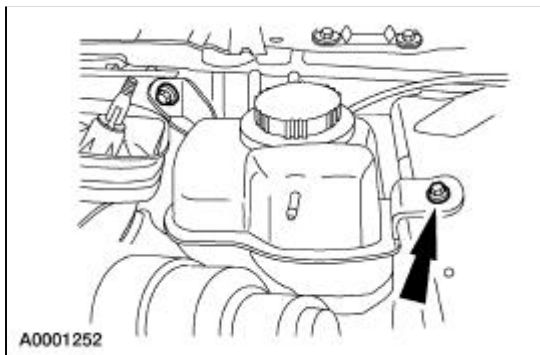
8. Remove the brake master cylinder. For additional information, refer to [Section 206-06](#)
9. Disconnect the power brake booster check valve.



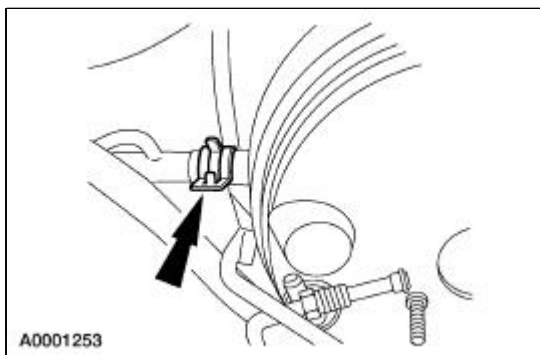
10. Disconnect the power brake booster electrical connector (as applicable).



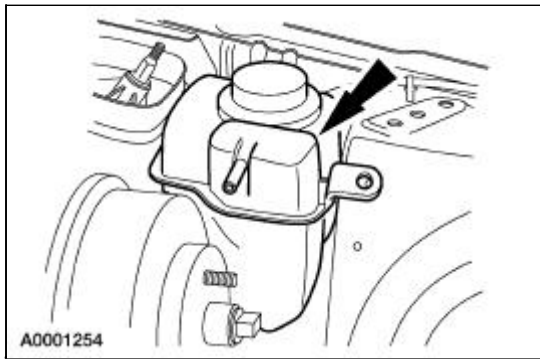
11. Remove the coolant reservoir bolts.



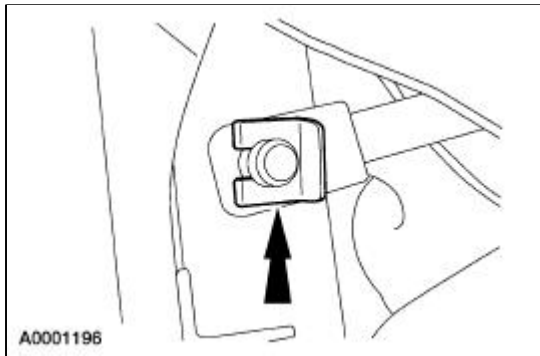
12. Disconnect the coolant reservoir hose.



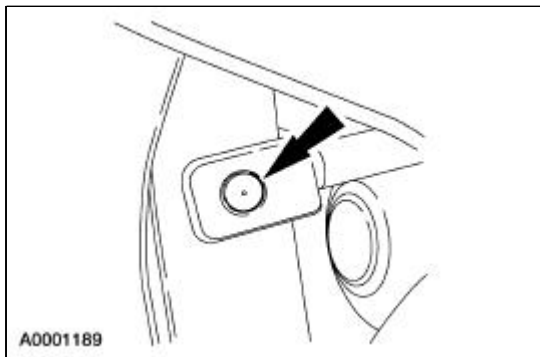
13. Remove the coolant reservoir.



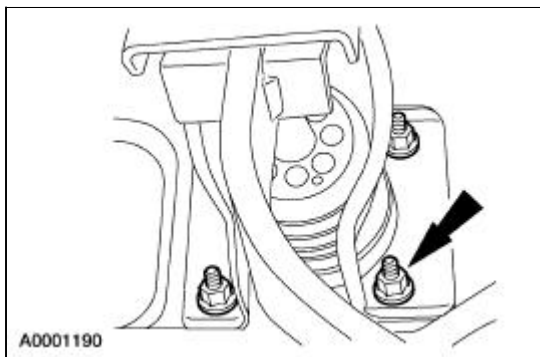
14. Remove the brake pedal pin clip.



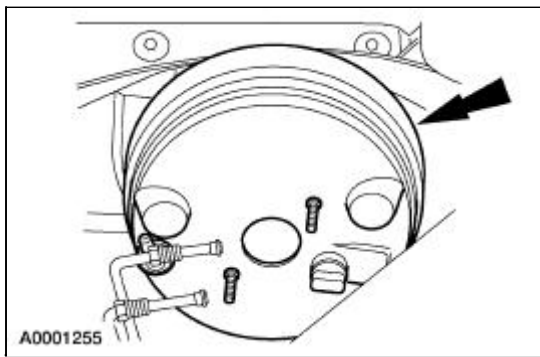
15. Remove the brake pedal pin.



16. Remove the booster nuts.

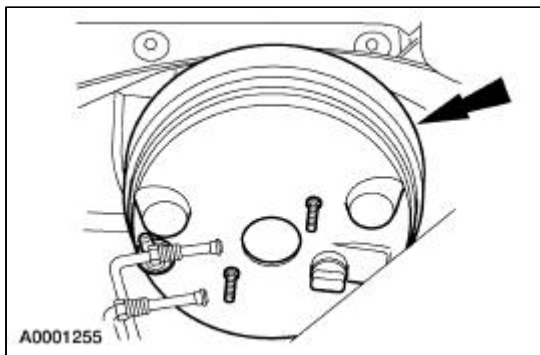


17. Remove the power brake booster.

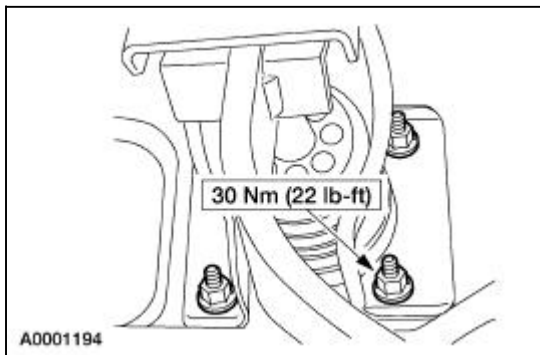


Installation

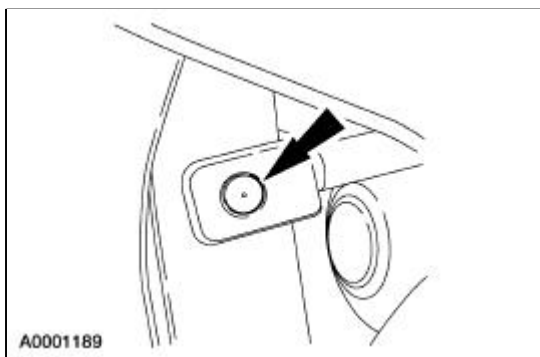
1. Install the power brake booster.



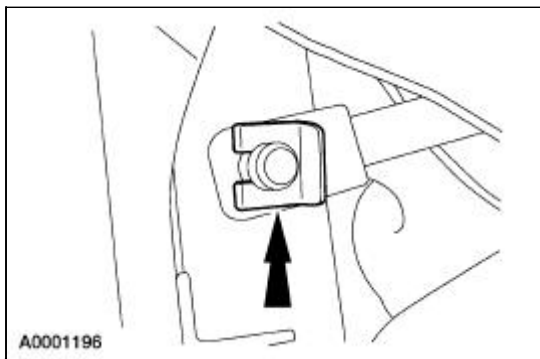
2. Install the booster nuts.



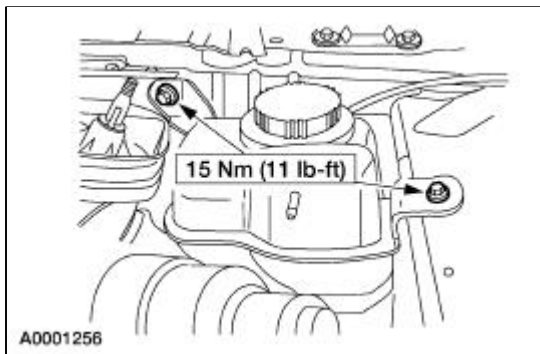
3. Install the brake pedal pin.



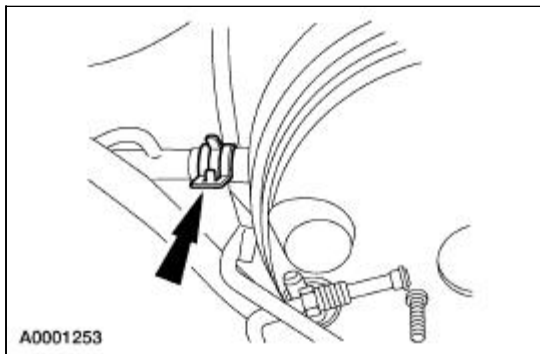
4. Install the brake pedal pin clip.



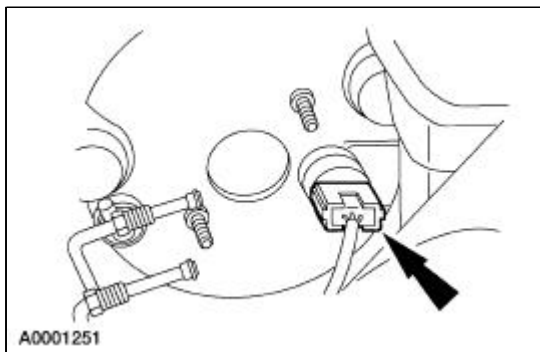
5. Install the radiator coolant recovery reservoir bolts.



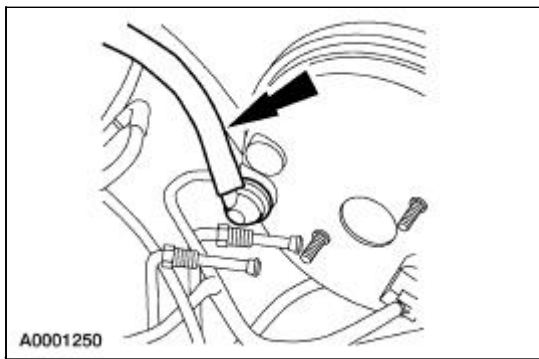
6. Install the coolant reservoir hose.



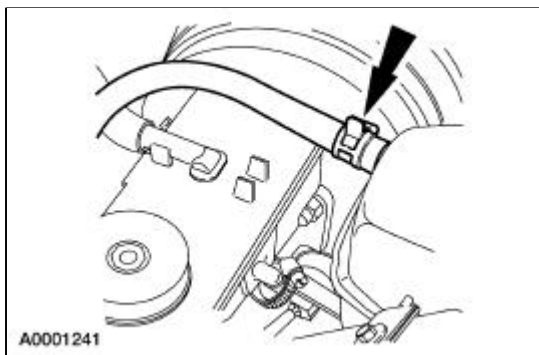
7. Connect the power brake booster electrical connector (as applicable).



8. Connect the power brake booster check valve.

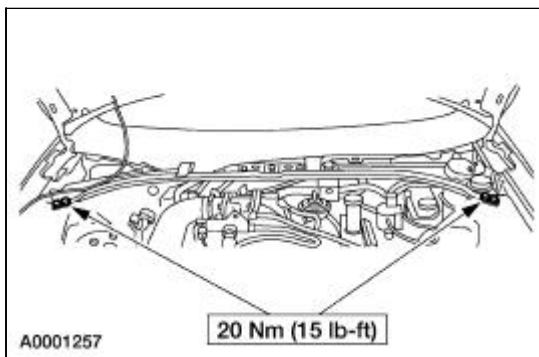


9. Connect the coolant reservoir return hose.

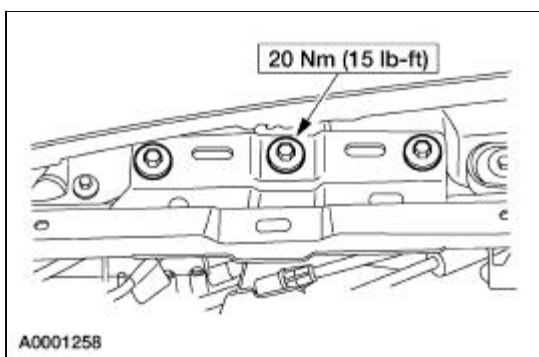


10. Install the brake master cylinder. For additional information, refer to [Section 206-06](#)

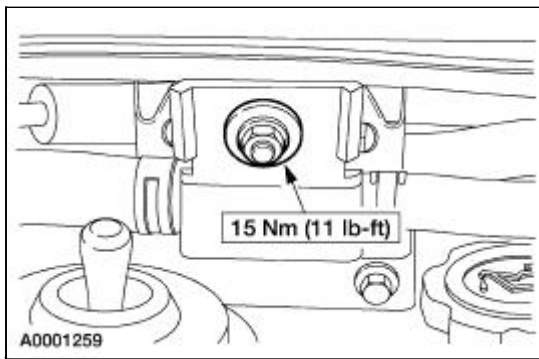
11. Install the cowl brace end bolts.



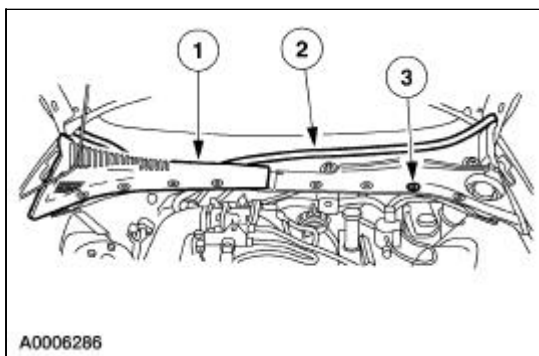
12. Install the cowl brace center bolts.



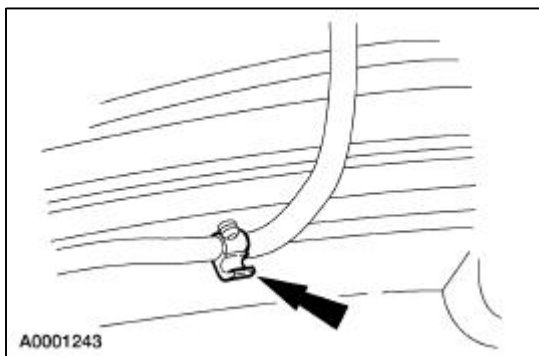
13. Install the vacuum hose bracket nut.



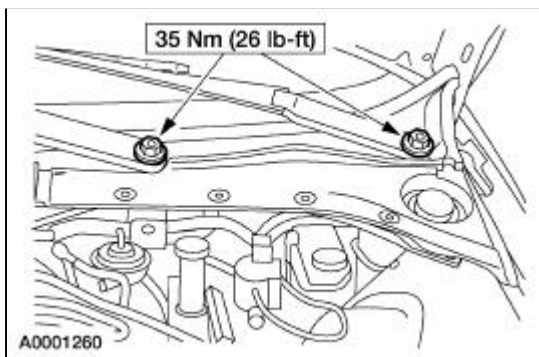
14. Install the cowl cover.
 1. Install the cowl cover.
 2. Install the cowl cover rubber trim.
 3. Install the cowl cover pushpins.



15. Connect the washer hose.



16. Install the wiper arm nuts.



17. Bleed brake system. For additional information, refer to [Section 206-00](#).

General Specifications

Item	Specification
High Temperature 4X4 Front Axle and Wheel Bearing Grease E8TZ-19590-A	ESA-M1C198-A
RTV Silicone Sealant F5TZ-19G204-AB (Canada CXC-114A)	NAVSTR Sealer

Torque Specifications

Description	Nm	lb-ft	lb-in
Anti-lock brake control module bolts	2	—	18
Brake line to (HCU) nuts	18	13	—
Electronic hydraulic control unit bolts	11	8	—
Rear anti-lock brake sensor bolt	9	—	80

Anti-Lock Control

The four wheel anti-lock brake system (4WABS) consists of the following components:

- anti-lock brake module
- front anti-lock brake sensors
- front anti-lock brake sensor indicators
- hydraulic control unit (HCU)
- rear anti-lock brake sensors
- rear anti-lock brake sensor indicators
- yellow anti-lock brake warning indicator




For removal and installation of the front anti-lock brake sensor indicators, refer to [Section 204-01](#).

For removal and installation of the rear anti-lock brake sensor indicators, refer to [Section 205-05](#).

Anti-Lock Control

Refer to Wiring Diagrams Section [206-09A](#) for schematic and connector information.

Special Tool(s)

 ST1137-A	73 III Automotive Meter 105-R0057 or equivalent
 ST2332-A	Worldwide Diagnostic System (WDS) 418-F224, New Generation STAR (NGS) Tester 418-F052, or equivalent scan tool
 ST2574-A	Flex Probe Kit 105-R025B

Principles of Operation

The anti-lock-brake control module receives wheel speed readings from each anti-lock brake sensor and processes this information to determine if an ABS event is necessary. The anti-lock brake sensor electrically senses each tooth of the anti-lock brake sensor indicators as it passes through the anti-lock brake sensor magnetic field.

The anti-lock brake control module continuously monitors and compares the rotational speed of each wheel and, when it detects an impending wheel lock, modulates brake pressure to the appropriate brake caliper. This is accomplished by triggering the hydraulic control unit (HCU) to open and close the appropriate solenoid valves. Once the affected wheel returns to normal speed, the anti-lock brake control module returns the solenoid valves to their normal position, and normal (base) braking resumes.

The anti-lock brake control module is self-monitoring. When the ignition switch is turned to the RUN position, the anti-lock brake control module will do a preliminary electrical check, and at approximately 20 km/h (12 mph) the pump motor is turned on for approximately one half-second. Any malfunction of the ABS will cause the ABS to shut off and the yellow anti-lock brake warning indicator to illuminate; normal power assisted braking, however, remains.

Inspection and Verification

1. Verify the customer concern by applying the brakes under different conditions.
2. Visually inspect for obvious signs of mechanical and electrical damage.

Visual Inspection Chart

Mechanical	Electrical
<ul style="list-style-type: none"> ● Anti-lock brake sensor indicator ● Base brake concerns ● HCU ● Tire pressure ● Tire size or mismatched tires 	<ul style="list-style-type: none"> ● Underhood auxiliary junction box (AJB) Maxifuses: <ul style="list-style-type: none"> ■ 114 (30A) ■ 122 (30A) ● Central junction box (CJB) Fuse: <ul style="list-style-type: none"> ■ 203 (5A) ● Anti-lock brake control module ● Anti-lock brake sensors ● Brake pedal position (BPP) switch ● Circuitry ● Connectors or connections ● EVAC and fill connector ● Wire harness routing

3. If the fault is not visually evident, connect the scan tool to the data link connector (DLC) located beneath the instrument panel and select the vehicle to be tested from the scan tool menu. If the scan tool does not communicate with the vehicle:
 - check that the program card is correctly installed.
 - check the connections to the vehicle.
 - check the ignition switch position.
4. If the scan tool still does not communicate with the vehicle, refer to the New Generation STAR Tester manual.
5. Carry out the DATA LINK DIAGNOSTIC TEST. If the scan tool responds with:
 - CKT914, CKT915, or CKT70 = ALL ECUS NO RESP/NOT EQUIP, refer to [Section 418-00](#).
 - NO RESP/NOT EQUIP for anti-lock brake control module, go to Pinpoint Test A.
 - SYSTEM PASSED, retrieve and record the continuous diagnostic trouble codes (DTCs), erase the continuous DTCs and carry out the self-test diagnostics for the anti-lock brake control module.
6. If the DTCs retrieved are related to the concern, go to Anti-Lock Brake Control Module Diagnostic Trouble Code (DTC) Index to continue diagnostics.
7. If no DTCs related to the concern are retrieved, proceed to Symptom Chart.

Anti-Lock Brake Control Module Diagnostic Trouble Code (DTC) Index

Anti-Lock Brake Control Module Diagnostic Trouble Code (DTC) Index

DTC	Description	Source	Action
B1342	ECU is Defective	Anti-Lock Brake Control	INSTALL a new anti-lock brake control module; REFER to Anti-Lock Brake System (ABS) Module .

		Module	
B1485	Brake Pedal Input Circuit Battery Short	Anti-Lock Brake Control Module	Go To Pinpoint Test B .
B1676	Battery Pack Voltage Out of Range	Anti-Lock Brake Control Module	Go To Pinpoint Test C .
B2477	Module Configuration Failure	Anti-Lock Brake Control Module	CONFIGURE the anti-lock brake control module; REFER to Section 418-01 . CLEAR the DTCs. REPEAT the self-test. If DTC B2477 is retrieved again, INSTALL a new anti-lock brake control module; REFER to Anti-Lock Brake System (ABS) Module . REPEAT the self-test.
C1095	Hydraulic Pump Motor Circuit Failure	Anti-Lock Brake Control Module	Go To Pinpoint Test D .
C1145	Speed Wheel Sensor RF Input Circuit Failure	Anti-Lock Brake Control Module	Go To Pinpoint Test E .
C1155	Speed Wheel Sensor LF Input Circuit Failure	Anti-Lock Brake Control Module	Go To Pinpoint Test E .
C1165	Speed Wheel Sensor RR Input Circuit Failure	Anti-Lock Brake Control Module	Go To Pinpoint Test E .
C1175	Speed Wheel Sensor LR Input Circuit Failure	Anti-Lock Brake Control Module	Go To Pinpoint Test E .
C1233	Speed Wheel LF Input Signal Missing	Anti-Lock Brake Control Module	Go To Pinpoint Test F .
C1234	Speed Wheel RF Input Signal Missing	Anti-Lock Brake Control Module	Go To Pinpoint Test F .
C1235	Speed Wheel RR Input Signal Missing	Anti-Lock Brake Control Module	Go To Pinpoint Test F .
C1236	Speed Wheel LR Input Signal Missing	Anti-Lock Brake Control Module	Go To Pinpoint Test F .

Symptom Chart



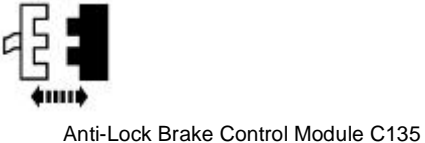

NOTE: Refer to the wiring diagrams for connector numbers stated in the pinpoint tests.

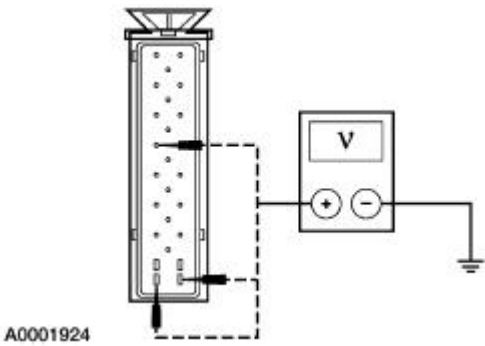
Symptom Chart

Condition	Possible Sources	Action
<ul style="list-style-type: none"> No communication with the anti-lock brake control module 	<ul style="list-style-type: none"> Underhood AJB Maxifuses 114 (30 A) and 122 (30A). CJB Fuse 203 (5A). Circuitry. Anti-Lock brake control module. 	<ul style="list-style-type: none"> Go To Pinpoint Test A.
<ul style="list-style-type: none"> The yellow anti-lock brake warning indicator does not self-check 	<ul style="list-style-type: none"> Anti-lock brake control module. Circuitry. Instrument cluster. Indicator bulb. 	<ul style="list-style-type: none"> Go To Pinpoint Test G.
<ul style="list-style-type: none"> Spongy brake pedal with no warning indicator 	<ul style="list-style-type: none"> Air in brake hydraulic system. 	<ul style="list-style-type: none"> REFER to Section 206-00.

Pinpoint Tests

PINPOINT TEST A: NO COMMUNICATION WITH THE ANTI-LOCK BRAKE CONTROL MODULE

CONDITIONS	DETAILS/RESULTS/ACTIONS						
 CAUTION: Use the Flex Probe Kit for all test connections to prevent damage to the wiring terminals. Do not use standard multimeter probes.							
A1 CHECK VOLTAGE TO THE ANTI-LOCK BRAKE CONTROL MODULE							
<p>1</p>  <p>2</p>  <p>3</p>  <p>4</p>	<p>4</p> <p>Measure the voltage between anti-lock brake control module C135 pins, and ground as follows:</p> <table border="1"> <thead> <tr> <th>Pin</th> <th>Circuit</th> </tr> </thead> <tbody> <tr> <td>25</td> <td>30-CF6A (RD)</td> </tr> <tr> <td>20</td> <td>20-CF6A (PK/YE)</td> </tr> </tbody> </table>	Pin	Circuit	25	30-CF6A (RD)	20	20-CF6A (PK/YE)
Pin	Circuit						
25	30-CF6A (RD)						
20	20-CF6A (PK/YE)						



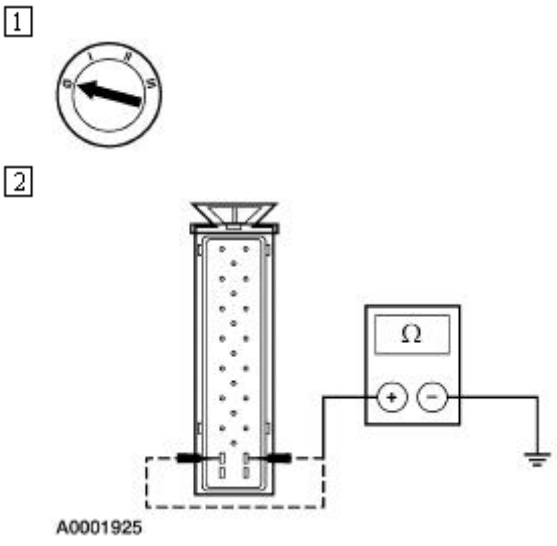
9	30-CF13 (RD)
---	--------------

- Are the voltages greater than 10 volts?

→ **Yes**
GO to [A2](#).

→ **No**
REPAIR the circuit in question. TEST the system for normal operation.

A2 CHECK ANTI-LOCK BRAKE MODULE GROUNDS



2 Measure the resistance between anti-lock brake control module C135 pin 8, circuit 31-CF6B (BK/YE), harness side and ground; and between anti-lock brake control module C135 pin 24, circuit 31-CF6A (BK/YE), harness side and ground.

- Are the resistances less than 5 ohms?

→ **Yes**
REFER to [Section 418-00](#).

→ **No**
REPAIR the circuit in question. TEST the system for normal operation.

PINPOINT TEST B: DTC B1485 , BRAKE PEDAL INPUT CIRCUIT BATTERY SHORT

CONDITIONS	DETAILS/RESULTS/ACTIONS



CAUTION: Use the Flex Probe Kit for all test connections to prevent damage to the wiring terminals. Do not use standard multimeter probes.

B1 CHECK THE STOPLAMP OPERATION

1 Press the brake pedal.

- Do the stoplamps operate correctly?

→ **Yes**
GO to [B2](#).

→ **No**
REFER to [Section 417-01](#).

B2 CHECK CIRCUIT 29S-CF58 (OG/GN) FOR OPEN

1



2

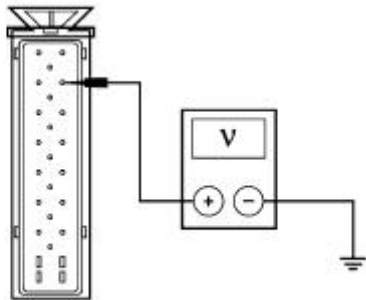


Anti-Lock Brake Control Module C135

3



4



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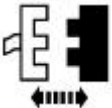

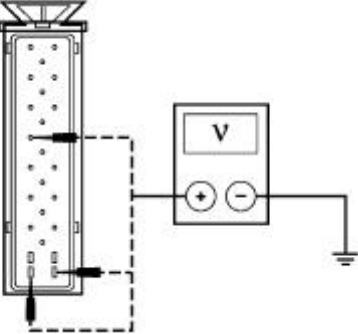
4 Measure the voltage between anti-lock brake control module pin 2 circuit 29S-CF58 (OG/GN), harness side and ground, while depressing the brake pedal.

- Is the voltage greater than 10 volts?

→ **Yes**
INSTALL a new anti-lock brake control module; REFER to [Anti-Lock Brake System \(ABS\) Module](#). CLEAR the DTCs. REPEAT the self-test.

→ **No**
REPAIR the circuit. CLEAR the DTCs. REPEAT the self-test.

PINPOINT TEST C: DTC B1676, BATTERY PACK VOLTAGE OUT OF RANGE

CONDITIONS	DETAILS/RESULTS/ACTIONS								
<p> CAUTION: Use the Flex Probe Kit for all test connections to prevent damage to the wiring terminals. Do not use standard multimeter probes.</p>									
<p>C1 CHECK THE BATTERY VOLTAGE</p>									
<p>1</p> 	<p>2 Measure the voltage between positive and negative battery posts.</p> <ul style="list-style-type: none"> ● Is the voltage between 10 and 17 volts? <p>→ Yes GO to C2.</p> <p>→ No REFER to Section 414-00.</p>								
<p>C2 CHECK VOLTAGE TO THE ANTI-LOCK BRAKE CONTROL MODULE</p>									
<p>1</p>  <p>Anti-Lock Brake Control Module C135</p> <p>2</p>  <p>3</p>  <p>A0001924</p>	<p>3 Measure the voltage between anti-lock brake control module C135 pins, and ground as follows:</p> <table border="1"> <thead> <tr> <th>Pin</th> <th>Circuit</th> </tr> </thead> <tbody> <tr> <td>25</td> <td>30-CF6A (RD)</td> </tr> <tr> <td>20</td> <td>20-CF6A (PK/YE)</td> </tr> <tr> <td>9</td> <td>30-CF13 (RD)</td> </tr> </tbody> </table> <ul style="list-style-type: none"> ● Are the voltages greater than 10 volts? <p>→ Yes GO to C3.</p>	Pin	Circuit	25	30-CF6A (RD)	20	20-CF6A (PK/YE)	9	30-CF13 (RD)
Pin	Circuit								
25	30-CF6A (RD)								
20	20-CF6A (PK/YE)								
9	30-CF13 (RD)								

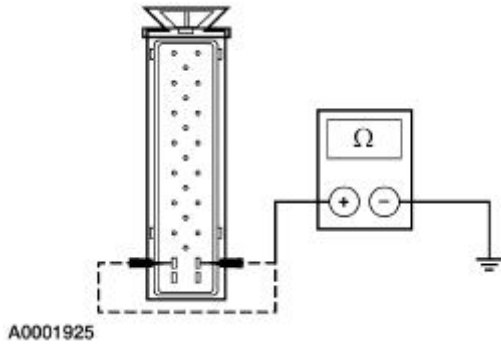
→ **No**
REPAIR the circuit in question. CLEAR the DTCs. REPEAT the self-test.

C3 CHECK THE ANTI-LOCK BRAKE CONTROL MODULE GROUNDS

1



2



2 Measure the resistance between anti-lock control module pin 24, circuit 31-CF6A (BK/YE), harness side and ground; and between anti-lock control module pin 8, circuit 31-CF6B (BK/YE), harness side and ground.

- Are the resistances less than 5 ohms?

→ **Yes**
INSTALL a new anti-lock brake control module; REFER to [Anti-Lock Brake System \(ABS\) Module](#). CLEAR the DTCs. REPEAT the self-test.

→ **No**
REPAIR the circuit in question. CLEAR the DTCs. REPEAT the self-test.

PINPOINT TEST D: DTC C1095, HYDRAULIC PUMP MOTOR CIRCUIT FAILURE

CONDITIONS	DETAILS/RESULTS/ACTIONS
<p>CAUTION: Use the Flex Probe Kit for all test connections to prevent damage to the wiring terminals. Do not use standard multimeter probes.</p>	
<p>D1 CHECK ABS PUMP MOTOR</p>	
<p>1</p>	<ul style="list-style-type: none"> • Is the ABS pump motor running all the time? <p>→ Yes INSTALL a new anti-lock brake control</p>

module; REFER to [Anti-Lock Brake System \(ABS\) Module](#). REPEAT the self-test.

→ **No**
GO to [D2](#).

D2 CHECK PUMP MOTOR OPERATION

1



2 Trigger the anti-lock brake control module active command PMP MOTOR ON.

- **Does the ABS pump motor run for approximately three seconds?**

→ **Yes**

CLEAR the DTCs. CHECK the yellow ABS warning indicator while driving the vehicle (brakes must not be applied) above 32 km/h (20 mph). If the yellow ABS warning indicator illuminates, RETRIEVE continuous DTCs. If DTC C1095 is retrieved again, INSTALL a new anti-lock brake control module; REFER to [Anti-Lock Brake System \(ABS\) Module](#). REPEAT the self-test.

If the yellow anti-lock brake warning indicator does not illuminate, the system is OK.

→ **No**

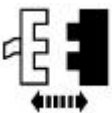
TRIGGER the anti-lock brake control module active command PMP MOTOR OFF. GO to [D3](#).

D3 CHECK CIRCUIT 30-CF6A (RD) AND CIRCUIT 30-CF13 (RD) FOR OPEN

1



2



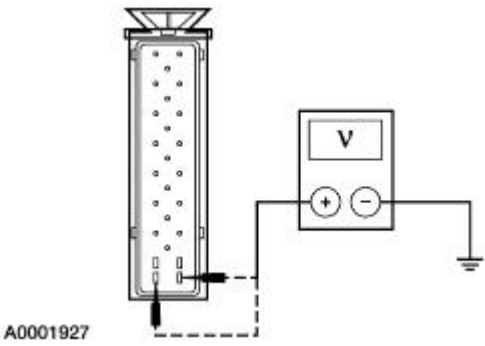
Anti-Lock Brake Control Module

3



4

4 Measure the voltage between anti-lock



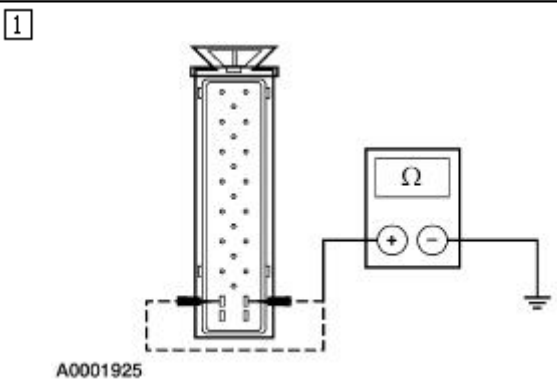
brake control module C135 pin 25 circuit 30-CF6A (RD), harness side and ground; and between anti-lock brake control module C135 pin 9 circuit 30-CF13 (RD), harness side and ground.

- Are the voltages greater than 10 volts?

→ **Yes**
GO to [D4](#).

→ **No**
REPAIR the circuit in question. CLEAR the DTCs. REPEAT the self-test.

D4 CHECK CIRCUIT 31-CF6A (BK/YE) AND 31-CF6B (BK/YE) FOR AN OPEN



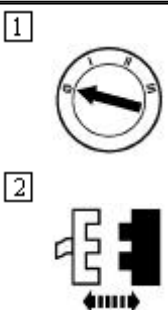
1 Measure the resistance between anti-lock brake control module C135 pin 24, circuit 31-CF6A (BK/YE), harness side and ground; and between anti-lock brake control module C135 pin 8, circuit 31-CF6B (BK/YE), harness side and ground.

- Are the resistances less than 5 ohms?

→ **Yes**
GO to [D5](#).

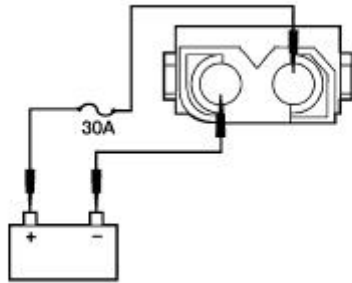
→ **No**
REPAIR circuit 31-CF6A (BK/YE) or circuit 31-CF6B (BK/YE). CLEAR the DTCs. REPEAT the self-test.

D5 CHECK THE PUMP MOTOR FOR OPERATION



Pump Motor Connector

3



GH1811-A

3

Using a heavy gauge wire, make a connection between the negative battery post and the pump motor connector brown wire (HCU side); momentarily connect a fused (30A) jumper wire between the positive battery post and the pump motor connector red wire (HCU side).

● Does the pump motor run?



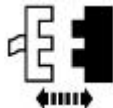
→ Yes

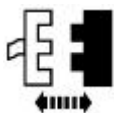
INSTALL a new anti-lock brake control module; REFER to [Anti-Lock Brake System \(ABS\) Module](#). CLEAR the DTCs. REPEAT the self-test.

→ No

INSTALL a new HCU; REFER to [Hydraulic Control Unit \(HCU\)](#). CLEAR the DTCs REPEAT the self-test.

PINPOINT TEST E: DTC C 1145 (RF), DTC C1155 (LF), DTC C1165 (RR), DTC C1175 (LR), ANTI-LOCK BRAKE SENSOR CIRCUIT FAILURE

CONDITIONS	DETAILS/RESULTS/ACTIONS
<p> CAUTION: Use the Flex Probe Kit for all test connections to prevent damage to the wiring terminals. Do not use standard multimeter probes.</p> <p>NOTE: Any time an anti-lock brake sensor is removed, thoroughly clean the mounting surfaces, apply High Temperature 4x4 Front Axle and Wheel Bearing Grease E8TZ-19590-A or equivalent meeting Ford specification ESA-M1C198-A.</p>	
<p>E1 CHECK FOR SHORT TO POWER</p>	
<p>NOTE: Both circuits must be checked for each DTC.</p>	
<p>1 </p> <p>2  Anti-Lock Brake Control Module C135</p> <p>3</p>	

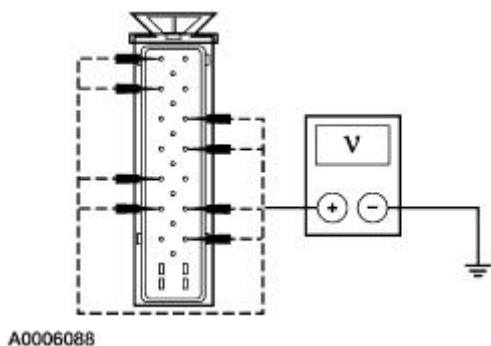


Suspect Anti-Lock Brake Sensor

4



5



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5 Measure the voltage between anti-lock brake control module C135 pin, harness side and ground as follows:

DTC	Anti-Lock Brake Control Module C135	Circuit
C1145 (RF)	Pin 3	8-CF38 (WH/RD)
C1145 (RF)	Pin 4	7-CF38 (YE/RD)
C1155 (LF)	Pin 17	8-CF32 (WH)
C1155 (LF)	Pin 18	7-CF32 (YE)
C1165 (RR)	Pin 7	8-CF40 (WH/GN)
C1165 (RR)	Pin 6	7-CF40 (YE/GN)
C1175 (LR)	Pin 21	8-CF34 (WH/BU)
C1175 (LR)	Pin 22	7-CF34 (YE/BU)

● Is any voltage present?

→ **Yes**

If DTC C1145, REPAIR circuit 8-CF38 (WH/RD), or circuit 7-CF38 (YE/RD). CLEAR the DTCs. REPEAT the self-test.

If DTC C1155, REPAIR circuit 8-CF32 (WH), or circuit 7-CF32 (YE). CLEAR the DTCs. REPEAT the self-test.

If DTC C1165, REPAIR circuit 8-CF40 (WH/GN), or circuit 7-CF40 (YE/GN). CLEAR the DTCs. REPEAT the self-test.

If DTC C1175, REPAIR circuit 8-CF34 (WH/BU), or circuit 7-CF34 (YE/BU). CLEAR the DTCs. REPEAT the self-test.

→ **No**

GO to [E2](#).

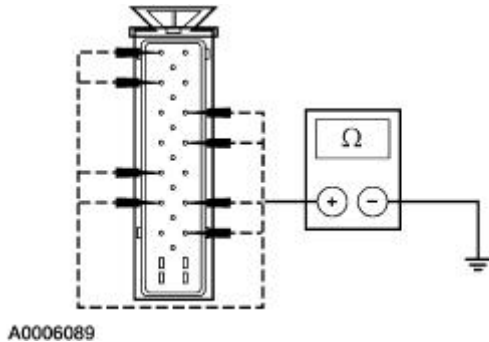
E2 CHECK FOR SHORT TO GROUND

NOTE: Both circuits must be checked for each DTC.

1



2



2

Measure the resistance between anti-lock brake control module C135 pin, harness side and ground as follows:

DTC	Anti-Lock Brake Control Module C135	Circuit
C1145 (RF)	Pin 3	8-CF38 (WH/RD)
C1145 (RF)	Pin 4	7-CF38 (YE/RD)
C1155 (LF)	Pin 17	8-CF32 (WH)
C1155 (LF)	Pin 18	7-CF32 (YE)
C1165 (RR)	Pin 7	8-CF40 (WH/GN)
C1165 (RR)	Pin 6	7-CF40 (YE/GN)
C1175 (LR)	Pin 21	8-CF34 (WH/BU)
C1175 (LR)	Pin 22	7-CF34 (YE/BU)

● **Is the resistance greater than 10,000 ohms?**

→ **Yes**
GO to [E3](#).

→ **No**
If DTC C1145, REPAIR circuit 8-CF38 (WH/RD), or circuit 7-CF38 (YE/RD). CLEAR the DTCs. REPEAT the self-test.

If DTC C1155, REPAIR circuit 8-CF32 (WH), or circuit 7-CF32 (YE). CLEAR the DTCs. REPEAT the self-test.

If DTC C1165, REPAIR circuit 8-CF40 (WH/GN), or circuit 7-CF40 (YE/GN). CLEAR the DTCs. REPEAT the self-test.

If DTC C1175, REPAIR circuit 8-CF34 (WH/BU), or circuit 7-CF34 (YE/BU). CLEAR the DTCs. REPEAT the self-test.

E3 CHECK FOR AN OPEN

NOTE: Both circuits must be checked for each DTC.

1 Measure the resistance between anti-lock brake control module C135 pins, harness side and suspect anti-lock brake sensor connector, harness side as follows:

DTC	Anti-Lock Brake Control Module C135 Pin	Anti-Lock Brake Sensor	Circuit
C1145 (RF)	3	C160 pin 2	8-CF38 (WH/RD)
C1145 (RF)	4	C160 pin 1	7-CF38 (YE/RD)
C1155 (LF)	17	C150 pin 2	8-CF32 (WH)
C1155 (LF)	18	C150 pin 1	7-CF32 (YE)
C1165 (RR)	7	C426 pin 1	8-CF40 (WH/GN)
C1165 (RR)	6	C426 pin 2	7-CF40 (WH/GN)
C1175 (LR)	21	C440 pin 2	8-CF34 (WH/BU)
C1175 (LR)	22	C440 pin 1	7-CF34 (YE/BU)

● **Is the resistance less than 5 ohms?**

→ **Yes**
GO to [E4](#).

→ **No**
If DTC C1145, REPAIR circuit 8-CF38 (WH/RD), or circuit 7-CF38 (YE/RD). CLEAR the DTCs. REPEAT the self-test.


If DTC C1155, REPAIR circuit 8-CF32 (WH), or circuit 7-CF32 (YE). CLEAR the DTCs. REPEAT the self-test.

If DTC C1165, REPAIR circuit 8-CF40 (WH/GN), or circuit 7-CF40 (YE/GN). CLEAR the DTCs. REPEAT the self-test.


If DTC C1175, REPAIR circuit 8-CF34 (WH/BU), or circuit 7-CF34 (YE/BU). CLEAR the DTCs. REPEAT the self-test.

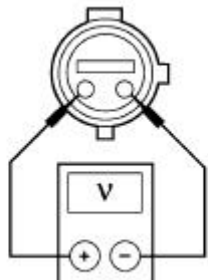
E4 CHECK THE ANTI-LOCK BRAKE CONTROL MODULE OUTPUT

1



Anti-Lock Brake Control Module C135

2 

3 

A0006087


3 Measure the voltage between suspect anti-lock brake sensor connector pins, harness side.

● Is the voltage greater than 9 volts?

→ **Yes**
 INSTALL a new anti-lock brake sensor; REFER to [Front Wheel Speed Sensor](#) , or [Rear Wheel Speed Sensor](#) . CLEAR the DTCs. TEST the system for normal operation.

→ **No**
 INSTALL a new anti-lock brake control module; REFER to [Anti-Lock Brake System \(ABS\) Module](#) . CLEAR the DTCs. TEST the system for normal operation.

PINPOINT TEST F: DTCS C1233, C1234, C1235 AND C1236 — ANTI-LOCK BRAKE SENSOR OUTPUT FAILURE

CONDITIONS	DETAILS/RESULTS/ACTIONS
<p>NOTE: Any time an anti-lock brake sensor is removed, thoroughly clean the mounting surfaces. On front anti-lock brake sensors, apply High-Temperature 4x4 Front Axle and Wheel Bearing Grease.</p>	
<p>F1 CHECK FOR DTCS</p>	
<p>1 </p> <p>2</p>	



3 Retrieve DTCs.

- Is DTC C1145, C1155, C1165 or C1175 present?

→ Yes
[Go To Pinpoint Test E](#).

→ No
GO to [F2](#).

F2 CHECK THE ANTI-LOCK BRAKE SENSOR PIDS

1



2



2 Monitor the anti-lock brake control module PIDS LF_WSPD, RF_WSPD, LR_WSPD and RR_WSP while driving the vehicle at a constant speed.

- Are the anti-lock brake sensor PIDS consistent?

→ Yes
CLEAR the DTCs. DRIVE the vehicle. RETRIEVE DTCs. If DTC C1233, C1234, C1235 or C1236 is present, INSTALL a new anti-lock brake control module. REFER to [Anti-Lock Brake System \(ABS\) Module](#). REPEAT the self-test.

→ No
GO to [F3](#).


F3 CHECK FOR ANTI-LOCK BRAKE SENSOR DAMAGE AND LOOSENESS

NOTE: Any time an anti-lock brake sensor is removed, thoroughly clean the mounting surfaces. On front anti-lock brake sensors, apply High-Temperature 4x4 Front Axle and Wheel Bearing Grease.

1



2 Raise and support the vehicle. Refer to [Section 100-02](#).

3  **CAUTION:** Examine the anti-lock brake sensor wire carefully with good light. Failure to verify damage in the anti-lock brake sensor wire can lead to the unnecessary installation of a

new component.

Inspect the anti-lock brake sensor mounting for looseness. If the anti-lock brake sensor is suspected, inspect the sensor for corrosion on the anti-lock brake sensor mounting flange. Clean as necessary.

● **Is the anti-lock brake sensor OK?**

→ **Yes**
GO to [F4](#).

→ **No**
If the anti-lock brake sensor mounting is loose or corroded, REMOVE the anti-lock brake sensor, PLUG the opening, and thoroughly CLEAN the mounting surfaces. On the front anti-lock brake sensors, APPLY High Temperature 4x4 Front Axle and Wheel Bearing Grease E8TZ-19590-A or equivalent meeting Ford Specification ESA-M1C198-A. REPEAT the self-test.

If the anti-lock brake sensor is damaged, INSTALL a new anti-lock brake sensor.


For the front anti-lock brake sensor, REFER to [Front Wheel Speed Sensor](#). CLEAR the DTCs. REPEAT the self-test.

For the rear anti-lock brake sensor, REFER to [Rear Wheel Speed Sensor](#). CLEAR the DTCs. REPEAT the self-test.

F4 CHECK FOR ANTI-LOCK BRAKE SENSOR INDICATOR DAMAGE

NOTE: Any time an anti-lock brake sensor is removed, thoroughly clean the mounting surfaces. On front anti-lock brake sensors, apply High Temperature 4x4 Front Axle and Wheel Bearing Grease.

1 Remove the anti-lock brake sensor.

2  **CAUTION: Examine the anti-lock brake sensor indicator carefully with good light. Failure to verify damage in the anti-lock brake sensor indicator can lead to the unnecessary installation of a new component.**

Inspect the anti-lock brake sensor indicator for damaged or missing teeth. Rotate the wheel to verify that no teeth are missing.

● **Is the wheel speed sensor indicator OK?**

→ **Yes**

GO to [F5](#).

→ **No**
INSTALL a new wheel speed sensor indicator.

For the front wheel speed sensor indicator, REFER to [Front Wheel Speed Sensor](#). CLEAR the DTCs. REPEAT the self-test.

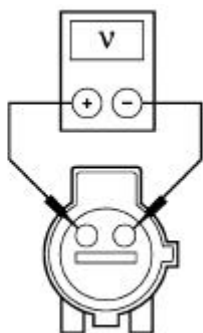
For the rear wheel speed sensor indicator, REFER to [Rear Wheel Speed Sensor](#). CLEAR the DTCs. REPEAT the self-test.

F5 CHECK THE ANTI-LOCK BRAKE CONTROL MODULE OUTPUT

1



2



GH2097-A

2 Measure the voltage between the suspect anti-lock brake sensor as follows:

DTC	Suspect Anti-Lock Brake Sensor Circuit	Suspect Anti-Lock Brake Sensor Circuit
C1234 (RF)	514 (YE/RD)	516 (YE/BK)
C1233 (LF)	521 (TN/OG)	522 (TN/BK)
C1235 (RR)	523 (RD/PK)	524 (PK/BK)
C1236 (LR)	518 (LG/RD)	519 (LG/BK)


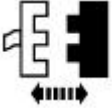




● Is the voltage greater than 9 volts?

→ **Yes**
INSTALL a new wheel speed sensor. REFER to [Front Wheel Speed Sensor](#) or [Rear Wheel Speed Sensor](#). CLEAR the DTCs. TEST the system for normal operation.

→ **No**
INSTALL a new anti-lock brake control module. REFER to [Anti-Lock Brake System \(ABS\) Module](#). TEST the system for normal operation.

PINPOINT TEST G: THE YELLOW ANTI-LOCK BRAKE WARNING

INDICATOR DOES NOT SELF-CHECK

CONDITIONS	DETAILS/RESULTS/ACTIONS
G1 CHECK THE YELLOW ANTI-LOCK BRAKE WARNING INDICATOR	
<p>1 </p> <p>2  Anti-Lock Brake Control Module C135</p> <p>3 </p>	<ul style="list-style-type: none"> ● Is the yellow anti-lock warning indicator illuminated? <p>→ Yes GO to G2.</p> <p>→ No REFER to Section 413-01.</p>
G2 CHECK PROVE OUT	
<p>1 </p> <p>2  Anti-Lock Brake Control Module C135</p> <p>3 </p>	<ul style="list-style-type: none"> ● Does the yellow anti-lock brake warning indicator prove out for three seconds and then turn off? <p>→ Yes The yellow anti-lock brake warning indicator operation is OK.</p> <p>→ No INSTALL a new anti-lock brake control module; REFER to Anti-Lock</p>

[Brake System \(ABS\) Module](#). TEST the system for normal operation.

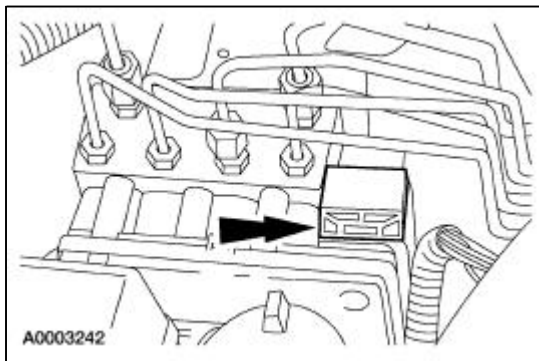
Hydraulic Control Unit (HCU)

Removal and Installation

⚠ WARNING: Brake fluid contains polyglycol ethers and polyglycols. Avoid contact with eyes. Wash hands thoroughly after handling. If brake fluid contacts eyes, flush eyes with running water for 15 minutes. Get medical attention if irritation persists. If taken internally, drink water and induce vomiting. Get medical attention immediately.

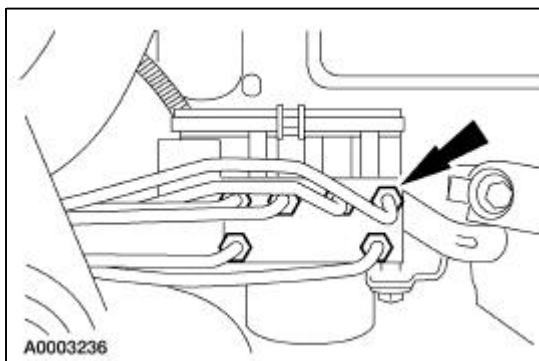
⚠ CAUTION: Brake fluid is harmful to painted and plastic surfaces. If brake fluid is spilled onto a painted or plastic surface, immediately wash it with water.

1. Disconnect the battery ground cable. For additional information, refer to [Section 414-01](#).
2. Disconnect the electrical connector by lifting up on the release tab.

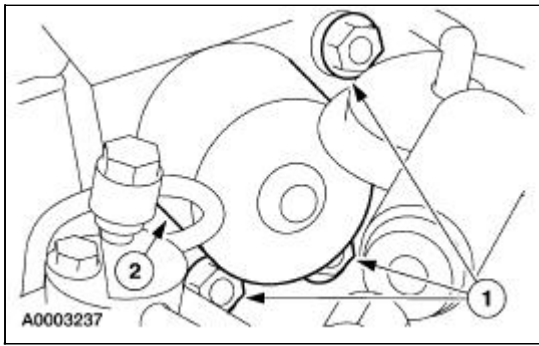



3. **NOTE:** Plug each open port to prevent any brake fluid from spilling.

Disconnect the brake lines from the hydraulic control unit (HCU).




4. Remove the HCU.
 1. Remove the bolts.
 2. Remove the HCU.



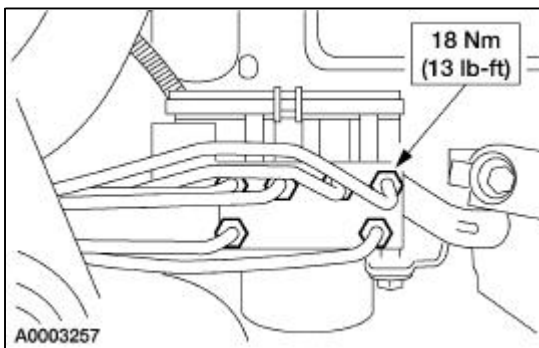
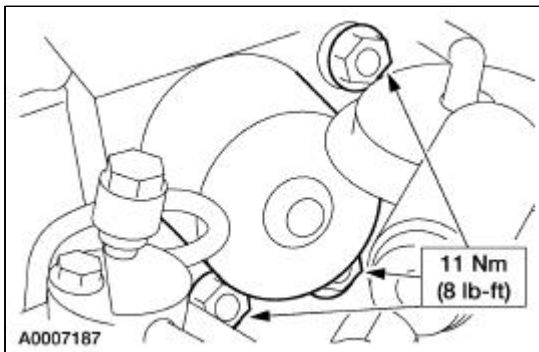
5.  **WARNING:** Brake fluid contains polyglycol ethers and polyglycols. Avoid contact with eyes. Wash hands thoroughly after handling. If brake fluid contacts eyes, flush eyes with running water for 15 minutes. Get medical attention if irritation persists. If taken internally, drink water and induce vomiting. Get medical attention immediately.

 **CAUTION:** Brake fluid is harmful to painted and plastic surfaces. If brake fluid is spilled onto a painted or plastic surface, immediately wash it with water.

 **CAUTION:** After the HCU is installed, it is necessary to bleed the hydraulic brake system. For additional information, refer to [Section 206-00](#).

NOTE: When the battery is disconnected and reconnected, some abnormal drive symptoms may occur while the vehicle relearns its adaptive strategy. The vehicle may need to be driven 16 km (10 mi) or more to relearn the strategy.

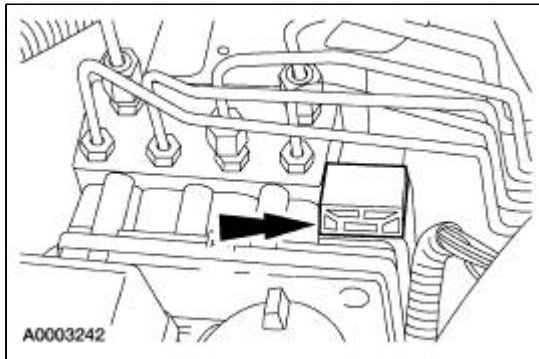
To install, reverse the removal procedure.



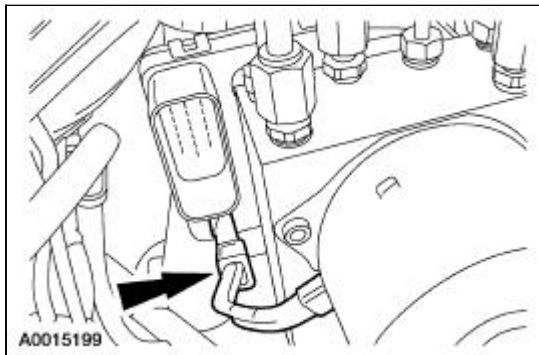
Anti-Lock Brake System (ABS) Module

Removal and Installation

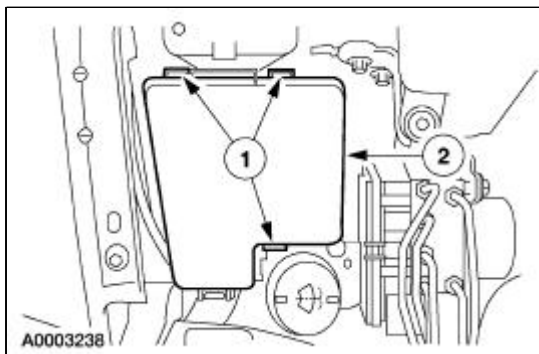
1. Disconnect the battery ground cable. For additional information, refer to [Section 414-01](#).
2. Disconnect the anti-lock brake control module electrical connector.



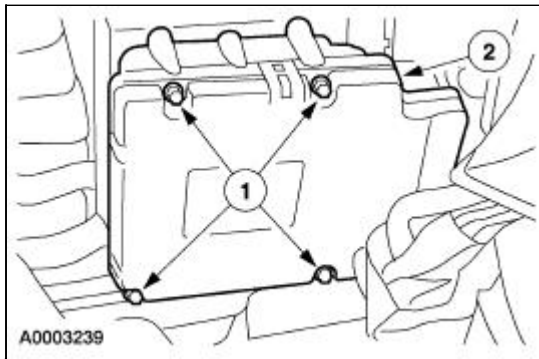
3. Disconnect the anti-lock brake pump motor electrical connector.




4. Position the underhood auxiliary junction box (AJB) aside.
 1. Release the underhood AJB clips.
 2. Position the underhood AJB aside.



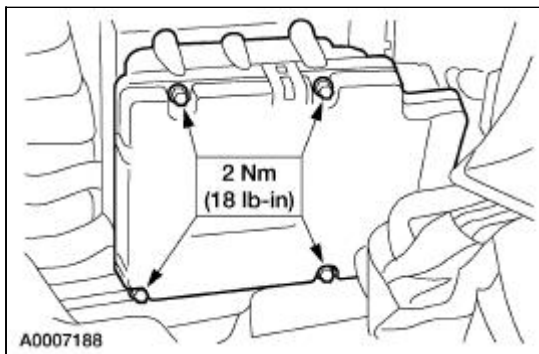
5. Remove the anti-lock brake control module.
 1. Remove the bolts.
 2. Remove the control module.



6.  **CAUTION:** Once the new module is installed, it is necessary to download the module configuration information from the scan tool into the module. For additional information, refer to [Section 418-01](#).

NOTE: When the battery is disconnected and reconnected, some abnormal drive symptoms may occur while the vehicle relearns its adaptive strategy. The vehicle may need to be driven 16 km (10 mi) or more to relearn the strategy.

To install, reverse the removal procedure.



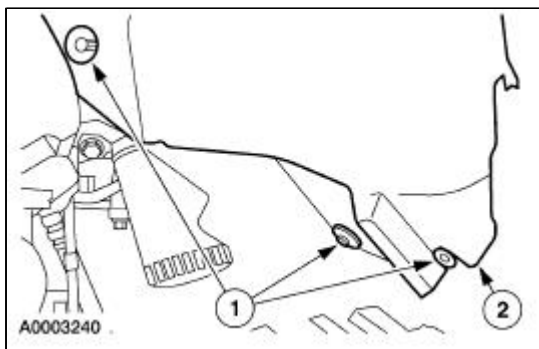
Front Wheel Speed Sensor

Material

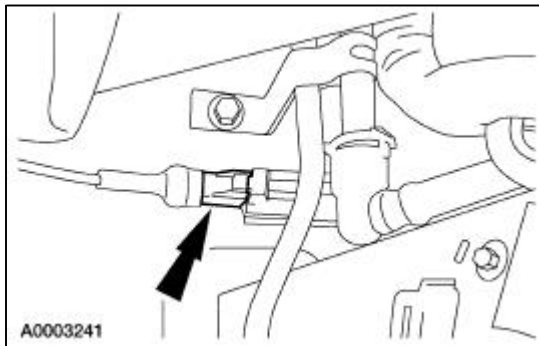
Item	Specification
RTV Silicone Sealant FSTZ-19G204-AB (Canada CXC-114A)	NAVSTR Sealer

Removal and Installation

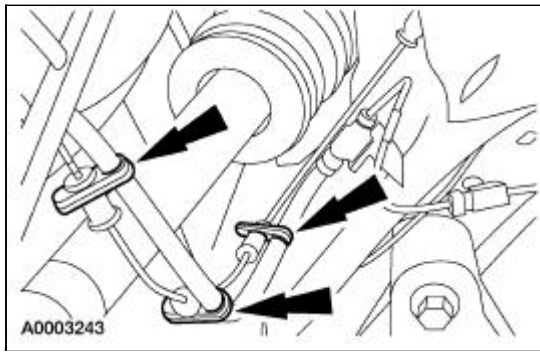
1. Raise and support the vehicle. For additional information, refer to [Section 100-02](#).
2. Position the inner splash shield aside.
 1. Remove the pin-type retainers.
 2. Position the inner splash shield aside.



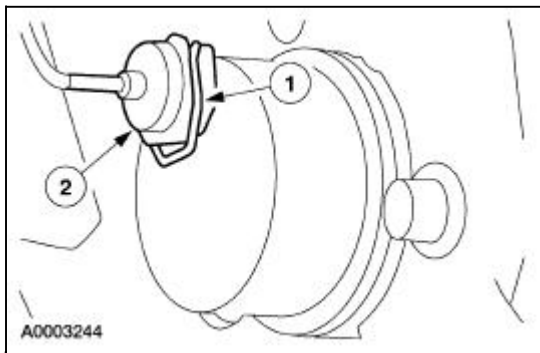
3. Disconnect the anti-lock brake sensor electrical connector.



4. Remove the anti-lock brake sensor harness from the brake hose clips.



5. Remove the anti-lock brake sensor.
 1. Remove the anti-lock brake sensor clip.
 2. Remove the anti-lock brake sensor.



6. **NOTE:** Make sure the anti-lock brake sensor is fully seated before installation of the new clip.

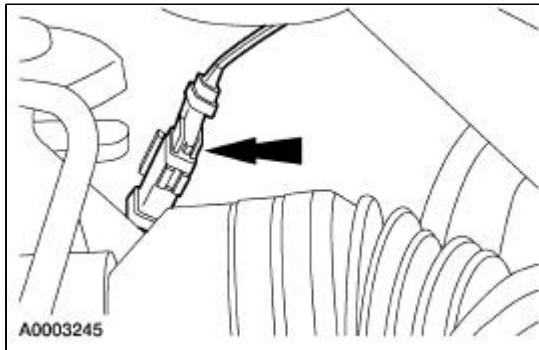
To install, reverse the removal procedure.

- Apply a 2.5 mm (0.1 in) bead of silicone sealant to the outside diameter of the anti-lock brake sensor.
-

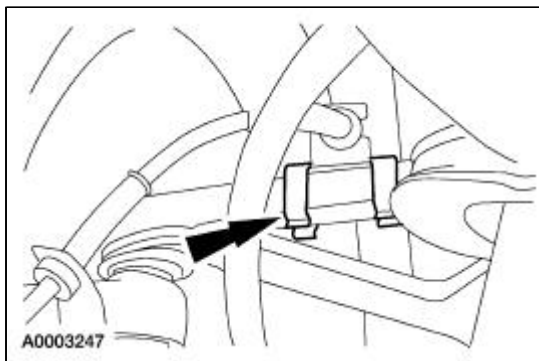
Rear Wheel Speed Sensor

Removal and Installation

1. Raise and support the vehicle. For additional information, refer to [Section 100-02](#).
2. Disconnect the rear anti-lock brake sensor electrical connector.



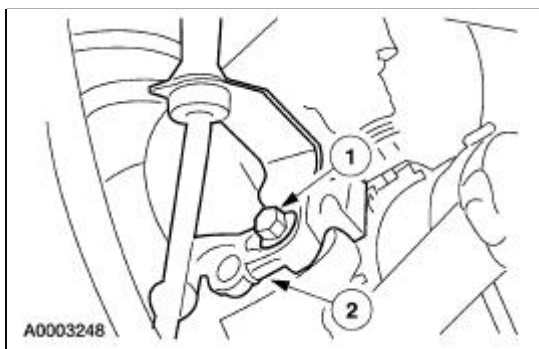
3. Remove the rear anti-lock brake sensor harness from the control arm clips.



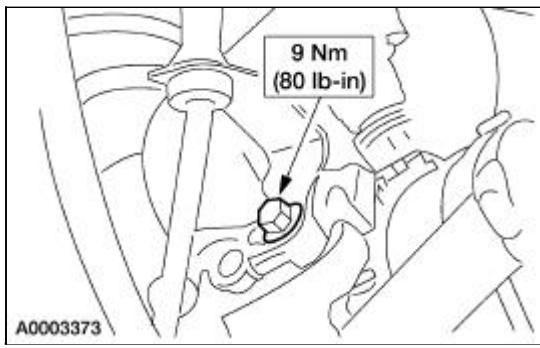
4. **NOTE:** Clean off dirt and foreign material that may have collected around the rear anti-lock brake sensor before removal.

Remove the rear anti-lock brake sensor.

1. Remove the anti-lock brake sensor bolt.
2. Remove the anti-lock brake sensor.



5. To install, reverse the removal procedure.



General Specifications

Item	Specification
High Temperature 4X4 Front Axle and Wheel Bearing Grease E8TZ-19590-A	ESA-M1C198-A

Torque Specifications

Description	Nm	lb-ft	lb-in
Anti-lock brake control module bolts	2	—	18
Brake line to (HCU) nuts	18	13	—
Electronic hydraulic control unit bolts	11	8	—
Rear anti-lock brake sensor bolt	9	—	80

Anti-Lock Control —Traction Control

The four wheel anti-lock brake system (4WABS) with traction control consists of the following components:



- anti-lock brake control module
- front anti-lock brake sensors
- front anti-lock brake sensor indicators
- hydraulic control unit (HCU)
- rear anti-lock brake sensors
- rear anti-lock brake sensor indicators
- traction control event indicator
- traction control switch
- yellow anti-lock brake warning indicator

For removal and installation of the front anti-lock brake sensor indicators, refer to [Section 204-01](#) .

For removal and installation of the rear anti-lock brake sensor indicators, refer to [Section 205-05](#) .

Anti-Lock Control —Traction Control

Special Tool(s)

 ST1217-A	New Generation STAR (NGS) Tester or equivalent 418-F048 (007-00500)
 ST1137-A	73III Automotive Meter 105-R0057

Refer to Wiring Diagrams Section 206-09B-00, Anti-Lock Brake Control—Traction Control for schematic and electrical information.

Principles of Operation

The anti-lock-brake control module receives wheel speed readings from each anti-lock brake sensor and processes this information to determine if an ABS event is necessary. The anti-lock brake sensor electrically senses each tooth of the anti-lock brake sensor indicators as it passes through the anti-lock brake sensor magnetic field.

The anti-lock brake control module continuously monitors and compares the rotational speed of each wheel and, when it detects an impending wheel lock, modulates brake pressure to the appropriate brake caliper. This is accomplished by triggering the hydraulic control unit (HCU) to open and close the appropriate solenoid valves. Once the affected wheel returns to normal speed, the anti-lock brake control module returns the solenoid valves to their normal position, and normal (base) braking resumes.

The anti-lock brake control module is self-monitoring. When the ignition switch is turned to the RUN position, the anti-lock brake control module will do a preliminary electrical check, and at approximately 20 km/h (12 mph) the pump motor is turned on for approximately one half-second. Any malfunction of the ABS will cause the ABS or anti-lock brake system/traction control (ABS/TC) to shut off and the yellow anti-lock brake warning indicator to illuminate, however the power assist braking system functions normally.

The anti-lock brake control module and traction control communicates with the powertrain control module (PCM) to assist with traction control. At speeds under 40 km/h (25 mph) the anti-lock brake control module requests the PCM to reduce engine torque, while simultaneously applying and releasing the appropriate brake to restore traction when one or both drive wheels lose traction and begin to spin. The PCM accomplishes this by minor incremental timing changes and fewer fuel injector pulses until the anti-lock brake control module ends the request (when driven wheel speed returns to normal). After the vehicle speed exceeds 40 km/h (25 mph), the traction control is accomplished only through the PCM torque control.

If the traction control system is cycled excessively, the brake portion of the system will shut down to

prevent the rear brakes from overheating. A limited traction control function using only engine torque reduction will still control the wheels from over-spinning. When the rear brakes have cooled down the system will again function normally. Anti-lock braking is not affected by this condition and will function normally during the cool down period.

The traction control system can be disabled by depressing the traction control switch. The traction control system will reset and return to normal traction assist when the ignition switch is cycled or when the traction control switch is depressed again.

Inspection and Verification

NOTE: The anti-lock brake control module must be reconfigured upon replacement; refer to [Section 418-01](#).

1. Verify the customer concern by applying the brakes under different conditions.
2. Visually inspect for obvious signs of mechanical and electrical damage.

Visual Inspection Chart

Mechanical	Electrical
<ul style="list-style-type: none"> ● Anti-lock brake sensor indicator ● Base brake concerns ● HCU ● Tire pressure ● Tire size or mismatched tires 	<ul style="list-style-type: none"> ● Underhood auxiliary junction box (AJB) Maxi Fuses: <ul style="list-style-type: none"> ■ 114 (30A) ■ 122 (30A) ● Central junction box (CJB) Fuses: <ul style="list-style-type: none"> ■ 205 (5A) ■ 203 (5A) ● Anti-lock brake control module ● Anti-lock brake sensors ● Brake pedal position (BPP) switch ● Circuitry ● Connectors or connections ● EVAC and fill connector ● Traction control switch ● Wire harness routing

3. If the fault is not visually evident, connect the New Generation STAR (NGS) to the data link connector (DLC) located beneath the instrument panel and select the vehicle to be tested from the NGS menu. If the NGS does not communicate with the vehicle:
 - check that the program card is correctly installed.
 - check the connections to the vehicle.
 - check the ignition switch position.
4. If the NGS still does not communicate with the vehicle, refer to the New Generation STAR Tester manual.
5. Carry out the DATA LINK DIAGNOSTIC TEST. If the NGS responds with:
 - CKT914, CKT915, or CKT70 = ALL ECUS NO RESP/NOT EQUIP, refer to [Section 418-00](#).
 - NO RESP/NOT EQUIP for anti-lock brake control module, go to Pinpoint Test A.
 - SYSTEM PASSED, retrieve and record the continuous diagnostic trouble codes (DTCs), erase the continuous DTCs and carry out the self-test diagnostics for the anti-lock brake

control module.

6. If the DTCs retrieved are related to the concern, go to Anti-Lock Brake Control Module Diagnostic Trouble Code (DTC) Index to continue diagnostics.
7. If no DTCs related to the concern are retrieved, proceed to Symptom Chart.

Anti-Lock Brake Control Module Diagnostic Trouble Code (DTC) Index

DTC	Description	Source	Action
B1342	ECU is Defective	Anti-Lock Brake Control Module	INSTALL a new anti-lock brake control module; REFER to Module—Anti-Lock Brake Control .
B1485	Brake Pedal Input Circuit Battery Short	Anti-Lock Brake Control Module	GO to Pinpoint Test B .
B1676	Battery Pack Voltage Out of Range	Anti-Lock Brake Control Module	GO to Pinpoint Test C .
B2477	Module Configuration Failure	Anti-Lock Brake Control Module	CONFIGURE the anti-lock brake control module; REFER to Section 418-01 . CLEAR the DTCs. REPEAT the self-test. If DTC B2477 is retrieved again, INSTALL a new anti-lock brake control module; REFER to Module—Anti-Lock Brake Control . REPEAT the self-test.
C1095	Hydraulic Pump Motor Circuit Failure	Anti-Lock Brake Control Module	GO to Pinpoint Test D .
C1145	Speed Wheel Sensor RF Input Circuit Failure	Anti-Lock Brake Control Module	GO to Pinpoint Test E .
C1155	Speed Wheel Sensor LF Input Circuit Failure	Anti-Lock Brake Control Module	GO to Pinpoint Test E .
C1165	Speed Wheel Sensor RR Input Circuit Failure	Anti-Lock Brake Control Module	GO to Pinpoint Test E .
C1175	Speed Wheel Sensor LR Input Circuit Failure	Anti-Lock Brake Control Module	GO to Pinpoint Test E .
C1233	Speed Wheel LF Input Signal Missing	Anti-Lock Brake Control Module	GO to Pinpoint Test F .
C1234	Speed Wheel RF Input Signal Missing	Anti-Lock Brake	GO to Pinpoint Test F .

		Control Module	
C1235	Speed Wheel RR Input Signal Missing	Anti-Lock Brake Control Module	GO to Pinpoint Test F.
C1236	Speed Wheel LR Input Signal Missing	Anti-Lock Brake Control Module	GO to Pinpoint Test F.
P0112	IAT Circuit Low Input	PCM	REFER to Powertrain Control/Emissions Diagnosis (PC/ED) manual.
P0122	TP Sensor A Circuit Low Input	PCM	REFER to Powertrain Control/Emissions Diagnosis (PC/ED) manual.
P0123	TP Sensor A Circuit High Input	PCM	REFER to Powertrain Control/Emissions Diagnosis (PC/ED) manual.
P0500	Vehicle Speed Sensor Malfunction	PCM	REFER to Powertrain Control/Emissions Diagnosis (PC/ED) manual.
P0501	Vehicle Speed Sensor Range/Performance	PCM	REFER to Powertrain Control/Emissions Diagnosis (PC/ED) manual.
P0502	Vehicle Speed Sensor Low Input	PCM	REFER to Powertrain Control/Emissions Diagnosis (PC/ED) manual.
P0503	Vehicle Speed Sensor Intermittent	PCM	REFER to Powertrain Control/Emissions Diagnosis (PC/ED) manual.
P1120	TP Sensor Out Of Range Low (Ratch Too Low)	PCM	REFER to Powertrain Control/Emissions Diagnosis (PC/ED) manual.
P1183	Engine Oil Temperature Circuit Malfunction	PCM	REFER to Powertrain Control/Emissions Diagnosis (PC/ED) manual.
P1184	Engine Oil Temperature Out Of Self Test Range	PCM	REFER to Powertrain Control/Emissions Diagnosis (PC/ED) manual.
U1009	SCP (J1850) Invalid or Missing Data for Engine Torque	ABS/TC	CARRY OUT the PCM self-test.
U1027	SCP (J1850) Invalid or Missing Data for Engine RPM	ABS/TC	CARRY OUT the PCM self-test.
U1262	SCP (J1850) Communication Bus Fault	ABS/TC	REFER to Section 418-00.

Anti-Lock Brake Control Module Parameter Identification (PID) Index

PID	Description	Expected Value
CONTABS	Number of Continuous DTCs on ABS	one count per bit
BOO_ABS	Brake Switch Input	ON, OFF
ABSLF_I	Left Front ABS Inlet Valve	Off--, Off--G, Off-B-, Off-BG, OffO--, OffO-G, OffOB-, OffOBG, On--, On--G, On-B-, On-BG, OnO--, OnO-G, OnOB-, OnOBG

ABSLF_O	Left Front ABS Outlet Valve	Off---, Off--G, Off-B-, Off-BG, OffO--, OffO-G, OffOB-, OffOBG, On---, On--G, On-B-, On-BG, OnO--, OnO-G, OnOB-, OnOBG
ABSLR_I	Left Rear ABS Inlet Valve	Off---, Off--G, Off-B-, Off-BG, OffO--, OffO-G, OffOB-, OffOBG, On---, On--G, On-B-, On-BG, OnO--, OnO-G, OnOB-, OnOBG
ABSLR_O	Left Rear ABS Outlet Valve	Off---, Off--G, Off-B-, Off-BG, OffO--, OffO-G, OffOB-, OffOBG, On---, On--G, On-B-, On-BG, OnO--, OnO-G, OnOB-, OnOBG
ABSRF_I	Right Front ABS Inlet Valve	Off---, Off--G, Off-B-, Off-BG, OffO--, OffO-G, OffOB-, OffOBG, On---, On--G, On-B-, On-BG, OnO--, OnO-G, OnOB-, OnOBG
ABSRF_O	Right Front ABS Outlet Valve	Off---, Off--G, Off-B-, Off-BG, OffO--, OffO-G, OffOB-, OffOBG, On---, On--G, On-B-, On-BG, OnO--, OnO-G, OnOB-, OnOBG
ABSRR_I	Right Rear ABS Inlet Valve	Off---, Off--G, Off-B-, Off-BG, OffO--, OffO-G, OffOB-, OffOBG, On---, On--G, On-B-, On-BG, OnO--, OnO-G, OnOB-, OnOBG
ABSRR_O	Right Rear ABS Outlet Valve	Off---, Off--G, Off-B-, Off-BG, OffO--, OffO-G, OffOB-, OffOBG, On---, On--G, On-B-, On-BG, OnO--, OnO-G, OnOB-, OnOBG
LF_WSPD	Left Front Wheel Speed Sensor	0-255 KPH
LR_WSPD	Left Rear Wheel Speed Sensor	0-255 KPH
RF_WSPD	Right Front Wheel Speed Sensor	one count per bit
RR_WSPD	Right Rear Wheel Speed Sensor	0-255 KPH
TC_LVAL	Left Rear Traction Control Output State	ON, OFF
TC_RVAL	Right Rear Traction Control Output State	ON, OFF
TC/YC_SW	TC or TC/YC Switch, push button, input status	ON, OFF
TC/YC_FNC	TC or TC/YC function available state, status	ON, OFF

Anti-Lock Brake Control Module Active Command Index

Active Command	Display	Action
ABS Output Control	PMP MOTOR	ON, OFF
	LF INLET	ON, OFF
	RF INLET	ON, OFF
	LR INLET	ON, OFF
	RR INLET	ON, OFF
	LF OUTLET	ON, OFF

	RF OUTLET	ON, OFF
	LR OUTLET	ON, OFF
	RR OUTLET	ON, OFF
TC OUTPUT CONTROL	LR TC VLV	ON, OFF
	RR TC VLV	ON, OFF

Symptom Chart

NOTE: Refer to the wiring diagrams for connector numbers stated in the pinpoint tests.




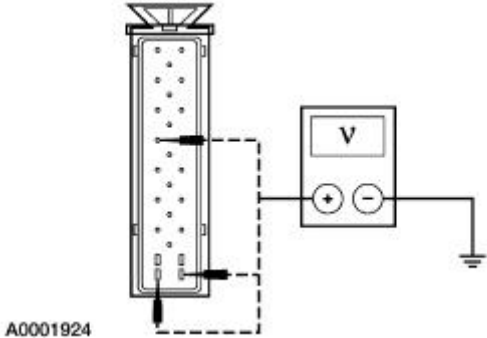


Symptom Chart

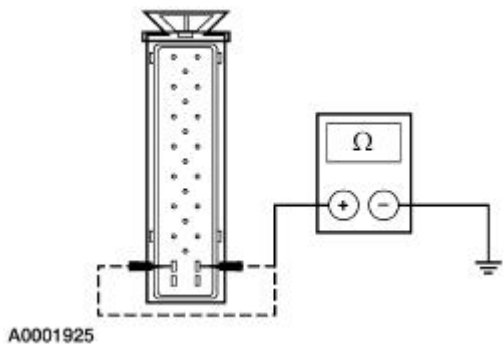
Condition	Possible Sources	Action
<ul style="list-style-type: none"> No communication with the anti-lock brake control module 	<ul style="list-style-type: none"> Underhood AJB Maxi Fuses 114 (30 A) and 122 (30A). CJB Fuses 203 (5A) and 205 (5A). Circuitry. Anti-lock brake control module. 	<ul style="list-style-type: none"> GO to Pinpoint Test A.
<ul style="list-style-type: none"> The yellow anti-lock brake warning indicator does not self-check 	<ul style="list-style-type: none"> Anti-lock brake control module. Circuitry. Instrument cluster. Indicator bulb. 	<ul style="list-style-type: none"> GO to Pinpoint Test G.
<ul style="list-style-type: none"> Spongy brake pedal with no warning indicator 	<ul style="list-style-type: none"> Air in brake hydraulic system. 	<ul style="list-style-type: none"> GO to Section 206-00.
<ul style="list-style-type: none"> The traction control is inoperative 	<ul style="list-style-type: none"> Circuitry. Traction control switch. Anti-lock brake control module. Hydraulic control unit (HCU). Base brake system. 	<ul style="list-style-type: none"> GO to Pinpoint Test H. REFER to Section 206-00.
<ul style="list-style-type: none"> The traction control cannot be disabled 	<ul style="list-style-type: none"> Circuitry. Traction control switch. Anti-lock brake control module. 	<ul style="list-style-type: none"> GO to Pinpoint Test I.
<ul style="list-style-type: none"> The traction control switch is never/always on 	<ul style="list-style-type: none"> Circuitry. Traction control switch. Anti-lock brake control module. 	<ul style="list-style-type: none"> GO to Pinpoint Test J.

Pinpoint Tests

PINPOINT TEST A: NO COMMUNICATION WITH THE ANTI-LOCK

BRAKE CONTROL MODULE

CONDITIONS	DETAILS/RESULTS/ACTIONS								
A1 CHECK VOLTAGE TO THE ANTI-LOCK BRAKE CONTROL MODULE									
<p>1 </p> <p>2  Anti-Lock Brake Control Module C135</p> <p>3 </p> <p>4  A0001924</p>	<p>4 Measure the voltage between anti-lock brake control module C135 pins, and ground as follows:</p> <table border="1"> <thead> <tr> <th>Pin</th> <th>Circuit</th> </tr> </thead> <tbody> <tr> <td>25</td> <td>30-CF6A (RD)</td> </tr> <tr> <td>20</td> <td>20-CF6A (PK/YE)</td> </tr> <tr> <td>9</td> <td>30-CF13 (RD)</td> </tr> </tbody> </table> <p>• Are the voltages greater than 10 volts?</p> <p>→ Yes GO to A2 .</p> <p>→ No REPAIR the circuit in question. TEST the system for normal operation.</p>	Pin	Circuit	25	30-CF6A (RD)	20	20-CF6A (PK/YE)	9	30-CF13 (RD)
Pin	Circuit								
25	30-CF6A (RD)								
20	20-CF6A (PK/YE)								
9	30-CF13 (RD)								
A2 CHECK ANTI-LOCK BRAKE MODULE GROUNDS									
<p>1 </p> <p>2 </p>	<p>2 Measure the resistance between anti-lock brake control module C135 pin 8, circuit 31-CF6B (BK/YE), harness side and ground; and between anti-lock brake control module C135 pin 24, circuit 31-CF6A (BK/YE), harness side and ground.</p>								



A0001925

- Are the resistances less than 5 ohms?




→ **Yes**

REFER to [Section 418-00](#).

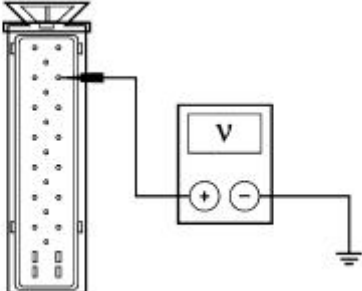
→ **No**

REPAIR the circuit in question. TEST the system for normal operation.

PINPOINT TEST B: DTC B1485 , BRAKE PEDAL INPUT CIRCUIT BATTERY SHORT

CONDITIONS	DETAILS/RESULTS/ACTIONS
B1 CHECK THE STOPLAMP OPERATION	
	<p>1 Press the brake pedal.</p> <ul style="list-style-type: none"> ● Do the stoplamps operate correctly? <p>→ Yes GO to B2.</p> <p>→ No REFER to Section 417-01.</p>
B2 CHECK CIRCUIT 29S-CF58 (OG/GN) FOR OPEN	
<p>1 </p> <p>2  Anti-Lock Brake Control Module C135</p> <p>3 </p>	

4



A0001926


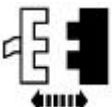
4 Measure the voltage between anti-lock brake control module pin 2 circuit 29S-CF58 (OG/GN), harness side and ground, while depressing the brake pedal.

- Is the voltage greater than 10 volts?

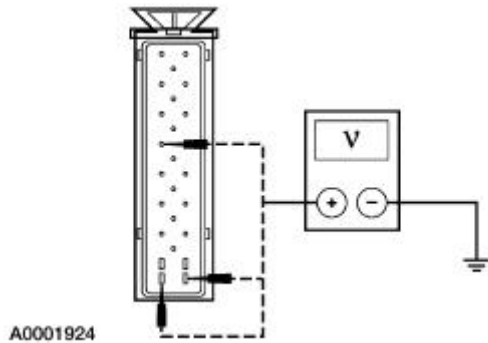
→ **Yes**
 INSTALL a new anti-lock brake control module; REFER to [Module—Anti-Lock Brake Control](#). CLEAR the DTCs. REPEAT the self-test.

→ **No**
 REPAIR the circuit. CLEAR the DTCs. REPEAT the self-test.

PINPOINT TEST C: DTC B1676, BATTERY PACK VOLTAGE OUT OF RANGE

CONDITIONS	DETAILS/RESULTS/ACTIONS
C1 CHECK THE BATTERY VOLTAGE	
<p>1</p> 	<p>2 Measure the voltage between positive and negative battery posts.</p> <ul style="list-style-type: none"> ● Is the voltage between 10 and 14 volts? <p>→ Yes GO to C2.</p> <p>→ No REFER to Section 414-00.</p>
C2 CHECK VOLTAGE TO THE ANTI-LOCK BRAKE CONTROL MODULE	
<p>1</p>  <p>Anti-Lock Brake Control Module C135</p>	

2



2

Measure the voltage between anti-lock brake control module C135 pins, and ground as follows:

Pin	Circuit
25	30-CF6A (RD)
20	20-CF6A (PK/YE)
9	30-CF13 (RD)

- Are the voltages greater than 10 volts?

→ **Yes**
GO to [C3](#).

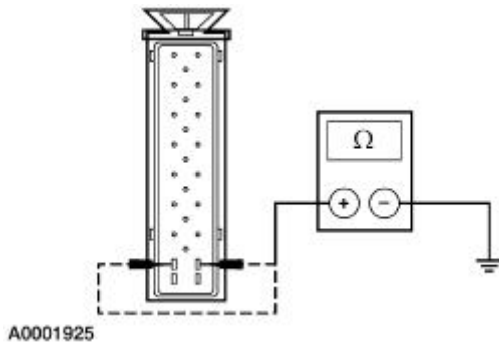
→ **No**
REPAIR the circuit in question. CLEAR the DTCs. REPEAT the self-test.

C3 CHECK THE ANTI-LOCK BRAKE CONTROL MODULE GROUNDS

1



2



2




Measure the resistance between anti-lock control module pin 24, circuit 31-CF6A (BK/YE), harness side and ground; and between anti-lock control module pin 8, circuit 31-CF6B (BK/YE), harness side and ground.

- Are the resistances less than 5 ohms?

→ **Yes**
INSTALL a new anti-lock brake control module; REFER to [Module—Anti-Lock Brake Control](#). CLEAR the DTCs. REPEAT the self-test.

→ **No**
REPAIR the circuit in question. CLEAR the DTCs. REPEAT the self-test.

PINPOINT TEST D: DTC C1095, HYDRAULIC PUMP MOTOR CIRCUIT FAILURE

CONDITIONS	DETAILS/RESULTS/ACTIONS
D1 CHECK ABS PUMP MOTOR	
<p>1</p> 	<ul style="list-style-type: none"> <li>● Is the ABS pump motor running all the time? <p>→ Yes INSTALL a new anti-lock brake control module; REFER to Module—Anti-Lock Brake Control. REPEAT the self-test.</p> <p>→ No GO to D2.</p>
D2 CHECK PUMP MOTOR OPERATION	
<p>1</p> 	<p>2 Trigger the anti-lock brake control module active command PMP MOTOR ON.</p> <ul style="list-style-type: none"> <li>● Does the ABS pump motor run for approximately three seconds? <p>→ Yes CLEAR the DTCs. CHECK the yellow anti-lock brake warning indicator while driving the vehicle (brakes must not be applied) above 32 km/h (20 mph). If the yellow anti-lock brake warning indicator illuminates, RETRIEVE continuous DTCs. If DTC C1095 is retrieved again, INSTALL a new anti-lock brake control module; REFER to Module—Anti-Lock Brake Control. REPEAT the self-test.</p> <p>If the yellow anti-lock brake warning indicator does not illuminate, the system is OK.</p> <p>→ No TRIGGER the anti-lock brake control module active command PMP MOTOR OFF. GO to D3.</p>
D3 CHECK CIRCUIT 30-CF6A (RD) AND CIRCUIT 30-CF13 (RD) FOR OPEN	
<p>1</p> 	

2

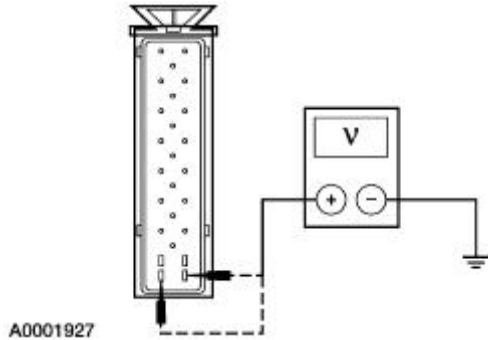


Anti-Lock Brake Control Module

3



4



4

Measure the voltage between anti-lock brake control module C135 pin 25 circuit 30-CF6A (RD), harness side and ground; and between anti-lock brake control module C135 pin 9 circuit 30-CF13 (RD), harness side and ground.

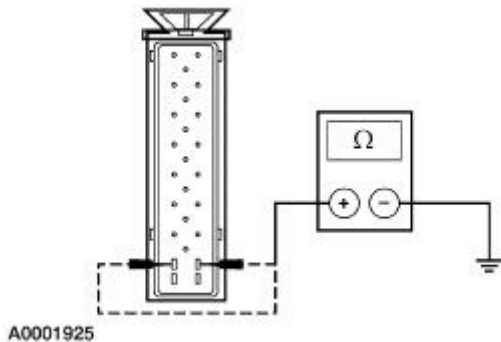
- Are the voltages greater than 10 volts?

→ **Yes**
GO to [D4](#).

→ **No**
REPAIR the circuit in question. CLEAR the DTCs. REPEAT the self-test.

D4 CHECK CIRCUIT 31-CF6A (BK/YE) AND 31-CF6B (BK/YE) FOR AN OPEN

1



1

Measure the resistance between anti-lock brake control module C135 pin 24, circuit 31-CF6A (BK/YE), harness side and ground; and between anti-lock brake control module C135 pin 8, circuit 31-CF6B (BK/YE), harness side and ground.

- Are the resistances less than 5 ohms?

→ **Yes**
GO to [D5](#).

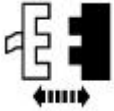
→ **No**
REPAIR circuit 31-CF6A (BK/YE) or circuit 31-CF6B (BK/YE). CLEAR the DTCs. REPEAT the self-test.

D5 CHECK THE PUMP MOTOR FOR OPERATION

1

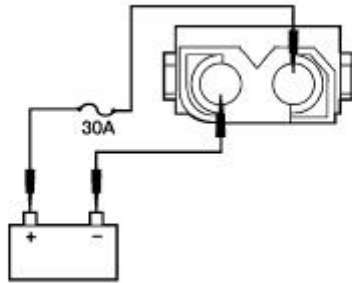


2



Pump Motor Connector

3



GH1811-A

3

Using a heavy gauge wire, make a connection between the negative battery post and the pump motor connector brown wire (HCU side); momentarily connect a fused (30A) jumper wire between the positive battery post and the pump motor connector red wire (HCU side).

● Does the pump motor run?


→ Yes

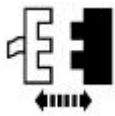
INSTALL a new anti-lock brake control module; REFER to [Module—Anti-Lock Brake Control](#). CLEAR the DTCs. REPEAT the self-test.

→ No

INSTALL a new HCU; REFER to [Hydraulic Control Unit—\(HCU\)](#). CLEAR the DTCs. REPEAT the self-test.

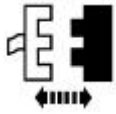
PINPOINT TEST E: DTC C 1145 (RF), DTC C1155 (LF), DTC C1165 (RR), DTC C1175 (LR), ANTI-LOCK BRAKE SENSOR CIRCUIT FAILURE

CONDITIONS	DETAILS/RESULTS/ACTIONS
<p>NOTE: Any time an anti-lock brake sensor is removed, thoroughly clean the mounting surfaces, apply High Temperature 4x4 Front Axle and Wheel Bearing Grease E8TZ-19590-A or equivalent meeting Ford specification ESA-M1C198-A.</p>	
<p>E1 CHECK FOR SHORT TO POWER</p>	
<p>NOTE: Both circuits must be checked for each DTC.</p>	
<p>1</p>  <p>2</p>	



Anti-Lock Brake Control Module C135

3

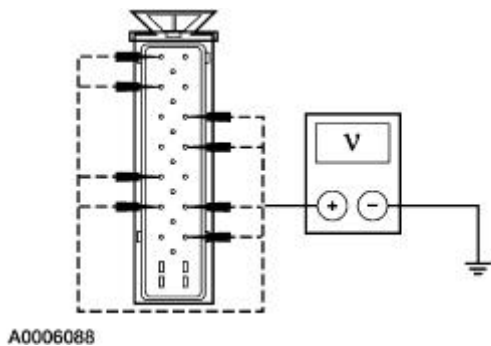


Suspect Anti-Lock Brake Sensor

4



5



- 5 Measure the voltage between anti-lock brake control module C135 pin, harness side and ground as follows:

DTC	Anti-Lock Brake Control Module C135	Circuit
C1145 (RF)	Pin 3	8-CF38 (WH/RD)
C1145 (RF)	Pin 4	7-CF38 (YE/RD)
C1155 (LF)	Pin 17	8-CF32 (WH)
C1155 (LF)	Pin 18	7-CF32 (YE)
C1165 (RR)	Pin 7	8-CF40 (WH/GN)
C1165 (RR)	Pin 6	7-CF40 (YE/GN)
C1175 (LR)	Pin 21	8-CF34 (WH/BU)
C1175 (LR)	Pin 22	7-CF34 (YE/BU)

- Is any voltage present?

→ Yes

If DTC C1145, REPAIR circuit 8-CF38 (WH/RD), or circuit 7-CF38 (YE/RD). CLEAR the DTCs. REPEAT the self-test.

If DTC C1155, REPAIR circuit 8-CF32 (WH), or circuit 7-CF32 (YE). CLEAR the DTCs. REPEAT the self-test.

If DTC C1165, REPAIR circuit 8-CF40 (WH/GN), or circuit 7-CF40 (YE/GN). CLEAR the DTCs. REPEAT the self-test.

If DTC C1175, REPAIR circuit 8-CF34 (WH/BU), or circuit 7-CF34 (YE/BU). CLEAR the DTCs. REPEAT the self-test.

→ **No**
GO to [E2](#).

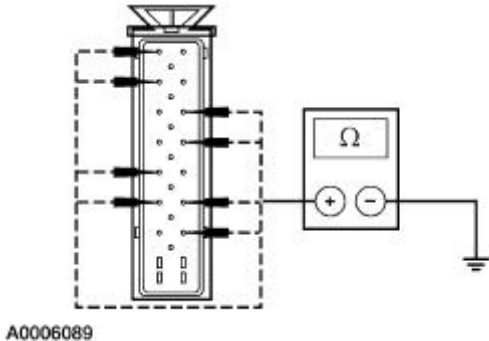
E2 CHECK FOR SHORT TO GROUND

NOTE: Both circuits must be checked for each DTC.

1



2



2 Measure the resistance between anti-lock brake control module C135 pin, harness side and ground as follows:

DTC	Anti-Lock Brake Control Module C135	Circuit
C1145 (RF)	Pin 3	8-CF38 (WH/RD)
C1145 (RF)	Pin 4	7-CF38 (YE/RD)
C1155 (LF)	Pin 17	8-CF32 (WH)
C1155 (LF)	Pin 18	7-CF32 (YE)
C1165 (RR)	Pin 7	8-CF40 (WH/GN)
C1165 (RR)	Pin 6	7-CF40 (YE/GN)
C1175 (LR)	Pin 21	8-CF34 (WH/BU)
C1175 (LR)	Pin 22	7-CF34 (YE/BU)

● **Is the resistance greater than 10,000 ohms?**

→ **Yes**
GO to [E3](#).

→ **No**
If DTC C1145, REPAIR circuit 8-CF38 (WH/RD), or circuit 7-CF38 (YE/RD). CLEAR the DTCs. REPEAT the self-test.

If DTC C1155, REPAIR circuit 8-CF32 (WH), or circuit 7-CF32 (YE). CLEAR the DTCs. REPEAT the self-test.

If DTC C1165, REPAIR circuit 8-CF40 (WH/GN), or circuit 7-CF40 (YE/GN).

CLEAR the DTCs. REPEAT the self-test.

If DTC C1175, REPAIR circuit 8-CF34 (WH/BU), or circuit 7-CF34 (YE/BU).
CLEAR the DTCs. REPEAT the self-test.

E3 CHECK FOR AN OPEN

NOTE: Both circuits must be checked for each DTC.

- 1 Measure the resistance between anti-lock brake control module C135 pins, harness side and suspect anti-lock brake sensor connector, harness side as follows:

DTC	Anti-Lock Brake Control Module C135 Pin	Anti-Lock Brake Sensor	Circuit
C1145 (RF)	3	C160 pin 2	8-CF38 (WH/RD)
C1145 (RF)	4	C160 pin 1	7-CF38 (YE/RD)
C1155 (LF)	17	C150 pin 2	8-CF32 (WH)
C1155 (LF)	18	C150 pin 1	7-CF32 (YE)
C1165 (RR)	7	C426 pin 1	8-CF40 (WH/GN)
C1165 (RR)	6	C426 pin 2	7-CF40 (WH/GN)
C1175 (LR)	21	C440 pin 2	8-CF34 (WH/BU)
C1175 (LR)	22	C440 pin 1	7-CF34 (YE/BU)

- Is the resistance less than 5 ohms?

→ **Yes**
GO to [E4](#).

→ **No**
If DTC C1145, REPAIR circuit 8-CF38 (WH/RD), or circuit 7-CF38 (YE/RD).
CLEAR the DTCs. REPEAT the self-test.

If DTC C1155, REPAIR circuit 8-CF32 (WH), or circuit 7-CF32 (YE). CLEAR the DTCs. REPEAT the self-test.

If DTC C1165, REPAIR circuit 8-CF40 (WH/GN), or circuit 7-CF40 (YE/GN).
CLEAR the DTCs. REPEAT the self-test.

If DTC C1175, REPAIR circuit 8-CF34 (WH/BU), or circuit 7-CF34 (YE/BU). CLEAR the DTCs. REPEAT the self-test.

E4 CHECK THE ANTI-LOCK BRAKE CONTROL MODULE OUTPUT

1

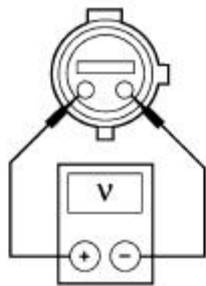


Anti-Lock Brake Control Module C135

2



3



A0006087

3

Measure the voltage between suspect anti-lock brake sensor connector pins, harness side.

● Is the voltage greater than 9 volts?

→ Yes

INSTALL a new anti-lock brake sensor; REFER to [Sensor—Front](#), or [Sensor—Rear](#). CLEAR the DTCs. TEST the system for normal operation.

→ No


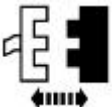

INSTALL a new anti-lock brake control module; REFER to [Module—Anti-Lock Brake Control](#). CLEAR the DTCs. TEST the system for normal operation.

PINPOINT TEST F: DTC C1233 (LF), DTC C1234 (RF), DTC C1235 (RR), DTC C1236 (LR) — ANTI-LOCK BRAKE SENSOR INPUT SIGNAL MISSING




CONDITIONS	DETAILS/RESULTS/ACTIONS
<p>NOTE: Any time an anti-lock brake sensor is removed, thoroughly clean the mounting surfaces, apply High Temperature 4x4 Front Axle and Wheel Bearing Grease E8TZ-19590-A or equivalent meeting Ford specification ESA-M1C198-A.</p>	
<p>F1 CHECK THE ANTI-LOCK BRAKE SENSOR</p>	
	<p>1 Check the suspect anti-lock brake sensor mounting. Check the suspect anti-lock brake sensor for excessive dirt buildup, metal obstructions, incorrect harness routing, and chafing.</p>

	<ul style="list-style-type: none"> ● Is the suspect anti-lock brake sensor OK? <p>→ Yes GO to F2.</p> <p>→ No REPAIR as necessary. CLEAR the DTCs. TEST the system for normal operation.</p>
F2 CHECK THE ANTI-LOCK BRAKE SENSOR INDICATOR	
	<p>1 Check the suspect anti-lock brake sensor indicator for corrosion, nicks, damaged teeth, incorrect mounting, alignment, and consistent air gap.</p> <ul style="list-style-type: none"> ● Is the suspect anti-lock brake sensor indicator OK? <p>→ Yes INSTALL a new anti-lock brake sensor; REFER to Sensor—Front, or Sensor—Rear. CLEAR the DTCs. TEST the system for normal operation.</p> <p>→ No REPAIR as necessary. CLEAR the DTCs. TEST the system for normal operation.</p>


PINPOINT TEST G: THE YELLOW ANTI-LOCK BRAKE WARNING INDICATOR DOES NOT SELF-CHECK

CONDITIONS	DETAILS/RESULTS/ACTIONS
G1 CHECK THE YELLOW ANTI-LOCK BRAKE WARNING INDICATOR	
<p>1 </p> <p>2  Anti-Lock Brake Control Module C135</p> <p>3 </p>	<ul style="list-style-type: none"> ● Is the yellow anti-lock brake warning indicator illuminated? <p>→ Yes GO to G2.</p> <p>→ No REFER to Section 413-01.</p>

G2 CHECK PROVE OUT

<p>1 </p> <p>2  Anti-Lock Brake Control Module C135</p> <p>3 </p>	<ul style="list-style-type: none"> ● Does the yellow anti-lock brake warning indicator prove out for three seconds and then turn off? <p>→ Yes The yellow anti-lock brake warning indicator operation is OK.</p> <p>→ No INSTALL a new anti-lock brake control module; REFER to Module—Anti-Lock Brake Control. TEST the system for normal operation.</p>
--	--

PINPOINT TEST H: THE TRACTION CONTROL IS INOPERATIVE

CONDITIONS	DETAILS/RESULTS/ACTIONS
H1 CHECK FOR DTCs	
<p>1 </p> <p>NGS</p>	<p>2 Retrieve and document continuous DTCs.</p> <ul style="list-style-type: none"> ● Are any DTCs retrieved? <p>→ Yes GO to Anti-Lock Brake Control Module Diagnostic Trouble Code (DTC) Index.</p> <p>→ No GO to H2.</p>
H2 CHECK THE ABS OPERATION	
	<p>1 Test drive the vehicle and carry out several anti-lock stops.</p>

● Does the ABS operate normally?

→ **Yes**
GO to [H3](#).

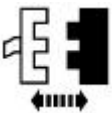
→ **No**
GO to Symptom Chart.

H3 CHECK THE TRACTION CONTROL OFF INPUT TO THE ANTI-LOCK BRAKE CONTROL MODULE FOR SHORT TO POWER

1



2

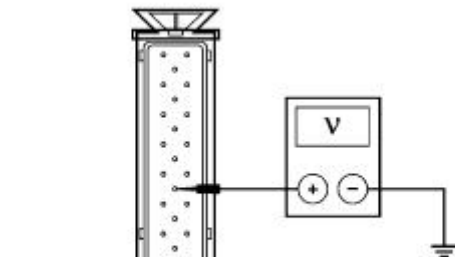


Anti-Lock Brake Control Module C135

3



4



A0001932

4 Measure the voltage between anti-lock brake control module C135 pin 14, circuit 8-CF54 (WH/VT), harness side and ground.

● Is any voltage present?

→ **Yes**
GO to [H4](#).

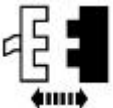
→ **No**
INSTALL a new anti-lock brake control module; REFER to [Module—Anti-Lock Brake Control](#). TEST the system for normal operation.

H4 CHECK CIRCUIT 8-CF54 (WH/VT) FOR A SHORT TO POWER


1

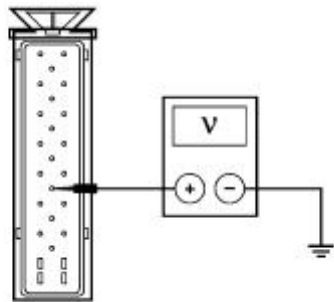


2



Traction Control Switch C308

3 

4 

A0001932




4 Measure the voltage between anti-lock brake control module C135 pin 14, circuit 8-CF54 (WH/VT), harness side and ground.

- Is any voltage present?

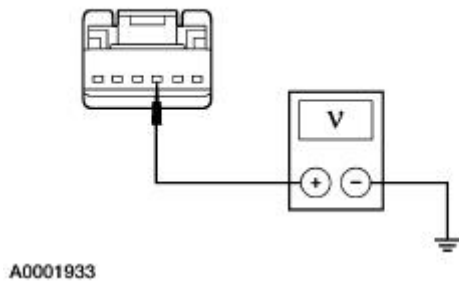
→ **Yes**
REPAIR the circuit. TEST the system for normal operation.

→ **No**
INSTALL a new traction control switch;
REFER to [Switch—Traction Control](#) .
TEST the system for normal operation.

PINPOINT TEST I: THE TRACTION CONTROL CANNOT BE DISABLED

CONDITIONS	DETAILS/RESULTS/ACTIONS
I1 CHECK CIRCUIT 15-CF54 (GN/WH) FOR AN OPEN	
<p>1 </p> <p>2 </p> <p>Traction Control Switch C308</p> <p>3 </p>	

4



4

Measure the voltage between traction control switch C308, circuit 15-CF54 (GN/WH), harness side and ground.

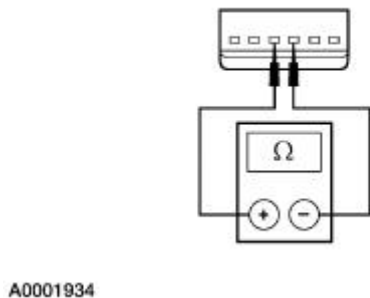
● Is any voltage present?

→ **Yes**
GO to [12](#).

→ **No**
REPAIR the circuit 15-CF54 (GN/WH) or circuit 15-DA5 (GN/OG). TEST the system for normal operation.

I2 CHECK THE TRACTION CONTROL SWITCH

1



1

Measure the resistance between traction control switch, pin 4 and pin 3 (component side) while depressing the traction control switch.

● Is the resistance less than 5 ohms?

→ **Yes**
GO to [13](#).

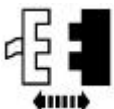
→ **No**
INSTALL a new traction control switch;
REFER to [Switch—Traction Control](#).
TEST the system for normal operation.

I3 CHECK CIRCUIT 8-CF54 (WH/VT) FOR AN OPEN

1

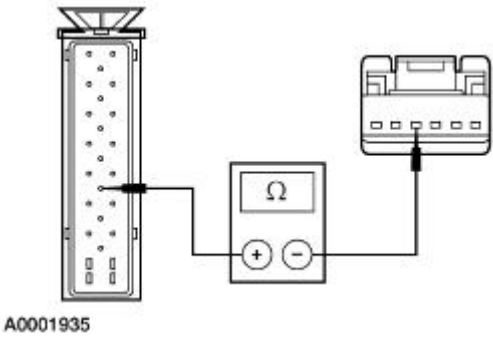


2



Anti-Lock Brake Control Module C135

3



A0001935



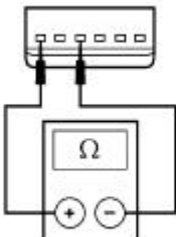
3 Measure the resistance between anti-lock brake control module C135 pin 14, circuit 8-CF54 (WH/VT), harness side and traction control switch C308 pin 4, circuit 8-CF54 (WH/VT), harness side.

- Is the resistance less than 5 ohms?

→ **Yes**
INSTALL a new anti-lock brake control module; REFER to [Module—Anti-Lock Brake Control](#). TEST the system for normal operation.

→ **No**
REPAIR the circuit. TEST the system for normal operation.

PINPOINT TEST J: THE TRACTION CONTROL SWITCH INDICATOR IS NEVER/ALWAYS ON

CONDITIONS	DETAILS/RESULTS/ACTIONS
J1 CHECK THE TRACTION CONTROL SWITCH	
<p>1</p>  <p>2</p>  <p>Traction Control Switch C308</p> <p>3</p>  <p>A0002337</p>	<p>3 Measure the resistance between traction control switch pin 1 and pin 3 (component side).</p> <ul style="list-style-type: none"> • Is the resistance approximately 32

ohms?

→ **Yes**

GO to [J2](#).

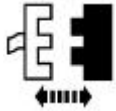
→ **No**

INSTALL a new traction control switch;
REFER to [Switch—Traction Control](#).

TEST the system for normal operation.

J2 CHECK CIRCUIT 31S-CF45 (BK/GN) FOR SHORT TO POWER

1

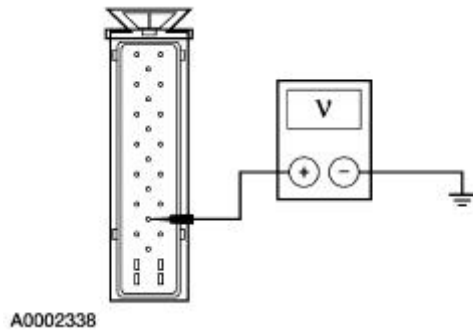


Anti-Lock Brake Control Module 135

2



3



3

Measure the voltage between anti-lock brake control module C135 pin 15, circuit 31S-CF45 (BK/GN), harness side and ground.

● **Is any voltage present?**

→ **Yes**

REPAIR the circuit. TEST the system for normal operation.

→ **No**

GO to [J3](#).

J3 CHECK CIRCUIT 31S-CF45 (BK/GN)

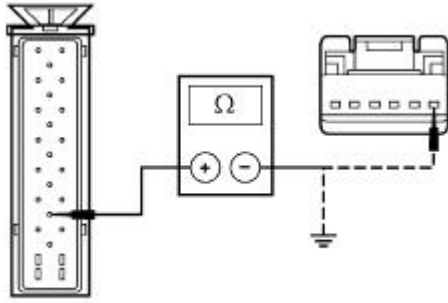
1



2

2

Measure the resistance between anti-lock brake control module C135 pin 15, circuit 31S-CF45 (BK/GN), harness side and traction control switch C308 pin 1, circuit 31S-CF45 (BK/GN), harness side; and between anti-lock brake control module C135 pin 15, circuit 31S-CF45 (BK/GN), harness side and ground.



A0002339

- Is the resistance less than 5 ohms between the anti-lock brake control module and traction control switch; and greater than 10,000 ohms between anti-lock brake control module and ground?

→ **Yes**

INSTALL a new anti-lock brake control module; REFER to [Module—Anti-Lock Brake Control](#). TEST the system for normal operation.

→ **No**

REPAIR the circuit. TEST the system for normal operation.

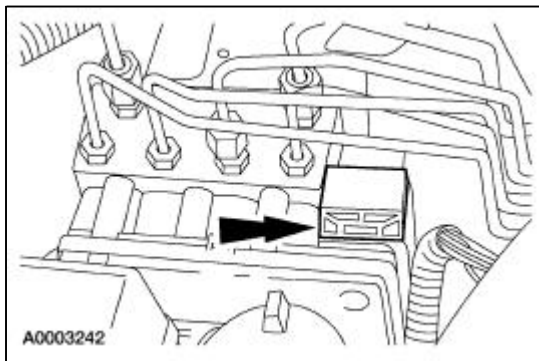
Hydraulic Control Unit —(HCU)

Removal

⚠ WARNING: Brake fluid contains polyglycol ethers and polyglycols. Avoid contact with eyes. Wash hands thoroughly after handling. If brake fluid contacts eyes, flush eyes with running water for 15 minutes. Get medical attention if irritation persists. If taken internally, drink water and induce vomiting. Get medical attention immediately.

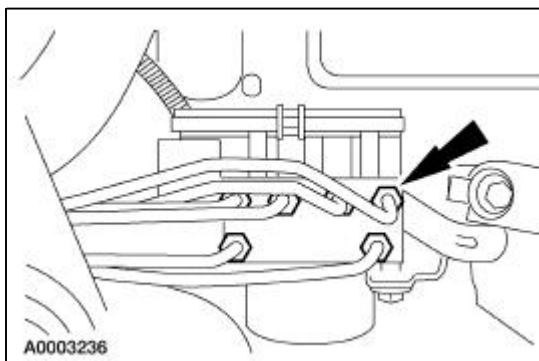
⚠ CAUTION: Brake fluid is harmful to painted and plastic surfaces. If brake fluid is spilled onto a painted or plastic surface, immediately wash it with water.

1. Disconnect the battery ground cable. For additional information, refer to [Section 414-01](#).
2. Disconnect the electrical connector by lifting up on the release tab.

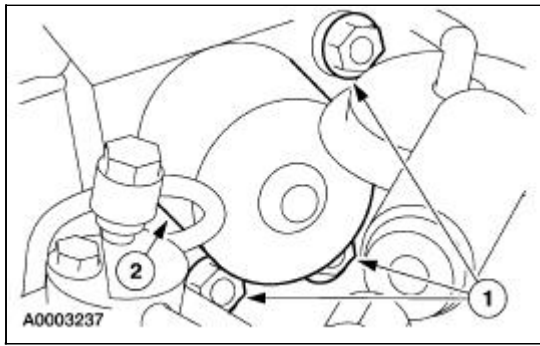


3. **NOTE:** Plug each open port to prevent any brake fluid from spilling.


Disconnect the brake lines from the hydraulic control unit (HCU).





4. Remove the HCU.
 1. Remove the bolts.
 2. Remove the HCU.



Installation

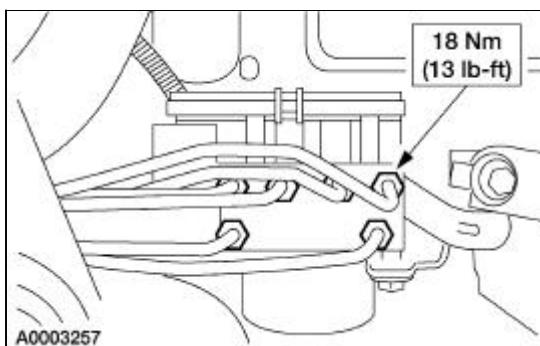
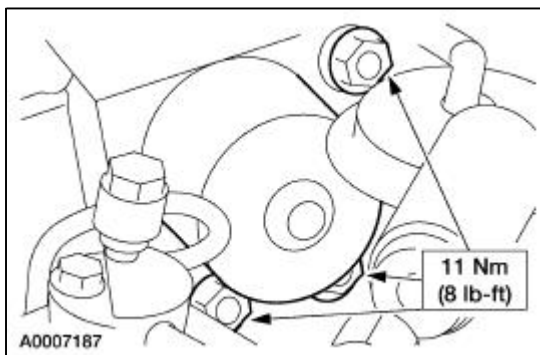
-  **WARNING:** Brake fluid contains polyglycol ethers and polyglycols. Avoid contact with eyes. Wash hands thoroughly after handling. If brake fluid contacts eyes, flush eyes with running water for 15 minutes. Get medical attention if irritation persists. If taken internally, drink water and induce vomiting. Get medical attention immediately.

 **CAUTION:** Brake fluid is harmful to painted and plastic surfaces. If brake fluid is spilled onto a painted or plastic surface, immediately wash it with water.

 **CAUTION:** After the HCU is installed, it is necessary to bleed the hydraulic brake system. For additional information, refer to [Section 206-00](#).

NOTE: When the battery is disconnected and reconnected, some abnormal drive symptoms may occur while the vehicle relearns its adaptive strategy. The vehicle may need to be driven 16 km (10 mi) or more to relearn the strategy.

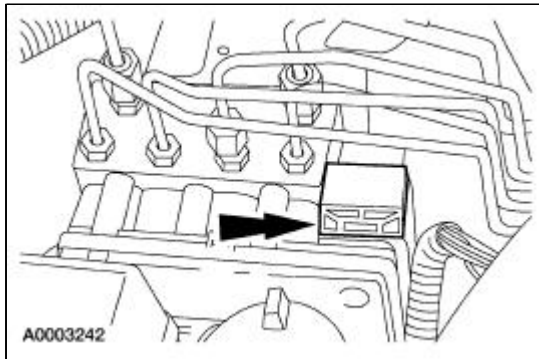
To install, reverse the removal procedure.



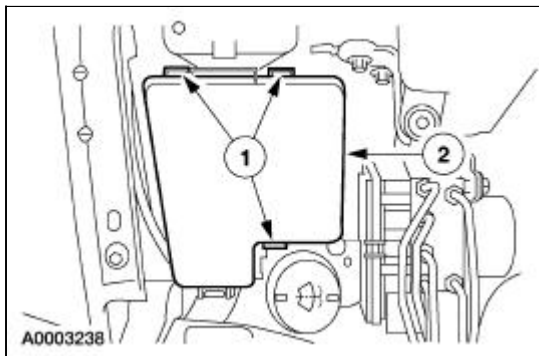
Module —Anti-Lock Brake Control

Removal

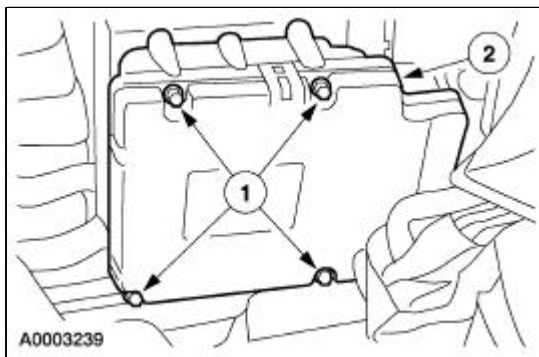
1. Disconnect the battery ground cable. For additional information, refer to [Section 414-01](#).
2. Disconnect the anti-lock brake control module electrical connector.




3. Position the underhood auxiliary junction box (AJB) aside.
 1. Release the underhood AJB clips.
 2. Position the underhood AJB aside.



4. Remove the anti-lock brake control module.
 1. Remove the bolts.
 2. Remove the control module.

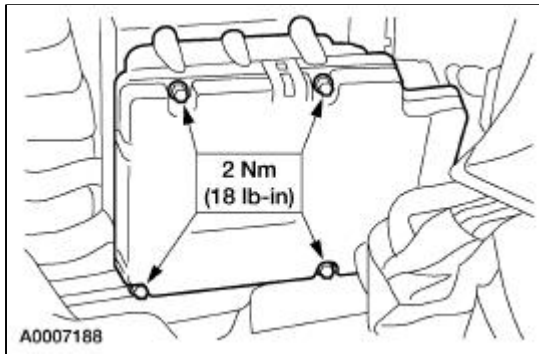


Installation

1.  **CAUTION:** Once the new module is installed, it is necessary to download the module configuration information from the New Generation STAR (NGS) Tester into the module. For additional information, refer to [Section 418-01](#).

NOTE: When the battery is disconnected and reconnected, some abnormal drive symptoms may occur while the vehicle relearns its adaptive strategy. The vehicle may need to be driven 16 km (10 mi) or more to relearn the strategy.

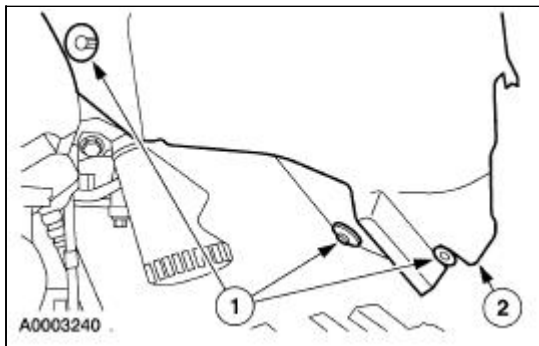
To install, reverse the removal procedure.



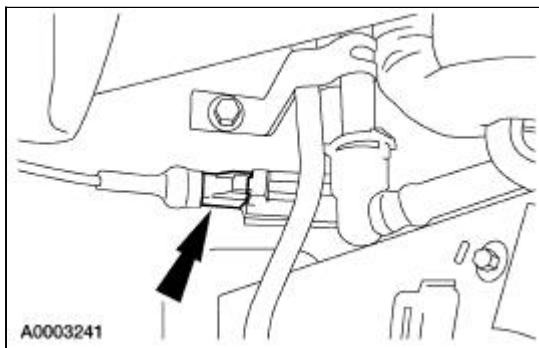
Sensor —Front

Removal

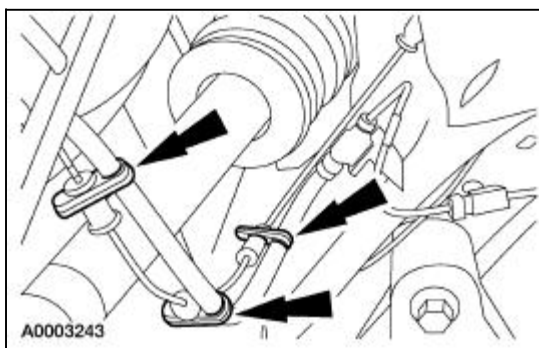
1. Raise and support the vehicle. For additional information, refer to [Section 100-02](#).
2. Position the inner splash shield aside.
 1. Remove the pin-type retainers.
 2. Position the inner splash shield aside.



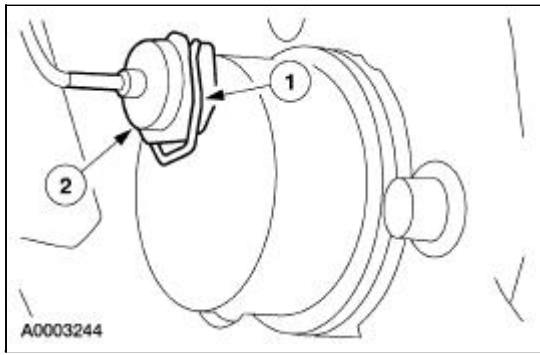
3. Disconnect the anti-lock brake sensor electrical connector.



4. Remove the anti-lock brake sensor harness from the brake hose clips.



5. Remove the rear anti-lock brake sensor.
 1. Remove the anti-lock brake sensor clip.
 2. Remove the anti-lock brake sensor.



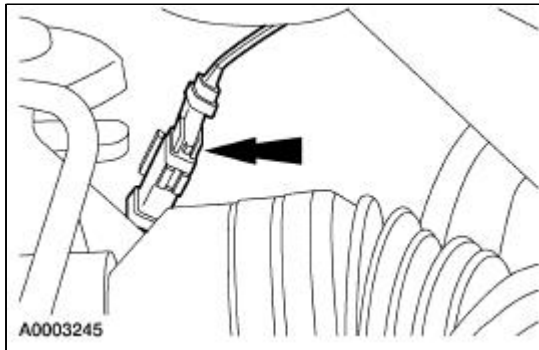
Installation

1. To install, reverse the removal procedure.
-

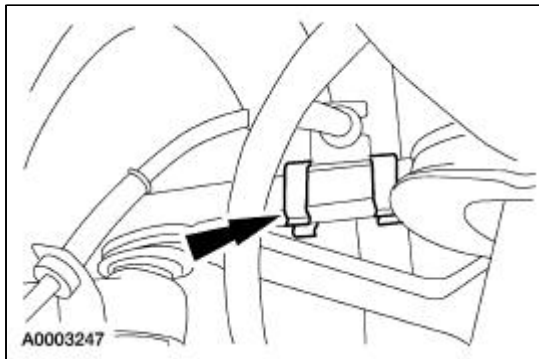
Sensor —Rear

Removal

1. Raise and support the vehicle. For additional information, refer to [Section 100-02](#).
2. Disconnect the rear anti-lock brake sensor electrical connector.



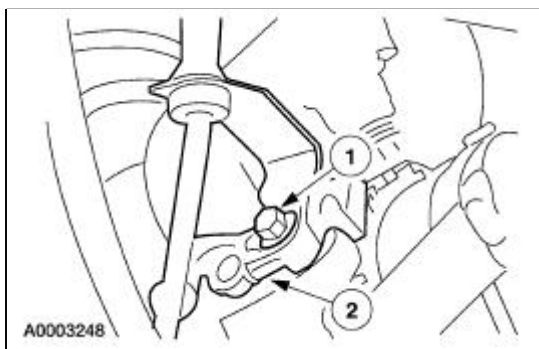
3. Remove the rear anti-lock brake sensor harness from the control arm clips.



4. **NOTE:** Clean off dirt and foreign material that may have collected around the rear anti-lock brake sensor before removal.

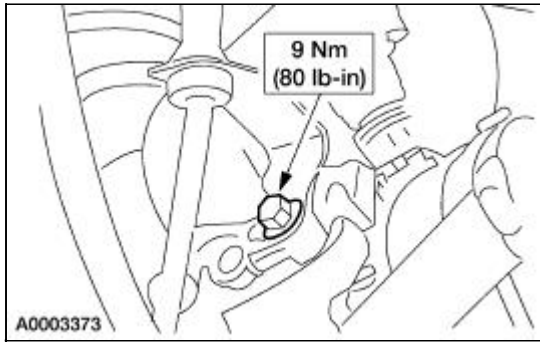
Remove the rear anti-lock brake sensor.

1. Remove the anti-lock brake sensor bolt.
2. Remove the anti-lock brake sensor.



Installation

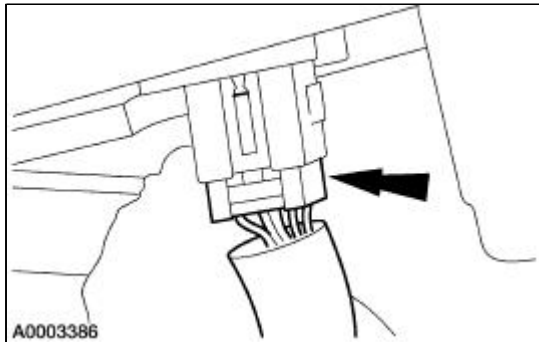
1. To install, reverse the removal procedure.



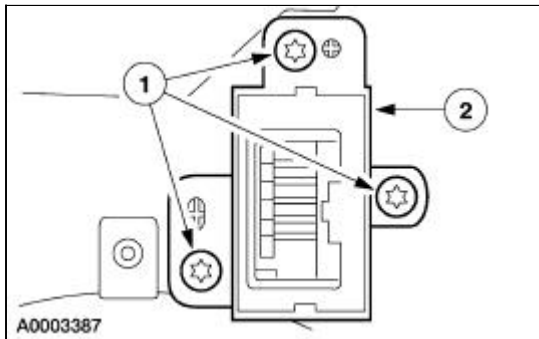
Switch —Traction Control

Removal

1. Remove the console panel assembly. For additional information, refer to [Section 501-12](#).
2. Remove the traction control switch electrical connector.



3. Remove the traction control switch.
 1. Remove the traction control switch screws.
 2. Remove the traction control switch.



Installation

1. To install, reverse the removal procedure.

SPECIFICATIONS

Torque Specifications

Description	Nm	lb-ft	lb-in
Stability assist module bolts	2	—	18
Brake line to (HCU) nuts	18	13	—
Electronic hydraulic control unit bolts	11	8	—
Rear anti-lock brake sensor bolt	9	—	80
Accelerometer bolts	9	—	80
Yaw rate sensor bolts	9	—	80

DESCRIPTION AND OPERATION

Anti-Lock Control — Traction Control and Stability Assist

The four wheel anti-lock brake system (4WABS) with traction control and stability assist system consists of the following components:

- active brake booster with integral solenoid
- brake booster release switch
- front anti-lock brake sensors
- front anti-lock brake sensor indicators
- hydraulic control unit (HCU)
- stability assist event indicator
- stability assist module
- lateral accelerometer
- rear anti-lock brake sensors
- rear anti-lock brake sensor indicators
- steering wheel position sensor
- two brake pressure transducers
- Advance Trac control switch
- yaw rate sensor
- yellow anti-lock brake warning indicator

For removal and installation of the brake booster release switch, refer to [Section 206-07](#).

For removal and installation of the front anti-lock brake sensor indicators, refer to [Section 204-01](#).



For removal and installation of the rear anti-lock brake sensor indicator, refer to [Section 205-05](#).

For removal and installation of the steering wheel position sensor, refer to [Section 211-04](#).

Anti-Lock Control — Traction Control and Stability Assist

Refer to Wiring Diagrams Section [206-09C](#) for schematic and connector information.

Special Tool(s)

 ST1217-A	New Generation STAR (NGS) Tester 418-F048 (007-00500) or equivalent
 ST1137-A	73III Automotive Meter 105-R0057 or equivalent

Principles of Operation

The stability assist module executes control of the anti-lock brakes, full speed traction control and stability assist functions to enhance the drivers control of the vehicle. The stability assist manages the interactions between the anti-lock, traction control, and engine control systems to optimize the vehicle traction during deceleration and acceleration. In addition, stability assist function modulates brake pressure during braking and nonbraking conditions as required to counteract excessive vehicle rotation while cornering.

The stability assist module is operational with the ignition switch in the RUN or START positions.

The stability assist module continuously monitors and compares the rotational speed of each wheel. The wheel speeds are measured by the anti-lock brake sensors which electrically sense each tooth of the anti-lock sensor indicator as they pass through the sensors magnetic field. When stability assist detects an impending wheel lock, wheel spin or vehicle motion that is inconsistent with the drivers commands, it modulates brake pressure to the appropriate brake caliper(s). This is accomplished by triggering the hydraulic control unit (HCU) to open and close the appropriate solenoid valves. Once the affected wheel returns to the desired speed, the stability assist module returns the solenoid valves to their normal position, and normal base brake operation resumes.

The stability assist module is self-monitoring. When the ignition switch is turned to the RUN position, the stability assist module will do a preliminary electrical check, and at approximately 20 km/h (12 mph) the pump motor is turned on for approximately one half-second. Any malfunction of the anti-lock brake control system will cause the ABS/TC/Stability Assist to shut off and anti-lock brake warning indicator to illuminate, however the power assist braking system will function normally.

The stability assist module communicates with the powertrain control module (PCM) to assist with traction control. At speeds under 40 km/h (25 mph) the stability assist module requests the PCM to reduce engine torque, while simultaneously applying and releasing the appropriate brake to restore traction when one or both drive wheels lose traction and begin to spin. The PCM accomplishes this by minor incremental timing changes and fewer fuel injector pulses until the stability assist module ends the request (when the driven wheel speed returns to normal). After the vehicle speed exceeds 40 km/h

(25 mph), the traction control is accomplished only through the PCM torque control.

An all new stability assist system helps maintain vehicle stability at the limits of tire adhesion. System effectiveness varies with vehicle speed, road conditions, and steering inputs.

The stability assist system constantly monitors vehicle motion relative to the driver's intended course. This is done by using added sensors to compare the steering inputs from the driver with the actual motion of the vehicle.

The driver's steering input is measured from a steering wheel rotation sensor. The motion of the vehicle is determined from a yaw rate sensor (measures rotation about the vehicle's vertical axis, caused by steering left/right), a lateral accelerometer (measures the acceleration generated from the vehicle sliding sideways), and the wheel speeds used for anti-lock brake system (ABS) and traction control function. When there is a discrepancy between the driver's inputs and the vehicle motion, the stability assist changes the force at each tire to help control the vehicle. If the vehicle is beginning to rotate excessively left or right, spin out, or slide sideways, the system will attempt to correct the excessive motion. If the vehicle is not responding to steering inputs, the system will attempt to increase the turning response of the vehicle.

The stability assist system defaults to ON when the engine is started. The system does not activate when the vehicle is traveling in reverse. In reverse, ABS and traction control will continue to function as usual. The system uses ABS and traction control (including control of the engine) as well as its more advanced controls to enhance vehicle stability. The stability assist/traction control switch (ATS) allows the driver to control use of the stability assist system. This is independent of the ABS function, which cannot be switched off by the driver. The stability assist system status is indicated by a stability assist warning light in the stability assist/traction control switch. The illuminated stability assist/traction control switch indicates stability assist system is switched off. In vehicles with a message center, the message "ADVANCETRAC OFF" is displayed.

During a stability assist event you may experience any of the following behaviors, which are normal:

- a rumble or grinding sound much like ABS or traction control
- a small deceleration or a reduction in the acceleration of the vehicle
- the stability assist indicator will flash
- if your foot is on the brake pedal, you will feel a vibration in the pedal much like ABS. As with any vehicle equipped with four-wheel anti-lock brakes, do not pump the brakes, but instead, press firmly on the pedal.
- if the event is severe and your foot is not on the brake, the brake pedal will move to apply higher brake forces. A whoosh sound may also be heard from under the instrument panel in an event this severe. All of these behaviors are normal during a stability assist event.

The stability assist system continually monitors and checks all of the sensors and actuators used to improve the stability of the vehicle. Some drivers may notice a slight movement of the brake pedal when the system checks itself. If the brake system has not been bled correctly, the brake pedal movement may become more significant. The brake pedal moves when an active test of the brake booster is run. During this test a small amount of pressure will be generated at the master cylinder, but no pressure will be generated in the calipers. This test will occur above 48 km/h (30 mph) after the vehicle has been running approximately 8 minutes. The test will only be run if the vehicle is stable, the driver is not braking and the accelerator pedal is depressed at least a small amount. If a failure is detected somewhere in the stability assist system which affects either the yaw control or traction control functions, the stability assist indicator will be illuminated. The anti-lock brake function will continue to work as designed unless the yellow anti-lock brake warning indicator is also illuminated. The normal brake function will always occur, unless the red brake warning indicator is illuminated.

Yaw Rate Sensor

The yaw rate sensor measures the rotation rate of the vehicle as it turns left and right.

Lateral Accelerometer

The lateral accelerometer measures the acceleration which corresponds to the force required to slide the vehicle sideways. This acceleration comes in two forms. The first is the centrifugal acceleration which is generated when an object travels around in a circle. The second is the acceleration due to gravity. The accelerometer only measures the acceleration along the lateral (or sideways) direction of the vehicle, so on level ground there is no contribution from this acceleration. However, if the vehicle is parked sideways on a bank or incline, the sensor will measure some lateral acceleration due to gravity even though the vehicle is stationary.

Steering Wheel Rotation Sensor

The steering wheel rotation sensor scans the steering wheel rotation sensor ring in the steering column which has holes punched in it at regular intervals. The steering wheel rotation sensor uses two signal lines to tell the stability assist module whether the steering wheel is being turned left or right and how far it is being turned. The steering wheel rotation sensor does not tell the stability assist module the position of the steering wheel relative to straight ahead. The stability assist system learns this by comparing the steering wheel position with other signals and remembering the position it has learned. The stability assist system confirms this position and modifies it as necessary during every new driving cycle of the vehicle.

Brake Booster

The brake booster is a normal brake booster which has the added function that it can be actuated electrically by the stability assist module. This is sometimes necessary in severe stability assist events, to make sure that the hydraulic control unit can generate enough brake pressure to improve vehicle stability. The help from the brake booster is especially needed in cold weather when the hydraulic control unit cannot draw the brake fluid from the reservoir when it becomes very thick and viscous at cold temperatures. Within the booster is a solenoid for electrical actuation and a release switch to indicate when the driver is stepping on the brake. The solenoid provides electrical actuation of the brake booster. Without the force of the input rod, the air valve is directly opened due to the movement of the energized solenoid. With increasing current applied to the solenoid, the air valve opens and output force is created. With decreasing current applied to the solenoid, the air valve is closed and the vacuum valve opens reducing output force.

The release switch indicates when the brake pedal has been depressed. It is integrated into the booster key that normally sits against the rear shell of the boot in its rest position and it adjoins the valve body when in its balance position. The switch itself provides indication from two positions. In its rest position, it supplies two signals, normally open (NO) and normally closed (NC). Upon application of sufficient force to initiate movement of the key away from the valve body, the brake booster switch changes state, signifying a driver application. When the stability assist module is activating the brake booster, the brake pedal is pulled forward as the valve body moves. The release switch is held in position by the input rod spring and remains against the valve body. Although the brake pedal position (BPP) switch changes state when the brake pedal drops, the release switch remains inactive until such time as it encounters an external force from the driver, whether in a stability assist event controlled by the stability assist module, or in a standard mechanical braking event.

The master cylinder attached to the booster functions the same as on vehicles not equipped with the stability assist system. It differs in that there are two pressure transducers that are installed in spare outlet ports. The values measured by each pressure transducer should be similar. The pressure transducer is a diaphragm type unit. When a pressure is seen the diaphragm is stretched, causing a voltage to be output. As the pressure increases or decreases, the voltage also increases or decreases with it. The configuration of the pressure transducers, which transducer is connected to the primary port and which is connected to the secondary port, is not known by the stability assist module. The harness connectors can be connected to either transducer, therefore, diagnosis of pressure faults requires some care to identify exactly which transducer is failed.

Modules which are normally connected to the BPP switch are connected to a signal from the stability

assist module. This signal is called driver brake application. This signal only changes state when the driver has applied the brake. If the ignition switch is in the RUN position, the brake booster is not electrically actuated, and no failure has been detected, the driver brake application signal will indicate a brake applied when either the BPP switch or the release switch built into the brake booster indicate that the driver has applied the brake pedal. If the ignition switch is in the OFF position, the driver brake application signal will indicate a brake apply only when the BPP switch indicates that the driver is applying the brake pedal. When the ignition switch is in the OFF position, failures cannot be detected. If there are failures, several layers of redundancy will try to keep the driver brake application signal accurate. If the stability assist system detects faults on the driver brake application signal line it will also attempt to maintain correct stoplamp operation by communicating on the standard corporate protocol (SCP) network. Control of the stoplamp operation is also required because the BPP switch can change states during a stability assist event when the driver is not applying the brake pedal. The switch can also change states during the system check of the brake booster. Only the stability assist system can interpret these state changes and determine which ones are actually due to the driver applying the brake. Similarly, the stability assist system can take advantage of its other sensors to detect failures in the BPP switch.

DTC C1963

This Diagnostic Trouble Code (DTC) is stored if the stability assist warning indicator has been turned ON because the system could not confirm the straight ahead position for more than 30 seconds above 18 km/h (11 mph). This condition will most likely occur if there is some other DTC. If there is another DTC logged with this DTC, the repair procedure is to follow the procedure for the other DTC. This DTC can be stored if:

- PRNDL or Reverse switch has failed (check operation of PRNDL display and back-up lights)
- Chassis modifications have been made that were not authorized by Ford.

In very rare circumstances this DTC may be stored by itself without the occurrence of any actual component failure. Two conditions can cause the DTC C1963 to set with no other DTC:

- The steering wheel has been turned while the ignition is off and then the vehicle is started, and either the vehicle is driven continuously in a circle or the vehicle is driven with continuous swerving, sliding or tire spinning.
- A new stability assist module may have been installed in the vehicle and was not calibrated.

Stability Assist Module Calibration

The stability assist module needs to be recalibrated whenever a component specific to the stability assist system is disconnected, moved, or a new component is installed; for additional information regarding the DTCs that require the recalibration procedure, refer to the stability assist Calibration List. If a DTC is logged for any component of the stability assist system, the DTC must be cleared before carrying out the recalibration procedure. The need to re-calibrate the stability assist module is also indicated by the active/fail lamp flashing. The lamp will flash after the clearing of DTC's that are indicated on the stability assist calibration list. If a DTC is retrieved after recalibration; refer to the Stability Assist Module Diagnostic Trouble Code (DTC) Index. If installing a new stability assist module, the calibration procedures as well as the configuration procedure must be carried out. For additional information regarding the module configuration procedure, refer to [Section 418-01](#).

When carrying out the lateral accelerometer or yaw rate calibration on the NGS Tester, the vehicle must be on a level surface, not moving, with ignition switch in the RUN position. When carrying out the booster learn cycle on the NGS Tester, the ignition switch must be in the RUN position with the engine running and the brake pedal must not be applied. When carrying out the steering wheel rotation sensor calibration on the NGS Tester, the ignition switch must be in the RUN position with the engine running and the steering wheel must be rotated back and forth from lock position to lock position.

Inspection and Verification

NOTE: The stability assist module must be reconfigured upon replacement; refer to [Section 418-01](#).

1. Verify the customer's concern by operating the vehicle to duplicate the condition.
2. Verify the stoplamps operate correctly by depressing and releasing the brake pedal with the ignition switch in the OFF position. If the stoplamps do not operate correctly, refer to [Section 417-01](#). If the stoplamps operate correctly, proceed to the next step.
3. Verify the PRNDL operates correctly on the instrument cluster. If the PRNDL does not operate correctly, refer to [Section 413-01](#). If the PRNDL operates correctly, proceed to the next step.
4. Inspect to determine if one of the following mechanical or electrical concerns apply:

Visual Inspection Chart

Mechanical	Electrical
<ul style="list-style-type: none"> ● Anti-lock brake sensor indicator. ● HCU. ● Incorrectly inflated tires. ● Mismatched wheels or tires on vehicle. ● Base brake concern. ● Brake booster vacuum hose. ● Ford specified steering components, suspension components and tire size. ● Steering wheel rotation ring. 	<ul style="list-style-type: none"> ● Underhood auxiliary junction box (AJB) Fuse: <ul style="list-style-type: none"> ■ 114 (30A) ■ 122 (30A) ● Battery junction box (BJB) Fuse: <ul style="list-style-type: none"> ■ 405 (10A) ● Central junction box (CJB) Fuse: <ul style="list-style-type: none"> ■ 203 (5A) ■ 205 (5A) ■ 235 (5A) ● Stability assist module. ● EVAC and fill connector. ● Anti-lock brake sensor. ● Stability assist/traction control switch. ● BPP switch. ● Steering wheel rotation sensor. ● Brake booster solenoid. ● Brake booster release switch. ● Primary/main pressure transducer. ● Secondary/redundant pressure transducer. ● Yaw rate sensor. ● Lateral accelerometer. ● Wiring harness. ● Connectors or connections. ● Circuitry.

5. If the concern remains after the inspection, connect the NGS Tester to the data link connector (DLC) located beneath the instrument panel, and select the vehicle to be tested from the NGS Tester menu. If the NGS Tester does not communicate with the vehicle:
 - Check that the program card is correctly installed.
 - Check the connection of the data link connector to the vehicle.
 - Check that the ignition switch is in the RUN position.
6. If the NGS Tester still does not communicate with the vehicle, refer to the New Generation STAR Tester manual.

7. Carry out the DATA LINK DIAGNOSTIC TEST. If NGS Tester responds with:
 - CKT914, CKT915 or CKT70 = ALL ECUS NO RESP/NOT EQUIP, refer to [Section 418-00](#).
 - NO RESP/NOT EQUIP for stability assist module, go to Pinpoint Test A.
 - SYSTEM PASSED, retrieve and record the continuous diagnostic trouble codes (DTCs), erase the continuous DTCs and carry out the self-test diagnostics for the stability assist module.
8. If the DTCs retrieved are related to the concern, go to Stability Assist Module Diagnostic Trouble Code (DTC) Index to continue diagnostics.
9. If no DTCs related to the concern are retrieved, proceed to the Symptom Chart to continue diagnostics.

Stability Assist Module Diagnostic Trouble Code (DTC) Index

NOTE: The need to re-calibrate the stability assist module is indicated by the active/fail lamp flashing. There are other service actions that may require re-calibration where there is no flashing lamp. Refer to the section Stability Assist Module Calibration. The lamp will flash after the clearing of DTC's that are indicated on the stability assist calibration list.

NOTE: Stability assist may be referred to as interactive vehicle dynamics (IVD) in the NGS Tester.

Stability Assist Module Diagnostic Trouble Code (DTC) Index

NOTE: DTC C1730 (Reference Voltage Out Of Range) must be repaired before DTC C1279, C1280, C1281, C1282, C1288, C1289.

DTC	Description	Source	Action
B1255	Air Temperature External Sensor Circuit Open	DATC	REFER to Section 412-00 .
B1257	Air Temperature External Sensor Circuit Short to Ground	DATC	REFER to Section 412-00 .
B1342	ECU Is Defective	Stability Assist	CLEAR the DTCs. RETRIEVE the DTCs. If DTC B1342 is retrieved, INSTALL a new stability assist module. REFER to Anti-Lock Brake System (ABS) Module—Stability Assist . REPEAT the self-test.
B1485	Brake Pedal Input Circuit Battery Short	Stability Assist	GO to Pinpoint Test B .
B1676	Battery Pack Voltage Out of Range	Stability Assist	GO to Pinpoint Test C .
B2477	Module Configuration Failure	Stability Assist	REFER to Section 418-01 .
C1095	ABS Hydraulic Pump Motor Circuit Failure	Stability Assist	GO to Pinpoint Test D .
C1145	Speed Wheel Sensor RF Input Circuit Failure	Stability Assist	GO to Pinpoint Test E .
C1155	Speed Wheel Sensor LF Input Circuit Failure	Stability Assist	GO to Pinpoint Test E .

C1165	Speed Wheel Sensor RR Input Circuit Failure	Stability Assist	GO to Pinpoint Test E .
C1175	Speed Wheel Sensor LR Input Circuit Failure	Stability Assist	GO to Pinpoint Test E .
C1233	Speed Wheel LF Input Signal Missing	Stability Assist	GO to Pinpoint Test F .
C1234	Speed Wheel RF Input Signal Missing	Stability Assist	GO to Pinpoint Test F .
C1235	Speed Wheel RR Input Signal Missing	Stability Assist	GO to Pinpoint Test F .
C1236	Speed Wheel LR Input Signal Missing	Stability Assist	GO to Pinpoint Test F .
C1277	Steering Wheel Angle 1 and 2 Circuit Failure	Stability Assist	GO to Pinpoint Test G .
C1278	Steering Wheel Angle 1 and 2 Signal Faulted	Stability Assist	GO to Pinpoint Test G .
C1279	Yaw Rate Sensor Circuit Failure	Stability Assist	GO to Pinpoint Test H .
C1280	Yaw Rate Sensor Signal Fault	Stability Assist	GO to Pinpoint Test H .
C1281	Lateral Accelerometer Circuit Failure	Stability Assist	GO to Pinpoint Test I .
C1282	Lateral Accelerometer Signal Fault	Stability Assist	GO to Pinpoint Test I .
C1285	Booster Solenoid Circuit Failure	Stability Assist	GO to Pinpoint Test J .
C1286	Booster Mechanical Failure	Stability Assist	GO to Pinpoint Test K .
C1287	Booster Pedal Force Switch Circuit Failure	Stability Assist	GO to Pinpoint Test L .
C1288	Pressure Transducer Main/Primary Input Circuit Failure	Stability Assist	GO to Pinpoint Test M .
C1289	Pressure Transducer Redundant/Secondary Input Circuit Failure	Stability Assist	GO to Pinpoint Test N .
C1730	Reference Voltage Out of Range (+5 V)	Stability Assist	GO to Pinpoint Test O .
C1805	Mismatched PCM and/or stability assist module	Stability Assist	Check for correct component and configuration for the PCM and stability assist module, INSTALL a new as necessary. REFER to Anti-Lock Brake System (ABS) Module—Stability Assist or Section 303-14 as necessary. CLEAR the DTC. REPEAT the self-test.
C1960	Driver Brake Apply Circuit Fault	Stability Assist	GO to Pinpoint Test P .
C1963	Stability Control Inhibit Warning	Stability Assist	This DTC is for information only; GO to the Principles of Operation. CLEAR the DTC. REPEAT the self-test.
C1969	TC/YC Switch Lamp Circuit Fault	Stability Assist	GO to Pinpoint Test S .

P0112	IAT Circuit Low Input	PCM	REFER to Powertrain Control/Emissions Diagnosis (PC/ED) manual.
P0117	ECT Circuit Low Input	PCM	REFER to Powertrain Control/Emissions Diagnosis (PC/ED) manual.
P0118	ECT Circuit High Input	PCM	REFER to Powertrain Control/Emissions Diagnosis (PC/ED) manual.
P0122	TP Sensor A Circuit Low Input	PCM	REFER to Powertrain Control/Emissions Diagnosis (PC/ED) manual.
P0123	TP Sensor A Circuit High Input	PCM	REFER to Powertrain Control/Emissions Diagnosis (PC/ED) manual.
P0500	Vehicle Speed Sensor Malfunction	PCM	REFER to Powertrain Control/Emissions Diagnosis (PC/ED) manual.
P0501	Vehicle Speed Sensor Range/Performance	PCM	REFER to Powertrain Control/Emissions Diagnosis (PC/ED) manual.
P0502	Vehicle Speed Sensor Low Input	PCM	REFER to Powertrain Control/Emissions Diagnosis (PC/ED) manual.
P0503	Vehicle Speed Sensor Intermittent	PCM	REFER to Powertrain Control/Emissions Diagnosis (PC/ED) manual.
P0707	Transmission Range Sensor Circuit Low Input	PCM	REFER to Powertrain Control/Emissions Diagnosis (PC/ED) manual.
P0708	Transmission Range Sensor Circuit High Input	PCM	REFER to Powertrain Control/Emissions Diagnosis (PC/ED) manual.
P1120	TP Sensor Out Of Range Low (Ratch Too Low)	PCM	REFER to Powertrain Control/Emissions Diagnosis (PC/ED) manual.
P1183	Engine Oil Temperature Circuit Malfunction	PCM	REFER to Powertrain Control/Emissions Diagnosis (PC/ED) manual.
P1184	Engine Oil Temperature Out of Self-Test Range	PCM	REFER to Powertrain Control/Emissions Diagnosis (PC/ED) manual.
U1009	SCP (J1850) Invalid or Missing Data for Engine Torque	PCM	REFER to Powertrain Control/Emissions Diagnosis (PC/ED) manual.
U1027	SCP (J1850) Invalid or Missing Data for Engine RPM	PCM	REFER to Powertrain Control/Emissions Diagnosis (PC/ED) manual.
U1059	SCP (J1850) Invalid or Missing Data for Transmission/Transaxle/PRNDL	PCM	REFER to Powertrain Control/Emissions Diagnosis (PC/ED) manual.
U1073	SCP (J1850) Invalid or Missing Data for Engine Coolant	PCM	REFER to Powertrain Control/Emissions Diagnosis (PC/ED) manual.
U1243	SCP (J1850) Invalid or Missing Data for Exterior Environment	PCM	REFER to Powertrain Control/Emissions Diagnosis (PC/ED) manual.
U1262	SCP (J1850) Communication Bus Fault	Network Fault	REFER to Section 418-00 .

Stability Assist Module Parameter Identification (PID) Index

Stability Assist Module Parameter Identification (PID) Index

PID	Description	Expected Value
ABSLF_I	Left Front ABS Inlet Valve	Off---, On---
ABSLF_O	Left Front ABS Outlet Valve	Off---, On---

ABSLR_I	Rear or Left Rear ABS Inlet Valve	Off---, On---
ABSLR_O	Left Rear ABS Outlet Valve	Off---, On---
ABSRF_I	Right Front ABS Inlet Valve	Off---, On---
ABSRF_O	Right Front ABS Outlet Valve	Off---, On---
ABSRR_I	Right Rear ABS Inlet Valve	Off---, On---
ABSRR_O	Right Rear ABS Outlet Valve	Off---, On---
BLNMDSC	Booster Learn Cycle Successful	No, Yes
BMECFAL	Booster Mechanical Failure	No, Yes
BOO	Brake Switch Input	Off, On
BSABNCR	Booster Solenoid Abnormal Current	No, Yes
BSBOOFL	Booster Solenoid Brake Switch Failure	No, Yes
BSCIRFL	Booster Solenoid Circuit Failure	No, Yes
BSNCFL	Booster Solenoid Output Normally Closed Switch Failure (Brake Booster Pedal Force)	No, Yes
BSNOFL	Booster Solenoid Output Normally Open Switch Failure (Brake Booster Pedal Force)	No, Yes
BSTSOST	Booster Solenoid Output State	No, Yes
CCNT	Number of Continuous DTCs in Module	one count per bit
DUMP_PT	Booster Non-Volatile Memory Dump Rise Point	#####
FAILCNT	Booster Non-Volatile Memory Failure Count	#####
LAT_ACC	Lateral Acceleration Value	#####
LF_WSPD	Left Front Wheel Speed Sensor	one count per bit
LR_WSPD	Left Rear Wheel Speed Sensor	one count per bit
MPRETDR	Main Brake Pressure Transducer	#####
MPRTDRF	Main Brake Pressure Transducer Failure	No, Yes
PDFCENO	Brake Booster Pedal Force Switch Normally Open (State)	Closed, Open
PDFCENC	Brake Booster Pedal Force Switch Normally Closed (State)	Closed, Open
PRMLPRE	Low Pressure Feedback Primary State	ACTIVE, notACT
RF_WSPD	Right Front Wheel Speed Sensor	one count per bit
RISE_PT	Booster Non-Volatile Memory Rise Point	#####
RISECHG	Booster Non-Volatile Memory Change In Rise Point	#####
RPRETDR	Redundant Brake Pressure Transducer	#####
RR_WSPD	Right Rear Wheel Speed Sensor	one count per bit

SECLPRE	Low Pressure Feedback Secondary State	ACTIVE, notACT
SENVBAT	stability assist Sensor Supply Voltage	#####
SGOTSTA	Switch Test Signal Output State	No, Yes
SPRTDRF	Redundant Brake Pressure Transducer Failure	No, Yes
SWA_POS	Steering Wheel Angle	#####
SWA_CCW	CCW Steering Wheel Angle Position From Start	#####
SWA_CW	CW Steering Wheel Angle Position From Start	#####
SWA1	Steering Wheel Angle # 1	Off---, OffO--, Off-B-, Off--G, OffO-G, OffOB-, Off-BG, OffOBG, On---, OnO--, On-B-, On--G, OnO-G, OnOB-, On-BG, OnOBG
SWA2	Steering Wheel Angle # 2	Off---, OffO--, Off-B-, Off--G, OffO-G, OffOB-, Off-BG, OffOBG, On---, OnO--, On-B-, On--G, OnO-G, OnOB-, On-BG, OnOBG
TC_LVAL	Left T/A Control Valve Output Status	Off---, On---
TC_RVAL	Right T/A Control Valve Output Status	Off---, On---
TC/YC_SW	TC or TC/YC (Stability Assist) Switch, Push Button Input Status	Off, On
TC/YC_FNC	TC or TC/YC (Stability Assist) Function Status	Off, On
YAW_IN	Yaw Rate Sensor Input	Off---, Off-B-, Off--G, On---, On-B-, On--G
YAWRATE	Yaw Rate Value	#####
YAWOUT or LAT_IN	Lateral Accelerometer Input	Off---, Off-B-, Off--G, On---, On-B-, On--G

Stability Assist Module Active Command Index

Stability Assist Module Active Command Index

Active Command	Display	Action
ABS OUTPUT CONTROL	LF INLET	Off, On
	LF OUTLET	Off, On
	LR INLET	Off, On
	LR OUTLET	Off, On
	PMP MOTOR	Off, On
	R INLET (Low Pressure Feed Valve)	Off, On
	R OUTLET (Low Pressure Feed Valve)	Off, On
	RF INLET	Off, On
	RF OUTLET	Off, On
	RR INLET	Off, On
	RR OUTLET	Off, On

TRACTION CONTROL	LR TC VLV	Off, On
	RR TC VLV	Off, On
YAW OUTPUT CONTROL COMMAND	BOOST SOL	Off, On
	PRI LP VLV	Off, On
	SEC LP VLV	Off, On
	LAT INIT	Off, On
	YAW INIT	Off, On
	SW TST SG	Off, On

Stability Assist Calibration List

NOTE: The need to re-calibrate the stability assist module is indicated by the active/fail lamp flashing. Refer to the section Stability Assist Module Calibration for other service actions requiring re-calibration. The lamp will flash after the clearing of DTC's that are indicated on the stability assist calibration list.

Stability Assist Calibration List

DTC	Description	Stability Assist Calibration
C1277	Steering Wheel Angle 1 and 2 Circuit Failure	YES
C1278	Steering Wheel Angle 1 and 2 Signal Faulted	YES
C1279	Yaw Rate Sensor Circuit Failure	YES
C1280	Yaw Rate Sensor Signal Fault	YES
C1281	Lateral Accelerometer Circuit Failure	YES
C1282	Lateral Accelerometer Signal Fault	YES
C1283	Switch Test Signal Failure	YES
C1285	Booster Solenoid Circuit Failure	YES
C1286	Booster Mechanical Failure	YES
C1287	Booster Pedal Force Switch Circuit Failure	YES
C1288	Pressure Transducer Main / Primary Input Circuit Failure	YES
C1289	Pressure Transducer Redundant / Secondary Input Circuit Failure	YES
C1730	Reference Voltage Out of Range (+5 V)	YES
C1960	Driver Brake Apply Circuit Fault	NO
C1963	Stability Control Inhibit Warning	NO

Symptom Chart

NOTE: Refer to the wiring diagrams for connector numbers stated in the pinpoint tests.

Symptom Chart

--	--	--

Condition	Possible Sources	Action
<ul style="list-style-type: none"> No communication with the stability assist module 	<ul style="list-style-type: none"> Underhood AJB Fuse 114 (30A) or 122 (30A). CJB Fuse 203 (5A). Circuitry. Stability assist module. 	<ul style="list-style-type: none"> GO to Pinpoint Test A.
<ul style="list-style-type: none"> The yellow ABS warning indicator does not self-check 	<ul style="list-style-type: none"> Circuitry. Stability assist module. 	<ul style="list-style-type: none"> GO to Pinpoint Test Q.
<ul style="list-style-type: none"> Spongy brake pedal with no warning indicator 	<ul style="list-style-type: none"> Air in brake hydraulic system. 	<ul style="list-style-type: none"> REFER to Section 206-00.
<ul style="list-style-type: none"> The traction control is inoperative 	<ul style="list-style-type: none"> Circuitry. Stability assist/traction control switch. Stability assist module. Base brake system. Thermal model. 	<ul style="list-style-type: none"> GO to Pinpoint Test R. REFER to Section 206-00. Wait for brakes to cool down, the thermal model will reset automatically.
<ul style="list-style-type: none"> The stability assist/traction control switch indicator is never/always on 	<ul style="list-style-type: none"> Circuitry. Stability assist/traction control switch. Stability assist module. 	<ul style="list-style-type: none"> GO to Pinpoint Test S.
<ul style="list-style-type: none"> The stability assist system cannot be disabled 	<ul style="list-style-type: none"> Circuitry. Traction control switch. Stability assist module. 	<ul style="list-style-type: none"> GO to Pinpoint Test T.
<ul style="list-style-type: none"> The stability assist indicator does not self-check 	<ul style="list-style-type: none"> Circuitry. Stability assist module. 	<ul style="list-style-type: none"> GO to Pinpoint Test U.

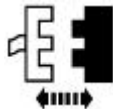
Pinpoint Tests

PINPOINT TEST A: NO COMMUNICATION WITH THE STABILITY ASSIST MODULE

CONDITIONS	DETAILS/RESULTS/ACTIONS
A1 CHECK THE VOLTAGE TO THE STABILITY ASSIST MODULE	
1	



2

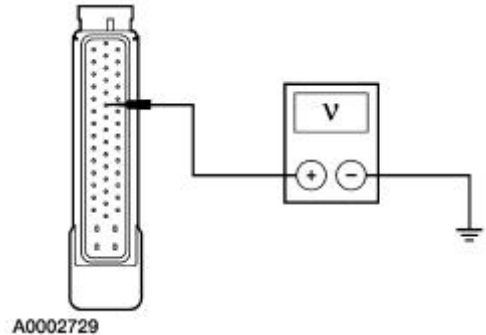


Stability Assist Module C155

3



4



4 Measure the voltage between stability assist module C155 pin 22, circuit 20-CF6A (PK/YE), harness side, and ground.

• Is the voltage greater than 10 volts?

→ Yes
GO to [A2](#).

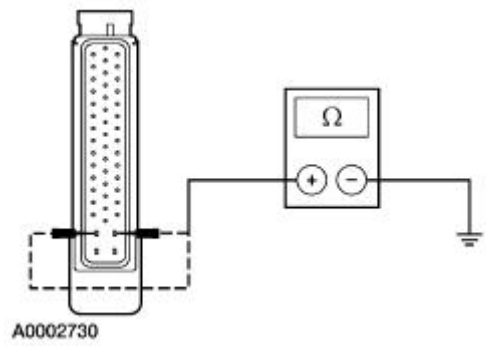
→ No
REPAIR circuit 20-CF6A (PK/YE) or circuit 20-CF6 (PK/YE). REPEAT the self-test.

A2 CHECK THE STABILITY ASSIST MODULE GROUNDS

1



2


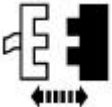
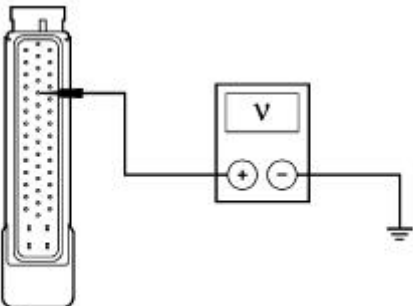


2 Measure the resistance between stability assist module C155 pin 15, circuit 31-CF6A (BK/YE), harness side, and ground; and between stability assist module C155 pin 32, circuit 31-CF6B (BK/YE), harness side, and ground.


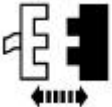

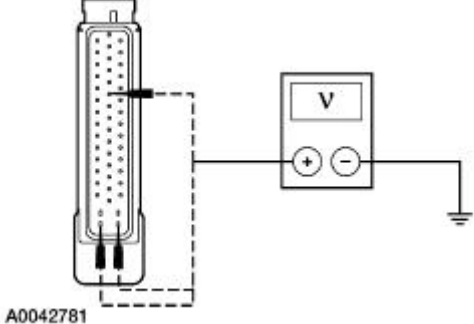
• Are the resistances less than 5

	<p>ohms?</p> <p>→ Yes Section 418-00.</p> <p>→ No REPAIR circuit 31-CF6B (BK/YE) or circuit 31-CF6A (BK/YE). REPEAT the self-test.</p>
--	--

PINPOINT TEST B: DTC B1485 — BRAKE PEDAL INPUT CIRCUIT BATTERY SHORT


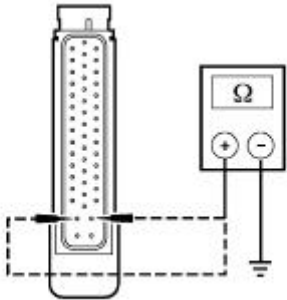
CONDITIONS	DETAILS/RESULTS/ACTIONS
B1 CHECK CIRCUIT 29S-CF1 (OG/YE) FOR AN OPEN	
<p>1</p>  <p>2</p>  <p>Stability Assist Module C155</p> <p>3</p>  <p>A0002731</p>	<p>3</p> <p>Measure the voltage between stability assist module C155 pin 21, circuit 29S-CF1 (OG/YE), harness side, and ground, while depressing and releasing the brake pedal.</p> <ul style="list-style-type: none"> ● Is the voltage greater than 10 volts with the brake pedal depressed, and zero volts with the brake pedal released? <p>→ Yes INSTALL a new stability assist module. REFER to Anti-Lock Brake System (ABS) Module—Stability Assist . REPEAT the self-test.</p> <p>→ No REPAIR the circuit. CLEAR the DTCs. REPEAT the self-test.</p>

PINPOINT TEST C: DTC B1676 — BATTERY PACK VOLTAGE OUT OF RANGE


CONDITIONS	DETAILS/RESULTS/ACTIONS
C1 CHECK THE BATTERY VOLTAGE	
	<p>1 Measure the battery voltage between the positive and negative battery posts with the key ON engine OFF (KOEO), and with the engine running.</p> <ul style="list-style-type: none"> ● Is the battery voltage between 10 and 13 volts with KOEO, and between 11 and 17 volts with the engine running? <p>→ Yes GO to C2.</p> <p>→ No REFER to Section 414-00. TEST the system for normal operation.</p>
C2 CHECK VOLTAGE TO THE STABILITY ASSIST MODULE	
<p>1</p>  <p>2</p>  <p>Stability Assist Module C155</p> <p>3</p>  <p>4</p>  <p>A0042781</p>	<p>4 Measure the voltage between stability assist module C155 pin 16, circuit 30-CF6A (RD), C155 pin 22, circuit 20-CF6A (PK/YE), harness side and ground; and between stability assist module C155 pin 33, circuit 30-CF13 (RD), harness side and ground.</p> <ul style="list-style-type: none"> ● Are the voltages greater than 10 volts? <p>→ Yes</p>

	<p>GO to C3.</p> <p>→ No REPAIR circuit 20-CF6A (PK/YE) or circuit 30-CF13 (RD). CLEAR the DTCs. REPEAT the self-test.</p>
--	---

C3 CHECK CIRCUIT 31-CF6A (BK/YE) AND CIRCUIT 31-CF6B (BK/YE)

<p>1</p>  <p>2</p>  <p>A0043709</p>	<p>2</p> <p>Measure the resistance between the stability assist module C155 pin 15, circuit 31-CF6A (BK/YE), harness side and ground; and between C155 pin 32, circuit 31-CF6B (BK/YE), harness side and ground.</p> <ul style="list-style-type: none"> • Are the resistances less than 5 ohms? <p>→ Yes INSTALL a new stability assist module. REFER to Anti-Lock Brake System (ABS) Module—Stability Assist in this section. REPEAT the self-test.</p> <p>→ No REPAIR circuit 31-CF6A (BK/YE) or circuit 31-CF6B (BK/YE). REPEAT the self-test.</p>
---	--

PINPOINT TEST D: DTC C1095 — ABS HYDRAULIC PUMP MOTOR CIRCUIT FAILURE

CONDITIONS	DETAILS/RESULTS/ACTIONS
D1 CHECK ABS PUMP MOTOR	
<p>1</p> 	<ul style="list-style-type: none"> • Is the ABS pump motor running all the time? <p>→ Yes</p>

INSTALL a new stability assist module. REFER to [Anti-Lock Brake System \(ABS\) Module—Stability Assist](#). CLEAR the DTCs. REPEAT the self-test.

→ **No**
GO to [D2](#).

D2 CHECK PUMP MOTOR OPERATION

1



2 Trigger the stability assist module active command PMP MOTOR ON.

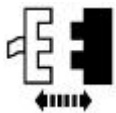
- Does the ABS pump motor run for approximately three seconds?

→ **Yes**
CLEAR the DTC. CHECK the yellow ABS warning indicator while driving the vehicle (brakes must not be applied) above 32 km/h (20 mph). If the yellow ABS warning indicator illuminates, RETRIEVE the DTCs. If DTC C1095 is retrieved, INSTALL a new HCU. REFER to [Hydraulic Control Unit \(HCU\)](#). CLEAR the DTCs. REPEAT the self-test. If the yellow ABS warning indicator does not illuminate, system is OK.

→ **No**
TRIGGER the stability assist module active command PMP MOTOR OFF. GO to [D3](#).

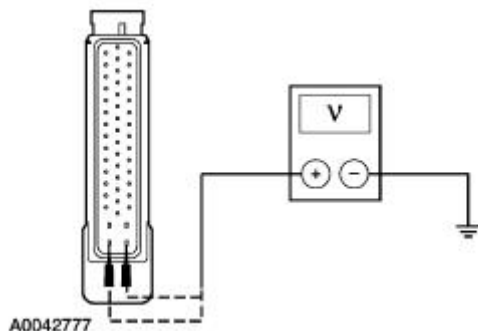
D3 CHECK CIRCUIT 30-CF13 (RD) FOR AN OPEN

1



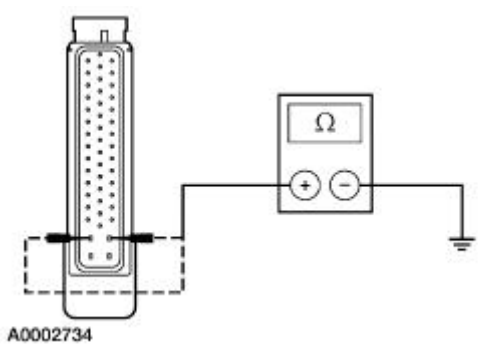
Stability Assist Module C155

2


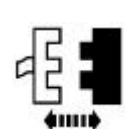


2 Measure the voltage between stability assist module C155 pin 33, circuit 30-CF13 (RD) and C155 pin 16, circuit 30-CF6A (RD), harness side, and ground.

- Is the voltage greater than 10 volts?

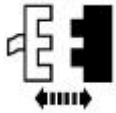
	<p>→ Yes GO to D4.</p> <p>→ No REPAIR the circuit. CLEAR the DTCs. REPEAT the self-test.</p>
<p>D4 CHECK CIRCUIT 31-CF6A (BK/YE) AND 31-CF6B (BK/YE) FOR AN OPEN</p>	
<p>1</p>  <p>A0002734</p>	<p>1 Measure the resistance between stability assist module C155 pin 15, circuit 31-CF6A (BK/YE), harness side, and ground; and between stability assist module C155 pin 32, circuit 31-CF6B (BK/YE), harness side, and ground.</p> <p>• Are the resistances less than 5 ohms?</p> <p>→ Yes INSTALL a new HCU. REFER to Hydraulic Control Unit (HCU). REPEAT the self-test.</p> <p>→ No REPAIR circuit 31-CF6B (BK/YE) or circuit 31-CF6A (BK/YE). CLEAR the DTCs. REPEAT the self-test.</p>

PINPOINT TEST E: DTC C1145 (RF), DTC C1155 (LF), DTC C1165 (RR), DTC C1175 (LR) — ANTI-LOCK BRAKE SENSOR INPUT CIRCUIT FAILURE

CONDITIONS	DETAILS/RESULTS/ACTIONS
<p>NOTE: Any time an anti-lock brake sensor is removed, thoroughly clean the mounting surfaces and apply High Temperature 4x4 Front Axle and Wheel Bearing Grease E8TZ-19590-A or equivalent meeting Ford specification ESA-M1C198-A.</p>	
<p>E1 CHECK FOR SHORT TO POWER</p>	
<p>NOTE: Both circuits must be checked for each DTC.</p>	
<p>1</p>  <p>2</p> 	

Stability Assist Module C155

3

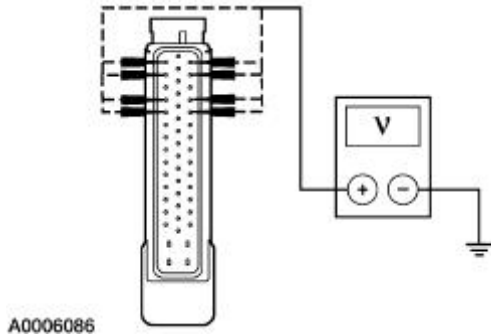


Suspect Anti-lock Brake Sensor

4



5



5

Measure the voltage between stability assist module C155 pin, harness side, and ground, as follows:

DTC	Stability Assist Module C155	Circuit
C1145 (RF)	Pin 35	7-CF38 (YE/RD)
C1145 (RF)	Pin 34	8-CF38 (WH/RD)
C1155 (LF)	Pin 1	7-CF32 (YE)
C1155 (LF)	Pin 2	8-CF32 (WH)
C1165 (RR)	Pin 38	7-CF40 (YE/GN)
C1165 (RR)	Pin 37	8-CF40 (WH/GN)
C1175 (LR)	Pin 5	7-CF34 (YE/BU)
C1175 (LR)	Pin 4	8-CF34 (WH/BU)

● Is voltage present?

→ Yes

If DTC C1145, REPAIR circuit 7-CF38 (YE/RD) or circuit 8-CF38 (YE/BK). CLEAR the DTCs. REPEAT the self-test.

If DTC C1155, REPAIR circuit 7-CF32 (YE) or circuit 8-CF32 (WH). CLEAR the DTCs. REPEAT the self-test.

If DTC C1165, REPAIR circuit 7-CF40 (YE/GN) or circuit 8-CF40 (WH/GN). CLEAR the DTCs. REPEAT the self-test.

If DTC C1175, REPAIR circuit 7-CF34 (YE/BU) or circuit 8-CF34 (WH/BU). CLEAR the DTCs. REPEAT the self-test.

→ **No**
GO to [E2](#).

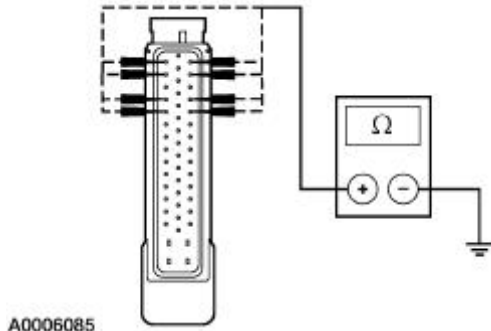
E2 CHECK FOR SHORT TO GROUND

NOTE: Both circuits must be checked for each DTC.

1



2



2 Measure the resistance between stability assist module C155 pin, harness side, and ground, as follows:

DTC	Stability Assist Module C155	Circuit
C1145 (RF)	Pin 35	7-CF38 (YE/RD)
C1145 (RF)	Pin 34	8-CF38 (WH/RD)
C1155 (LF)	Pin 1	7-CF32 (YE)
C1155 (LF)	Pin 2	8-CF32 (WH)
C1165 (RR)	Pin 38	7-CF40 (YE/GN)
C1165 (RR)	Pin 37	8-CF40 (WH/GN)
C1175 (LR)	Pin 5	7-CF34 (YE/BU)
C1175 (LR)	Pin 4	8-CF34 (WH/BU)

● **Are the resistances greater than 10,000 ohms?**

→ **Yes**
GO to [E3](#).

→ **No**
If DTC C1145, REPAIR circuit 7-CF38 (YE/RD) or circuit 8-CF38 (YE/BK). CLEAR the DTCs. REPEAT the self-test.

If DTC C1155, REPAIR circuit 7-CF32 (YE) or circuit 8-CF32 (WH). CLEAR the DTCs. REPEAT the self-test.

If DTC C1165, REPAIR circuit 7-CF40 (YE/GN) or circuit 8-CF40 (WH/GN). CLEAR the DTCs. REPEAT the self-test.

If DTC C1175, REPAIR circuit 7-CF34 (YE/BU) or circuit 8-CF34 (WH/BU).

CLEAR the DTCs. REPEAT the self-test.

E3 CHECK FOR AN OPEN

NOTE: Both circuits must be checked for each DTC.

- 1 Measure the resistance between stability assist module C155 pins, harness side, and suspect anti-lock brake sensor connector, harness side, as follows:

DTC	Stability Assist Module C155	Anti-lock Brake Sensor	Circuit
C1145 (RF)	Pin 35	C160 Pin 1	7-CF38 (YE/RD)
C1145 (RF)	Pin 34	C160 Pin 2	8-CF38 (YE/BK)
C1155 (LF)	Pin 1	C150 Pin 1	7-CF32 (YE)
C1155 (LF)	Pin 2	C150 Pin 2	8-CF32 (WH)
C1165 (RR)	Pin 38	C426 Pin 1	7-CF40 (YE/GN)
C1165 (RR)	Pin 37	C426 Pin 2	8-CF40 (WH/GN)
C1175 (LR)	Pin 5	C440 Pin 1	7-CF34 (YE/BU)
C1175 (LR)	Pin 4	C440 Pin 2	8-CF34 (WH/BU)

- Is the resistance less than 5 ohms?

→ **Yes**
GO to [E4](#).

→ **No**
If DTC C1145, REPAIR circuit 7-CF38 (YE/RD) or circuit 8-CF38 (YE/BK). CLEAR the DTCs. REPEAT the self-test.


If DTC C1155, REPAIR circuit 7-CF32 (YE) or circuit 8-CF32 (WH). CLEAR the DTCs. REPEAT the self-test.

If DTC C1165, REPAIR circuit 7-CF40 (YE/GN) or circuit 8-CF40 (WH/GN). CLEAR the DTCs. REPEAT the self-test.


If DTC C1175, REPAIR circuit 7-CF34 (YE/BU) or circuit 8-CF34 (WH/BU). CLEAR the DTCs. REPEAT the self-test.

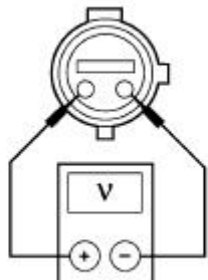
E4 CHECK THE STABILITY ASSIST MODULE OUTPUT

1



Stability Assist Module C155

2 

3 

A0006087

3 Measure the voltage between suspect anti-lock brake sensor pins, harness side.

● Is the voltage less than 9 volts?

→ **Yes**
 INSTALL a new stability assist module. REFER to [Anti-Lock Brake System \(ABS\) Module—Stability Assist](#). CLEAR the DTCs. REPEAT the self-test.




→ **No**
 INSTALL a new wheel speed sensor. REFER to [Front Wheel Speed Sensor](#) or [Rear Wheel Speed Sensor](#). CLEAR the DTCs. REPEAT the self-test.

PINPOINT TEST F: DTC C1233 (LF), DTC C1234 (RF), DTC C1235 (RR), DTC C1236 (LR) — ANTI-LOCK BRAKE SENSOR INPUT SIGNAL MISSING

CONDITIONS	DETAILS/RESULTS/ACTIONS
	<p>NOTE: Any time an anti-lock brake sensor is removed, thoroughly clean the mounting surfaces and apply High Temperature 4x4 Front Axle and Wheel Bearing Grease E8TZ-19590-A or equivalent meeting Ford specification ESA-M1C198-A.</p>
	<p>F1 CHECK THE ANTI-LOCK BRAKE SENSOR</p> <p>1 Check the suspect anti-lock brake sensor mounting. Check the suspect anti-lock brake sensor for excessive dirt buildup, metal obstructions, incorrect harness routing, and chafing.</p> <p>● Is the suspect anti-lock brake sensor OK?</p> <p>→ Yes GO to F2.</p>

	<p>→ No REPAIR as necessary. CLEAR the DTCs. REPEAT the self-test.</p>
F2 CHECK THE ANTI-LOCK BRAKE SENSOR INDICATOR	
<p>1 Check the suspect anti-lock brake sensor indicator for corrosion, nicks, damaged teeth, correct mounting, alignment, and consistent air gap.</p> <p>● Is the suspect anti-lock brake sensor indicator OK?</p>	<p>→ Yes INSTALL a new anti-lock brake sensor; REFER to Front Wheel Speed Sensor or Rear Wheel Speed Sensor. CLEAR the DTCs. REPEAT the self-test.</p> <p>→ No REPAIR as necessary. CLEAR the DTCs. REPEAT the self-test.</p>

PINPOINT TEST G: DTC C1277 — STEERING WHEEL ANGLE 1 AND 2 CIRCUIT FAILURE, DTC C1278 — STEERING WHEEL ANGLE 1 AND 2 CIRCUIT FAULTED

CONDITIONS	DETAILS/RESULTS/ACTIONS
G1 CARRY OUT THE RECALIBRATION PROCEDURE	
<p>1</p>  <p>2</p>  <p>Clear the DTC</p> <p>4</p>  <p>Retrieve DTCs</p>	<p>3 Carry out the steering wheel angle recalibration procedure using the NGS Tester.</p> <p>● Are any DTCs retrieved or does the recalibration procedure indicate a fault?</p> <p>→ Yes If DTC C1277 or C1278 is retrieved or recalibration procedure indicates a fault, GO to G2.</p>

If any other DTC, GO to the Stability Assist Module Diagnostic Trouble Code (DTC) Index.

→ **No**
The stability assist system is operating correctly.

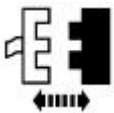
The DTC C1278 was meant for detection of steering wheel rotation sensor harness wiring problems at vehicle assembly time. The steering wheel rotation sensor circuit is checked for swapped wires (channel A and B). This DTC should not occur during repair unless the harness wiring to the steering wheel rotation sensor was changed or the PRNDL position indicator is not operating correctly. The DTC will occur only after driving a few feet and making a turn if the wiring problem or PRNDL problem exists.

G2 CHECK THE VOLTAGE TO THE STEERING WHEEL ROTATION SENSOR

1



2

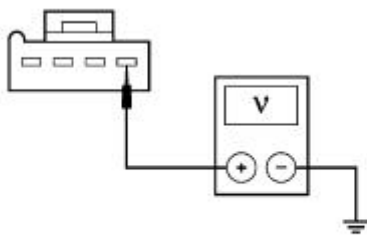


Steering Wheel Rotation Sensor C226

3



4



A0002737

4 Measure the voltage between steering wheel rotation sensor C226 pin 4, circuit 15-CC16 (GN/OG), harness side, and ground.

● **Is the voltage greater than 10 volts?**

→ **Yes**
GO to [G3](#).

→ **No**
REPAIR the circuit. CLEAR the DTCs.

RECALIBRATE the stability assist module. REPEAT the self-test.

G3 CHECK THE STEERING WHEEL ROTATION SENSOR CIRCUITRY FOR SHORT TO POWER

1



2

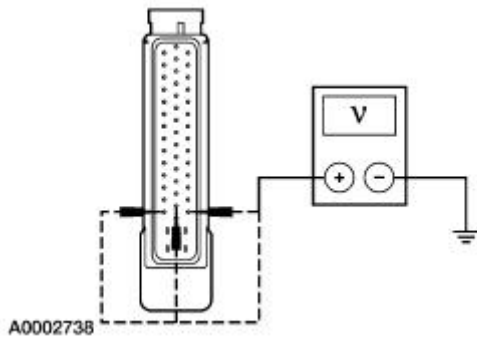


Stability Assist Module C155

3



4



A0002738

4 Measure the voltage between stability assist module C155 pins, harness side and ground as follows:

Stability Assist Module C155	Circuit
Pin 30	9-CC16 (BN/YE)
Pin 47	8-CC18 (WH/RD)
Pin 14	10-CC17 (GY)

• Is any voltage present?

→ **Yes**
REPAIR the circuit in question. CLEAR the DTCs. RECALIBRATE the stability assist module. REPEAT the self-test.

→ **No**
GO to [G4](#).

G4 CHECK THE STEERING WHEEL ROTATION SENSOR CIRCUITRY FOR SHORT TO GROUND

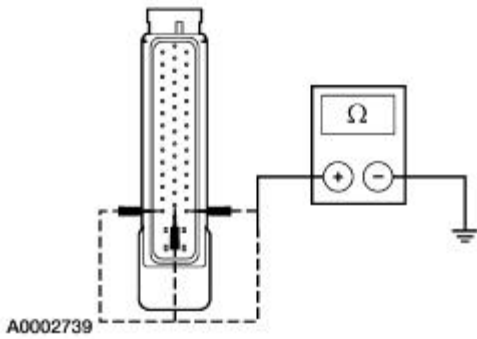
1



2

2 Measure the resistance between stability assist module C155 pins, harness side and ground as follows:

Stability Assist	



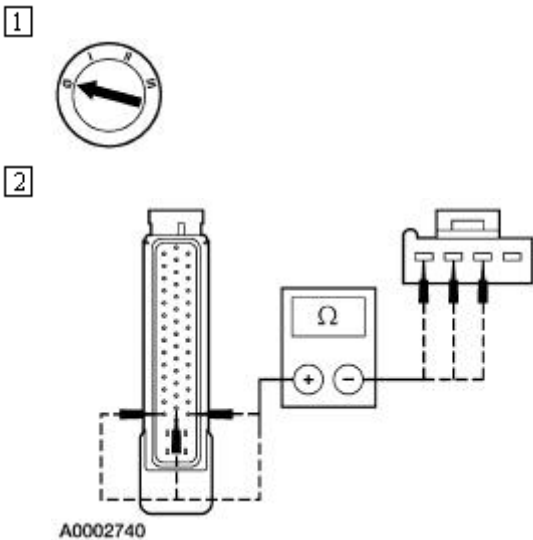
Module C155	Circuit
Pin 30	9-CC16 (BN/YE)
Pin 47	8-CC18 (WH/RD)
Pin 14	10-CC17 (GY)

- Is the resistance greater than 10,000 ohms?

→ **Yes**
GO to [G5](#).

→ **No**
REPAIR the circuit in question. CLEAR the DTCs. RECALIBRATE the stability assist module. REPEAT the self-test.

G5 CHECK THE STEERING WHEEL ROTATION SENSOR CIRCUITRY FOR AN OPEN



- 2 Measure the resistance between stability assist module C155 pins, harness side, and steering wheel rotation sensor C226 pins, harness side, as follows:

Stability Assist Module C155	Steering Wheel Rotation Sensor C226	Circuit
Pin 30	Pin 1	9-CC16 (BN/YE)
Pin 47	Pin 2	8-CC18 (WH/RD)
Pin 14	Pin 3	10-CC17 (GY)

- Is the resistance less than 5 ohms?

→ **Yes**
GO to [G6](#).

→ **No**
REPAIR the circuit in question. CLEAR the DTCs. RECALIBRATE the stability assist module. REPEAT the self-test.

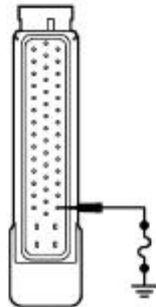
G6 CHECK THE STEERING WHEEL ROTATION SENSOR OUTPUT

1



Steering Wheel Rotation Sensor C226

2

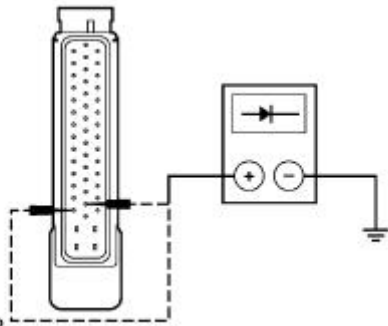


A0002741

3



4



A0002742

2

Connect a fused (5A) jumper wire between stability assist module C155-30, circuit 9-CC16 (BN/YE), harness side, and ground.

4

NOTE: The WDS scan tool can also be used to monitor steering wheel rotation sensor output PIDs.

Connect 73III Automotive Meter leads between stability assist module C155-14, circuit 10-CC17 (GY), harness side, and ground; and between stability assist module C155-47, circuit 8-CC18 (WH/RD), harness side, and ground.

- While turning the steering wheel in each direction, is the voltage switching from 0 to 2 volts \pm 0.5 volt?

→ Yes

INSTALL a new stability assist module. REFER to [Anti-Lock Brake System \(ABS\) Module—Stability Assist](#) . REPEAT the self-test.

→ No

INSTALL a new steering wheel rotation sensor. REFER to [Section 211-02](#) . CLEAR the DTCs. REPEAT the self-test.

PINPOINT TEST H: DTC C1279 — YAW RATE SENSOR CIRCUIT FAILURE, DTC C1280 — YAW RATE SENSOR SIGNAL FAULT

CONDITIONS	DETAILS/RESULTS/ACTIONS
------------	-------------------------

H1 CARRY OUT THE RECALIBRATION PROCEDURE

1



2



Clear DTC

4



Retrieve DTCs

3

Carry out the yaw rate sensor recalibration procedure using the NGS Tester.

- **Are any DTCs retrieved or does the recalibration procedure indicate a fault?**

→ **Yes**

If DTC C1279 or C1280 is retrieved, or yaw rate portion of the recalibration procedure indicates failed, GO to [H2](#).

If any other DTC, GO to the Stability Assist Module Diagnostic Trouble Code (DTC) Index.

→ **No**

The stability assist system is operating correctly.

H2 CHECK THE STABILITY ASSIST MODULE PID YAWRATE

1

Monitor the stability assist module PID YAWRATE.

- **Is the stability assist module PID YAWRATE value between 479 and 545?**

→ **Yes**

CLEAR DTCs. RECALIBRATE the stability assist module. REPEAT the self-test.

→ **No**

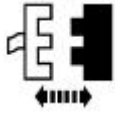
GO to [H3](#).

H3 CHECK THE RETURN SIGNAL VOLTAGE

1

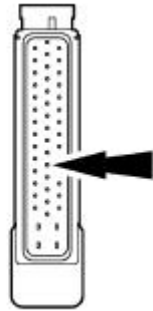


2



Stability Assist Module C155

3



A0002747

4

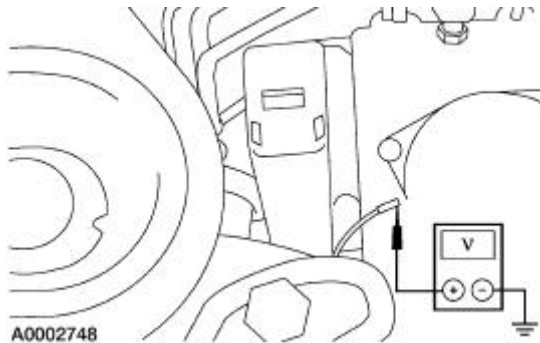


Stability Assist Module C155

5



6



A0002748

3

Back out the stability assist module C155 pin 27, circuit 8-CF67 (WH/RD), harness side.

6

Measure the voltage between stability assist module C155 pin 27, circuit 8-CF67 (WH/RD), harness side, and ground.

● Is the voltage approximately 2.5 volts?

→ **Yes**
RECONNECT the backed out pin. GO to [H4](#).

→ **No**
GO to [H5](#).

H4 REVERIFY THE STABILITY ASSIST MODULE PID YAWRATE

1

Monitor the stability assist module PID

YAWRATE.

- Is the stability assist module PID YAWRATE value between 479 and 545?

→ **Yes**

Check the stability assist module connector for loose or corroded pins. CLEAR the DTCs. REPEAT the self-test.

→ **No**

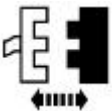
INSTALL a new stability assist module. REFER to [Anti-Lock Brake System \(ABS\) Module—Stability Assist](#). REPEAT the self-test.

H5 CHECK YAW RATE SENSOR CIRCUITRY FOR SHORT TO POWER

1

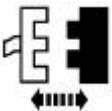


2



Stability Assist Module C155

3

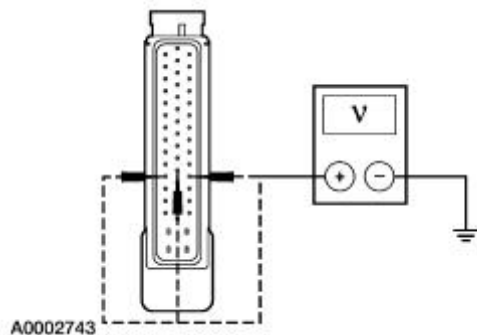


Yaw Rate Sensor C245

4



5



5

Measure the voltage between stability assist module C155 pins, harness side, and ground as follows:

Stability Assist Module C155	Circuit
Pin 27	8-CF67 (WH/RD)
Pin 11	9-CF67 (BN/RD)
Pin 44	7-CF67 (YE/RD)

- Is any voltage present?

→ **Yes**

REPAIR the circuit in question. CLEAR the DTCs. RECALIBRATE the stability assist module. REPEAT the self-test.

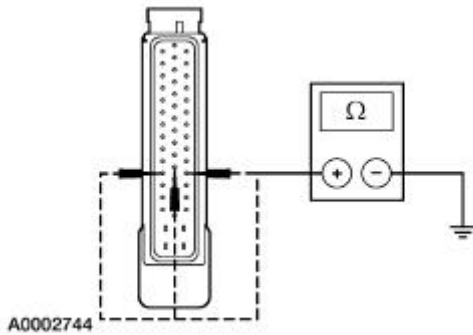
→ **No**
GO to [H6](#).

H6 CHECK YAW RATE SENSOR CIRCUITRY FOR SHORT TO GROUND

1



2



2

Measure the resistance between stability assist module C155 pins, harness side, and ground as follows:

Stability Assist Module C155	Circuit
Pin 27	8-CF67 (WH/RD)
Pin 11	9-CF67 (BN/RD)
Pin 44	7-CF67 (YE/RD)

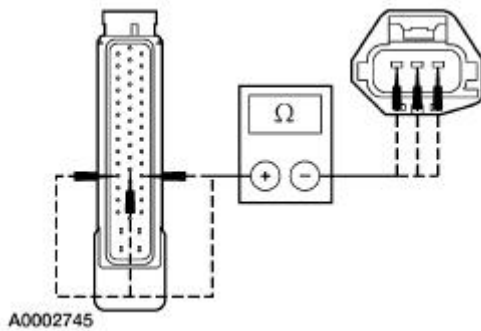
● Is the resistance greater than 10,000 ohms?

→ **Yes**
GO to [H7](#).

→ **No**
REPAIR the circuit in question. CLEAR the DTCs. RECALIBRATE the stability assist module. REPEAT the self-test.

H7 CHECK YAW RATE SENSOR CIRCUITRY FOR AN OPEN

1



1

Measure the resistance between stability assist module C155 pins, harness side, and yaw rate sensor C245 pins, harness side as follows:

Stability Assist Module C155	Yaw Rate Sensor C245	Circuit
Pin 27	Pin 1	8-CF67 (WH/RD)
Pin 11	Pin 2	9-CF67 (BN/RD)
Pin 44	Pin 3	7-CF67 (YE/RD)

● Is the resistance less than 5 ohms?

→ **Yes**
GO to [H8](#).

→ **No**
REPAIR the circuit in question. CLEAR the DTCs. RECALIBRATE the stability assist module. REPEAT the self-test.

H8 CHECK THE VOLTAGE FROM THE STABILITY ASSIST MODULE

1

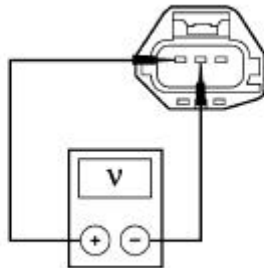


Stability Assist Module C155

2



3



A0002746

3 Measure the voltage between yaw rate sensor C245 pin 3, circuit 7-CF67 (YE/RD), harness side, and yaw rate sensor C245 pin 2, circuit 9-CF67 (BN/RD), harness side.

● **Is the voltage approximately 5 volts?**

→ **Yes**
INSTALL a new yaw rate sensor. REFER to [Yaw Rate Sensor](#). CLEAR the DTCs. REPEAT the self-test.

→ **No**
INSTALL a new stability assist module. REFER to [Anti-Lock Brake System \(ABS\) Module—Stability Assist](#). CLEAR the DTCs. REPEAT the self-test.

PINPOINT TEST I: DTC C1281 — LATERAL ACCELEROMETER CIRCUIT FAILURE, DTC C1282 — LATERAL ACCELEROMETER SIGNAL FAULT

CONDITIONS	DETAILS/RESULTS/ACTIONS
I1 CARRY OUT THE RECALIBRATION PROCEDURE	
1	



2



Clear DTC

4



Retrieve DTCs

3 Carry out the lateral accelerometer recalibration procedure using the NGS Tester.

- **Are any DTCs retrieved or does the recalibration procedure indicate a fault?**

→ **Yes**

If DTC C1281 or C1282 is retrieved, or lateral accelerometer portion of the recalibration procedure indicates failed, GO to [12](#).

If any other DTC, GO to the Stability Assist Module Diagnostic Trouble Code (DTC) Index.

→ **No**

The stability assist system is operating correctly.

12 CHECK THE STABILITY ASSIST MODULE PID LAT_ACC

1 Monitor the stability assist module PID LAT_ACC.

- **Is the stability assist module PID LAT_ACC value between 547 and 681?**

→ **Yes**

INSTALL a new lateral accelerometer. REFER to [Accelerometer](#). CLEAR DTCs. RECALIBRATE the stability assist module. REPEAT the self-test.

→ **No**

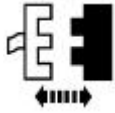
GO to [13](#).

13 CHECK THE RETURN SIGNAL VOLTAGE

1

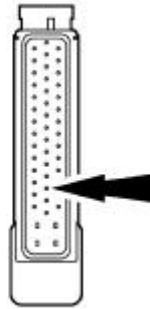


2



Stability Assist Module C155

3



A0002753

4

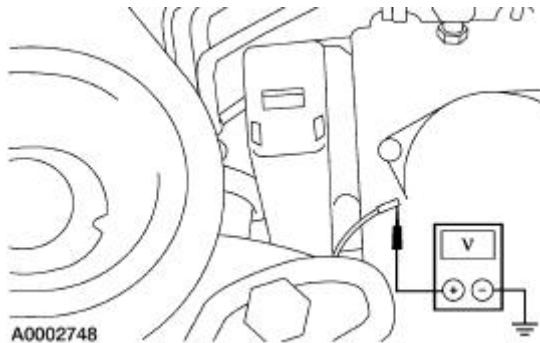


Stability Assist Module C155

5



6



A0002748

3

Back out the stability assist module C155 pin 29, circuit 8-CF66 (WH/BU), harness side.

6

Measure the voltage between stability assist module C155 pin 29, circuit 8-CF66 (WH/BU), harness side, and ground.

● Is the voltage approximately 3 volts?

→ Yes
RECONNECT the backed out pin. GO to [14](#).

→ No
GO to [15](#).

14 REVERIFY THE STABILITY ASSIST MODULE PID LAT_ACC

1

Monitor the stability assist module PID

LAT_ACC.

- Is the stability assist module PID LAT_ACC value between 547 and 681?

→ **Yes**

Check the stability assist module connector for loose or corroded pins. CLEAR the DTCs. REPEAT the self-test.

→ **No**

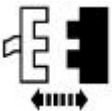
INSTALL a new stability assist module. REFER to [Anti-Lock Brake System \(ABS\) Module—Stability Assist](#). REPEAT the self-test.

15 CHECK LATERAL ACCELEROMETER CIRCUITRY FOR SHORT TO POWER

1

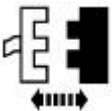


2



Stability Assist Module C155

3

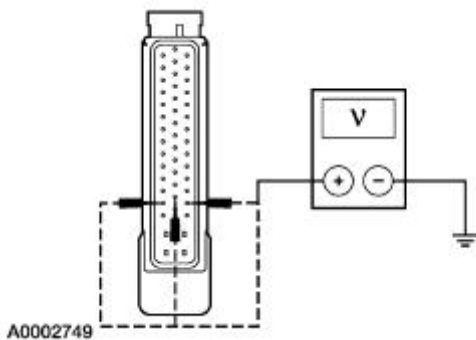


Lateral Accelerometer C244

4



5



5

Measure the voltage between stability assist module C155 pins, harness side, and ground, as follows:

Stability Assist Module C155	Circuit
Pin 13	9-CF66 (BN/BU)
Pin 29	8-CF66 (WH/BU)
Pin 46	7-CF66 (YE/BU)

- Is any voltage present?

→ **Yes**

REPAIR the circuit in question. CLEAR the DTCs. RECALIBRATE the stability assist module. REPEAT the self-test.

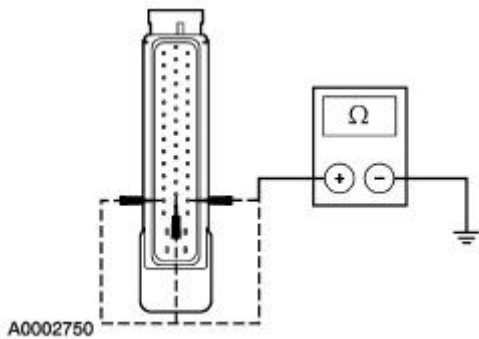
→ **No**
GO to [16](#).

16 CHECK LATERAL ACCELEROMETER CIRCUITRY FOR SHORT TO GROUND

1



2



2

Measure the resistance between stability assist module C155 pins, harness side, and ground as follows:

Stability Assist Module C155	Circuit
Pin 13	9-CF66 (BN/BU)
Pin 29	8-CF66 (WH/BU)
Pin 46	7-CF66 (YE/BU)

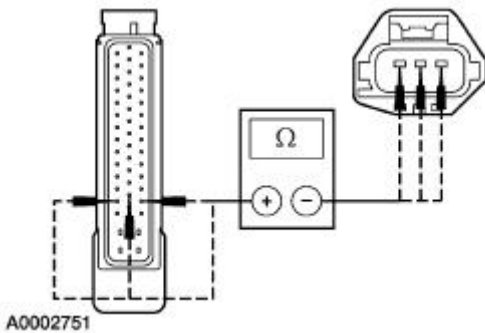
● Is the resistance greater than 10,000 ohms?

→ **Yes**
GO to [17](#).

→ **No**
REPAIR the circuit in question. CLEAR the DTCs. RECALIBRATE the stability assist module. REPEAT the self-test.

17 CHECK LATERAL ACCELEROMETER CIRCUITRY FOR AN OPEN

1



1

Measure the resistance between stability assist module C155 pins, harness side, and lateral accelerometer C244 pin, harness side as follows:

Stability Assist Module C155	Lateral Accelerometer C244	Circuit
Pin 13	Pin 1	9-CF66 (BN/BU)
Pin 29	Pin 2	8-CF66 (WH/BU)
Pin 46	Pin 3	7-CF66 (YE/BU)

● Is the resistance less than 5 ohms?

→ **Yes**
GO to [18](#).

→ **No**
REPAIR the circuit in question. CLEAR the DTCs. RECALIBRATE the stability assist module. REPEAT the self-test.

18 CHECK THE VOLTAGE FROM THE STABILITY ASSIST MODULE

1

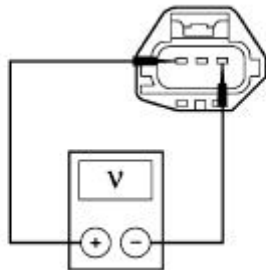


Stability Assist Module C155

2



3



A0002752

3 Measure the voltage between lateral accelerometer C244 pin 3, circuit 7-CF66 (YE/BU), harness side, and lateral accelerometer C244 pin 1, circuit 9-CF66 (BN/BU), harness side.

● **Is the voltage approximately 5 volts?**

→ **Yes**
INSTALL a new lateral accelerometer. REFER to [Accelerometer](#). CLEAR the DTCs. REPEAT the self-test.

→ **No**
INSTALL a new stability assist module. REFER to [Anti-Lock Brake System \(ABS\) Module—Stability Assist](#). CLEAR the DTCs. REPEAT the self-test.

PINPOINT TEST J: DTC C1285—BRAKE BOOSTER SOLENOID OUTPUT FAILURE

CONDITIONS	DETAILS/RESULTS/ACTIONS
J1 CARRY OUT THE RECALIBRATION PROCEDURE	
1	



2



Clear DTC

4



Retrieve DTCs

3 Carry out the brake booster recalibration procedure using the NGS Tester.

• Are any DTCs retrieved or does the recalibration procedure indicate a fault?

→ Yes

If DTC C1285 is retrieved, or brake booster portion of the recalibration procedure indicates failed, GO to [J2](#).

If any other DTC, GO to the Stability Assist Module Diagnostic Trouble Code (DTC) Index.

→ No

The stability assist system is operating correctly.

J2 CHECK THE BRAKE BOOSTER SOLENOID

1



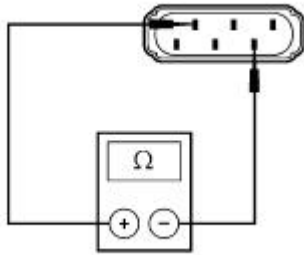
2



Brake Booster C149

3

3 Measure the resistance between brake booster pin 3 (component side) and brake booster solenoid pin 4 (component side).



A0002754

- Is the resistance between 1 and 2 ohms?

→ **Yes**
GO to [J3](#).

→ **No**
INSTALL a new brake booster. REFER to [Section 206-07](#). CLEAR the DTCs. RECALIBRATE the stability assist module. REPEAT the self-test.

J3 CHECK THE BRAKE BOOSTER SOLENOID CIRCUITRY FOR SHORT TO POWER

1

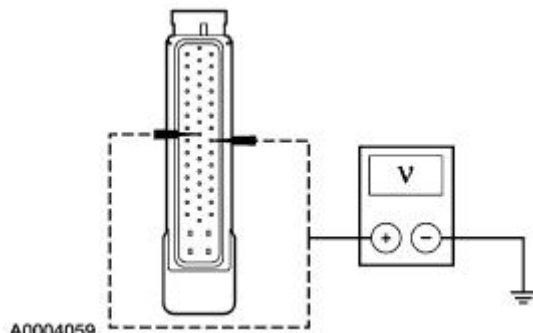


Stability Assist Module C155

2



3



A0004059

- 3 Measure the voltage between stability assist module C155 pin 8, circuit 8-CF68 (WH/RD), harness side, and ground; and stability assist module C155 pin 24, circuit 9-CF68 (BN/RD), harness side, and ground.

- Is the any voltage present?

→ **Yes**
REPAIR the circuit in question. CLEAR the DTCs. RECALIBRATE the stability assist module. REPEAT the self-test.

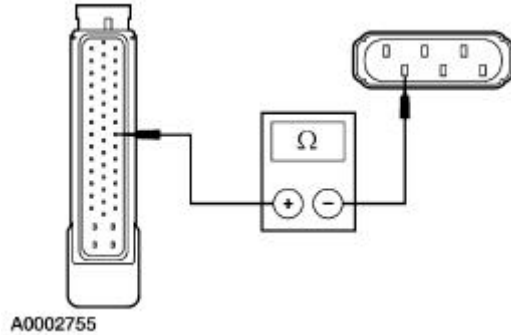
→ **No**
GO to [J4](#).

J4 CHECK CIRCUIT 8-CF68 (WH/RD)

1



2



2

Measure the resistance between stability assist module C155 pin 8, circuit 8-CF68 (WH/RD), harness side, and brake booster C149 pin 4, circuit 8-CF68 (WH/RD), harness side; and stability assist module C155 pin 8, circuit 8-CF68 (WH/RD), harness side, and ground.

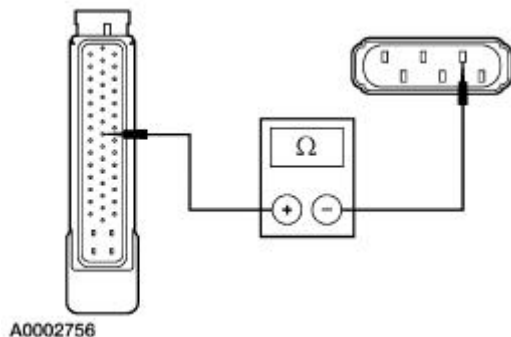
- Is the resistance less than 5 ohms between stability assist module and brake booster; and greater than 10,000 ohms between stability assist module and ground?

→ **Yes**
GO to [J5](#).

→ **No**
REPAIR the circuit. CLEAR the DTCs. RECALIBRATE the stability assist module. REPEAT the self-test.

J5 CHECK CIRCUIT 9-CF68 (BN/RD)

1



1

Measure the resistance between stability assist module C155 pin 24, circuit 9-CF68 (BN/RD), harness side, and brake booster C149 pin 3, circuit 9-CF68 (BN/RD), harness side; and stability assist module C155 pin 24, circuit 9-CF68 (BN/RD), harness side and ground.

- Is the resistance less than 5 ohms between stability assist module and brake booster; and greater than 10,000 ohms between stability assist module and ground?

→ **Yes**
GO to [J6](#).

→ **No**

REPAIR the circuit. CLEAR the DTCs. RECALIBRATE the stability assist module. REPEAT the self-test.

J6 CHECK THE BRAKE BOOSTER SOLENOID FOR CORRECT OPERATION

1

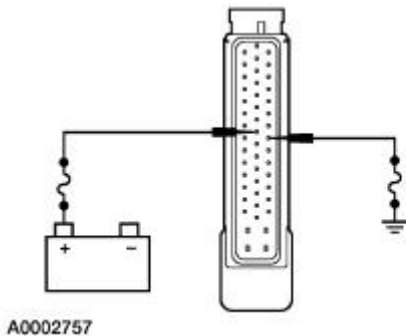


Brake Booster C149

2



4



3 Wait a few minutes to create engine vacuum in the brake booster and then place the ignition switch in the OFF position.


4 Connect a fused (10A) jumper wire between stability assist module pin 8, circuit 8-CF68 (WH/RD), harness side, and ground; and connect a fused (10A) jumper wire for several seconds between stability assist module pin 24, circuit 9-CF68 (WH/RD), harness side, and the positive battery post, while observing the brake pedal for movement.

● Does the brake pedal move?

→ **Yes**
INSTALL a new stability assist module. REFER to [Anti-Lock Brake System \(ABS\) Module—Stability Assist](#). REPEAT the self-test.

→ **No**
INSTALL a new brake booster. REFER to [Section 206-07](#). CLEAR the DTCs. RECALIBRATE the stability assist module. REPEAT the self-test.

PINPOINT TEST K: DTC C1286—BOOSTER MECHANICAL FAILURE

CONDITIONS	DETAILS/RESULTS/ACTIONS
K1 CARRY OUT THE RECALIBRATION PROCEDURE	
<p>1</p> 	

2



Clear DTC

4



Clear DTC

5



Retrieve DTCs

3 Carry out the brake booster recalibration procedure using the NGS Tester.

• Are any DTCs retrieved or does the recalibration procedure indicate a fault?

→ Yes

If DTC C1286 is retrieved or recalibration procedure indicate a fault, GO to [K2](#).

If any other DTC, GO to the Stability Assist Module Diagnostic Trouble Code (DTC) Index.

→ No

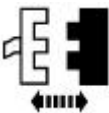
The stability assist system is operating correctly.

K2 CHECK THE BRAKE BOOSTER SOLENOID

1



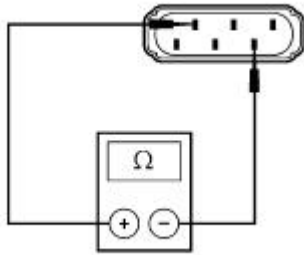
2



Brake Booster C149

3

3 Measure the resistance between brake booster pin 3 (component side) and brake booster solenoid pin 4 (component side).



A0002754

- Is the resistance between 1 and 2 ohms?

→ **Yes**
GO to [K3](#).

→ **No**
INSTALL a new brake booster. REFER to [Section 206-07](#). CLEAR the DTCs. RECALIBRATE the stability assist module. REPEAT the self-test.

K3 CHECK THE BRAKE BOOSTER SOLENOID CIRCUITRY FOR SHORT TO POWER

1

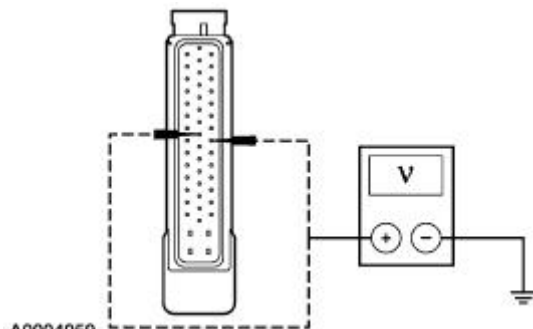


Stability Assist Module C155

2



3



A0004059

- 3 Measure the voltage between stability assist module C155 pin 8, circuit 8-CF68 (WH/RD), harness side and ground; and stability assist module C155 pin 24, circuit 9-CF68 (BN/RD), harness side and ground.

- Is the any voltage present?

→ **Yes**
REPAIR the circuit in question. CLEAR the DTCs. RECALIBRATE the stability assist module. REPEAT the self-test.

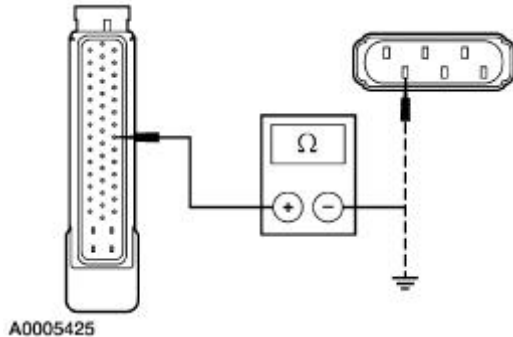
→ **No**
GO to [K4](#).

K4 CHECK CIRCUIT 8-CF68 (WH/RD)

1



2



A0005425

2

Measure the resistance between stability assist module C155 pin 8, circuit 8-CF68 (WH/RD), harness side, and brake booster C149 pin 4, circuit 8-CF68 (WH/RD), harness side; and stability assist module C155 pin 8, circuit 8-CF68 (WH/RD), harness side, and ground.

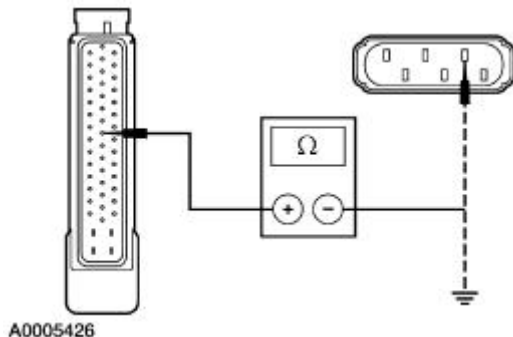
- Is the resistance less than 5 ohms between stability assist module and brake booster; and greater than 10,000 ohms between stability assist module and ground?

→ **Yes**
GO to [K5](#).

→ **No**
REPAIR the circuit. CLEAR the DTCs. RECALIBRATE the stability assist module. REPEAT the self-test.

K5 CHECK CIRCUIT 9-CF68 (BN/RD)

1



A0005426

1

Measure the resistance between stability assist module C155 pin 24, circuit 9-CF68 (BN/RD), harness side, and brake booster C149 pin 3, circuit 9-CF68 (BN/RD), harness side; and stability assist module C155 pin 24, circuit 9-CF68 (BN/RD), harness side, and ground.

- Is the resistance less than 5 ohms between stability assist module and brake booster; and greater than 10,000 ohms between stability assist module and ground?

→ **Yes**
GO to [K6](#).

→ **No**
REPAIR the circuit. CLEAR the DTCs.

RECALIBRATE the stability assist module. REPEAT the self-test.

K6 CHECK THE BRAKE BOOSTER SOLENOID FOR CORRECT OPERATION

1

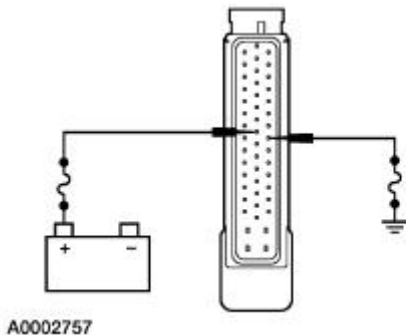


Brake Booster C149

2



4



3 Wait a few minutes to create engine vacuum in the brake booster and then place the ignition switch in the OFF position.


4 Connect a fused (10A) jumper wire between stability assist module pin 8, circuit 8-CF68 (WH/RD), harness side, and ground; and connect a fused (10A) jumper wire for several seconds between stability assist module pin 24, circuit 9-CF68 (BN/RD), harness side, and the positive battery post, while observing the brake pedal for movement.

● Does the brake pedal move?

→ **Yes**
 INSTALL a new stability assist module. REFER to [Anti-Lock Brake System \(ABS\) Module—Stability Assist](#). REPEAT the self-test.

→ **No**
 INSTALL a new brake booster. REFER to [Section 206-07](#). CLEAR the DTCs. RECALIBRATE the stability assist module. REPEAT the self-test.

PINPOINT TEST L: DTC C1287 — BOOSTER PEDAL FORCE SWITCH CIRCUIT FAILURE

CONDITIONS	DETAILS/RESULTS/ACTIONS
L1 CARRY OUT THE RECALIBRATION PROCEDURE	
<p>1</p> 	

2



Clear DTC

4



Retrieve DTCs

3

Carry out the brake booster recalibration procedure using the NGS Tester.

● Are any DTCs retrieved or does the recalibration procedure indicate a fault?

→ Yes

If DTC C1287 is retrieved or recalibration procedure indicates a fault, GO to [L2](#).

If any other DTC, GO to the Stability Assist Module Diagnostic Trouble Code (DTC) Index.

→ No

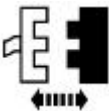
The stability assist system is operating correctly.

L2 CHECK THE NORMALLY CLOSED RELEASE SWITCH

1

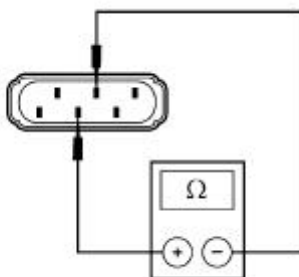


2



Brake Booster C149

3



A0002759

3

Measure the resistance between brake booster pin 2 (component side) and brake booster pin 5 (component side), while depressing and releasing the brake pedal.

● Is the resistance less than 5 ohms when the brake pedal is pressed

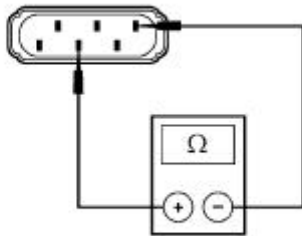
and greater than 10,000 ohms when the brake pedal is released?

→ **Yes**
GO to [L3](#).

→ **No**
INSTALL a new brake booster. REFER to [Section 206-07](#). CLEAR the DTCs. RECALIBRATE the stability assist module. REPEAT the self-test.

L3 CHECK THE NORMALLY OPEN RELEASE SWITCH

1



A0002758

1

Measure the resistance between brake booster pin 1 (component side) and brake booster pin 5 (component side), while depressing and releasing the brake pedal.

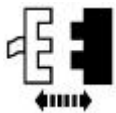
- Is the resistance less than 5 ohms with the brake pedal depressed and greater than 10,000 ohms with the brake pedal released?

→ **Yes**
GO to [L4](#).

→ **No**
INSTALL a new brake booster. REFER to [Section 206-07](#). CLEAR the DTCs. RECALIBRATE the stability assist module. REPEAT the self-test.

L4 CHECK THE BRAKE BOOSTER CIRCUITRY FOR SHORT TO POWER

1



Stability Assist Module C155

2

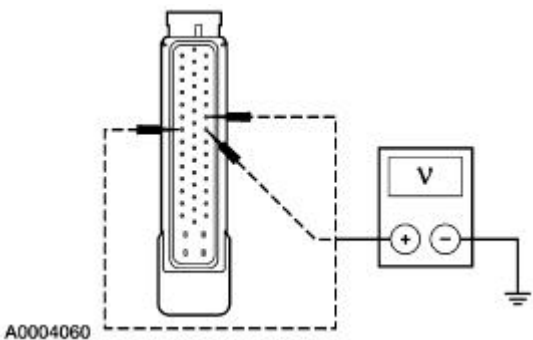


3

3

Measure the voltage between stability assist module C155 pins, harness side, and ground, as follows:

Stability Assist Module C155	Circuit
------------------------------	---------



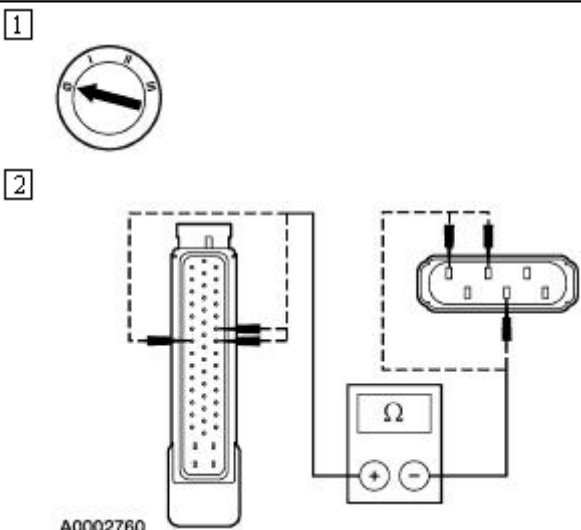
A0004060

Pin 40	9-CF51 (BN/GN)
Pin 7	10-CF51 (GY/OG)
Pin 6	8-CF51 (WH/GN)

● Is any voltage present?

- **Yes**
REPAIR the circuit in question. CLEAR the DTC. RECALIBRATE the stability assist module. REPEAT the self-test.
- **No**
GO to [L5](#).

L5 CHECK THE BRAKE BOOSTER CIRCUITRY



A0002760





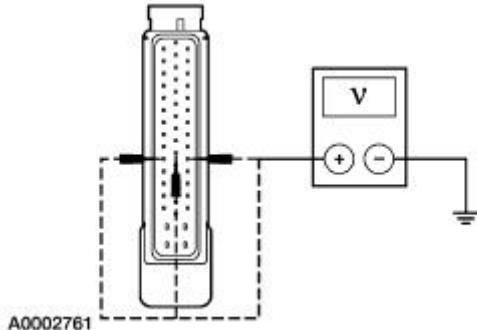
2 Measure the resistance between stability assist module C155 pins, harness side, and brake booster C149 pins, harness side, as follows:

Stability Assist Module C155	Brake Booster C149	Circuit
Pin 40	Pin 5	9-CF51 (BN/GN)
Pin 7	Pin 2	10-CF51 (GY/OG)
Pin 6	Pin 1	8-CF51 (WH/GN)

● Are the resistances less than 5 ohms?

- **Yes**
INSTALL a new stability assist module. REFER to [Anti-Lock Brake System \(ABS\) Module—Stability Assist](#). REPEAT the self-test.
- **No**
REPAIR the circuit in question. CLEAR the DTC. RECALIBRATE the stability assist module. REPEAT the self-test.

PINPOINT TEST M: DTC C1288—PRESSURE TRANSDUCER MAIN/PRIMARY INPUT CIRCUIT FAILURE

CONDITIONS	DETAILS/RESULTS/ACTIONS								
<p>NOTE: When diagnosing this DTC, the main/primary pressure transducer is the C147 pin 1, Circuit 9-CF64 (BN/YE). The pressure transducer connectors can be connected to either the main or the redundant pressure transducer and still operate correctly, therefore the wire color must be looked at before continuing diagnostics.</p>									
<p>M1 CHECK MAIN/PRIMARY PRESSURE TRANSDUCER CIRCUITRY FOR SHORT TO POWER</p>									
<p>1 </p> <p>2  Stability Assist Module C155</p> <p>3  Main/Primary Pressure Transducer C147</p> <p>4 </p> <p>5  A0002761</p>	<p>5 Measure the voltage between stability assist module C155 pins, harness side, and ground as follows:</p> <table border="1"> <thead> <tr> <th>Stability Assist Module C155</th> <th>Circuit</th> </tr> </thead> <tbody> <tr> <td>Pin 43</td> <td>9-CF64 (BN/YE)</td> </tr> <tr> <td>Pin 26</td> <td>8-CF64 (WH/BK)</td> </tr> <tr> <td>Pin 10</td> <td>7-CF64 (YE/BK)</td> </tr> </tbody> </table> <p>• Is any voltage present?</p> <p>→ Yes REPAIR the circuit in question. CLEAR the DTCs. REPEAT the self-test.</p> <p>→ No</p>	Stability Assist Module C155	Circuit	Pin 43	9-CF64 (BN/YE)	Pin 26	8-CF64 (WH/BK)	Pin 10	7-CF64 (YE/BK)
Stability Assist Module C155	Circuit								
Pin 43	9-CF64 (BN/YE)								
Pin 26	8-CF64 (WH/BK)								
Pin 10	7-CF64 (YE/BK)								

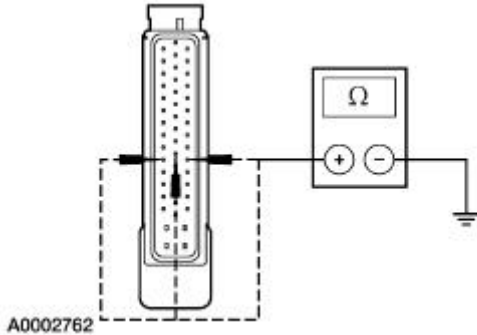
GO to [M2](#).

M2 CHECK MAIN/PRIMARY PRESSURE TRANSDUCER CIRCUITRY FOR SHORT TO GROUND

1



2



2

Measure the resistance between stability assist module C155 pins, harness side, and ground, as follows:

Stability Assist Module C155	Circuit
Pin 43	9-CF64 (BN/YE)
Pin 26	8-CF64 (WH/BK)
Pin 10	7-CF64 (YE/BK)

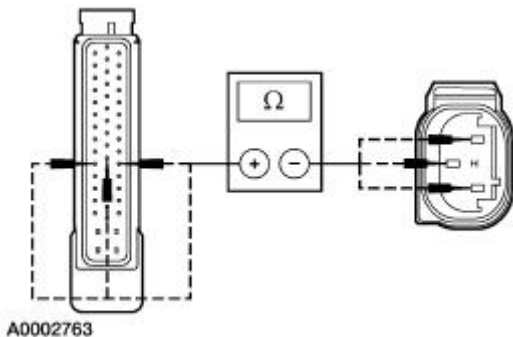
● Is the resistance greater than 10,000 ohms?

→ **Yes**
GO to [M3](#).

→ **No**
REPAIR the circuit in question. CLEAR the DTCs. REPEAT the self-test.

M3 CHECK MAIN/PRIMARY PRESSURE TRANSDUCER CIRCUITRY FOR AN OPEN

1



1

Measure the resistance between stability assist module C155 pins, harness side, and main/primary pressure transducer C147 pins, harness side, as follows:

Stability Assist Module C155	Main/Primary Pressure Transducer C147	Circuit
Pin 43	Pin 1	9-CF64 (BN/YE)
Pin 26	Pin 2	8-CF64 (WH/BK)
Pin 10	Pin 3	7-CF64 (YE/BK)

● Is the resistance less than 5 ohms?

→ **Yes**
GO to [M4](#).

→ **No**
REPAIR the circuit in question. CLEAR the DTCs. REPEAT the self-test.

M4 CHECK THE STABILITY ASSIST MODULE OUTPUT

1

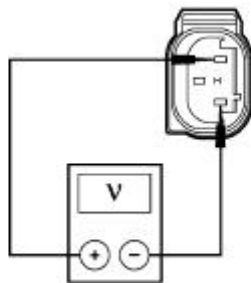


Stability Assist Module C155

2



3



A0002764

3 Measure the voltage between main/primary pressure transducer C147 pin 3, circuit 7-CF64 (YE/BK), harness side, and main/primary pressure transducer C147 pin 1, circuit 9-CF64 (BN/YE), harness side.

- Is the voltage approximately 5 volts?

→ **Yes**
GO to [M5](#).

→ **No**
INSTALL a new stability assist module. REFER to [Anti-Lock Brake System \(ABS\) Module—Stability Assist](#). REPEAT the self-test.

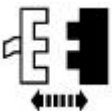
M5 CHECK THE MAIN/PRIMARY PRESSURE TRANSDUCER OUTPUT

1



Main/Primary Pressure Transducer C147

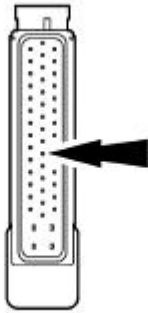
2



Stability Assist Module C155

3

3 Back out the stability assist module C155 pin 26, circuit 8-CF64 (WH/BK), harness side.



A0002765

4

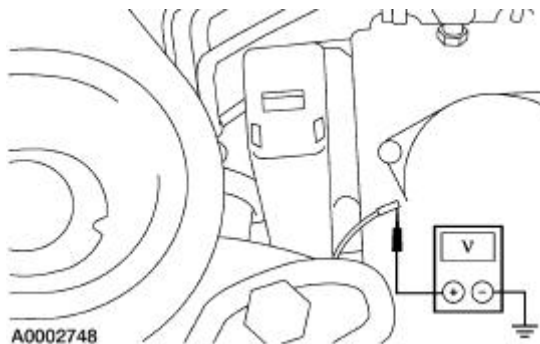


Stability Assist Module C155

5



6



A0002748

6 Measure the voltage between stability assist module back out pin 26, circuit 8-CF64 (WH/BK), harness side, and ground, while depressing and releasing the brake pedal.

- Is the voltage between 0.125 and 0.375 volt with the brake pedal released and between 0.125 and 5 volts with the brake pedal depressed?

→ **Yes**
INSTALL a new stability assist module. REFER to [Anti-Lock Brake System \(ABS\) Module—Stability Assist](#). REPEAT the self-test.

→ **No**
INSTALL a new main/primary pressure transducer. REFER to [Transducer—Primary](#). CLEAR the DTC. RECALIBRATE the stability assist module. REPEAT the self-test.

PINPOINT TEST N: DTC C1289—PRESSURE TRANSDUCER REDUNDANT/SECONDARY INPUT CIRCUIT FAILURE

CONDITIONS

DETAILS/RESULTS/ACTIONS

NOTE: When diagnosing this DTC, the main/primary pressure transducer is the C148 pin 1, circuit 9-CF65 (BN/WH). The pressure transducer connectors can be connected to either the main or the redundant pressure transducer and still operate correctly, therefore the wire color must be looked at before continuing diagnostics.

N1 CHECK REDUNDANT/SECONDARY PRESSURE TRANSDUCER CIRCUITRY FOR SHORT TO POWER

1



2



Stability Assist Module C155

3

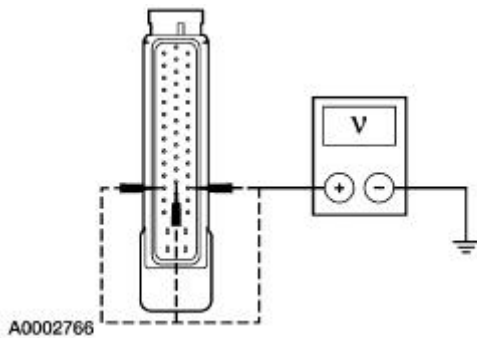


Redundant/Secondary Pressure Transducer C148

4



5



5 Measure the voltage between stability assist module C155 pins, harness side, and ground, as follows:

Stability Assist Module C155	Circuit
Pin 45	9-CF65 (BN/WH)
Pin 28	8-CF65 (WH/VT)
Pin 12	7-CF65 (YE/VT)

● **Is any voltage present?**

→ **Yes**
REPAIR the circuit in question. CLEAR the DTCs. REPEAT the self-test.

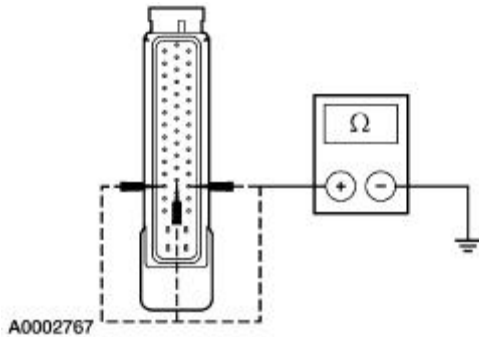
→ **No**
GO to [N2](#).

N2 CHECK REDUNDANT/SECONDARY PRESSURE TRANSDUCER CIRCUITRY FOR SHORT TO GROUND

1



2



2

Measure the resistance between stability assist module C155 pins, harness side, and ground, as follows:

Stability Assist Module C155	Circuit
Pin 45	9-CF65 (BN/WH)
Pin 28	8-CF65 (WH/VT)
Pin 12	7-CF65 (YE/VT)

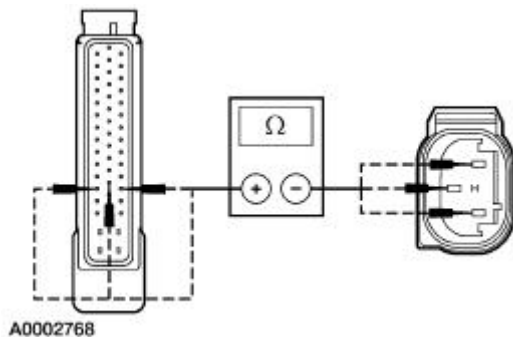
● Is the resistance greater than 10,000 ohms?

→ **Yes**
GO to [N3](#).

→ **No**
REPAIR the circuit in question. CLEAR the DTCs. REPEAT the self-test.

N3 CHECK REDUNDANT/SECONDARY PRESSURE TRANSDUCER CIRCUITRY FOR AN OPEN

1



1

Measure the resistance between stability assist module C155 pins, harness side and redundant/secondary pressure transducer C148 pins, harness side as follows:

Stability Assist Module C155	Redundant/Secondary-Pressure-Transducer-C148	Circuit
Pin 45	Pin 1	9-CF65 (BN/WH)
Pin 28	Pin 2	8-CF65 (WH/VT)
Pin 12	Pin 3	7-CF65 (YE/VT)

● Is the resistance less than 5 ohms?

→ **Yes**
GO to [N4](#).

→ **No**
REPAIR the circuit in question. CLEAR

the DTCs. REPEAT the self-test.

N4 CHECK THE STABILITY ASSIST MODULE OUTPUT

1

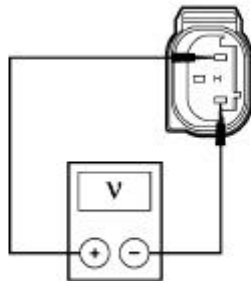


Stability Assist Module C155

2



3



A0002764

3 Measure the voltage between redundant/secondary pressure transducer C148 pin 3, circuit 7-CF65 (YE/VT), harness side, and redundant/secondary pressure transducer C148 pin 1, circuit 9-CF65 (BN/WH), harness side.

● Is the voltage approximately 5 volts?

→ Yes
GO to [N5](#).

→ No
INSTALL a new stability assist module. REFER to [Anti-Lock Brake System \(ABS\) Module—Stability Assist](#). REPEAT the self-test.

N5 CHECK THE REDUNDANT/SECONDARY PRESSURE TRANSDUCER OUTPUT

1



Redundant/Secondary Pressure Transducer C148

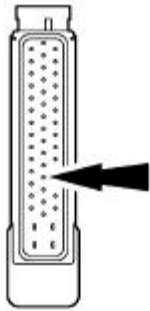
2



Stability Assist Module C155

3

3 Back out the stability assist module C155 pin 28, circuit 8-CF65 (WH/VT), harness side.



A0002769

4

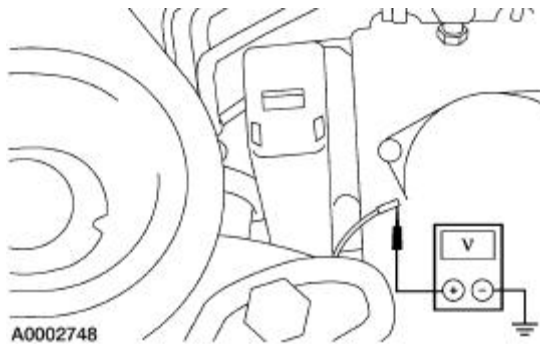


Stability Assist Module C155

5



6



A0002748


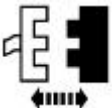
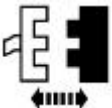

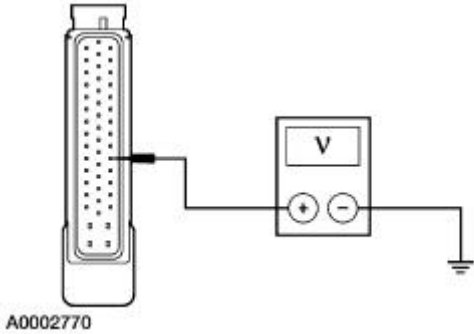


6 Measure the voltage between stability assist module back out pin 28, circuit 8-CF65 (WH/VT), harness side, and ground, while depressing and releasing the brake pedal.

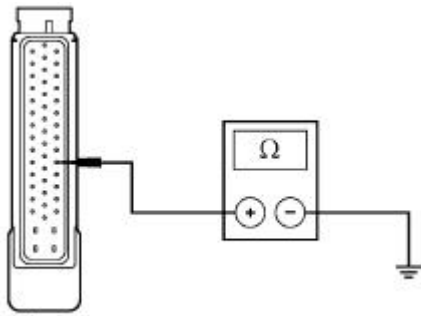
- Is the voltage between 0.125 and 0.375 volt with the brake pedal released and between 0.125 and 5 volts with the brake pedal depressed?

→ **Yes**
INSTALL a new stability assist module. REFER to [Anti-Lock Brake System \(ABS\) Module—Stability Assist](#). REPEAT the self-test.

→ **No**
INSTALL a new secondary pressure transducer. REFER to [Transducer—Secondary](#). CLEAR the DTCs. RECALIBRATE the stability assist module. REPEAT the self-test.

PINPOINT TEST O: DTC C1730 — REFERENCE VOLTAGE OUT OF RANGE (+5 V)

CONDITIONS	DETAILS/RESULTS/ACTIONS
O1 CHECK CIRCUIT 7-CF64 (YE/BK) FOR SHORT TO BATTERY	
<p>1 </p> <p>2  Stability Assist Module C155</p> <p>3  Main/Primary Pressure Transducer C147</p> <p>4 </p> <p>5  A0002770</p>	<p>5 Measure the voltage between stability assist module C155 pin 10, circuit 7-CF64 (YE/BK), harness side, and ground.</p> <p>● Is any voltage present?</p> <p>→ Yes REPAIR the circuit. CLEAR the DTCs. RECALIBRATE the stability assist module. REPEAT the self-test.</p> <p>→ No GO to O2.</p>
O2 CHECK CIRCUIT 7-CF64 (YE/BK) FOR SHORT TO GROUND	
<p>1 </p> <p>2 </p>	<p>2 Measure the resistance between stability assist module C155 pin 10, circuit 7-CF64 (YE/BK), harness side, and ground.</p>



A0002771

- Is the resistance greater than 10,000 ohms?

- **Yes**
GO to [O3](#).
- **No**
REPAIR the circuit. CLEAR the DTC. RECALIBRATE the stability assist module. REPEAT the self-test.

O3 CHECK CIRCUIT 7-CF65 (YE/VT) FOR SHORT TO BATTERY

1

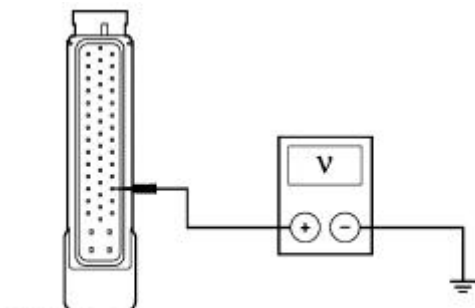


Redundant/Secondary Pressure Transducer C148

2



3



A0002772

- 3 Measure the voltage between stability assist module C155 pin 12, circuit 7-CF65 (YE/VT), harness side, and ground.

- Is any voltage present?

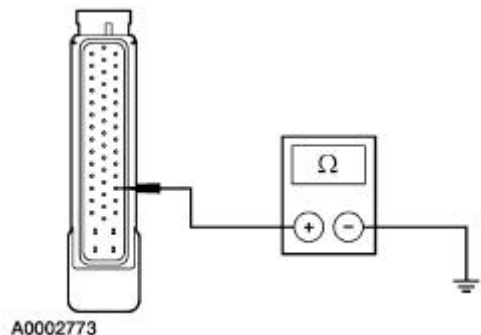
- **Yes**
REPAIR the circuit. CLEAR the DTC. RECALIBRATE the stability assist module. REPEAT the self-test.
- **No**
GO to [O4](#).

O4 CHECK CIRCUIT 7-CF65 (YE/VT) FOR SHORT TO GROUND

1



2



2

Measure the resistance between stability assist module C155 pin 12, circuit 7-CF65 (YE/VT), harness side, and ground.

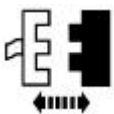
- Is the resistance greater than 10,000 ohms?

→ **Yes**
GO to [O5](#).

→ **No**
REPAIR the circuit. CLEAR the DTC. RECALIBRATE the stability assist module. REPEAT the self-test.

O5 CHECK CIRCUIT 7-CF66 (YE/BU) FOR SHORT TO BATTERY

1

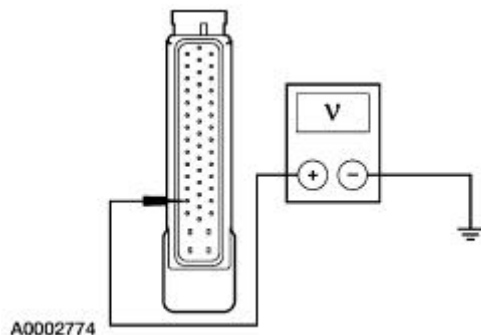


Lateral Accelerometer C244

2



3



3

Measure the voltage between stability assist module C155 pin 46, circuit 7-CF66 (YE/BU), harness side, and ground.

- Is any voltage present?

→ **Yes**
REPAIR the circuit. CLEAR the DTC.

RECALIBRATE the stability assist module. REPEAT the self-test.

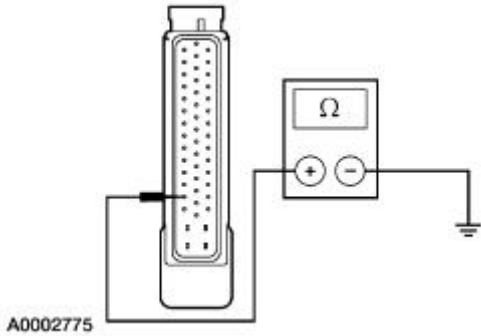
→ **No**
GO to [O6](#).

O6 CHECK CIRCUIT 7-CF66 (YE/BU) FOR SHORT TO GROUND

1



2



2 Measure the resistance between stability assist module C155 pin 46, circuit 7-CF66 (YE/BU), harness side, and ground.

● **Is the resistance greater than 10,000 ohms?**

→ **Yes**
GO to [O7](#).

→ **No**
REPAIR the circuit. CLEAR the DTC. RECALIBRATE the stability assist module. REPEAT the self-test.

O7 CHECK CIRCUIT 7-CF67 (YE/RD) FOR SHORT TO BATTERY

1



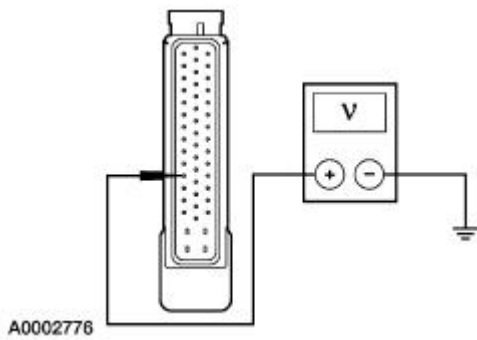
Yaw Rate Sensor C245

2



3

3 Measure the voltage between stability assist module C155 pin 44, circuit 7-CF67 (YE/RD), harness side, and ground.

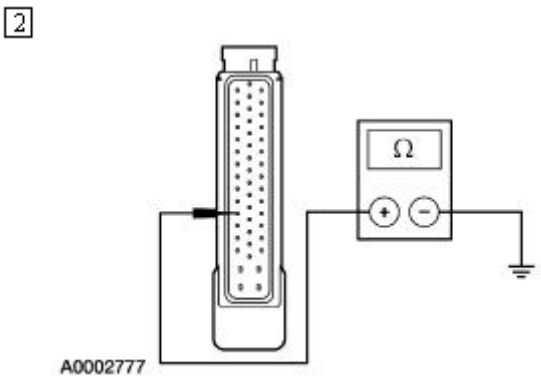
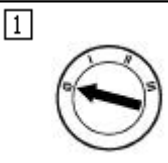


● Is any voltage present?

→ **Yes**
REPAIR the circuit. CLEAR the DTC. RECALIBRATE the stability assist module. REPEAT the self-test.

→ **No**
GO to [O8](#).

O8 CHECK CIRCUIT 7-CF66 (YE/BU) FOR SHORT TO GROUND



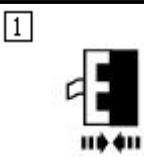
2 Measure the resistance between stability assist module C155 pin 44, circuit 7-CF67 (YE/RD), harness side, and ground.

● Is the resistance greater than 10,000 ohms?




→ **Yes**
GO to [O9](#).

→ **No**
REPAIR the circuit. CLEAR the DTC. RECALIBRATE the stability assist module. REPEAT the self-test.

O9 CHECK THE STABILITY ASSIST MODULE



Stability Assist Module C155




<p>2 </p> <p>3 </p> <p>Clear DTCs</p> <p>4 </p> <p>Retrieve DTCs</p>	<ul style="list-style-type: none"> ● Is DTC C1730 retrieved? <p>→ Yes INSTALL a new stability assist module. REFER to Anti-Lock Brake System (ABS) Module—Stability Assist. REPEAT the self-test.</p> <p>→ No GO to O10.</p>
---	---

O10 CHECK THE STABILITY ASSIST COMPONENTS


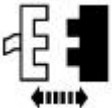

	<p>1 Reconnect the lateral accelerometer C244, yaw rate sensor C245, main/primary pressure transducer C147, and redundant/secondary pressure transducer C148 one at a time while clearing the DTCs and retrieving the DTCs in between each component being reconnected.</p> <ul style="list-style-type: none"> ● Is DTC C1730 retrieved? <p>→ Yes INSTALL a new component as necessary. CLEAR the DTCs. RECALIBRATE the stability assist module. REPEAT the self-test.</p> <p>→ No System is OK.</p>
--	---




PINPOINT TEST P: DTC C1960 — DRIVER BRAKE APPLY CIRCUIT FAULT

CONDITIONS	DETAILS/RESULTS/ACTIONS
P1 CHECK FOR OTHER DTCs	


<p>1 </p> <p>2  Clear DTCs</p> <p>3  Retrieve DTCs</p>	<p>● Is DTC C1960 retrieved?</p> <p>→ Yes INSTALL a new REM. REFER to Section 419-10. CLEAR the DTCs. REPEAT the self-test.</p> <p>→ No If a different DTC is retrieved, GO to the Stability Assist Module Diagnostic Trouble Code (DTC) Index.</p> <p>If no DTCs are retrieved, system is OK.</p>
---	---

PINPOINT TEST Q: THE YELLOW ABS WARNING INDICATOR DOES NOT SELF-CHECK

CONDITIONS	DETAILS/RESULTS/ACTIONS
Q1 CHECK THE YELLOW ANTI-LOCK BRAKE WARNING INDICATOR	
<p>1 </p> <p>2  Stability Assist Module C155</p> <p>3 </p>	<p>● Is the yellow anti-lock brake warning indicator illuminated?</p>

	<p>→ Yes GO to Q2.</p> <p>→ No REFER to Section 413-01.</p>
Q2 CHECK PROVE OUT	
<p>1 </p> <p>2  Stability Assist Module C162</p> <p>3 </p>	<p>● Does the yellow anti-lock brake warning indicator prove out for three seconds and then turn off?</p> <p>→ Yes The yellow anti-lock brake warning indicator is working correctly. TEST the system for normal operation.</p> <p>→ No INSTALL a new stability assist module. REFER to Anti-Lock Brake System (ABS) Module—Stability Assist. TEST the system for normal operation.</p>

PINPOINT TEST R: THE TRACTION CONTROL IS INOPERATIVE

CONDITIONS	DETAILS/RESULTS/ACTIONS
R1 CHECK FOR DTCS	
<p>1  NGS Tester</p>	<p>2 Retrieve and document continuous DTCs.</p> <p>● Are any DTCs retrieved?</p> <p>→ Yes GO to the Stability Assist Module Diagnostic Trouble Code (DTC) Index.</p>

→ **No**
GO to [R2](#).

R2 CHECK THE ABS OPERATION

- 1 Test drive the vehicle and carry out several anti-lock stops.
- **Does the ABS operate correctly?**
- **Yes**
GO to [R3](#).
- **No**
GO to the Symptom Chart.

R3 CHECK THE TRACTION CONTROL OFF INPUT TO THE STABILITY ASSIST MODULE FOR SHORT TO POWER

1



2

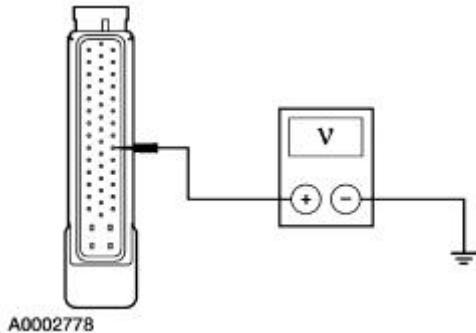


Stability Assist Module C155

3



4




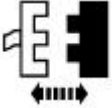

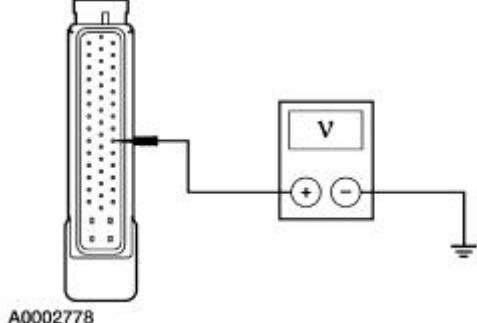
- 4 Measure the voltage between stability assist module C155 pin 9, circuit 8-CF54 (BK/GN), harness side, and ground.

- **Is any voltage present?**


→ **Yes**
GO to [R4](#).

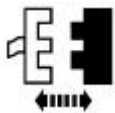
→ **No**
INSTALL a new stability assist module. REFER to [Anti-Lock Brake System \(ABS\) Module—Stability Assist](#). TEST the system for normal operation.

R4 CHECK CIRCUIT 8-CF54 (BK/GN) FOR SHORT TO POWER

<p>1 </p> <p>2  Traction Control Switch C308</p> <p>3 </p> <p>4  A0002778</p>	<p>4 Measure the voltage between stability assist module C155 pin 9, circuit 8-CF54 (BK/GN), harness side, and ground.</p> <ul style="list-style-type: none"> • Is any voltage present? <p>→ Yes REPAIR the circuit. TEST the system for normal operation.</p> <p>→ No INSTALL a new traction control actuator. REFER to Traction Control Actuator—Advance Trac. TEST the system for normal operation.</p>
--	---

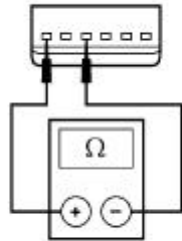
PINPOINT TEST S: THE STABILITY ASSIST/TRACTION CONTROL SWITCH INDICATOR IS NEVER/ALWAYS ON

CONDITIONS	DETAILS/RESULTS/ACTIONS
<p>S1 CHECK THE TRACTION CONTROL SWITCH</p> <p>1 </p> <p>2</p>	



Traction Control Switch C308

3



A0002337

3

Measure the resistance between traction control switch pin 1 (component side), and traction control switch pin 3 (component side).

- Is the resistance approximately 32 ohms?

→ **Yes**
GO to [S2](#).

→ **No**
INSTALL a new traction control actuator. REFER to [Traction Control Actuator—Advance Trac](#) . CLEAR the DTC. REPEAT the self-test.

S2 CHECK CIRCUIT 31S-CF45 (BK/GN) FOR SHORT TO POWER

1

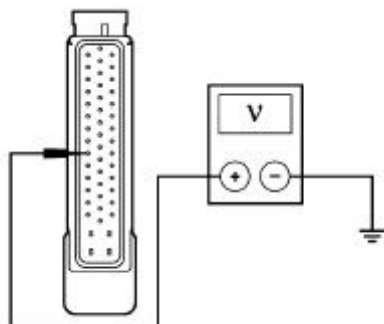


Stability Assist Module 155

2



3



A0002779

3

Measure the voltage between stability assist module C155 pin 42, circuit 31S-CF45 (BK/GN), harness side, and ground.

- Is any voltage present?

→ **Yes**

REPAIR the circuit. CLEAR the DTC.
REPEAT the self-test.

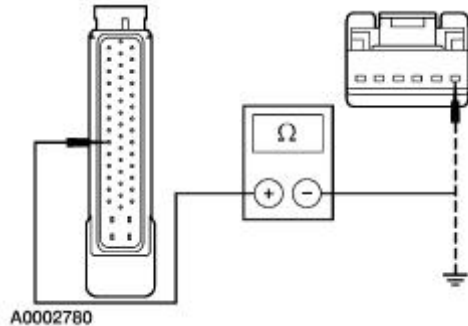
→ **No**
GO to [S3](#).

S3 CHECK CIRCUIT 31S-CF45 (BK/GN)

1



2



2



Measure the resistance between stability assist module C155 pin 42, circuit 31S-CF45 (BK/GN), harness side and traction control switch C308 pin 1, circuit 31S-CF45 (BK/GN), harness side; and between stability assist module C155 pin 42, circuit 31S-CF45 (BK/GN), harness side and ground.

- **Is the resistance less than 5 ohms between the stability assist module and traction control switch; and greater than 10,000 ohms between stability assist module and ground?**

→ **Yes**
INSTALL a new stability assist module. REFER to [Anti-Lock Brake System \(ABS\) Module—Stability Assist](#). CLEAR the DTC. REPEAT the self-test.

→ **No**
REPAIR the circuit. CLEAR the DTC. REPEAT the self-test.

PINPOINT TEST T: THE STABILITY ASSIST SYSTEM CANNOT BE DISABLED

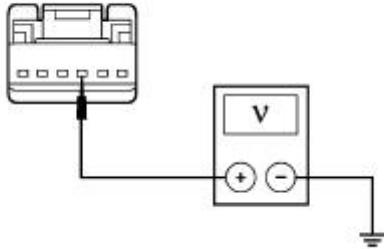
CONDITIONS	DETAILS/RESULTS/ACTIONS
T1 CHECK CIRCUIT 15-CF54 (GN/WH) FOR AN OPEN	
<p>1</p>  <p>2</p> 	

Traction Control Switch C308

3



4



A0001933

4

Measure the voltage between traction control switch C308 pin 3, circuit 15-CF54 (GN/WH), harness side, and ground.

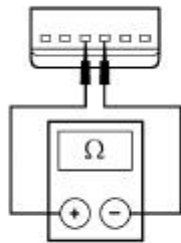
• Is the voltage greater than 10 volts?

→ **Yes**
GO to [T2](#).

→ **No**
REPAIR circuit 15-CF54 (GN/WH) or circuit 15-DA5 (GN/OG). TEST the system for normal operation.

T2 CHECK THE TRACTION CONTROL SWITCH

1



A0001934

1

Measure the resistance between traction control switch pin 3 (component side), and traction control switch pin 4 (component side), while depressing the traction control switch.

• Is the resistance less than 5 ohms?

→ **Yes**
GO to [T3](#).

→ **No**
INSTALL a new traction control actuator. REFER to [Traction Control Actuator—Advance Trac](#). TEST the system for normal operation.

T3 CHECK CIRCUIT 8-CF54 (WH/VT) FOR AN OPEN

1

2

Stability Assist Module C155

3

A0002781


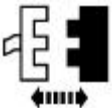
3 Measure the resistance between stability assist module pin 9, circuit 8-CF54 (WH/VT), harness side, and traction control switch C308 pin 4, circuit 8-CF54 (WH/VT), harness side.

- Is the resistance less than 5 ohms?

→ **Yes**
 INSTALL a new stability assist module. REFER to [Anti-Lock Brake System \(ABS\) Module—Stability Assist](#). TEST the system for normal operation.

→ **No**
 REPAIR the circuit. TEST the system for normal operation.

PINPOINT TEST U: THE STABILITY ASSIST INDICATOR DOES NOT SELF-CHECK

CONDITIONS	DETAILS/RESULTS/ACTIONS
U1 CHECK THE STABILITY ASSIST INDICATOR	
<p>1</p>  <p>2</p>  <p>Stability Assist Module C155</p> <p>3</p>	



● Is the stability assist indicator illuminated?

→ **Yes**
GO to [U2](#).

→ **No**
REFER to [Section 413-01](#).

U2 CHECK PROVE OUT

1



2



Stability Assist
Module C162

3



● Does the stability assist indicator prove out for three seconds and then turn off?

→ **Yes**
The stability assist indicator is working correctly. TEST the system for normal operation.

→ **No**
INSTALL a new stability assist module. REFER to [Anti-Lock Brake System \(ABS\) Module—Stability Assist](#). TEST the system for normal operation.

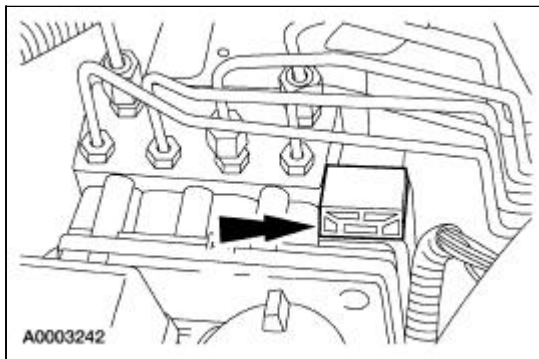
Hydraulic Control Unit (HCU)

Removal and Installation

⚠ WARNING: Brake fluid contains polyglycol ethers and polyglycols. Avoid contact with eyes. Wash hands thoroughly after handling. If brake fluid contacts eyes, flush eyes with running water for 15 minutes. Get medical attention if irritation persists. If taken internally, drink water and induce vomiting. Get medical attention immediately.

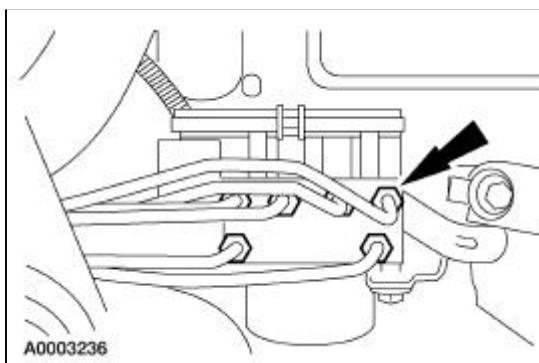
⚠ CAUTION: Brake fluid is harmful to painted and plastic surfaces. If brake fluid is spilled onto a painted or plastic surface, immediately wash it with water.

1. Disconnect the battery ground cable. For additional information, refer to [Section 414-01](#).
2. Disconnect the electrical connector by lifting up on the release tab.

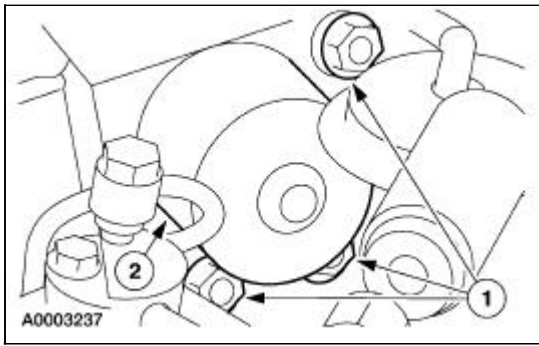



3. **NOTE:** Plug each open port to prevent any brake fluid from spilling.


Disconnect the brake lines from the hydraulic control unit (HCU).




4. Remove the HCU.
 1. Remove the bolts.
 2. Remove the HCU.



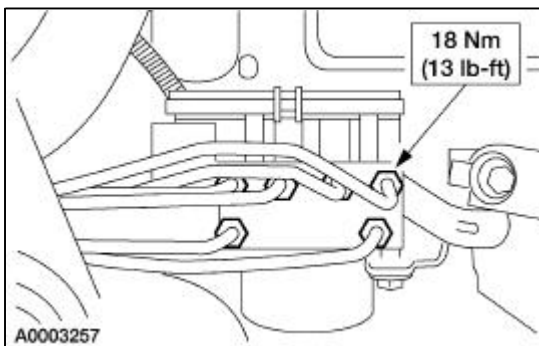
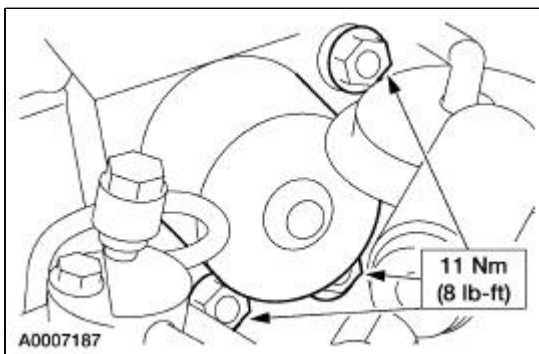
5.  **WARNING:** Brake fluid contains polyglycol ethers and polyglycols. Avoid contact with eyes. Wash hands thoroughly after handling. If brake fluid contacts eyes, flush eyes with running water for 15 minutes. Get medical attention if irritation persists. If taken internally, drink water and induce vomiting. Get medical attention immediately.

 **CAUTION:** Brake fluid is harmful to painted and plastic surfaces. If brake fluid is spilled onto a painted or plastic surface, immediately wash it with water.

 **CAUTION:** After the HCU is installed, it is necessary to bleed the hydraulic brake system. For additional information, refer to [Section 206-00](#).

NOTE: When the battery is disconnected and reconnected, some abnormal drive symptoms may occur while the vehicle relearns its adaptive strategy. The vehicle may need to be driven 16 km (10 mi) or more to relearn the strategy.

To install, reverse the removal procedure.



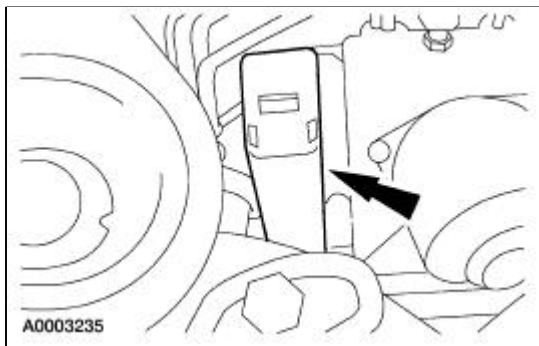
REMOVAL AND INSTALLATION

Anti-Lock Brake System (ABS) Module — Stability Assist

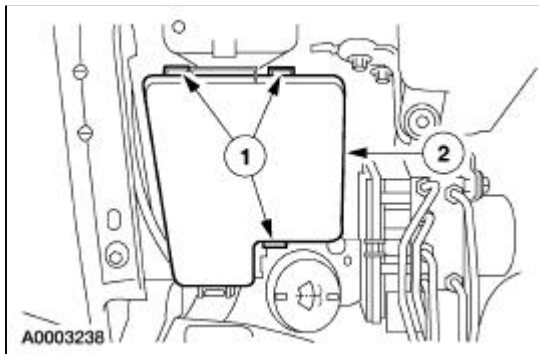
Removal

⚠ CAUTION: Before the module is removed, it is necessary to upload the module configuration information to the New Generation STAR (NGS) tester. For additional information, refer to [Section 418-01](#).

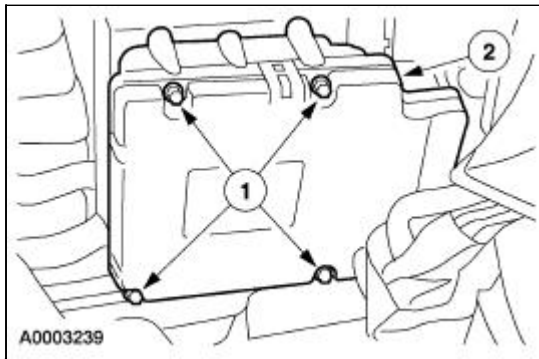
1. Disconnect the battery ground cable.
2. Disconnect the anti-lock brake control module electrical connector by lifting up on the release tab.



3. Position aside the underhood auxiliary junction box (AJB).
 1. Release the underhood AJB clips.
 2. Position the underhood AJB aside.



4. Remove the stability assist control module.
 1. Remove the bolts.
 2. Remove the control module.

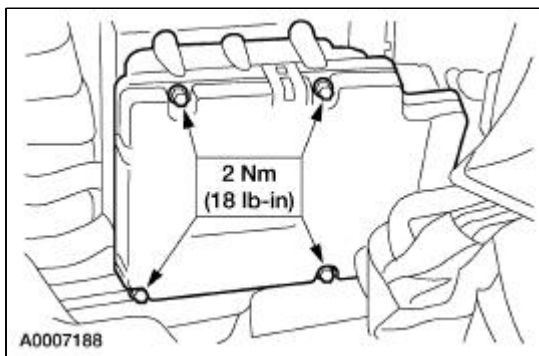


Installation

⚠ CAUTION: Once the new module is installed, it is necessary to download the module configuration information from the New Generation STAR (NGS) Tester into the module. For additional information, refer to [Section 418-01](#).

NOTE: When the battery is disconnected and reconnected, some abnormal drive symptoms may occur while the vehicle relearns its adaptive strategy. The vehicle may need to be driven 16 km (10 mi) or more to relearn the strategy.

1. To install, reverse the removal procedure.



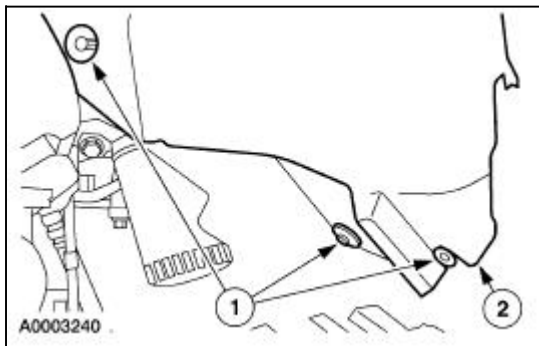
Front Wheel Speed Sensor

Material

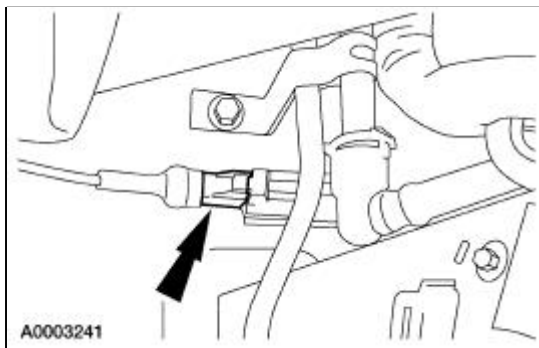
Item	Specification
RTV Silicone Sealant FSTZ-19G204-AB (Canada CXC-114A)	NAVSTR Sealer

Removal and Installation

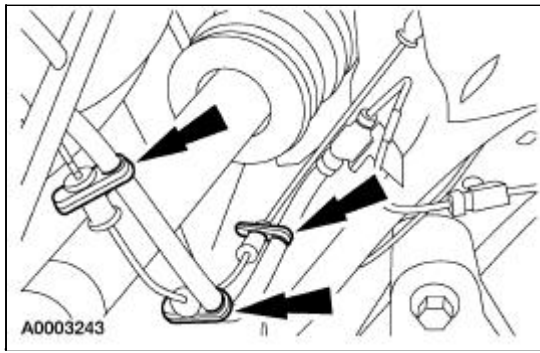
1. Raise and support the vehicle. For additional information, refer to [Section 100-02](#).
2. Position the inner splash shield aside.
 1. Remove the pin-type retainers.
 2. Position the inner splash shield aside.



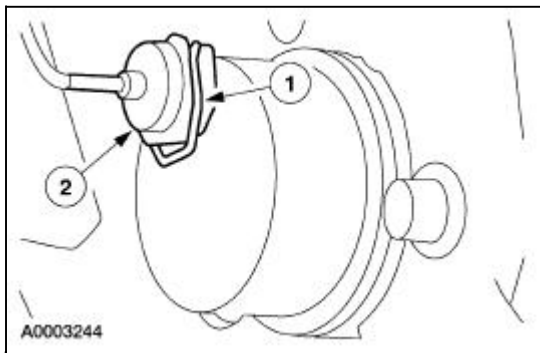
3. Disconnect the anti-lock brake sensor electrical connector.



4. Remove the anti-lock brake sensor harness from the brake hose clips.



5. Remove the anti-lock brake sensor.
 1. Remove the anti-lock brake sensor clip.
 2. Remove the anti-lock brake sensor.



6. **NOTE:** Make sure the anti-lock brake sensor is fully seated before installation of the new clip.

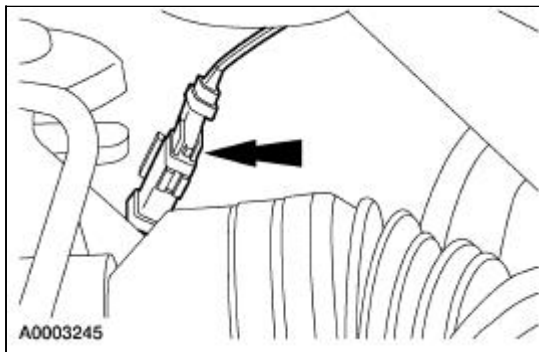
To install, reverse the removal procedure.

- Apply a 2.5 mm (0.1 in) bead of silicone sealant to the outside diameter of the anti-lock brake sensor.
-

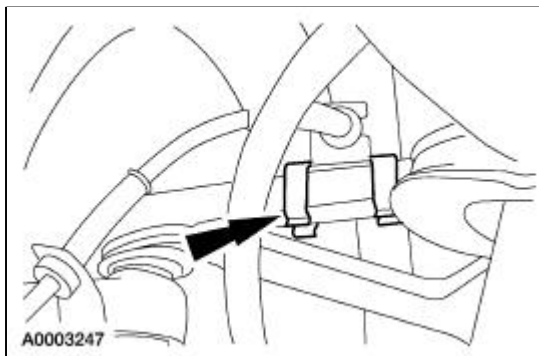
Rear Wheel Speed Sensor

Removal and Installation

1. Raise and support the vehicle. For additional information, refer to [Section 100-02](#).
2. Disconnect the rear anti-lock brake sensor electrical connector.



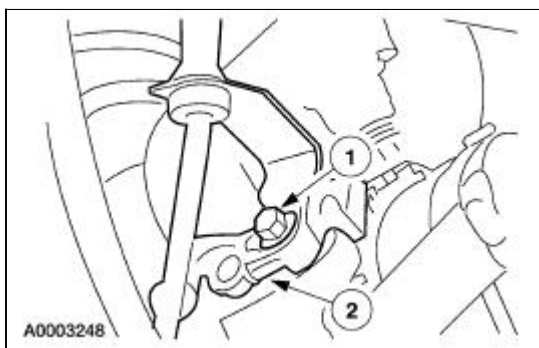
3. Remove the rear anti-lock brake sensor harness from the control arm clips.



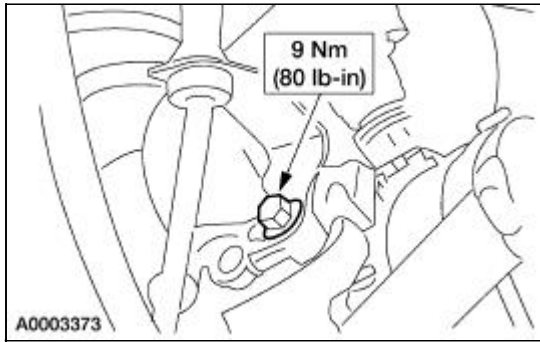
4. **NOTE:** Clean off dirt and foreign material that may have collected around the rear anti-lock brake sensor before removal.

Remove the rear anti-lock brake sensor.

1. Remove the anti-lock brake sensor bolt.
2. Remove the anti-lock brake sensor.



5. To install, reverse the removal procedure.



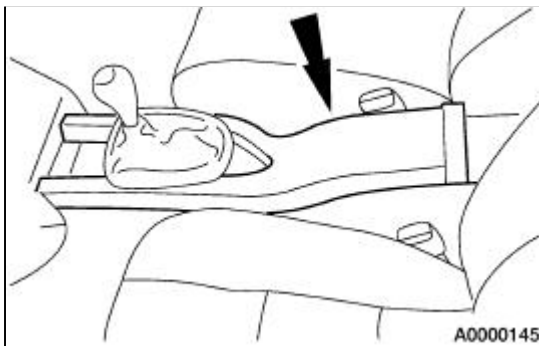
REMOVAL AND INSTALLATION

Yaw Rate Sensor

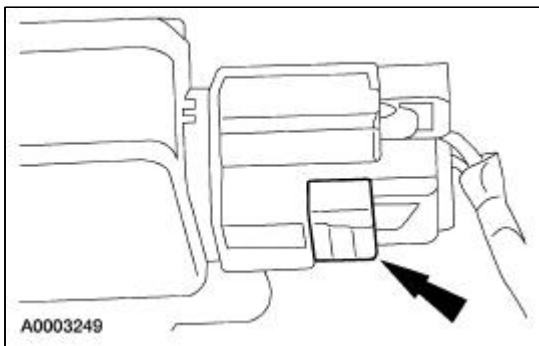
Removal

NOTE: The stability assist module needs to be recalibrated whenever a component is disconnected, moved, or a new component is installed. For additional information regarding the recalibration procedure and when the recalibration procedure should be carried out, refer to Principles of Operation. For additional information regarding the module configuration procedure, refer to [Section 418-01](#).

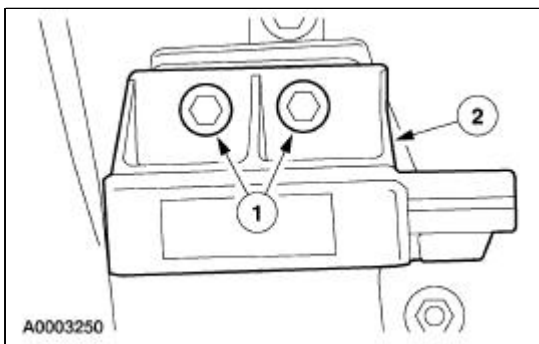
1. Remove the floor console. For additional information, refer to [Section 501-12](#).
2. Remove the center A/C duct.



3. Disconnect the yaw rate sensor electrical connector.



4. Remove the yaw rate sensor.
 1. Remove the yaw rate sensor bolts.
 2. Remove the yaw rate sensor.

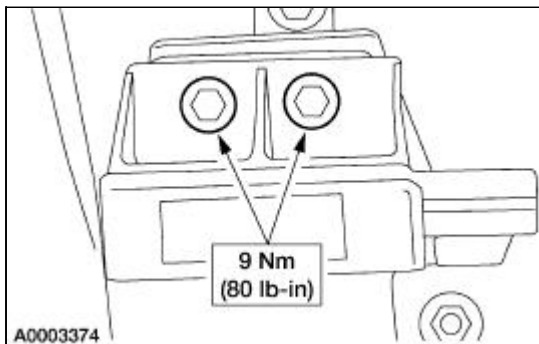


Installation

NOTE: The stability assist module needs to be recalibrated whenever a component is disconnected, moved, or a new component is installed. For additional information regarding the recalibration procedure and when the recalibration procedure should be carried out, refer to Principles of Operation. For additional information regarding the module configuration procedure, refer to [Section 418-01](#).

NOTE: The yaw rate sensor is positioned with the connector pointed to the left side of the vehicle. Be sure to mount the sensor in this orientation during the installation procedure.

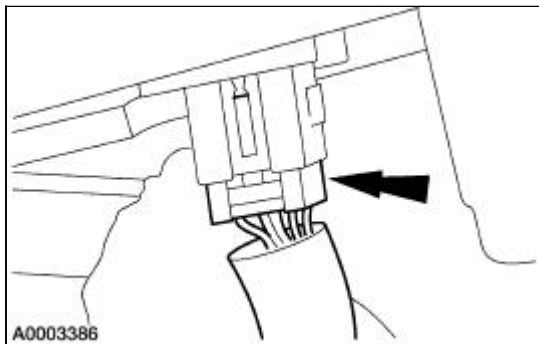
1. To install, reverse the removal procedure.



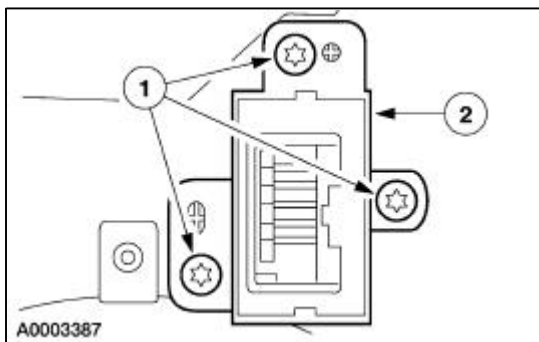
Traction Control Actuator — Advance Trac

Removal

1. Remove the floor console finish panel. For additional information, refer to [Section 501-12](#).
2. Disconnect the Advance Trac control switch electrical connector.



3. Remove the Advance Trac control switch.
 1. Remove the Advance Trac control switch screws.
 2. Remove the Advance Trac control switch.



Installation

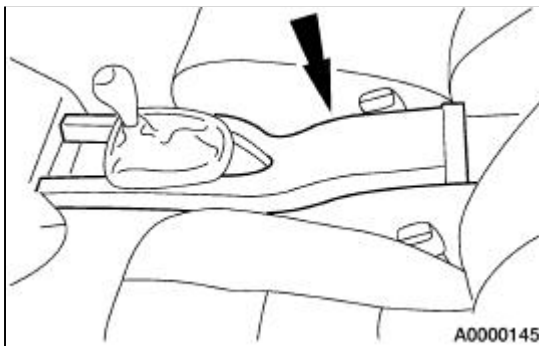
1. To install, reverse the removal procedure.

Accelerometer

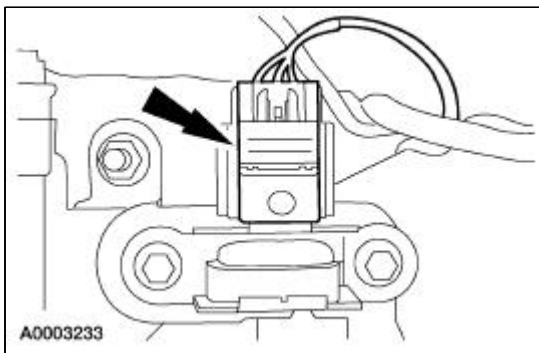
Removal

NOTE: The stability assist module needs to be recalibrated whenever a component is disconnected, moved, or a new component is installed. For additional information regarding the recalibration procedure and when the recalibration procedure should be carried out, refer to Principles of Operation. For additional information regarding the module configuration procedure, refer to [Section 418-01](#).

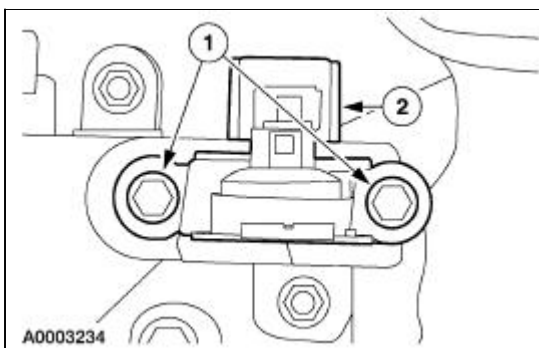
1. Remove the floor console. For additional information, refer to [Section 501-12](#).
2. Remove the console A/C duct.



3. Disconnect the lateral accelerometer electrical connector.



4. Remove the lateral accelerometer.
 1. Remove the lateral accelerometer bolts.
 2. Remove the lateral accelerometer.

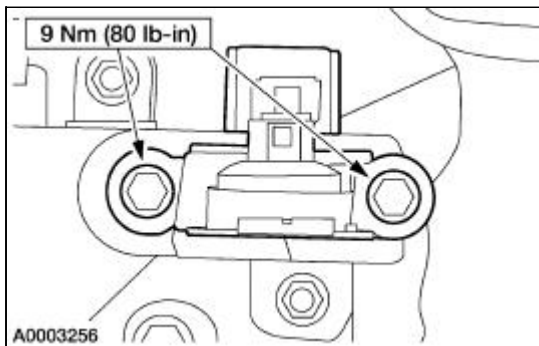


Installation

NOTE: The stability assist module needs to be recalibrated whenever a component is disconnected, moved, or a new component is installed. For additional information regarding the recalibration procedure and when the recalibration procedure should be carried out, refer to Principles of Operation. For additional information regarding the module configuration procedure, refer to [Section 418-01](#).

NOTE: The accelerometer is positioned with the connector pointed to the left side of the vehicle. Be sure to mount the accelerometer in this orientation during the installation procedure.

1. To install, reverse the removal procedure.

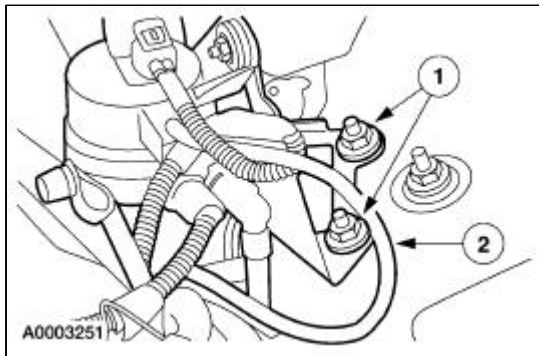


Transducer —Primary

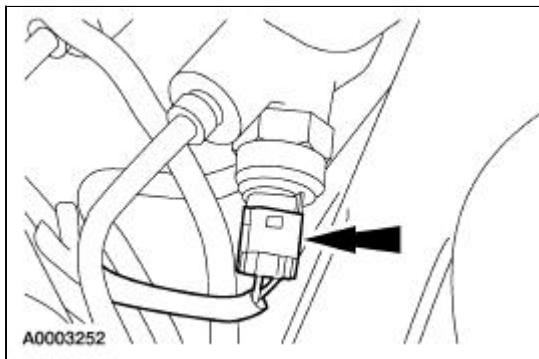
Removal

NOTE: The stability assist module needs to be recalibrated whenever a component is disconnected, moved, or a new component is installed. For additional information regarding the recalibration procedure and when the recalibration procedure should be carried out, refer to Principles of Operation. For additional information regarding the module configuration procedure, refer to [Section 418-01](#).

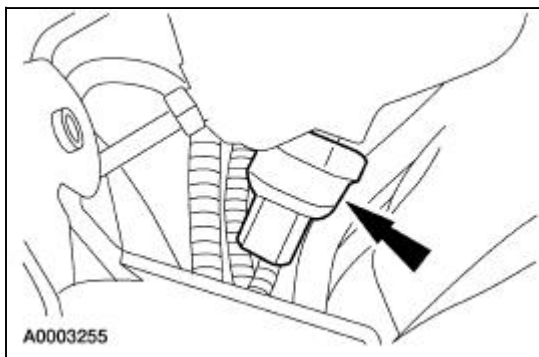
1. Position the vapor management valve aside.
 1. Remove the vapor management valve bracket bolts.
 2. Position the vapor management valve aside.



2. Disconnect the main pressure transducer electrical connector.



3. Remove the main pressure transducer.



Installation

NOTE: The stability assist module needs to be recalibrated whenever a component is disconnected, moved, or a new component is installed. For additional information regarding the recalibration procedure and when the recalibration procedure should be carried out, refer to Principles of Operation. For additional information regarding the module configuration procedure, refer to [Section 418-01](#) .

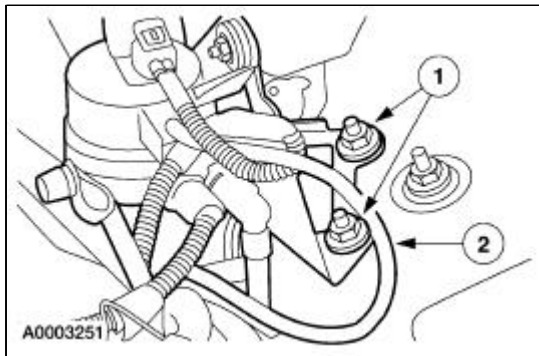
1. To install, reverse the removal procedure.
-

Transducer —Secondary

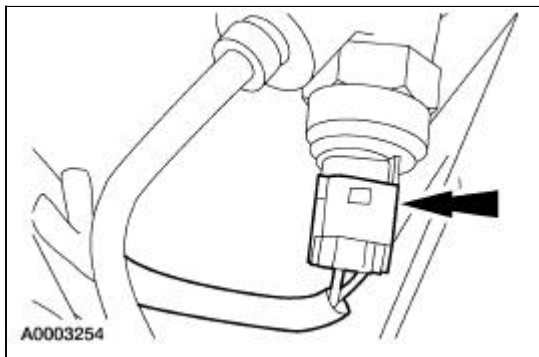
Removal

NOTE: The stability assist module needs to be recalibrated whenever a component is disconnected, moved, or a new component is installed. For additional information regarding the recalibration procedure and when the recalibration procedure should be carried out, refer to Principles of Operation. For additional information regarding the module configuration procedure, refer to [Section 418-01](#).

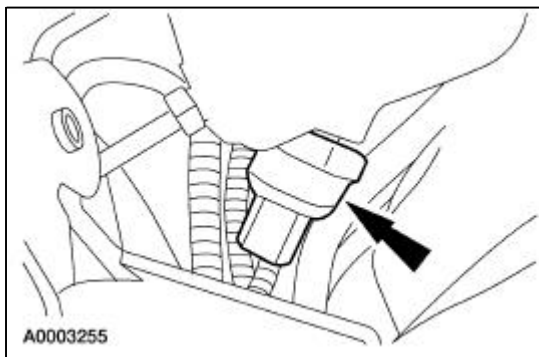
1. Position the vapor management valve aside.
 1. Remove the vapor management valve bracket bolts.
 2. Position the vapor management valve aside.



2. Disconnect the redundant pressure transducer electrical connector.



3. Remove the redundant pressure transducer.



Installation

NOTE: The stability assist module needs to be recalibrated whenever a component is disconnected, moved, or a new component is installed. For additional information regarding the recalibration procedure and when the recalibration procedure should be carried out, refer to Principles of Operation. For additional information regarding the module configuration procedure, refer to [Section 418-01](#) .

1. To install, reverse the removal procedure.
-

General Specifications

Item	Specification
Belt Tension ¹	
Limit mm (in)	16 (0.63)
New belt mm (in)	8-10 (0.31-0.39)
Used belt mm (in)	10-12 (0.39-0.47)
Power Steering Gear Operational Specifications	
Type	Rack and Pinion
Ratio	18:1
Static steering wheel turning effort Nm (lb-in)	3.7 (33)
Turning effort kg (lbs)	1.9 (4.1)
Turns of steering wheel ^a	2.9
Power Steering Reservoir	
Air purge vacuum kPa (in-Hg)	68-85 (20-25)
Power Steering Pump	
Flow	2.4 ± 0.2 gpm @ 50 psi & 1,500 rpm
Minimum capacity	1.4 gpm @ 750 psi @ 500 rpm
Relief pressure psi	1,400–1,530
Lubricants	
Motorcraft MERCON® Multi-Purpose (ATF) Transmission Fluid XT-2-QDX	MERCON®

¹ Power Steering Pump Belt Deflection (98 N [22 lb] Applied Force)

^a Lock to Lock-Linkage Disconnected

Steering System





The power steering system consists of the following components:

- power steering pressure lower hose (3F524)
 - power steering pressure hose (3E576)
 - power steering pump (3A674)
 - power steering pump reservoir (3R700)
 - power steering reservoir pump hose (3E525)
 - power steering return hose (3A713)
 - steering gear (3504)
-

Steering System

Refer to Wiring Diagrams Section [211-00](#) for schematic and connector information.

Special Tool(s)

 <p>ST2332-A</p>	<p>Worldwide Diagnostic System (WDS) 418-F224, New Generation STAR (NGS) Tester 418-F052, or equivalent scan tool</p>
 <p>ST1477-A</p>	<p>Power Steering Analyzer 014-00207 or equivalent</p>
 <p>ST1396-A</p>	<p>Dial Thermometer 0-220°F 023-R0007 or equivalent</p>
 <p>ST1137-A</p>	<p>73 III Automotive Meter 105-R0057 or equivalent</p>

Principles of Operation

Variable Assist Power Steering (VAPS)

The VAPS system controls the level of power assistance available to the driver based on vehicle speed. Below 3.2 km/h (2 mph), full power steering assist is provided to lessen steering efforts and increase maneuverability. Between 3.2 km/h (2 mph) and 191 km/h (119 mph), steering assist will decrease gradually at a calibrated rate to raise steering efforts for increased directional stability and greater road feel. Above 191 km/h (119 mph), steering assist is constant.

The front electronic module (FEM) outputs a pulse-width-modulated (PWM) current to the control valve actuator. The control valve actuator controls the hydraulic valve that determines the amount of hydraulic assist provided to the steering gear. The amount of assistance provided varies with the control valve actuator current, which is based on vehicle speed according to a look-up table internal to the FEM. The FEM pulse-width modulates the control valve actuator current to provide the desired amount of assistance. The amount of hydraulic steering assistance provided by the VAPS subsystem is proportional to the average control valve current.

The vehicle speed is provided to the FEM through the standard corporate protocol (SCP) network from the anti-lock brake system (ABS).

The engine rpm is provided to the FEM through the SCP network from the powertrain control module (PCM). The FEM uses the engine rpm to determine if the engine is running. The FEM will only output control valve actuator current when the engine is running to minimize noise, vibration, or harshness when the engine is off. The FEM will assume the engine is running only if the engine rpm is greater than 100 rpm.

Upon engine start, the FEM will provide a 200 millisecond full-on pulse followed by a 150 millisecond full-off pulse to the control valve actuator. Normal VAPS system operation will begin after this cleaning stroke is complete. In an event that the rpm signal is invalid from the PCM (less than 100 rpm), and the vehicle speed is less than 1.6 km/h (1 mph), the VAPS system will not carry out the cleaning stroke or apply current to the control valve actuator. When the engine speed exceeds 100 rpm, the system carries out the cleaning stroke and begins applying calibrated current to the actuator.

Inspection and Verification



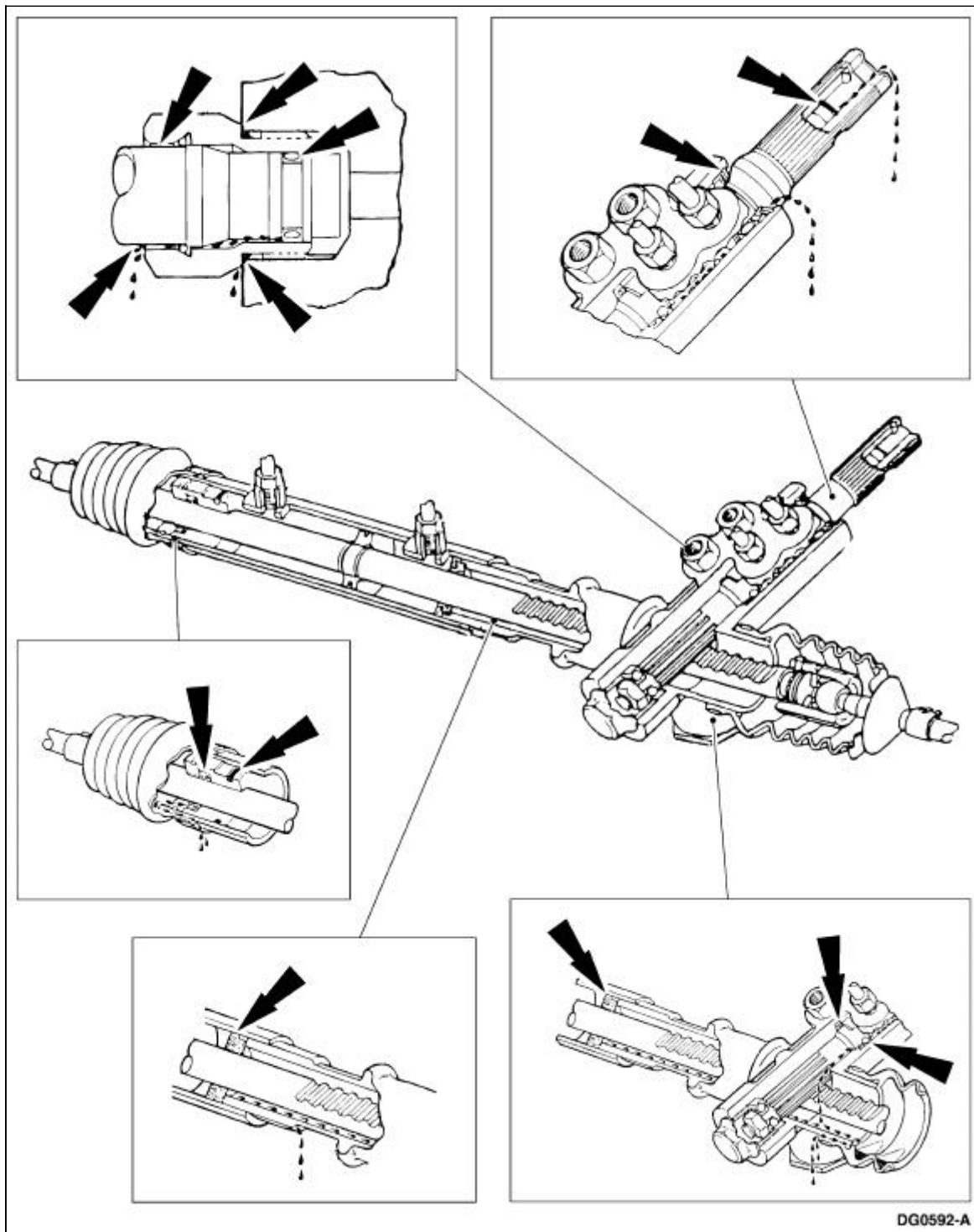
CAUTION: Do not hold the steering wheel (3600) at the stops for an extended amount of time. Damage to the power steering pump (3A674) can result.

NOTE: Make the following preliminary checks before repairing the steering system:

NOTE: The FEM must be reconfigured upon replacement; refer to [Section 418-01](#).

1. Verify the customer concern by operating the steering system.
2. Inspect Tires
 - Check the tire pressure. For additional information, refer to the Vehicle Certification (VC) label.
 - Verify that all tires are sized to specification. For additional information, refer to [Section 204-04](#).
 - Check the tires for damage or uneven wear. For additional information, refer to [Section 204-04](#).
3. Belt and Tensioner Check
 - Refer to [Section 303-05](#) for diagnosis and testing of the accessory drive system.
4. Fluid Level Check
 - Verify that the power steering fluid level is within the appropriate hot or cold range on the dipstick. Add MERCON® Multi-Purpose (ATF) Transmission Fluid XT-02-QDX or MERCON® equivalent.
5. Air Bleeding
 - Verify that there is no air in the power steering system. Run the engine (6007) until it reaches normal operating temperature. Turn the steering wheel to the left and right several times without hitting the stops. If any air bubbles are present, refer to Purging in this section.

External Leak Check — Typical Power Rack-and-Pinion Steering Gear



DG0592-A

6. External Leak Check

- With the ignition switch at OFF, wipe off the power steering pump, power steering pressure hose (3A719), power steering return hose (3A713), power steering fluid cooler and hose assembly and steering gear (3504).
- With the engine running, turn the steering wheel from stop-to-stop several times. Do not hold steering wheel at stops. Check for leaks. Repair as necessary if leaks are observed.

7. Turning Effort Check

- Refer to Turning Effort Test under Component Tests in this section.

8. Visually inspect for obvious signs of mechanical damage. For additional information, refer to the

following chart.

Visual Inspection Chart

Mechanical	Electrical
<ul style="list-style-type: none"> ● Loose tie-rod ends ● Loose suspension components ● Loose steering column shaft universal joints ● Loose column intermediate shaft bolts ● Steering gear ● Binding or misaligned steering column ● Power steering pump ● Bent or pinched power steering hoses 	<ul style="list-style-type: none"> ● Wiring ● Connectors

9. If an obvious cause for an observed or reported malfunction is found, correct the cause (if possible) before proceeding to the next step.
10. If the concern remains after the inspection, connect the Scan Tool to the data link connector (DLC) located beneath the instrument panel, and select the vehicle to be tested from the Scan Tool menu. If the Scan Tool does not communicate with the vehicle:
 - Check that the program card is correctly installed.
 - Check the connections to the vehicle.
 - Check the ignition switch position.
11. If the Scan Tool still does not communicate with the vehicle, refer to the tester manual.
12. Carry out the DATA LINK DIAGNOSTIC TEST. If Scan Tool responds with:
 - CKT914, CKT915 or CKT70 = ALL ECUS NO RESP/NOT EQUIP, refer to [Section 418-00](#).
 - NO RESP/NOT EQUIP for FEM, refer to [Section 418-00](#).
 - SYSTEM PASSED, retrieve and record the continuous diagnostic trouble codes (DTCs), erase the continuous DTCs and carry out the self-test diagnostics for the FEM.
13. If the DTCs retrieved are related to the concern, go to Diagnostic Trouble Code (DTC) Index to continue diagnostics.
14. If no DTCs related to the concern are retrieved, proceed to Symptom Chart to continue diagnostics.
15. If the fault is not visually evident, determine the symptom and proceed to the symptom chart.

Diagnostic Trouble Code (DTC) Index

FEM Diagnostic Trouble Code (DTC) Index

DTC	Description	Source	Action
C1924	VAPS Solenoid Actuator Output Circuit Short to Ground	FEM	Go To Pinpoint Test A.
C1925	VAPS Solenoid Actuator Return Circuit Failure	FEM	Go To Pinpoint Test B.
U1027	SCP (J1850) Invalid or Missing Data for Engine rpm	PCM	GO to Section 418-01 .
U1041	SCP (J1850) Invalid or Missing Data for Vehicle Speed	ABS	GO to Section 418-

			01 .
U1059	SCP (J1850) Invalid or Missing Data for Transmission / Transaxle / PRNDL	PCM	GO to Section 418-01 .
U1218	SCP (J1850) Invalid or Missing Data for External Lamps	ICM	GO to Section 418-01 .
U1222	SCP (J1850) Invalid or Missing Data for Interior Lamps	ICM	GO to Section 418-01 .
U1227	SCP (J1850) Invalid or Missing Data for Body Status Request	ICM	GO to Section 418-01 .

Steering System Symptom Definitions

Drift/Pull

Pull is a tugging sensation, felt by the hands on the steering wheel, that must be overcome to keep the vehicle going straight.

Drift describes what a vehicle with this condition does with hands off the steering wheel.

- A vehicle-related drift/pull, on a flat road, can cause a consistent deviation from the straight-ahead path and require constant steering input in the opposite direction to counteract the effect.
- Drift/pull can be induced by conditions external to the vehicle (i.e., wind, road camber).

Excessive Steering Wheel Play

Excessive steering wheel play is a condition in which there is too much steering wheel movement before the wheels move. A small amount of steering wheel free play is considered normal.

Feedback

Feedback is a roughness felt in the steering wheel when the vehicle is driven over rough pavement.

Hard Steering or Lack of Assist

Hard steering or lack of assist is experienced when the steering wheel effort exceeds specifications. Hard steering can remain constant through the full turn or occur near the end of a turn. It is important to know the difference between hard steering/lack of assist and binding.

Hard steering or lack of assist can result from either hydraulic or mechanical conditions. It is extremely important to know if this concern occurs during driving, during very heavy or static parking maneuvers.

Nibble

Sometimes confused with shimmy, nibble is a condition resulting from tire interaction with various road surfaces and observed by the driver as small rotational oscillations of the steering wheel.

Poor Returnability/Sticky Steering

Poor returnability and sticky steering is used to describe the poor return of the steering wheel to center after a turn or the steering correction is completed.

Shimmy

Shimmy, as observed by the driver, is large, consistent, rotational oscillations of the steering wheel resulting from large, side-to-side (lateral) tire/wheel movements.

Shimmy is usually experienced near 64 km/h (40 mph), and can begin or be amplified when the tire contacts pot holes or irregularities in the road surface.

Wander

Wander is the tendency of the vehicle to require frequent, random left and right steering wheel corrections to maintain a straight path down a level road.

Symptom Chart

Symptom Chart

Condition	Possible Sources	Action
<ul style="list-style-type: none"> No communication with the front electronics module 	<ul style="list-style-type: none"> Circuit. Module. 	<ul style="list-style-type: none"> REFER to Section 418-00.
<ul style="list-style-type: none"> Hard Steering or Lack of Assist 	<ul style="list-style-type: none"> Seized lower steering column shaft U-joints. Damaged, fractured steering column bearing(s). Power steering pump. Suspension components. Steering gear internal leakage. 	<ul style="list-style-type: none"> INSTALL a new lower steering column shaft. REFER to Section 211-04. REPAIR the steering column. REFER to Section 211-04. GO to Pump Flow and Pressure Test Component Test in this section. REFER to Section 204-00 for suspension system diagnosis and testing. GO to Pump Flow and Pressure Test Component Test in this section.
<ul style="list-style-type: none"> Excessive Steering Pump Noise 	<ul style="list-style-type: none"> Power steering pump. 	<ul style="list-style-type: none"> GO to Pump Flow and Pressure Test Component Test in this section.
<ul style="list-style-type: none"> Excessive Steering Wheel Play 	<ul style="list-style-type: none"> Damaged, loose, or worn tie-rod end (3290). Loose, worn or damaged tie-rod (3280). Damaged/worn steering gear. Loose, worn or damaged steering 	<ul style="list-style-type: none"> GO to the Steering Linkage Component Test. GO to the Tie-Rod Articulation Torque Component Test. INSTALL a new steering gear. REFER to Section 211-02. INSTALL new steering column



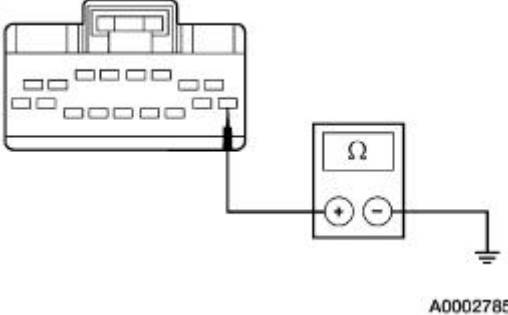
	<p>column bearing(s).</p> <ul style="list-style-type: none"> ● Loose, worn or damaged lower steering column shaft U-joint(s). 	<p>bearing(s). REFER to Section 211-04 .</p> <ul style="list-style-type: none"> ● INSTALL a new lower steering column shaft. REFER to Section 211-04 .
<ul style="list-style-type: none"> ● Wander 	<ul style="list-style-type: none"> ● Unevenly loaded or overloaded vehicle. ● Loose, worn or damaged tie-rod. ● Loose, worn or damaged tie-rod ends. ● Loose or damaged steering gear mounting bolts. ● Loose lower steering column shaft U-joint bolts. ● Loose, worn or damaged lower steering column shaft U-joints. ● Loose, worn or damaged steering column bearing(s). ● Suspension components. 	<ul style="list-style-type: none"> ● INFORM the customer of incorrect vehicle loading. ● GO to the Tie-Rod Articulation Torque Component Test. ● GO to the Steering Linkage Component Test. ● INSTALL new bolts or TIGHTEN the bolts. REFER to Section 211-02 . ● TIGHTEN the bolts. REFER to Section 211-04 . ● INSTALL a new lower steering column shaft. REFER to Section 211-04 . ● INSTALL new steering column bearings. REFER to Section 211-04 . ● REFER to Section 204-00 for suspension system diagnosis and testing.
<ul style="list-style-type: none"> ● Drift/Pull 	<ul style="list-style-type: none"> ● Unevenly loaded or overloaded vehicle. ● Wheel alignment. ● Loose, worn or damaged tie-rod. ● Loose, worn or damaged tie-rod ends. ● Suspension components. ● The steering gear 	<ul style="list-style-type: none"> ● INFORM the customer of incorrect vehicle loading. ● ADJUST as required. REFER to Section 204-00 . ● GO to the Tie-Rod Articulation Torque Component Test. ● GO to the Steering Linkage Component Test. ● REFER to Section 204-00 for suspension system diagnosis and testing. ● GO to Steering Gear

	<ul style="list-style-type: none"> valve effort out of balance. ● Check the brake system for correct operation. ● Incorrect frame/underbody alignment. 	<p>Valve Component Test in this section.</p> <ul style="list-style-type: none"> ● REFER to Section 206-00. ● CORRECT as required. REFER to Frame Dimension Manual.
<ul style="list-style-type: none"> ● Feedback 	<ul style="list-style-type: none"> ● Loose, worn or damaged tie-rod. ● Loose, worn or damaged tie-rod ends. ● Loose or damaged steering gear insulators or bolts. ● Loose lower steering column shaft U-joint bolts. ● Loose suspension bushings, fasteners or ball joints. ● Worn or damaged steering column bearing(s). 	<ul style="list-style-type: none"> ● GO to the Tie-Rod Articulation Torque Component Test. ● GO to the Steering Linkage Component Test. ● INSTALL new bolts or TIGHTEN the retaining bolts. REFER to Section 211-02. ● TIGHTEN the bolts. REFER to Section 211-04. ● INSTALL new as necessary. REFER to Section 204-01. ● INSTALL new steering column bearing(s). REFER to Section 211-04.
<ul style="list-style-type: none"> ● Poor Returnability/Sticky Steering 	<ul style="list-style-type: none"> ● Binding lower steering column shaft U-joints. ● Loose, worn or damaged front wheel spindle tie-rod. ● Loose, worn or damaged tie-rod ends. ● Suspension components. ● Binding steering column bearing(s). 	<ul style="list-style-type: none"> ● INSTALL a new lower steering column shaft. REFER to Section 211-04. ● GO to the Tie-Rod Articulation Torque Component Test. ● GO to the Steering Linkage Component Test. ● REFER to Section 204-00 for suspension system diagnosis and testing. ● INSTALL new steering column bearing(s). REFER to Section 211-04.
<ul style="list-style-type: none"> ● Shimmy 	<ul style="list-style-type: none"> ● Loose, worn or damaged tie-rod end. ● Loose, worn or damaged tie-rod. 	<ul style="list-style-type: none"> ● GO to the Steering Linkage Component Test. ● GO to the Tie-Rod Articulation Torque Component Test.

	<ul style="list-style-type: none"> ● Suspension components. 	<ul style="list-style-type: none"> ● REFER to Section 204-00 for suspension system diagnosis and testing.
<ul style="list-style-type: none"> ● Power steering pump noisy 	<ul style="list-style-type: none"> ● Low fluid level and possible leakage. ● Plugged reservoir filter. ● Power steering pump. 	<ul style="list-style-type: none"> ● FILL reservoir to specified level. CHECK for leaks. REPAIR as necessary. ● INSTALL a new reservoir; REFER to Section 211-02. ● INSTALL a new power steering pump; REFER to Section 211-02.

Pinpoint Tests

PINPOINT TEST A: DTC C1924 — VAPS SOLENOID ACTUATOR OUTPUT CIRCUIT SHORT TO GROUND

CONDITIONS	DETAILS/RESULTS/ACTIONS
A1 CHECK THE VAPS CIRCUITRY FOR SHORT TO GROUND	
<p>1 </p> <p>2  FEM C201a</p> <p>3 </p>	<p>3 Measure the resistance between FEM C201a pin 9, circuit 8-CE9 (WH/GN), harness side and ground.</p> <ul style="list-style-type: none"> ● Is the resistance greater than 10,000 ohms? <p>→ Yes GO to A2</p>

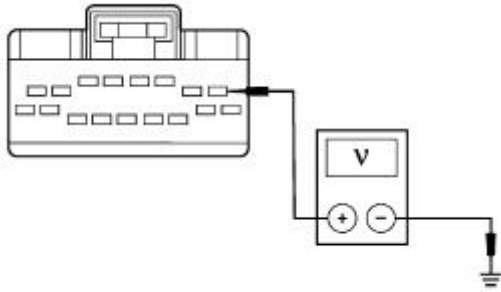
→ **No**
GO to [A3](#).

A2 CHECK CIRCUIT 29S-DK21 (OG/WH)

1



2



A0006017

2 Measure the voltage between FEM C201a pin 1, circuit 29S-DK21 (OG/WH), harness side and ground.

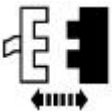
● **Is the voltage greater than 10 volts?**

→ **Yes**
INSTALL a new FEM; REFER to [Section 419-10](#). REPEAT the self-test.

→ **No**
REPAIR the circuit. REPEAT the self-test.

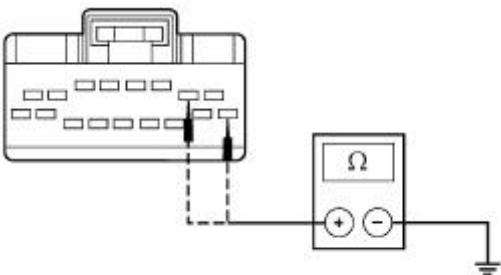
A3 CHECK CIRCUIT 8-CE9 (WH/GN) AND 9-CE9 (BN/GN) FOR A SHORT TO GROUND

1



Control Valve Actuator C120

2



A0002786


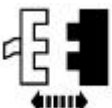

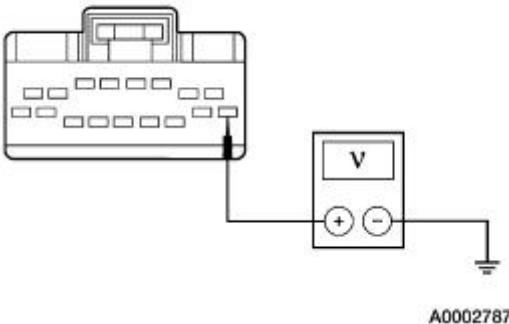

2 Measure the resistance between FEM C201a pin 9, circuit 8-CE9 (WH/GN), harness side and ground, and between FEM C201a pin 2, circuit 9-CE9 (BN/GN), harness side and ground.

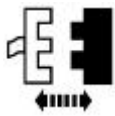
● **Is the resistance greater than 10,000 ohms?**

→ **Yes**
INSTALL a new control valve actuator; REFER to [Section 211-02](#). CLEAR the

	<p>DTCs. REPEAT the self-test.</p> <p>→ No REPAIR the circuit in question. CLEAR the DTCs. REPEAT the self-test.</p>
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PINPOINT TEST B: DTC C1925 — VAPS SOLENOID ACTUATOR RETURN CIRCUIT FAILURE

CONDITIONS	DETAILS/RESULTS/ACTIONS
B1 CHECK VAPS FOR SHORT TO POWER	
<p>1 </p> <p>2  FEM C201a</p> <p>3 </p> <p>4 </p>	<p>4 Measure the voltage between FEM C201a pin 9, circuit 8-CE9 (WH/GN), harness side and ground.</p> <p>• Is any voltage present?</p> <p>→ Yes GO to B2.</p> <p>→ No GO to B3.</p>
B2 CHECK CIRCUIT 8-CE9 (WH/GN) FOR A SHORT TO POWER	
<p>1 </p> <p>2</p>	

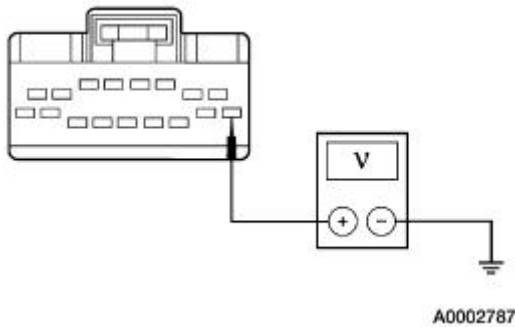


Control Valve Actuator C120

3



4



4 Measure the voltage between FEM C201a pin 9, circuit 8-CE9 (WH/GN), harness side and ground.

• Is any voltage present?

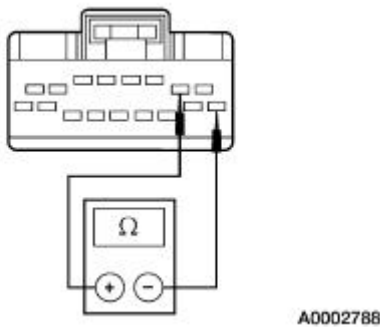
- **Yes**
REPAIR the circuit 8-CE9 (WH/GN).
CLEAR the DTCs. REPEAT the self-test.
- **No**
REPAIR the circuit 9-CE9 (BN/GN).
CLEAR the DTCs. REPEAT the self-test.

B3 CHECK THE VAPS SYSTEM FOR AN OPEN

1



2



2 Measure the resistance between FEM C201a pin 9, circuit 8-CE9 (WH/GN), harness side and FEM C201a pin 2, circuit 9-CE9 (BN/GN), harness side.

• Is the resistance between 4 and 85 ohms?

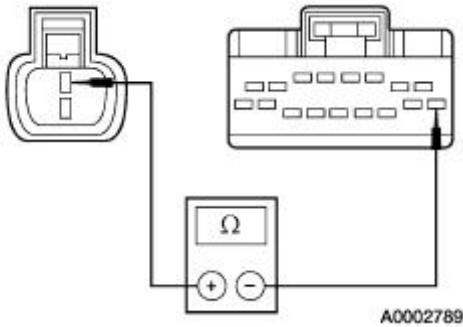
- **Yes**
INSTALL a new control valve actuator;
REFER to [Section 211-02](#). CLEAR the

DTCs. REPEAT the self-test. If DTC C1925 is retrieved, INSTALL a new FEM; REFER to [Section 419-10](#). TEST the system for normal operation.

→ **No**
GO to [B4](#).

B4 CHECK CIRCUIT 8-CE9 (WH/GN) FOR AN OPEN

1



1

Measure the resistance between FEM C201a pin 9, circuit 8-CE9 (WH/GN), harness side and control valve actuator C120 pin 1, circuit 8-CE9 (WH/GN), harness side.

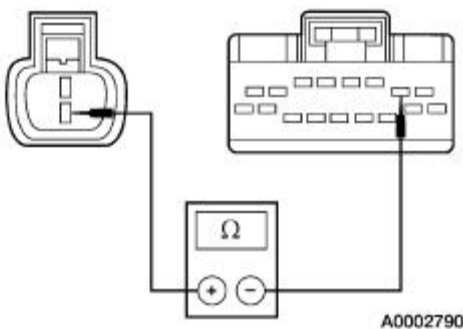
● Is the resistance less than 5 ohms?

→ **Yes**
GO to [B5](#).

→ **No**
REPAIR the circuit. CLEAR the DTCs. REPEAT the self-test.

B5 CHECK CIRCUIT 9-CE9 (BN/GN) FOR AN OPEN

1



1

Measure the resistance between FEM C201a pin 2, circuit 9-CE9 (BN/GN), harness side and control valve actuator C120 pin 2, circuit 9-CE9 (BN/GN), harness side.

● Is the resistance less than 5 ohms?

→ **Yes**
INSTALL a new control valve actuator; REFER to [Section 211-02](#). CLEAR the DTCs. REPEAT the self-test.

→ **No**
REPAIR the circuit. CLEAR the DTCs. REPEAT the self-test.

Steering Linkage

1. With the parking brake applied, carry out the following:
 1. **NOTE:** Excessive vertical or horizontal motion of the stud relative to the steering linkage ball sockets may indicate excessive wear.

Have an assistant rotate the steering wheel back and forth 360 degrees and watch for relative motion of the studs in the steering linkage ball sockets.

2. Watch for a loose steering gear attachment to the frame.
2. Another method is to raise the front tires off the ground, grasp the tire at the front and rear and watch for excessive play in the joints while trying to pivot the wheels by hand.
3. **NOTE:** Incorrect separation of the tapered stud from its seat will cause premature failure of the ball socket.

Joints can be checked for excessive wear by measuring the torque it takes to turn the stud.

1. Separate the tapered stud from its seat and thread the attaching nut back onto the stud.
2. **NOTE:** Some joint turning torques will be as little as 0.2 Nm (2 lb-in) within the first 1,000 miles and will remain there for the life of the joint.

Turn the stud with an inch-pound torque wrench and note the torque required to turn the stud.

Torque Required to Turn Stud in Socket	Nm	Lb-In
New joints	2.0-5.0	18-47
Used joints	0.2-3	2-26
Joints with excessive play	Less than 0.2	Less than 0.2

3. **NOTE:** Only install a new ball joint if the stud torque is less than 0.2 Nm (2 lb-in) and the joint has any play when moved by hand.

Install new ball joints as necessary; refer to [Section 204-01](#).

Pump Flow and Pressure Test



WARNING: Do not touch the flowmeter during the test procedure or severe burns and serious injury may occur.


1.  **CAUTION:** Make sure that the connection point will not interfere with any of the engine accessory drive components or drive belts.

Install the Power Steering Analyzer at the high pressure port of the power steering pump. Make sure the power steering analyzer gate valve is fully open.

- On some vehicles, the power steering pump high pressure port is inaccessible and the power steering analyzer should then be installed either at the steering gear or at a point in the high pressure line between the power steering pump and the steering gear.
2. Place a Dial Thermometer in the power steering pump reservoir.
 3. Check the power steering fluid level. If necessary, add power steering fluid.

- Use Motorcraft MERCON® Multi-Purpose (ATF) Transmission Fluid XT-2-QDX or equivalent meeting Ford specification MERCON®.

4. Install the digital tachometer.

5.  **CAUTION: Do not hold the steering wheel against the stops for more than three to five seconds at a time. Damage to the power steering pump will occur.**

Start the engine. Place the transmission in N (neutral). Set the parking brake. Raise the power steering fluid temperature to 74-80°C (165-175°F) by rotating the steering wheel fully to the left and right several times.

6. Set the engine speed to idle. Record the flow rate and pressure readings.
- If the flow rate is below the idle flow rate specification, the power steering pump may require repair. Continue with the test procedure.
 - If the pressure reading is above the idle pressure specification, then check power steering hoses for kinks and restrictions.

7. Partially close the gate valve to obtain 5102 kPa (740 psi). Record the flow rate.
- If the flow rate is less than the specified flow rate, replace the power steering pump.

8.  **CAUTION: Do not allow the gate valve to remain closed for more than five seconds.**

Completely close and partially open the gate valve three times. Record the pressure relief valve actuation pressure reading.

- If the pressure does not meet the relief pressure specification, install a new power steering pump.

9. Set the engine speed to 1,500 rpm. Record the flow rate.
- If the flow rate varies more than 3.785 liters/minute (1 gallon/minute) from initial flow rate reading, install a new power steering pump.

10.  **CAUTION: Do not hold the steering wheel against the stops for more than three to five seconds at a time. Damage to the power steering pump will occur.**

Set the engine speed at idle. Turn (or have an assistant turn) the steering wheel to the left and right stops. Record flow rate and pressure readings at the stops.

- The pressure reading at both stops should be nearly the same as the maximum pump relief pressure.
- The flow rate should drop below 1.9 liters/minute (0.5 gallon/minute).
- If the pressure does not reach the maximum pump relief pressure or the flow rate does not drop below the specified value, excessive internal leakage is occurring. Repair or install a new steering gear as necessary; refer to [Section 211-02](#).

11. Turn (or have an assistant turn) the steering wheel slightly in both directions and release it quickly while watching the pressure gauge.
- The pressure reading should move from the normal backpressure reading and snap back as the steering wheel is released.
 - If the pressure returns slowly or sticks, the rotary valve in the steering column is binding. Check the steering column and linkage before repairing the steering gear.

Turning Effort Test

NOTE: Make sure front wheels are correctly aligned and tire pressure is correct before checking turning effort.

1. Park vehicle on dry concrete and set parking brake.
2. Idle engine for two to three minutes. Turn steering wheel to the left and right several times to warm fluid to 43-49°C (110-120°F).
3. With engine running, attach a pull scale to rim of steering wheel. Measure pull required to turn one complete revolution in each direction. Refer to Specifications for Static Steering Wheel Turning Efforts for acceptable measurements.

Steering Gear Insulator

1. With the wheel normally loaded (on the ground), check the steering gear housing for excessive lateral movement.
 - If the steering gear housing moves more than 1.5 mm (0.05 in), the steering gear insulators may have deteriorated or the steering gear mounting nuts may have loosened. Tighten the steering gear mounting nuts.
 - If the steering gear housing movement is still excessive after tightening the gear mounting nuts, install new steering gear insulators.

Steering Gear Valve

NOTE: For vehicles with a steering pull.

1. With the vehicle in motion, place the transmission in N (neutral) and turn the engine OFF.
 - If the vehicle does not pull with the engine OFF, repair or install a new steering gear; refer to [Section 211-02](#).
 - If the vehicle pull direction does not change, check the front suspension components and wheel alignment; refer to [Section 204-00](#) and [Section 204-01](#).

Tie-Rod Articulation Torque

1. **NOTE:** This check can be done with the steering gear on or off the vehicle.

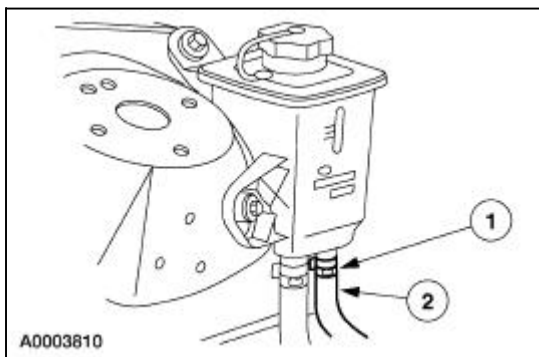
Disconnect the tie-rod end from the front wheel spindle. For additional information, refer to [Section 211-02](#).

2. Move the tie-rod back and forth three times.
3. Hook the Spring Scale over the tie-rod end or the threaded portion of the tie-rod and measure the force required to move the front wheel spindle tie-rod. For additional information, refer to Tie-Rod Articulation Torque in General Specifications in this section.
4. If the force required to move the front wheel spindle tie-rod does not meet the specifications, install a new tie-rod.

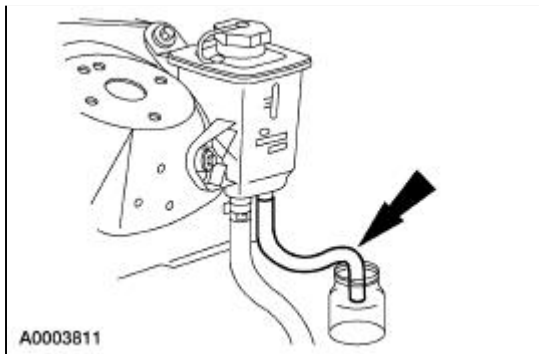
Power Steering System Flushing

⚠ WARNING: Do not mix fluid types. Any mixture of an unapproved fluid could lead to seal deterioration and leaks. A leak could ultimately cause loss of fluid, which could result in a loss of power steering assist.

1. Remove the coil on plug (COP) Fuse 12 in the underhood auxiliary junction box (AJB) to disable the engine from starting.
2. Disconnect the power steering return hose.
 1. Compress and move the hose clamp.
 2. Disconnect the power steering return hose and plug the fitting to the reservoir.



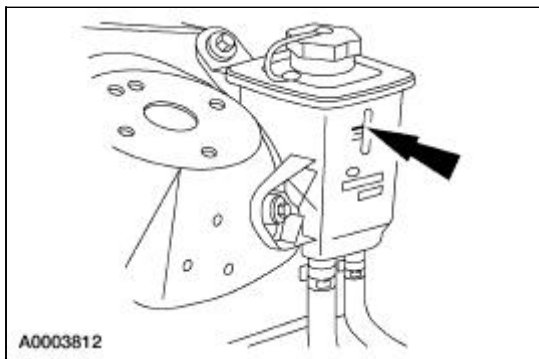
3. Attach an extension hose between the power steering reservoir port and an empty container.




4. **⚠ WARNING: Do not mix fluid types. Any mixture of an unapproved fluid could lead to seal deterioration and leaks. A leak could ultimately cause loss of fluid, which could result in a loss of power steering assist.**

Fill the power steering fluid reservoir.

- Use Motorcraft MERCON® Multi-Purpose (ATF) Transmission Fluid XT-2-QDX or equivalent meeting Ford specification MERCON®.




5. Raise the front wheels off the ground. For additional information, refer to [Section 100-02](#).

6.  **CAUTION: Do not operate the starter motor for more than 10 seconds at a time. Damage to the starter motor could result.**

Turn the steering wheel from stop to stop while cranking the engine until the fluid exiting the extension hose is clean.

7. Lower the vehicle.

8. Disconnect the extension hose from the power steering return hose and attach the power steering return hose to the power steering fluid reservoir.

9.  **WARNING: Do not mix fluid types. Any mixture of an unapproved fluid could lead to seal deterioration and leaks. A leak could ultimately cause loss of fluid, which could result in a loss of power steering assist.**

 **CAUTION: Do not overfill the power steering fluid reservoir.**

Fill the power steering fluid reservoir.

- Use Motorcraft MERCON® Multi-Purpose (ATF) Transmission Fluid XT-2-QDX or equivalent meeting Ford specification MERCON®.

10. Install the COP fuse.

11.  **CAUTION: Do not hold the steering wheel against the stops for more than three to five seconds at a time. Damage to the power steering pump will occur.**

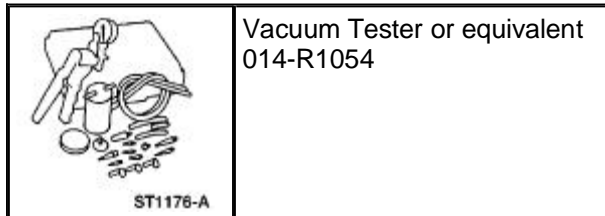
Start the engine and turn the steering wheel from stop to stop.

12. **NOTE:** If power steering is noisy and accompanied by evidence of aerated fluid, it will be necessary to purge the power steering system. Refer to [Power Steering System Purging](#).

Check the power steering fluid level.

Power Steering System Purging

Special Tool(s)



⚠ CAUTION: If the air is not purged from the power steering system correctly, pump failure could result. This condition can occur on pre-delivery vehicles with evidence of aerated fluid or on vehicles that had steering component repairs.

- ⚠ WARNING:** Do not mix fluid types. Any mixture of an unapproved fluid could lead to seal deterioration and leaks. A leak could ultimately cause loss of fluid, which could result in a loss of power steering assist.

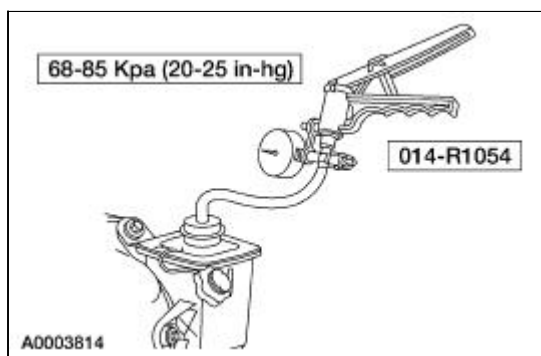
⚠ CAUTION: Do not overfill the power steering fluid reservoir.

NOTE: A whine heard from the power steering pump may be caused by air in the system. The power steering purge procedure must be carried out prior to any component repair for which power steering noise complaints are accompanied by evidence of aerated fluid and after installation of any new power steering system components (gear, hose, etc.).

Remove the fluid reservoir cap and check the fluid.

- Using the special tool, tightly insert the stopper into the fluid reservoir.
- Start the vehicle.

2. Apply maximum vacuum for a minimum of three minutes at idle. Maintain maximum vacuum with the source.



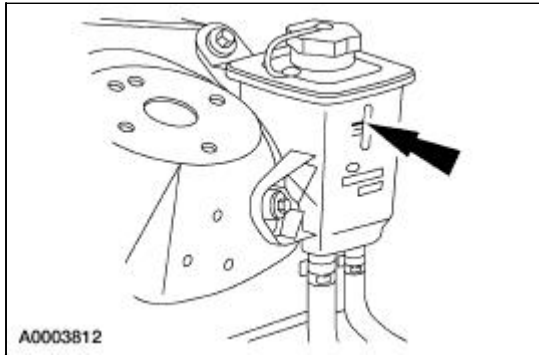
3. Remove the special tool.

4. **⚠ WARNING:** Do not mix fluid types. Any mixture of an unapproved fluid could lead to

seal deterioration and leaks. A leak could ultimately cause loss of fluid, which could result in a loss of power steering assist.

Add fluid to the appropriate level.

- Use Motorcraft MERCON® Multi-Purpose (ATF) Transmission Fluid XT-2-QDX or equivalent meeting Ford specification MERCON®.




5. Using the special tool, apply and maintain maximum vacuum.
6. **⚠ CAUTION: Do not hold the steering wheel against the stops for more than three to five seconds. Damage to the power steering pump will occur.**

Cycle the steering wheel from stop to stop every 30 seconds for approximately five minutes.

7. Remove the special tool and install the fluid reservoir cap.
8. **⚠ WARNING: Do not mix fluid types. Any mixture of an unapproved fluid could lead to seal deterioration and leaks. A leak could ultimately cause loss of fluid, which could result in a loss of power steering assist.**

Check the fluid level and for leaks at all connections. If the power steering still shows signs of aeration, repeat this procedure.


Power Steering System Filling

1.  **WARNING: Do not mix fluid types. Any mixture of an unapproved fluid could lead to seal deterioration and leaks. A leak could ultimately cause loss of fluid, which could result in a loss of power steering assist.**

Fill the power steering reservoir to the appropriate level.

- Use Motorcraft MERCON® Multi-Purpose (ATF) Transmission Fluid XT-2-QDX or equivalent meeting Ford specification MERCON®.

2. Remove the coil on plug (COP) Fuse 12 in the underhood auxiliary junction box (AJB) to disable the engine from starting.
3. Raise the front wheels off the floor. For additional information, refer to [Section 100-02](#).

4.  **CAUTION: Do not operate the starter motor for more than 10 seconds at a time. Damage to the starter motor could result.**

Turn the steering wheel from stop to stop while cranking the engine.

5. Lower the vehicle.

6.  **CAUTION: Do not overfill the power steering fluid reservoir.**

Fill the power steering fluid reservoir to the appropriate level.

- Use Motorcraft MERCON® Multi-Purpose (ATF) Transmission Fluid XT-2-QDX or equivalent meeting Ford specification MERCON®.

7. Install the COP fuse.
8. **NOTE:** If the power steering is noisy and accompanied by evidence of aerated fluid, it will be necessary to purge the power steering system. For additional information, refer to [Power Steering System Purging](#).

Clear the diagnostic trouble codes (DTCs). For additional information, refer to Section 2 in the Powertrain Control/Emissions Diagnosis (PC/ED) manual.

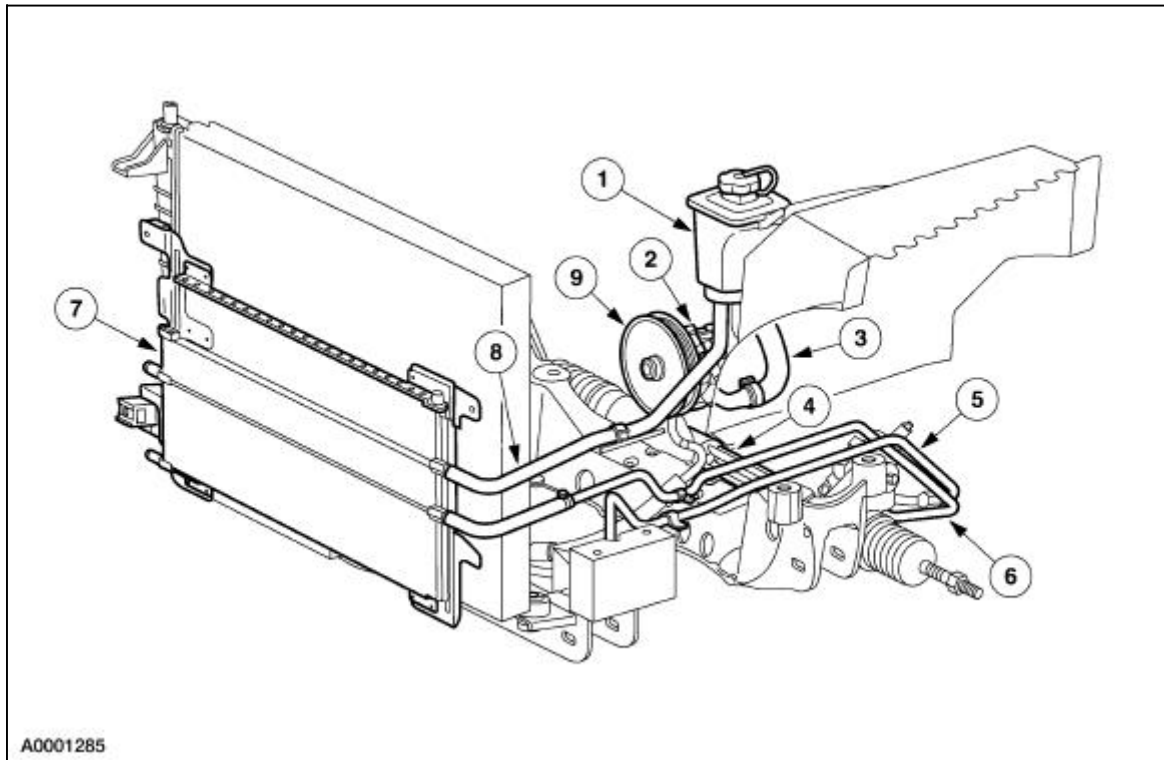
- Run the vehicle and check the system for leaks.
-

Torque Specifications

Description	Nm	lb-ft	lb-in
Power steering pump bolts	25	18	—
Power steering reservoir top bolt	6	—	53
Power steering reservoir side bolt	12	9	—
Power steering pressure hose-to-pump fitting	31	23	—
Power steering pressure hose-to-gear fitting	31	23	—
Power steering return hose-to-gear fitting	31	23	—
Power steering pressure hose bracket-to-frame bolt	10	—	89
Power steering hose bracket-to-steering gear housing bolt	10	—	89
Steering gear nuts	103	76	—
Power steering pressure hose bracket-to-pump bolt	10	—	89
Power steering pressure switch	11	8	—
Cooler-to-radiator bolts	10	—	89
Intermediate shaft bolt	25	18	—
Intermediate shaft-to-gear pinch bolt	35	26	—
Steering column shaft-to-intermediate shaft pinch bolt	35	26	—
Steering column lock nuts	40	30	—
A/C compressor bolts	25	18	—
Radiator tube-to-engine bolts	10	—	89
Wheel nuts	135	100	—
Tie-rod-to-rack	120	88	—
Tie-rod end-to-knuckle nut	100	74	—
Control valve actuator	30	22	—
Steering column opening reinforcement bolts	20	15	—
I-brace bolts (front)	55	41	—
I-brace bolts (rear)	30	22	—

Power Steering

System View



A0001285

Item	Part Number	Description
1	3E764	Power steering fluid reservoir
2	3A674	Power steering pump
3	3691	Power steering reservoir-to-pump hose
4	3504	Power steering gear
5	3A719	Power steering pressure hose
6	3A713	Power steering return hose
7	3D746	Power steering fluid cooler
8	—	Power steering cooler-to-reservoir hose
9	3A733	Power steering pump pulley

The power steering system consists of the following components:

- power steering pump (3A674)
- power steering fluid reservoir (3E764)
- power rack and pinion gear (3504)

- power steering fluid cooler (3D746) incorporated into an automatic transmission fluid cooler and hydraulic cooling fan fluid cooler
 - hoses connecting the various components
-

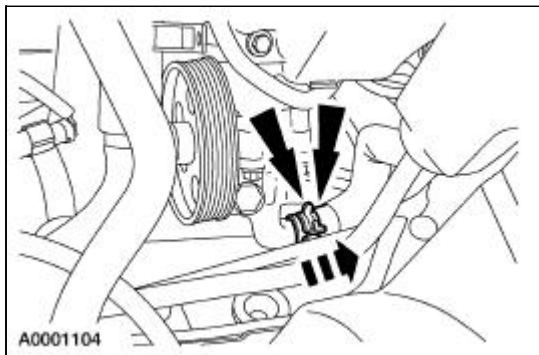
Power Steering

Refer to [Section 211-00](#) .

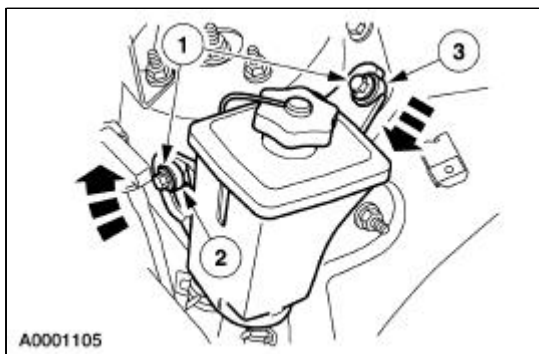
Reservoir

Removal

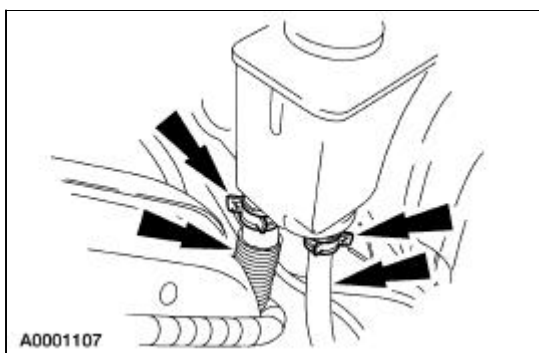
1. Remove the air cleaner. For additional information, refer to [Section 303-12](#).
2. Unclamp and disconnect the power steering reservoir-to-pump hose (3691) and drain the reservoir into a suitable container. Plug the pump inlet fitting.



3. Disconnect the reservoir (3E764).
 1. Loosen the bolts.
 2. Rotate the reservoir from the insulator.
 3. Pull the reservoir down from the insulator.



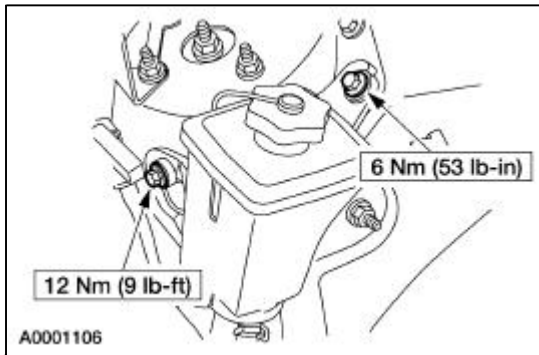
4. Unclamp and disconnect the hoses.



5. Remove the reservoir.

Installation

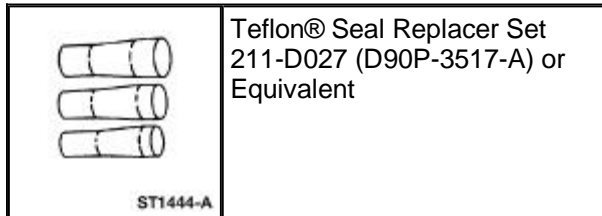
1. To install, reverse the removal procedure.



2. Fill and leak check the system. For additional information, refer to [Section 211-00](#).
-

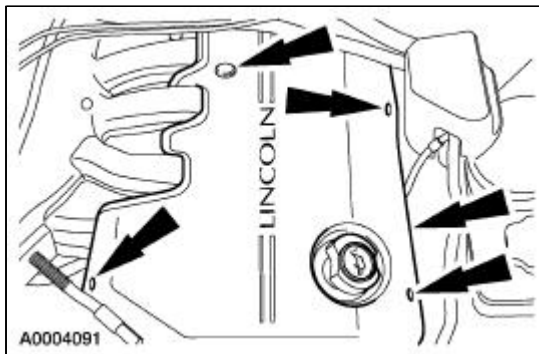
Pump —3.9L

Special Tool(s)

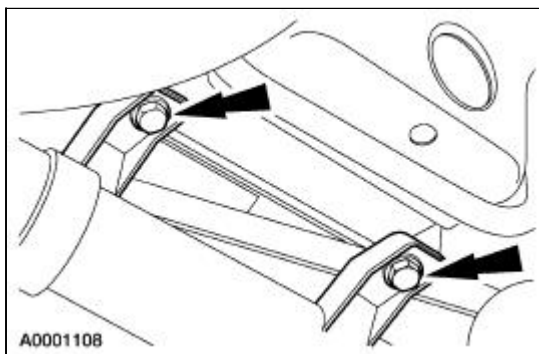


Removal

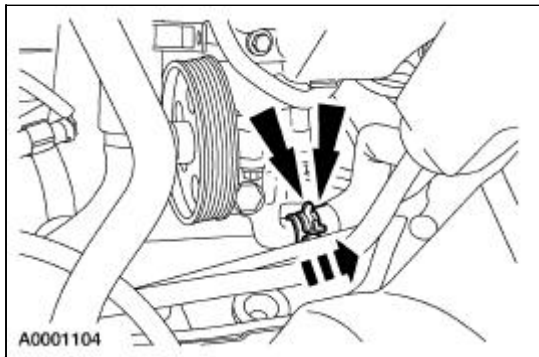
1. Remove four pushpins and the engine cover.



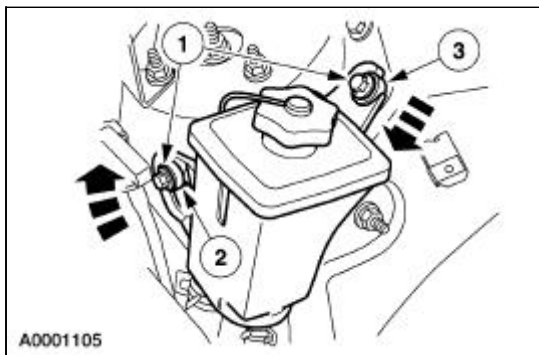
2. Remove the air cleaner and the air cleaner outlet tube. For additional information, refer to [Section 303-12](#).
3. Remove the bolts.



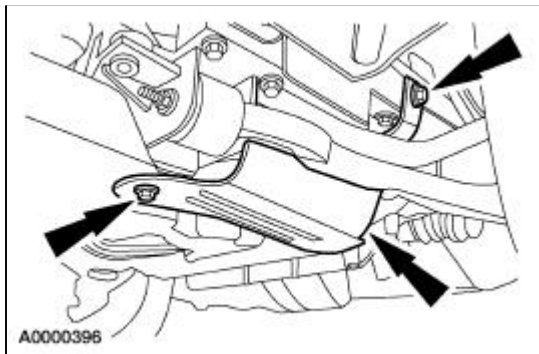
4. Remove the accessory drive belt. For additional information, refer to [Section 303-05](#).
5. Unclamp and disconnect the power steering reservoir-to-pump hose (3691) and drain the reservoir (3E764) into a suitable container.



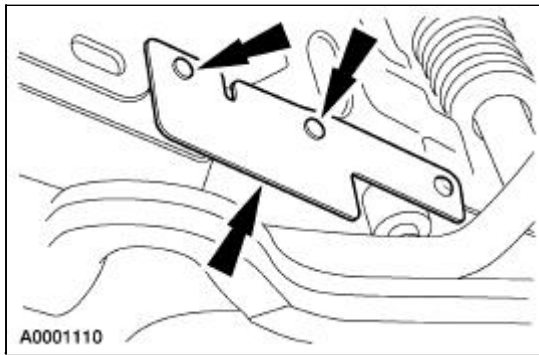
6. Position the power steering reservoir out of the way.
 1. Loosen the bolts.
 2. Rotate the reservoir from the insulator.
 3. Pull the reservoir down from the insulator and position the reservoir out of the way.



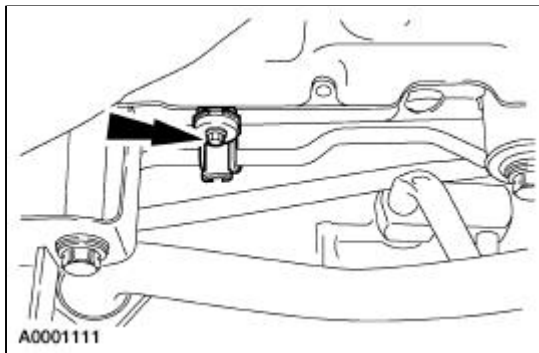
7. Raise the vehicle on a hoist. For additional information, refer to [Section 100-02](#).
8. Remove the wheel and tire assembly. For additional information, refer to [Section 204-04](#).
9. Remove two bolts, one pushpin and the shield.



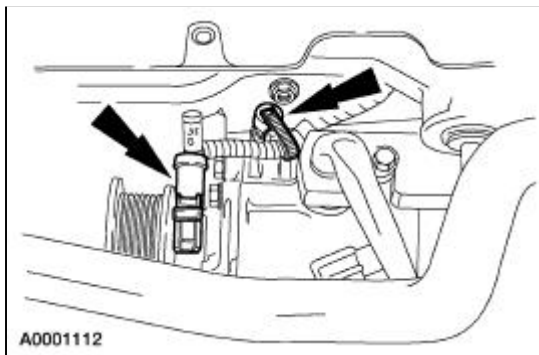
10. Remove two pushpins and the shield.



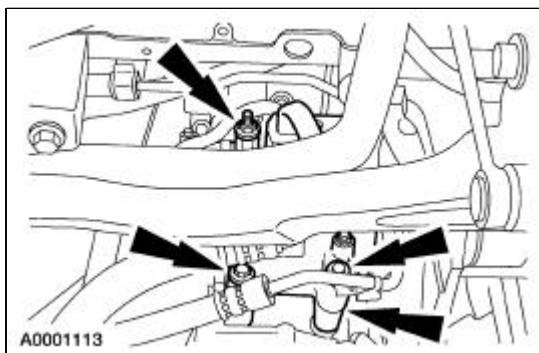
11. Remove the bolt.



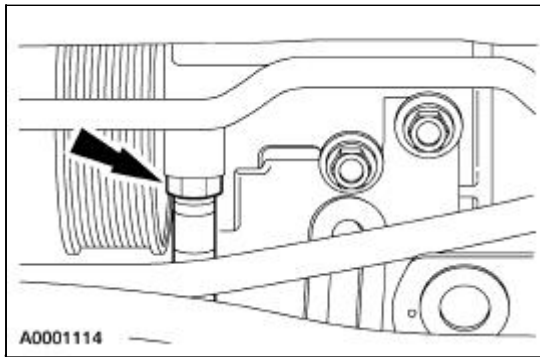
12. Disconnect the electrical connector and the wire retainer.



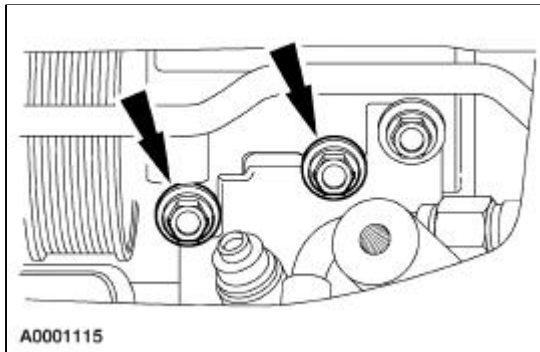
13. Remove four bolts and position the A/C compressor out of the way.



14. Disconnect the power steering pressure hose (3A714).

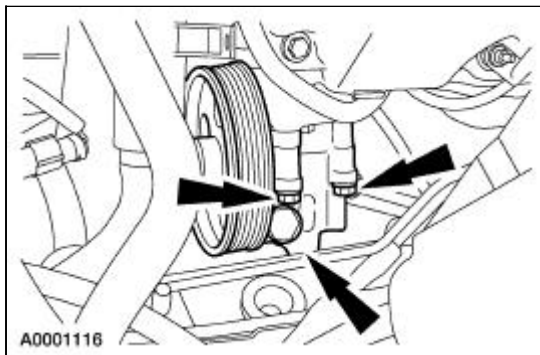


15. Remove the bolts.



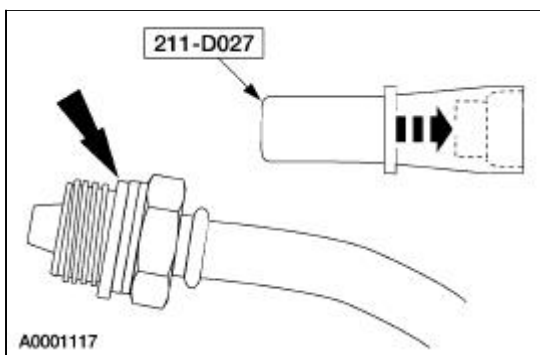
16. Lower the vehicle.

17. Remove the bolts and the pump (3A674).



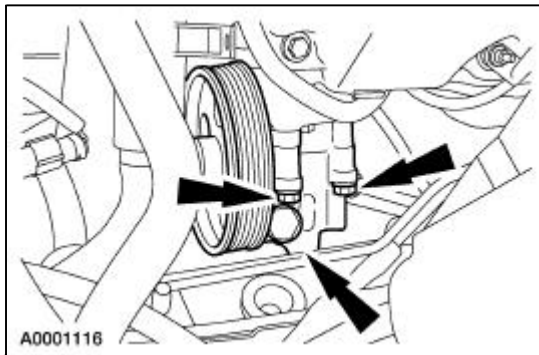
Installation

1. Using the appropriate special tool, install a new O-ring on the power steering pressure hose fitting.

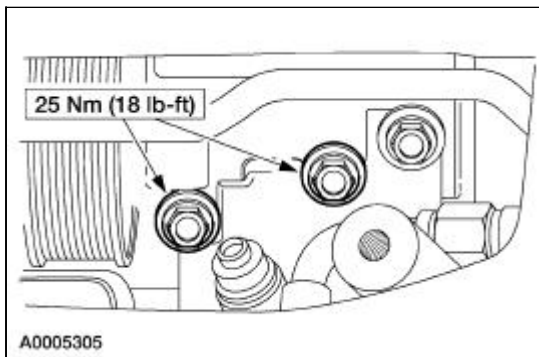


2. **NOTE:** Do not tighten the upper bolts until the lower bolts are installed.

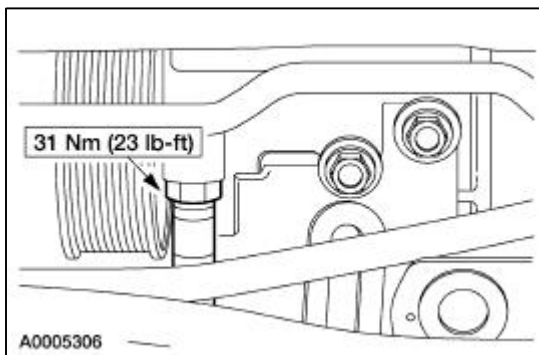
Position the pump and install the bolts.



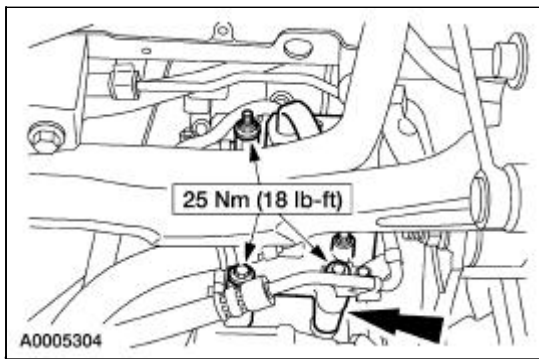
3. Raise the vehicle.
4. Install the bolts.



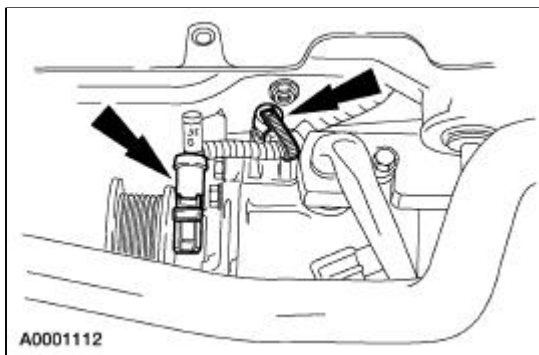
5. Connect the power steering pressure hose.



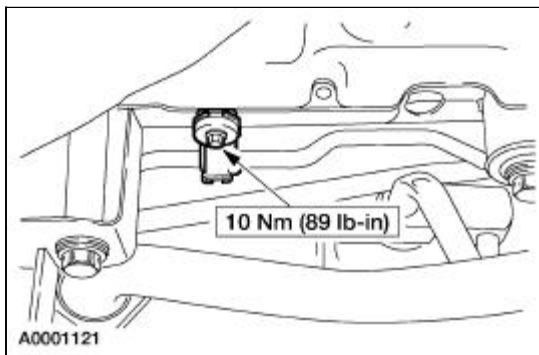
6. Position the A/C compressor and install four bolts.



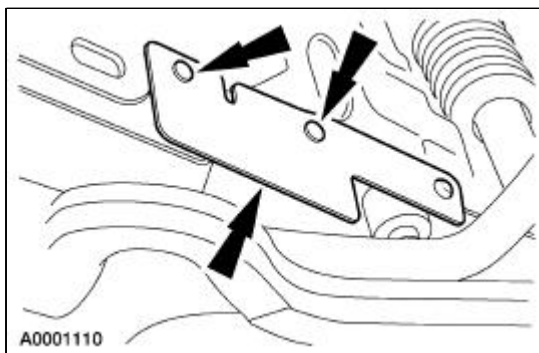
7. Connect the wire retainer and the electrical connector.



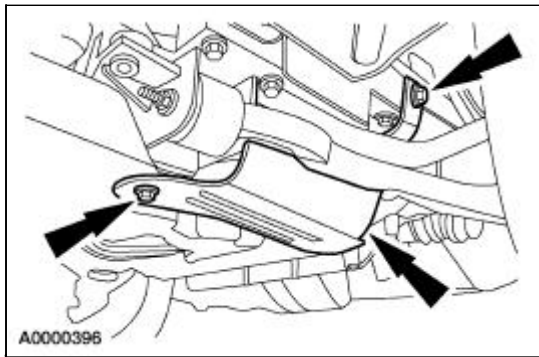
8. Install the bolt.



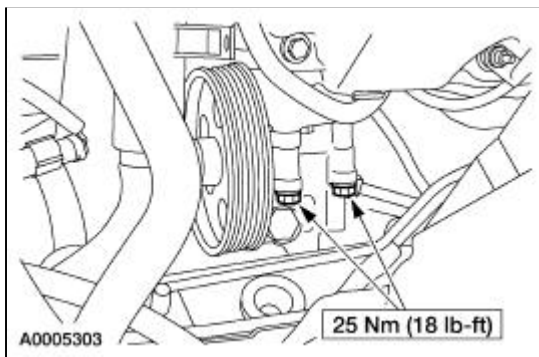
9. Install the shield and two pushpins.



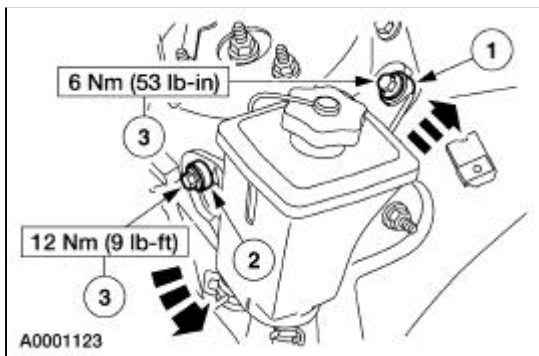
10. Install the shield, one pushpin and two bolts.



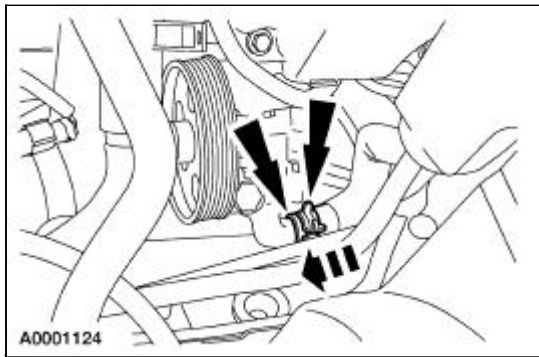
11. Install the wheel and tire assembly. For additional information, refer to [Section 204-04](#).
12. Lower the vehicle.
13. Tighten the bolts.



14. Connect the reservoir.
 1. Push the reservoir up on the insulator.
 2. Rotate the reservoir on the insulator.
 3. Tighten the bolts.

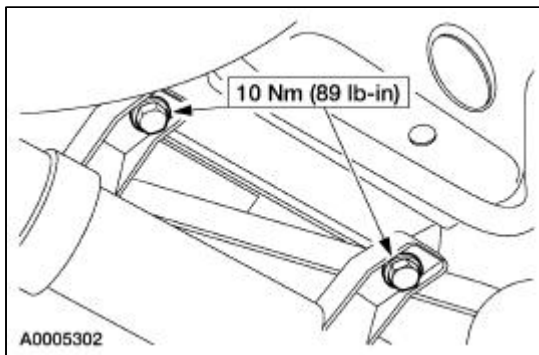


15. Connect and clamp the power steering reservoir-to-pump hose.



16. Install the accessory drive belt. For additional information, refer to [Section 303-05](#).

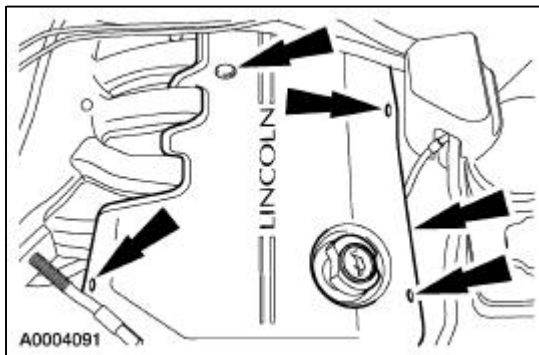
17. Install the bolts.



18. Install the air cleaner outlet tube and the air cleaner. For additional information, refer to [Section 303-12](#).

19. **NOTE:** Inspect the pushpins for cracks or other damage. Install new pushpins if necessary.

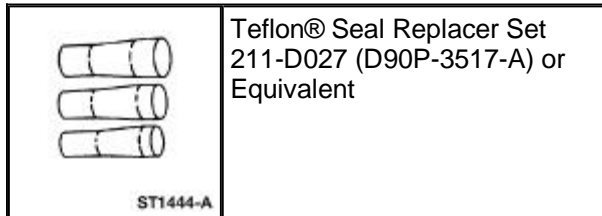
Install the engine cover and four pushpins.



20. Fill and leak check the system. For additional information, refer to [Section 211-00](#).

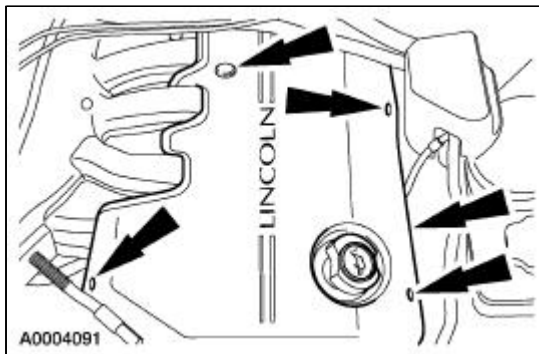
Pump —3.0L

Special Tool(s)

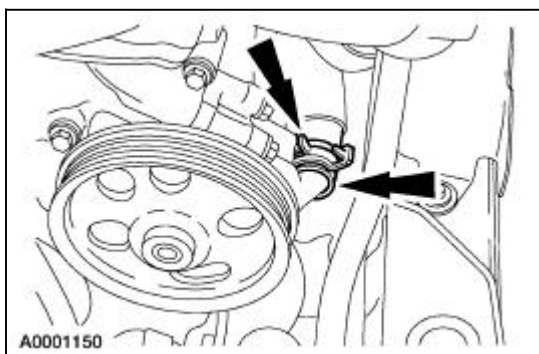


Removal

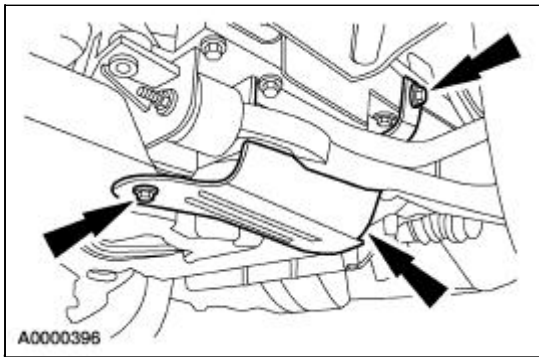
1. Remove four pushpins and the engine cover.



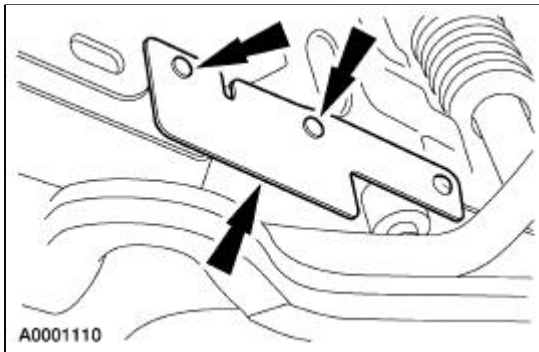
2. Remove the air cleaner and the air cleaner outlet tube. For additional information, refer to [Section 303-12](#).
3. Remove the accessory drive belt. For additional information, refer to [Section 303-05](#).
4. Unclamp and disconnect the power steering reservoir-to-pump hose (36911) and drain the reservoir into a suitable container.



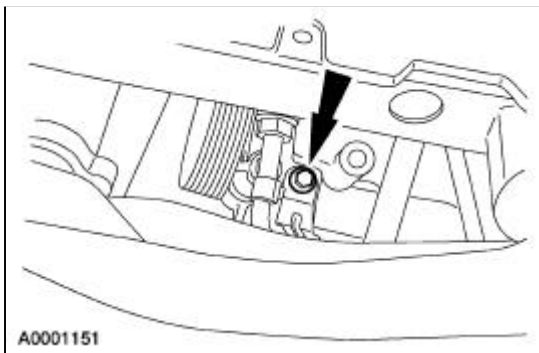
5. Raise the vehicle on a hoist. For additional information, refer to [Section 100-02](#).
6. Remove the wheel and tire assembly. For additional information, refer to [Section 204-04](#).
7. Remove two bolts, one pushpin and the shield.



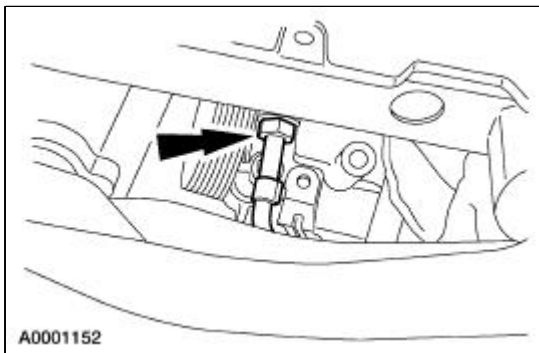
8. Remove two pushpins and the shield.



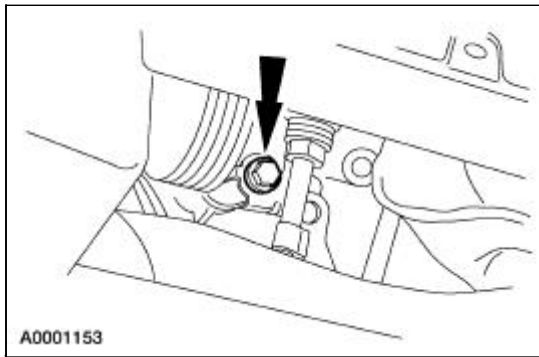
9. Remove the bolt.



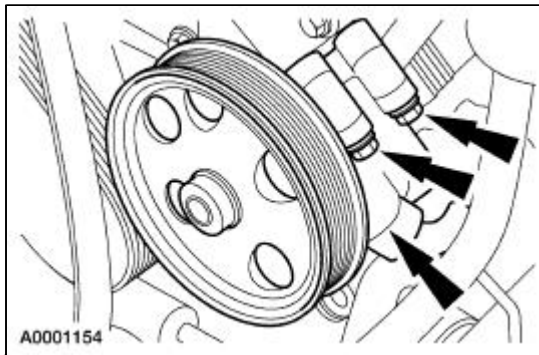
10. Disconnect the power steering pressure hose (3A714).



11. Remove the bolt.

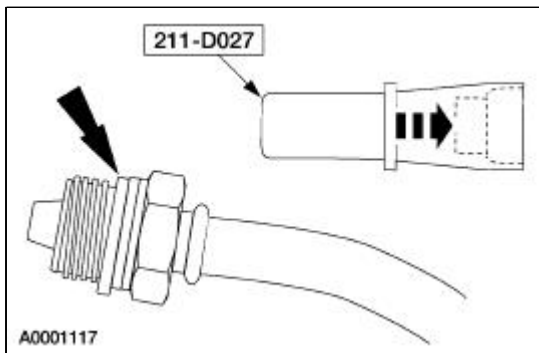


12. Lower the vehicle.
13. Remove the bolts and the pump (3A674).



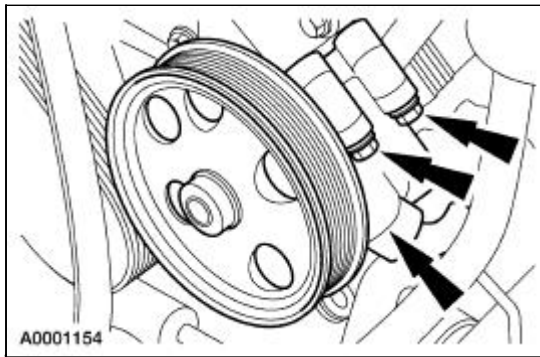
Installation

1. Install a new O-ring on the power steering pressure hose fitting.

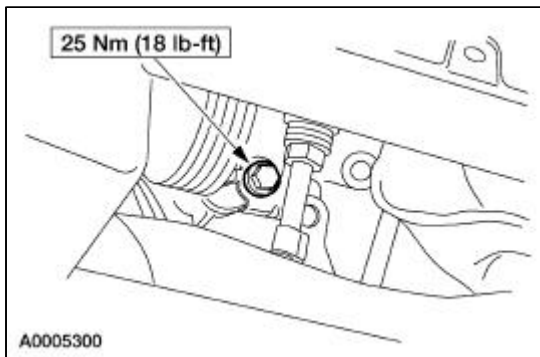


2. **NOTE:** Do not tighten the upper bolts until the lower bolts are installed.

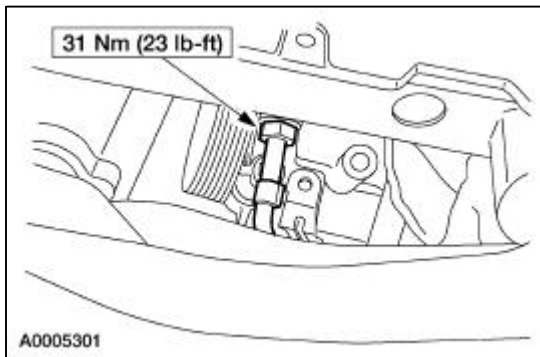
Install the pump and the bolts.



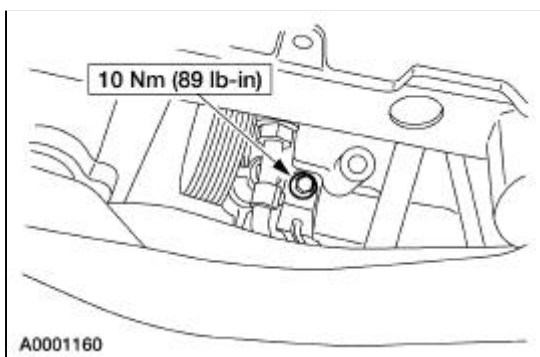
3. Raise the vehicle.
4. Install the bolt.



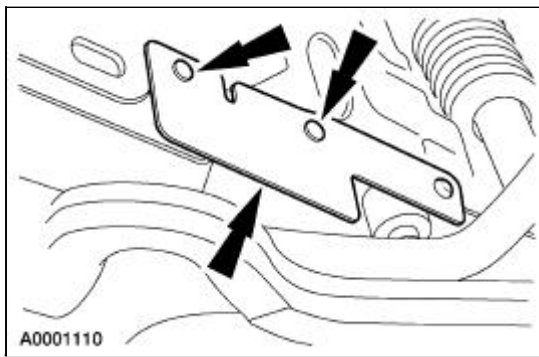
5. Connect the power steering pressure hose.



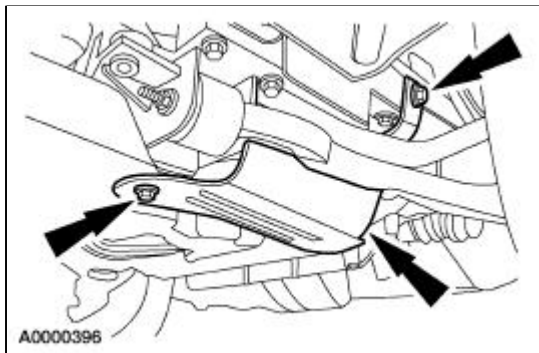
6. Install the bolt.



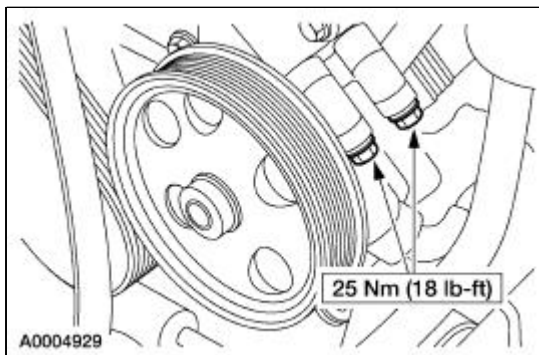
7. Install the shield and two pushpins.



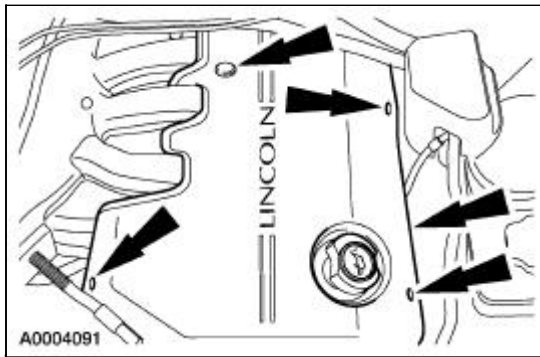
8. Install the shield, one pushpin and two bolts.



9. Install the wheel and tire assembly. For additional information, refer to [Section 204-04](#).
10. Lower the vehicle.
11. Tighten the bolts.





12. Install the accessory drive belt. For additional information, refer to [Section 303-05](#).
13. Install the air cleaner outlet tube and the air cleaner cover. For additional information, refer to [Section 303-12](#).
14. **NOTE:** Inspect the pushpins for cracks or other damage. Install new pushpins if necessary.
Install the engine cover and four pushpins.



15. Fill and leak check the system. For additional information, refer to [Section 211-00](#).
-

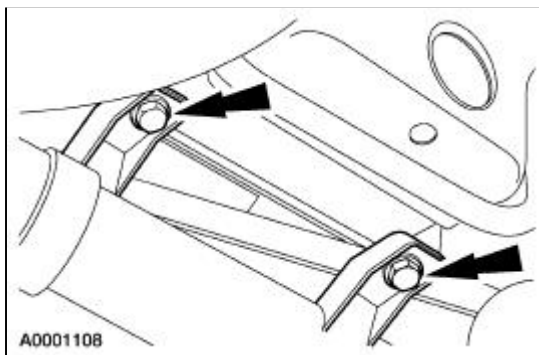
Pulley — Pump, 3.9L

Special Tool(s)

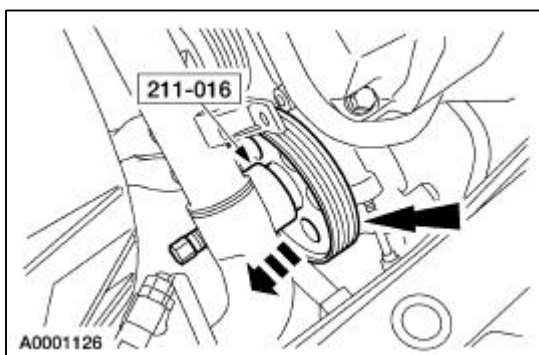
	Pump Pulley Remover 211-016 (T69L-10300-B)
	Steering Pump Pulley Replacer 211-185 (T91P-3A733-A)

Removal

1. Remove the air cleaner and the air cleaner outlet tube. For additional information, refer to [Section 303-12](#).
2. Remove the bolts.

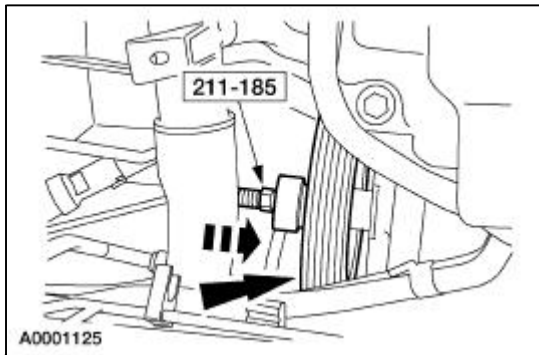


3. Remove the accessory drive belt. For additional information, refer to [Section 303-05](#).
4. Using the special tool, remove the pulley (3A733).

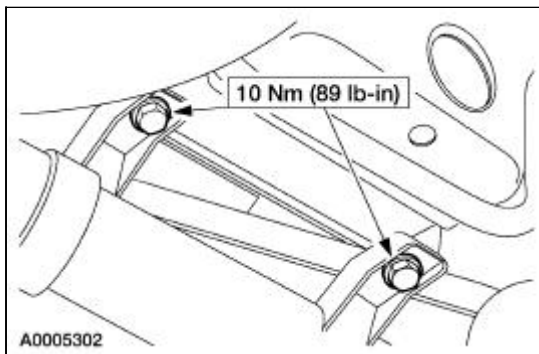


Installation

1. Using the special tool, install the pulley.





2. Install the accessory drive belt. For additional information, refer to [Section 303-05](#).
3. Install the bolts.



4. Install the air cleaner outlet tube and the air cleaner. For additional information, refer to [Section 303-12](#).
-

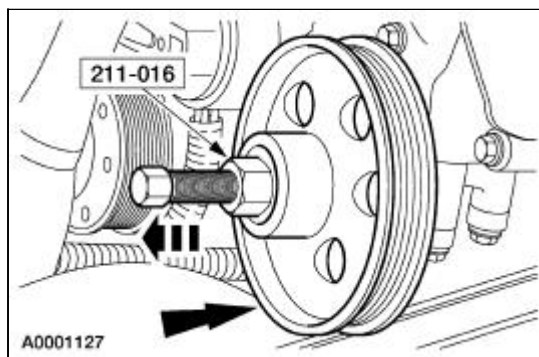
Pulley — Pump, 3.0L

Special Tool(s)

	Pump Pulley Remover 211-016 (T69L-10300-B)
	Pump Pulley Replacer 211-185 (T91P-3A733-A)

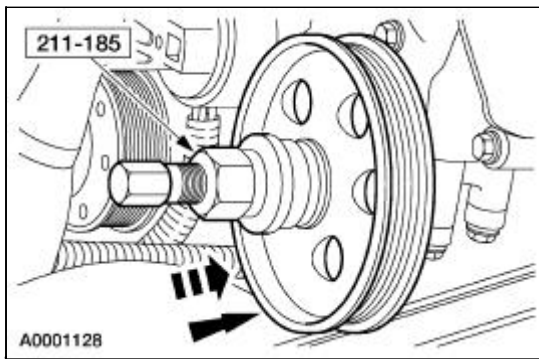
Removal

1. Remove the air cleaner cover and the air cleaner outlet tube. For additional information, refer to [Section 303-12](#).
2. Remove the accessory drive belt. For additional information, refer to [Section 303-05](#).
3. Using the special tool, remove the pulley (3A733).



Installation

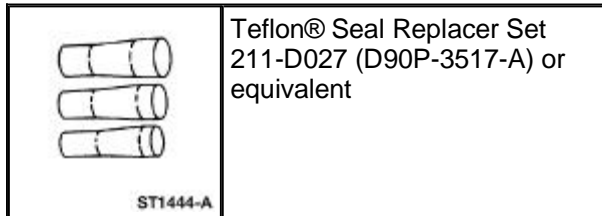
1. Using the special tool, install the pulley.



2. Install the accessory drive belt. For additional information, refer to [Section 303-05](#).
 3. Install the air cleaner outlet tube and the air cleaner cover. For additional information, refer to [Section 303-12](#).
-

Power Steering Pump to Steering Gear Pressure Line

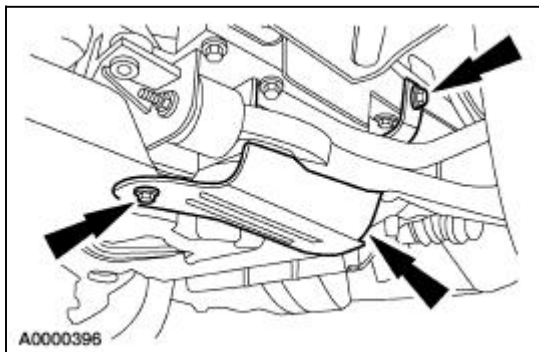
Special Tool(s)



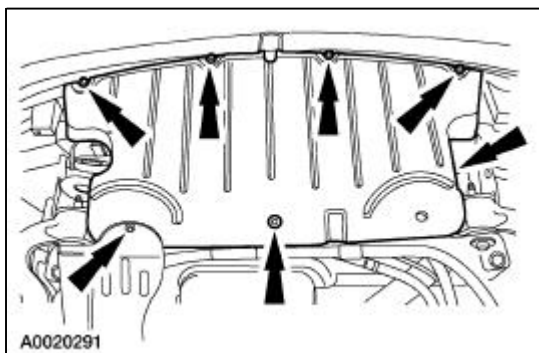
Removal and Installation

All vehicles

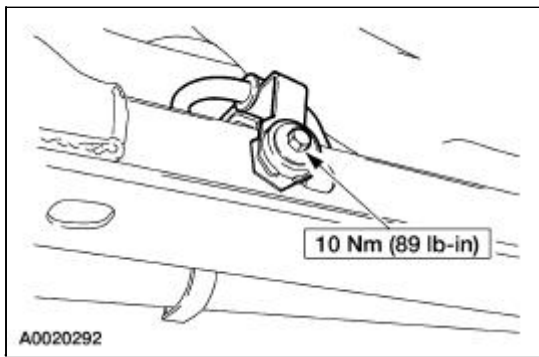
1. Raise and support the vehicle. For additional information, refer to [Section 100-02](#).
2. Remove the screw, pushpin and the air deflector.



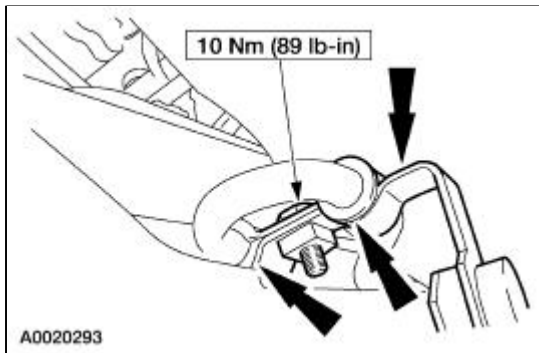
3. Remove the screws and the air deflector.



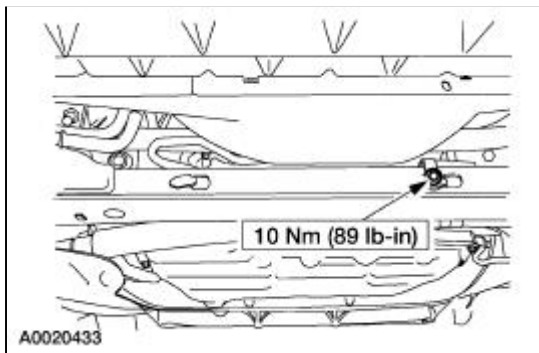
4. Remove the bolt.



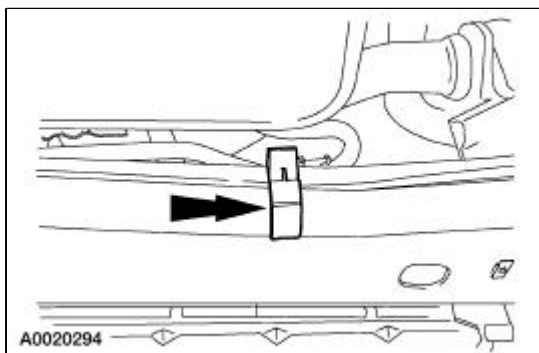
5. Remove the bolt, bracket and bushings.



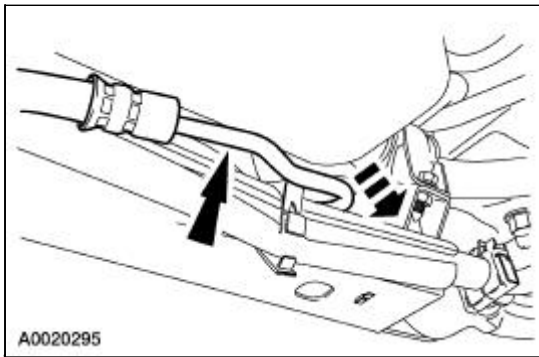
6. Remove the bolt.



7. Unclip the retainer.

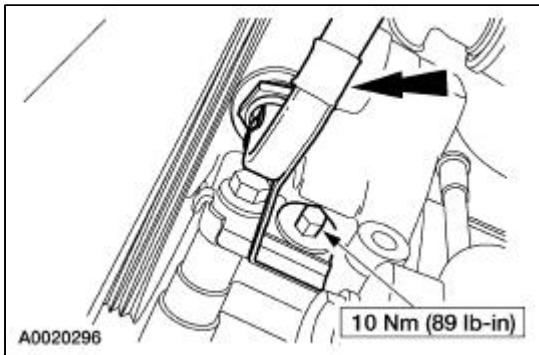


8. Pull the hose rearward between the oil pan and the radiator support crossmember.

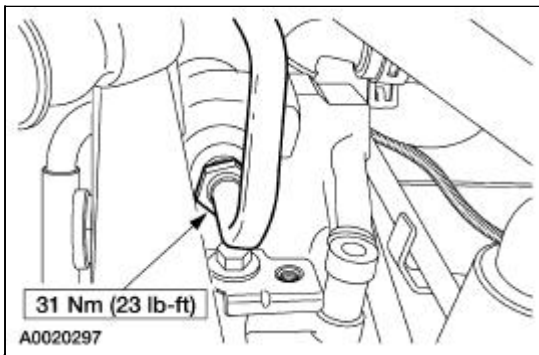


3.0L engine

9. Remove the bolt and the bracket.

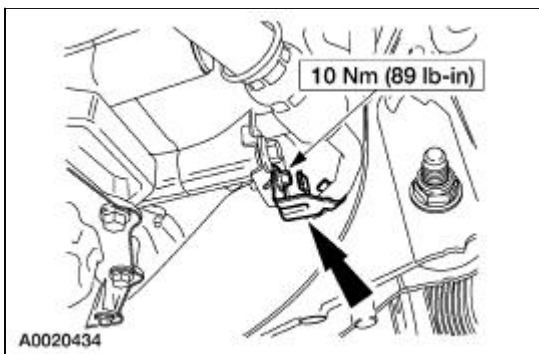


10. Disconnect the hose (3A719) at the pump.

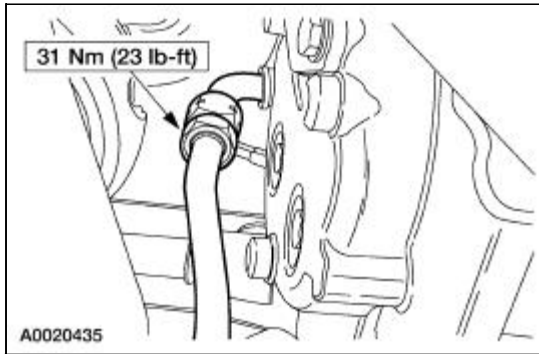


3.9L engine

11. Remove the bolt and the bracket.

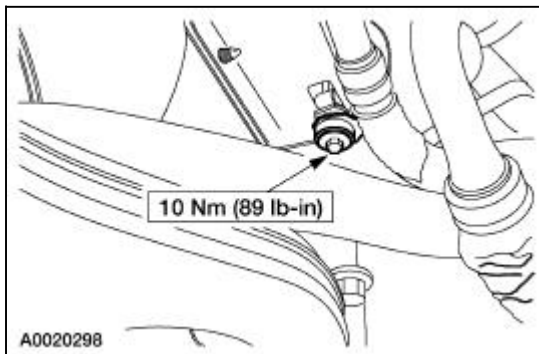


12. Disconnect the hose (3A719) at the pump.
 - Drain the fluid into a suitable container.

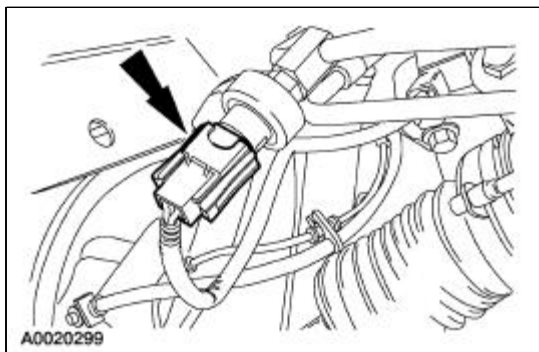


All vehicles

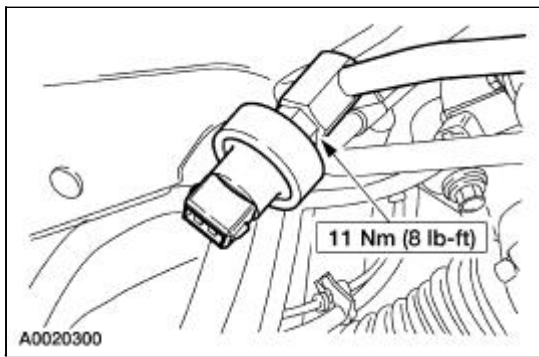
13. Remove the bolt.



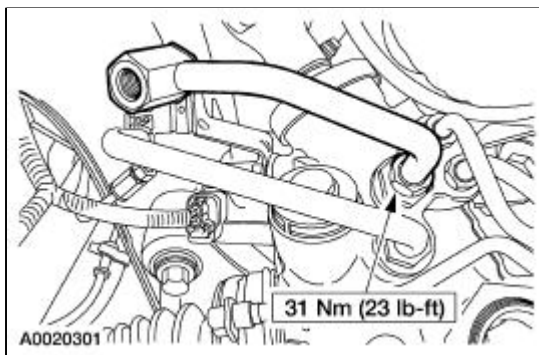
14. Disconnect the wiring at the pressure switch (3N824).



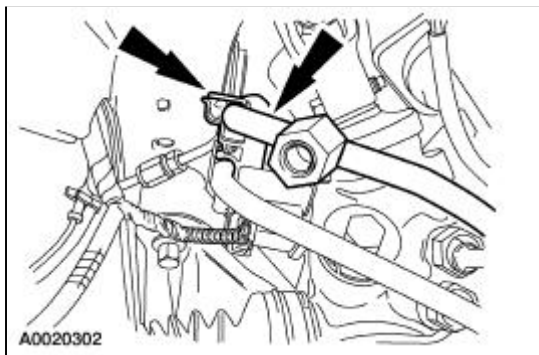
15. Remove the pressure switch.
 - Drain the fluid into a suitable container.



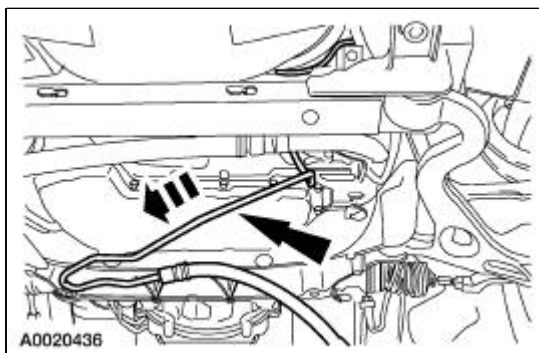
16. Disconnect the hose at the steering gear.



17. Unclip the retainer and detach the hose.

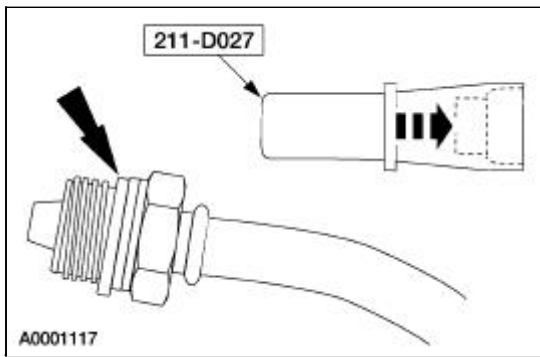


18. Remove the hose.



19. To install, reverse the removal procedure.

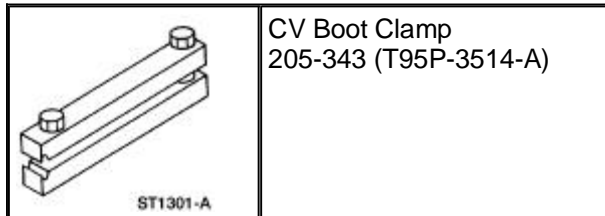
- Install a new seal using the special tool.



20. Fill and leak check the system. For additional information, refer to [Section 211-00](#).

Cooler —Fluid

Special Tool(s)

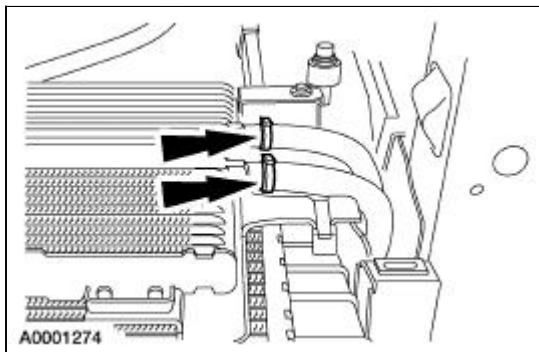


Removal

1. Remove the A/C condenser core. For additional information, refer to [Section 412-03](#).

NOTE: There are four hoses attached to the cooler on a vehicle equipped with a manual transmission. A vehicle equipped with an automatic transmission has six hoses attached to the cooler.

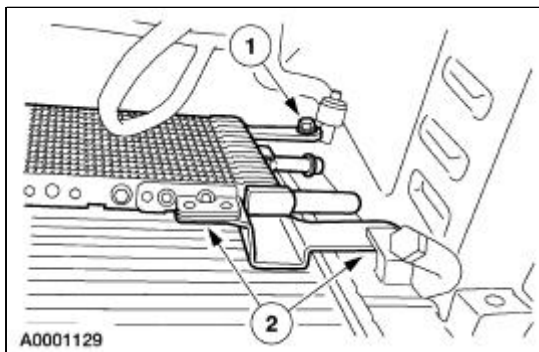
2. Remove and discard the clamps.



3. **NOTE:** Position a drain pan under the vehicle to catch any fluid that may spill.

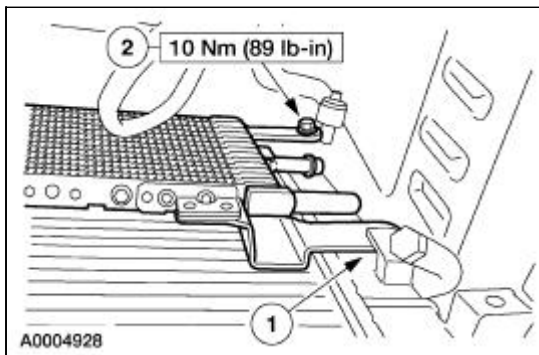
Disconnect the hoses. Plug the hoses and the cooler (3D746).

4. Remove the cooler.
 1. Remove two bolts.
 2. Lift the cooler from the retainers and remove the cooler.

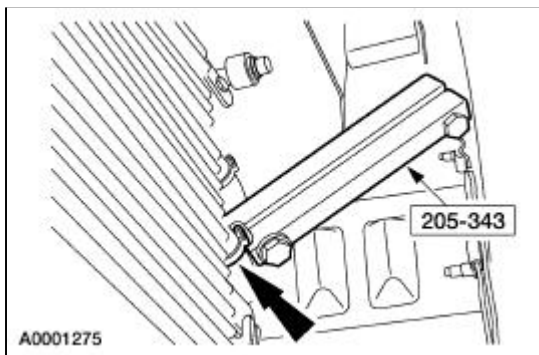


Installation

1. Install the cooler.
 1. Position the cooler on the retainers.
 2. Install two bolts.



2. Position new clamps on the hoses.
3. Unplug the hoses and the cooler. Connect the hoses.
4. Using the special tool, tighten the clamps.



5. Install the A/C condenser. For additional information, refer to [Section 412-03](#).
 6. Fill and leak check the system. For additional information, refer to [Section 211-00](#).
 7. If the vehicle is equipped with an automatic transmission, check and fill the transmission. For additional information, refer to [Section 307-01](#).
 8. Fill the cooling fan reservoir. For additional information, refer to [Section 303-03](#).
-

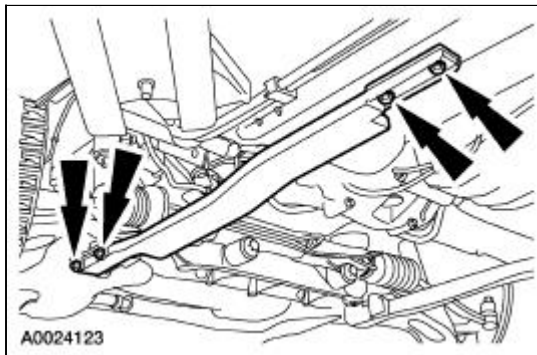
Steering Gear

Special Tool(s)



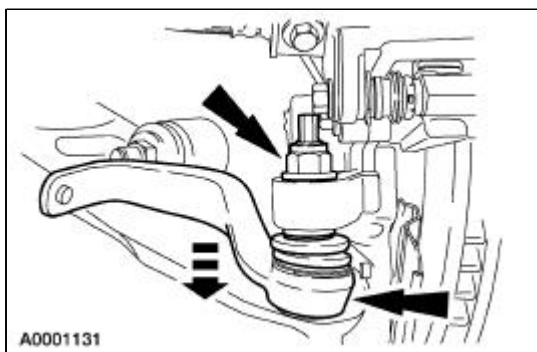
Removal

1. Raise the vehicle on a hoist. For additional information, refer to [Section 100-02](#).
2. Remove the wheel and tire assemblies. For additional information, refer to [Section 204-04](#).
3. If equipped, remove the eight bolts and the two I-braces.
 - Discard the bolts.

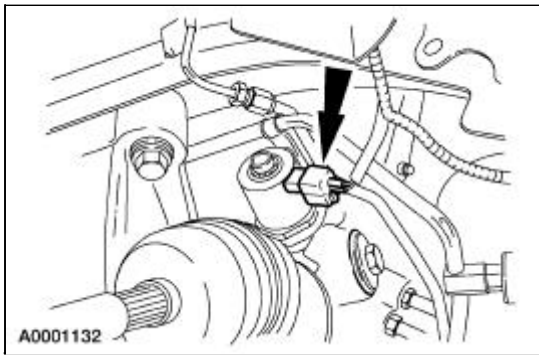


4. **NOTE:** To remove the nuts, first loosen the nut, and then use the hex holding feature to prevent the tie-rod end ball joint from turning.

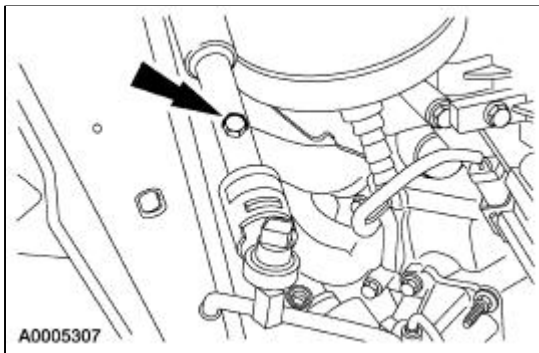
Remove the nuts and disconnect the tie-rod ends (3A130). Discard the nuts.



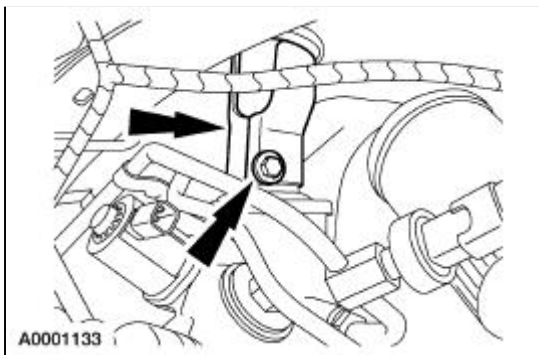
5. Disconnect the electrical connector.



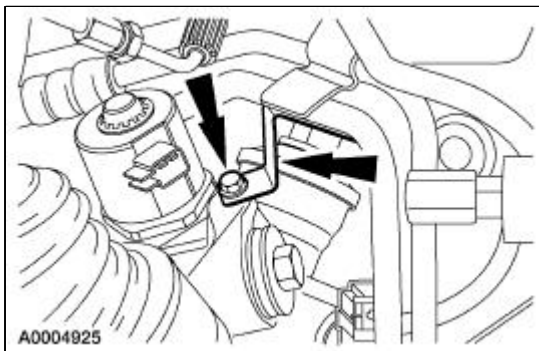
6. Loosen the bolt.



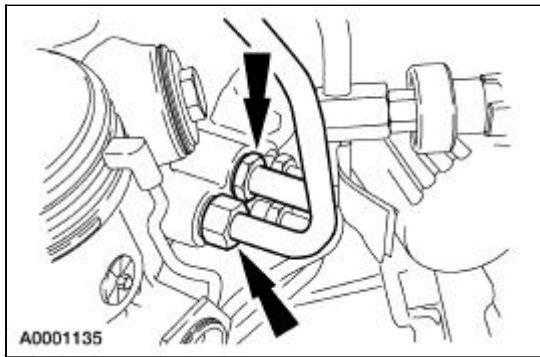
7. Remove the pinch bolt and disconnect the intermediate shaft (3A525).



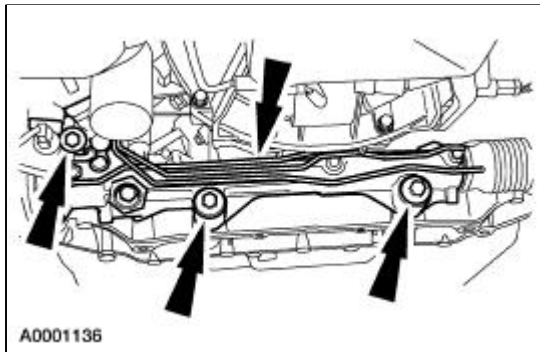
8. Remove the bolt and disconnect the power steering hose bracket.



9. Disconnect the power steering hoses. Plug the hose ends and the gear.

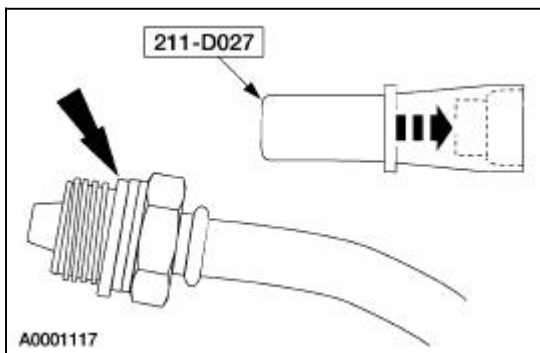


10. Remove the nuts, bolts and the power steering gear (3504). Discard the nuts.

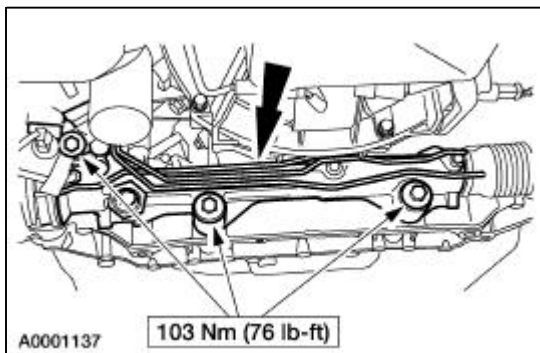


Installation

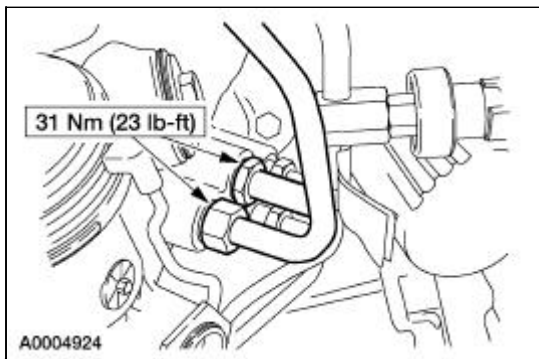
1. Using the appropriate special tool, install new O-rings on the power steering pressure and return hose fittings.



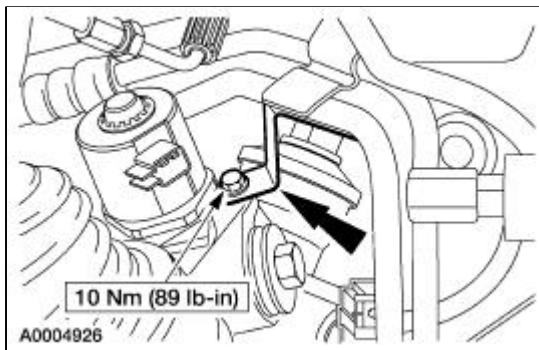
2. Position the power steering gear and install the bolts and new nuts.



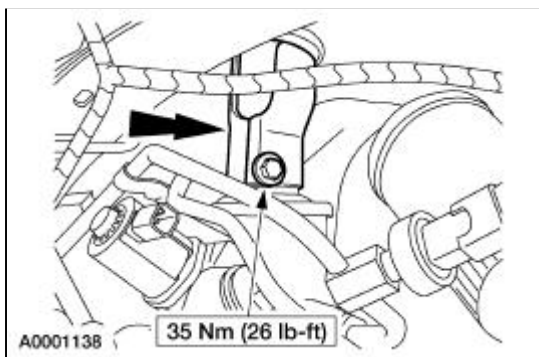
3. Remove the plugs and connect the power steering hoses.



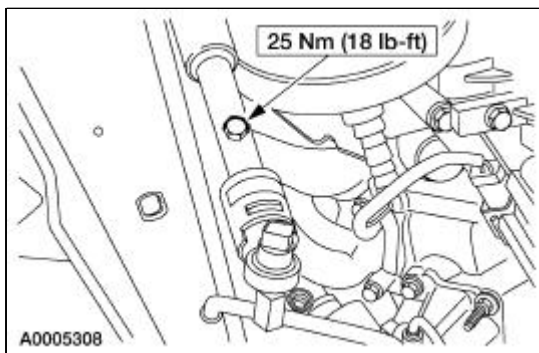
4. Connect the power steering hose bracket and install the bolt.



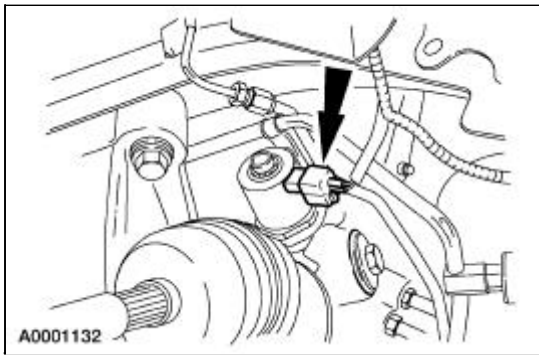
5. Connect the intermediate shaft and install the bolt.



6. Tighten the bolt.

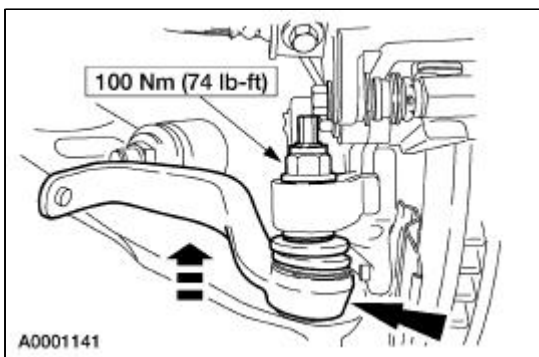


7. Connect the electrical connector.

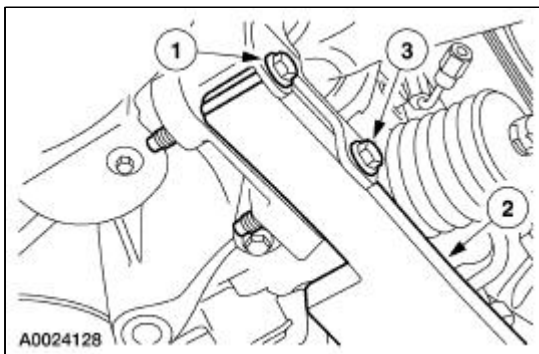


8. **NOTE:** To install the nuts, use the hex holding feature to prevent the tie-rod end ball joint from turning. Final tighten using a socket and a torque wrench.

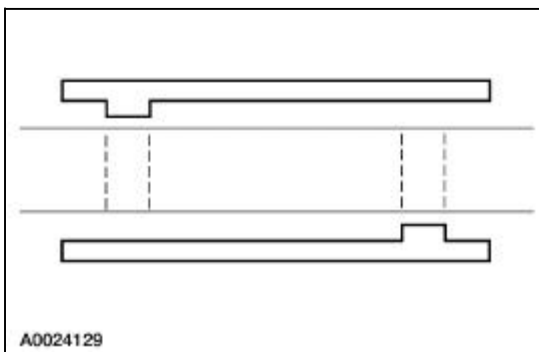
Connect the tie-rod ends and install new nuts.



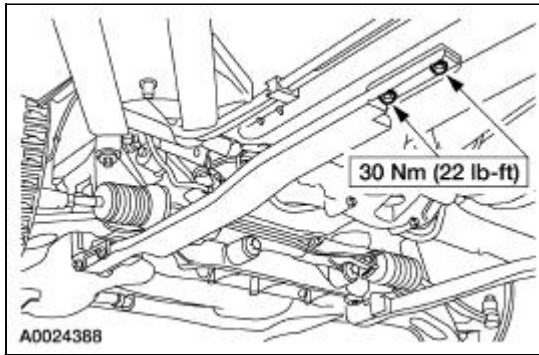
9. If equipped, position the two I-braces and loosely install the bolts.
1. Loosely install the front bolts.
 2. Position the I-braces.
 3. Loosely install the rear bolts.



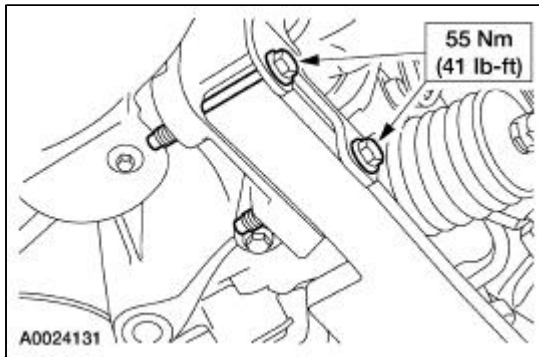
10. If equipped, make sure that the I-brace insulators are correctly positioned.



11. If equipped, install the I-brace bolts.



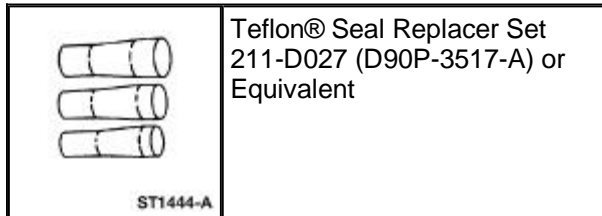
12. If equipped, tighten the I-brace bolts.



13. Install the wheel and tire assemblies. For additional information, refer to [Section 204-04](#).
 14. Lower the vehicle.
 15. Fill and leak check the system. For additional information, refer to [Section 211-00](#).
 16. Check wheel alignment. Adjust as necessary. For additional information, refer to [Section 204-00](#).
-

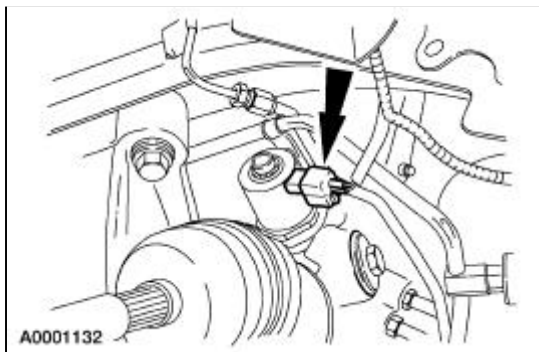
Power Steering Control Valve Actuator

Special Tool(s)

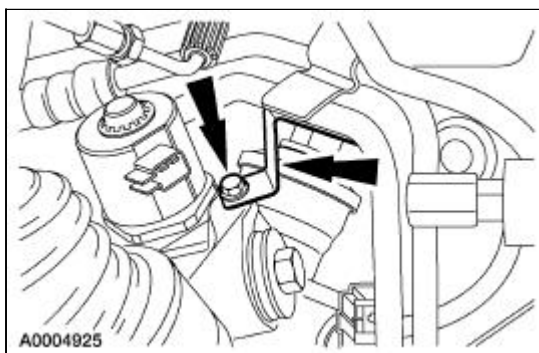


Removal

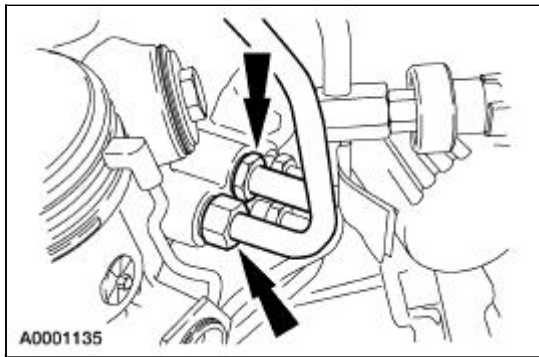
1. Raise the vehicle on a hoist. For additional information, refer to [Section 211-00](#).
2. Disconnect the electrical connector.



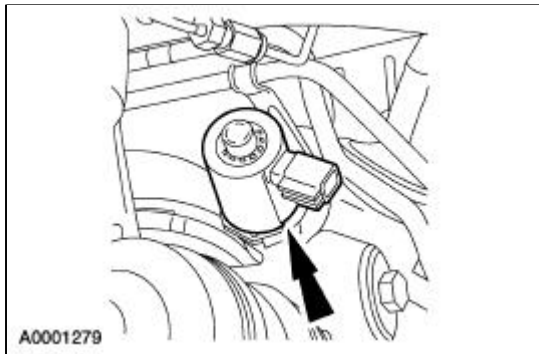
3. Remove the bolt and disconnect the power steering hose bracket.



4. Disconnect the power steering hoses. Plug the hose ends and the gear.

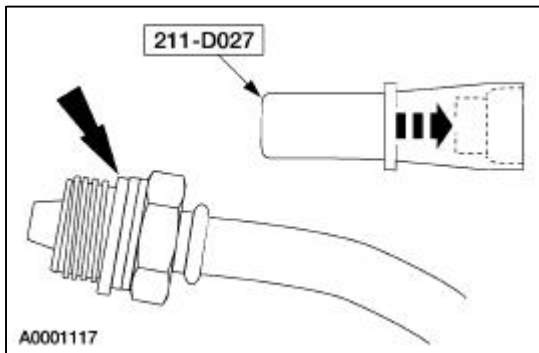


5. Remove the control valve actuator.

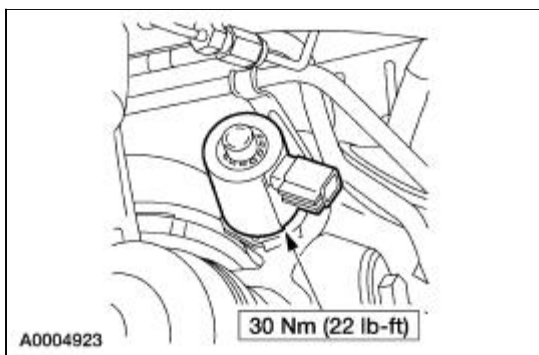


Installation

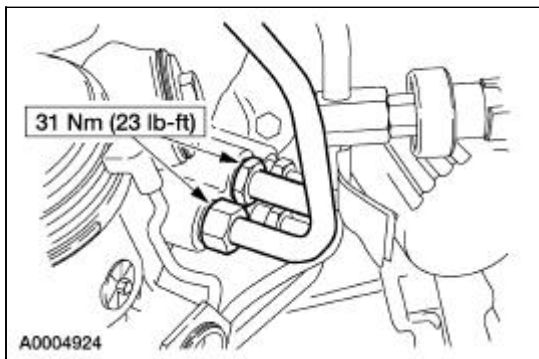
1. Using the appropriate special tool, install new O-rings on the power steering hose fittings.



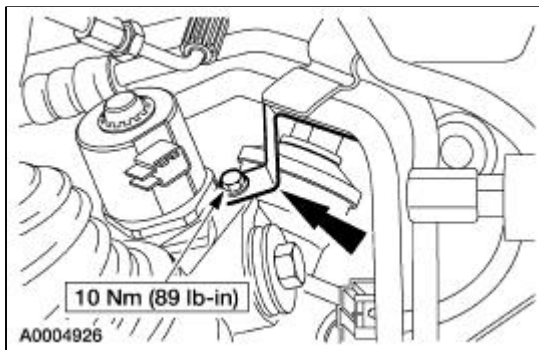
2. Install the control valve actuator.



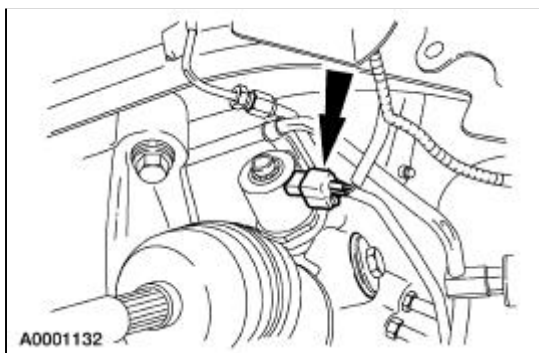
3. Remove the plugs and connect the power steering hoses.



4. Connect the power steering hose bracket and install the bolt.




5. Connect the electrical connector.





6. Lower the vehicle.
-


Steering Wheel Rotation Sensor


Removal

 **WARNING:** Always wear safety glasses when repairing an air bag supplemental restraint system (SRS) vehicle and when handling an air bag module. This will reduce the risk of injury in the event of an accidental deployment.


 **WARNING:** Carry a live air bag module with the air bag and trim cover pointed away from your body. This will reduce the risk of injury in the event of an accidental deployment.


 **WARNING:** Do not set a live air bag module down with the trim cover facing down. This will reduce the risk of injury in the event of an accidental deployment.

 **WARNING:** After deployment, the air bag surface may contain deposits of sodium hydroxide, a product of the gas generant combustion that is irritating to the skin. Wash your hands with soap and water afterwards.

 **WARNING:** Never probe the connectors on an air bag module. Doing so can result in air bag deployment, which can result in personal injury.

 **WARNING:** Air bag modules with discolored or damaged trim covers must be replaced, not repainted.

 **WARNING:** Vehicle sensor orientation is critical for proper system operation. If a vehicle equipped with an air bag supplemental restraint system (SRS) is involved in a collision, inspect the sensor mounting bracket and wiring pigtail for deformation. Replace and properly position the sensor or any other damaged supplemental restraint system (SRS) components whether or not the air bag is deployed.

 **WARNING:** To avoid accidental deployment and possible personal injury, the backup power supply must be depleted before repairing or replacing any front or side air bag supplemental restraint system (SRS) components and before servicing, replacing, adjusting or striking components near the front or side air bag sensors, such as doors, instrument panel, console, door latches, strikers, seats and hood latches.

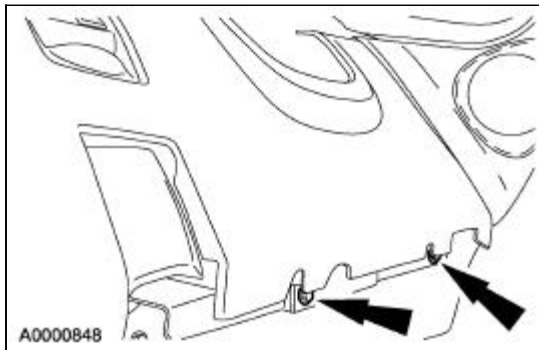
Please refer to the appropriate vehicle shop manual to determine location of the front air bag sensors.

The side air bag sensors are located at or near the base of the B-pillar.

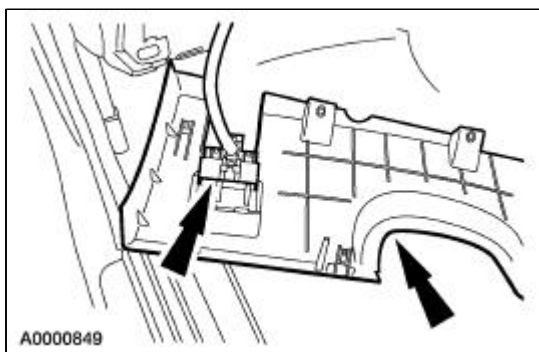
To deplete the backup power supply energy, disconnect the battery ground cable and wait at least one minute. Be sure to disconnect auxiliary batteries and power supplier (if equipped).

1. Center the steering wheel with the front wheels in the straight-ahead position.
2. Disconnect the battery ground cable. For additional information, refer to [Section 414-01](#).
3. Remove the driver air bag module. For additional information, refer to [Section 501-20B](#).

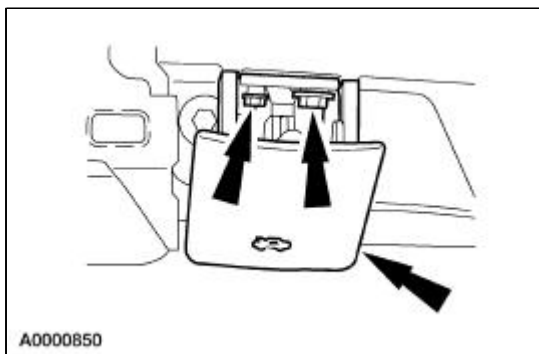
4. Remove the screws and pull the lower steering column opening finish panel out far enough to access the electrical connectors.



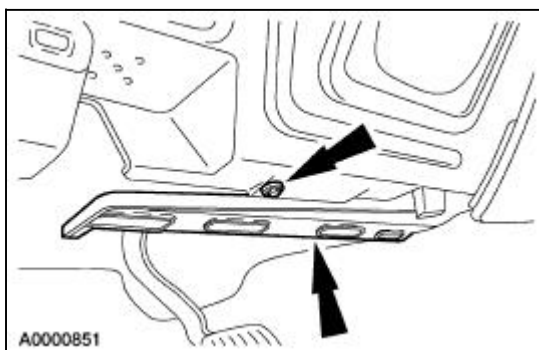
5. Disconnect the electrical connectors and remove the finish panel.



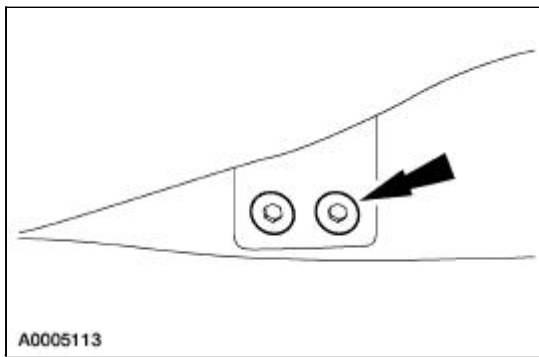
6. Remove the screws and disconnect the hood release assembly.



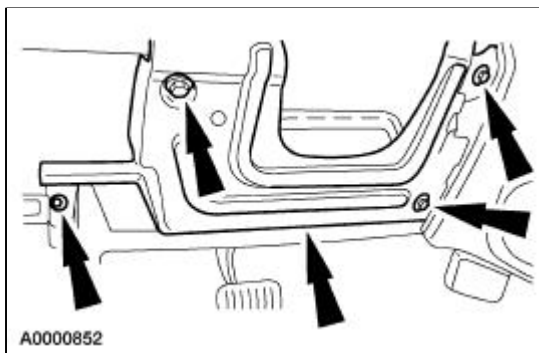
7. Remove the screw and the heater duct.



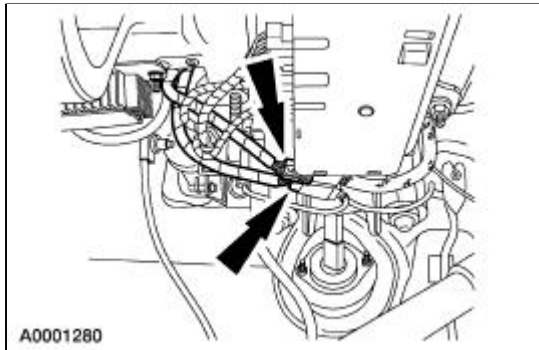
8. Pull the carpet away from the console tunnel and loosen the bolts.



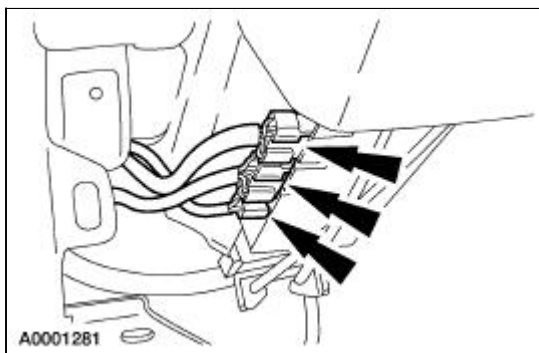
9. Remove four screws and the steering column opening reinforcement.




10. Disconnect the steering wheel rotation sensor and the electric tilt/telescoping motor electrical connectors.



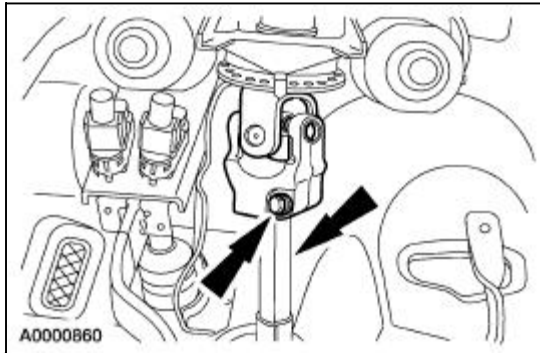
11. Disconnect the electrical connectors.



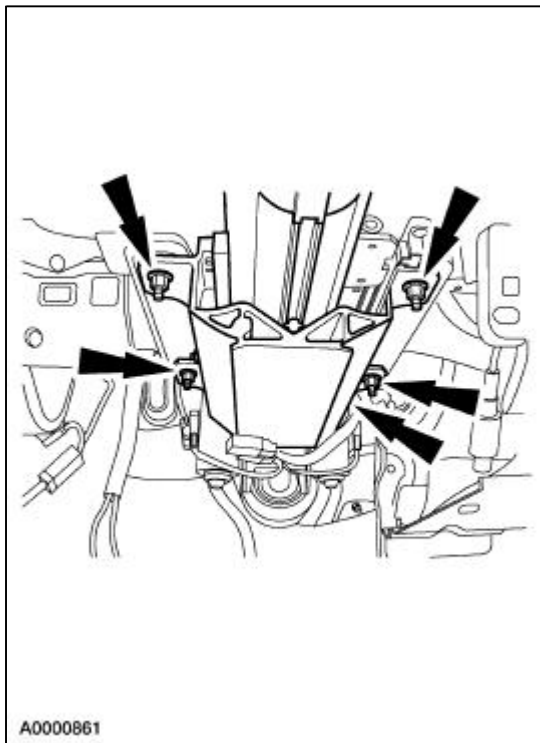
12.  **CAUTION:** The lower end of the steering column shaft must be wired in such a way that the steering column does not rotate, resulting in damage to the air bag sliding contact.

Using wire, secure the steering column shaft and the steering column to prevent damage to the air bag sliding contact.

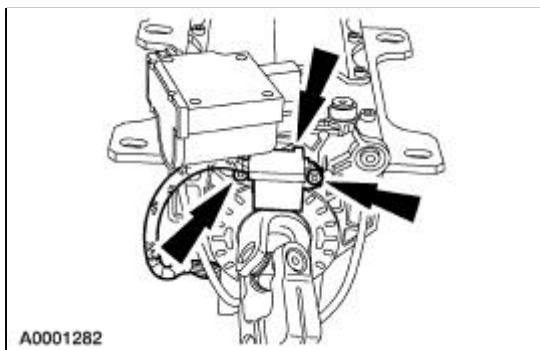
13. Remove and discard the steering column shaft pinch bolt. Disconnect the shaft.



14. While supporting the steering column, remove the lock nuts and the steering column. Discard the nuts.



15. Remove the screws. Detach the electrical connector from the steering column and remove the sensor.



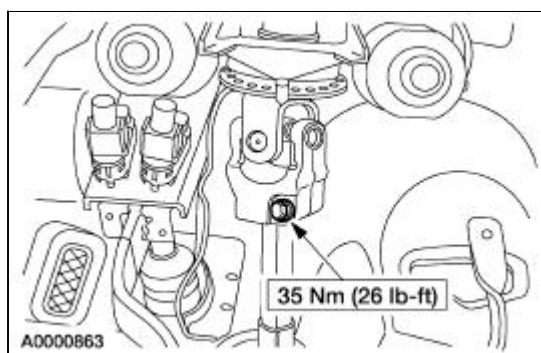
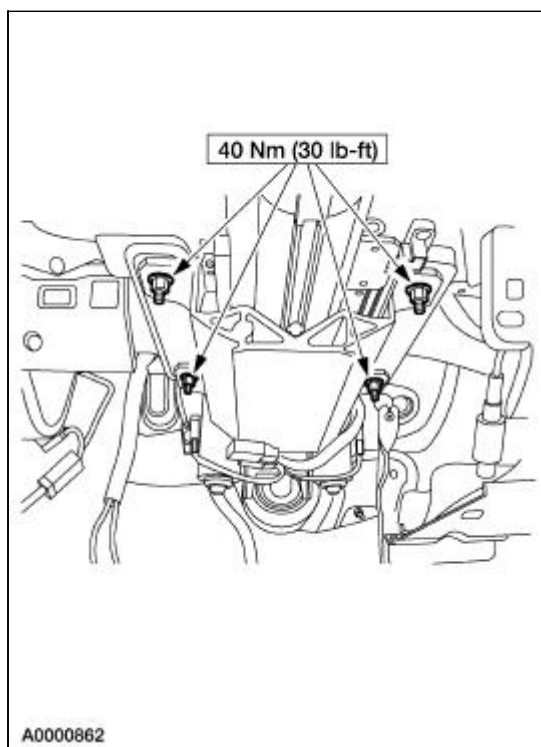
Installation

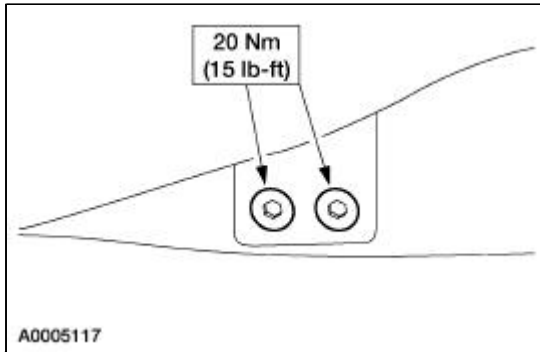
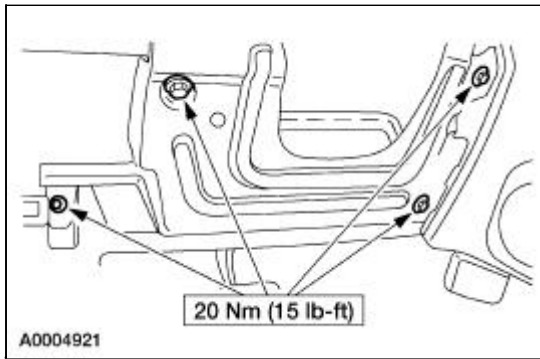
⚠ WARNING: Always wear safety glasses when repairing an air bag supplemental restraint system (SRS) vehicle and when handling an air bag module. This will reduce the risk of injury in the event of an accidental deployment.

⚠ WARNING: Carry a live air bag module with the air bag trim cover pointed away from your body. This will reduce the risk of injury in the event of an accidental deployment.

⚠ WARNING: Never probe the connectors on the air bag module. Doing so can result in air bag deployment, which can result in personal injury.

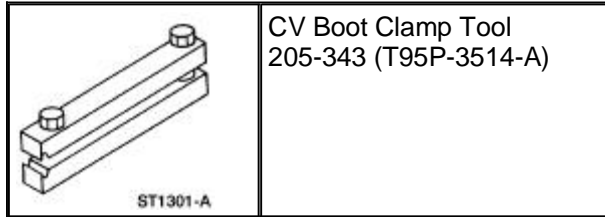
1. To install, reverse the removal procedure.
 - Use new lock nuts and a new pinch bolt.





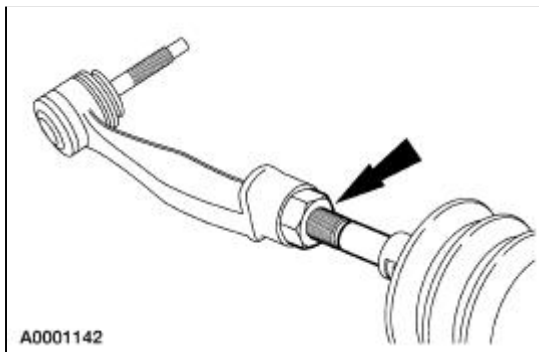
Gear

Special Tool(s)

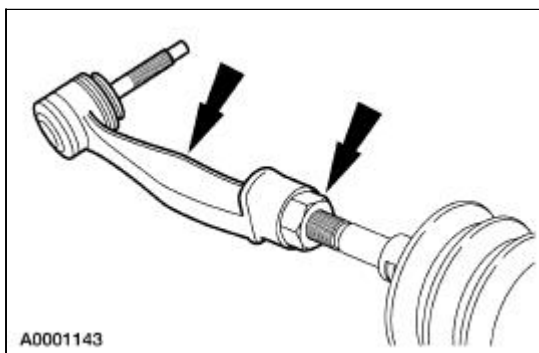


Disassembly

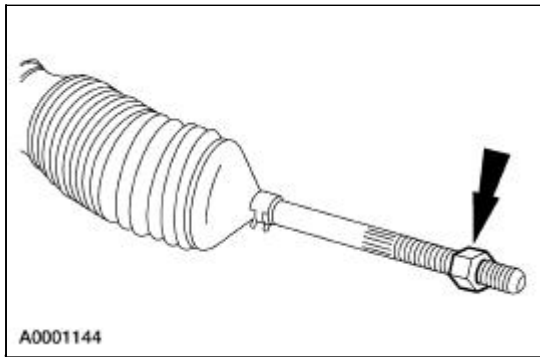
1. Position the power steering gear (3504) in a soft-jawed vice.
2. Mark the jam nuts and the tie-rods for installation reference.



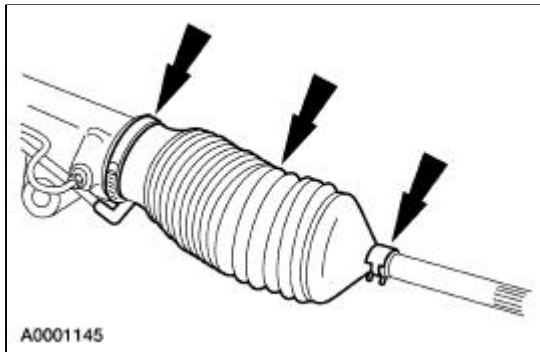
3. Loosen the jam nuts and remove the tie-rod ends (3A130).



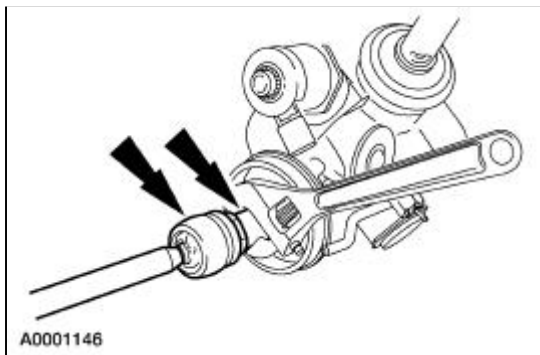
4. Remove the jam nuts.



5. Remove the boot clamps and the boots.

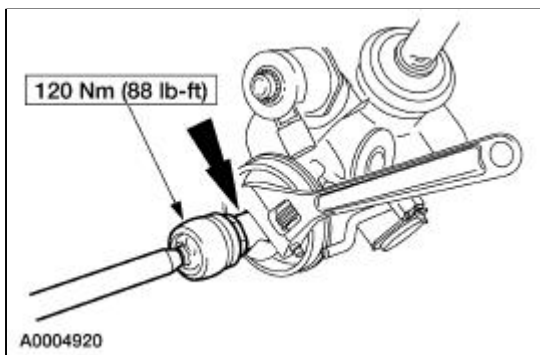


6. While holding the rack, remove the tie-rods.

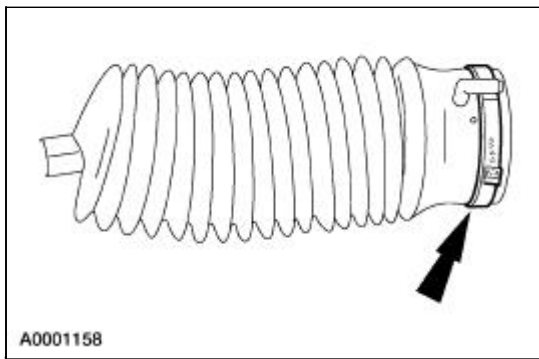


Assembly

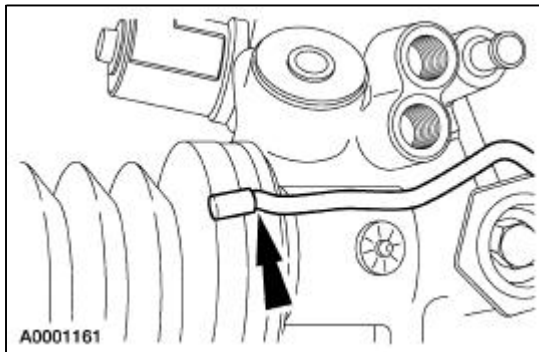
1. While holding the rack, install the tie-rods.



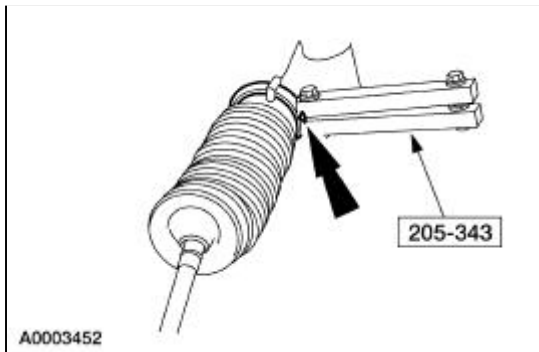
2. Position new inner clamps on the boots.



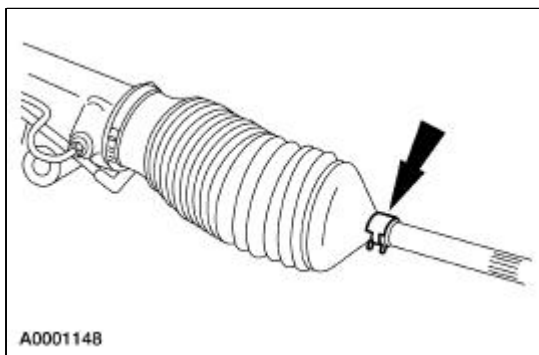
3. Position the boots on the gear, making sure the air tube is correctly installed in the boots and aligned between the locating marks on the gear housing.



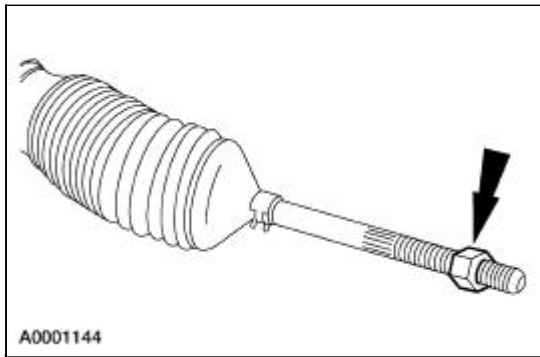
4. Using the special tool, tighten the clamps.



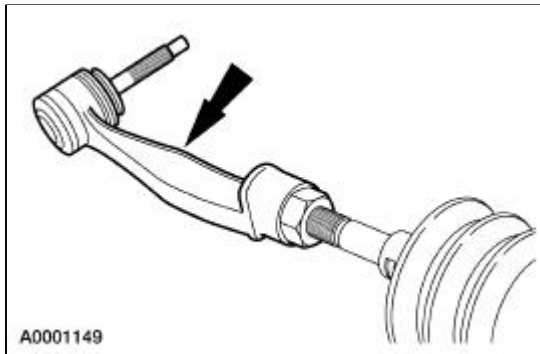
5. Install the clamp.



6. Install the jam nuts to the marks made during installation.



7. Install the tie-rod ends.



Torque Specifications

Description	Nm	lb-ft	lb-in
Steering column mounting nuts	17	13	—
Steering column release motor assembly mounting screws	3	—	27
Steering column-to-intermediate shaft pinch bolt	30	22	—
Intermediate shaft-to-gear pinch bolt	35	26	—
Steering sensor screws	3	—	27
Steering wheel bolt	38	38	—

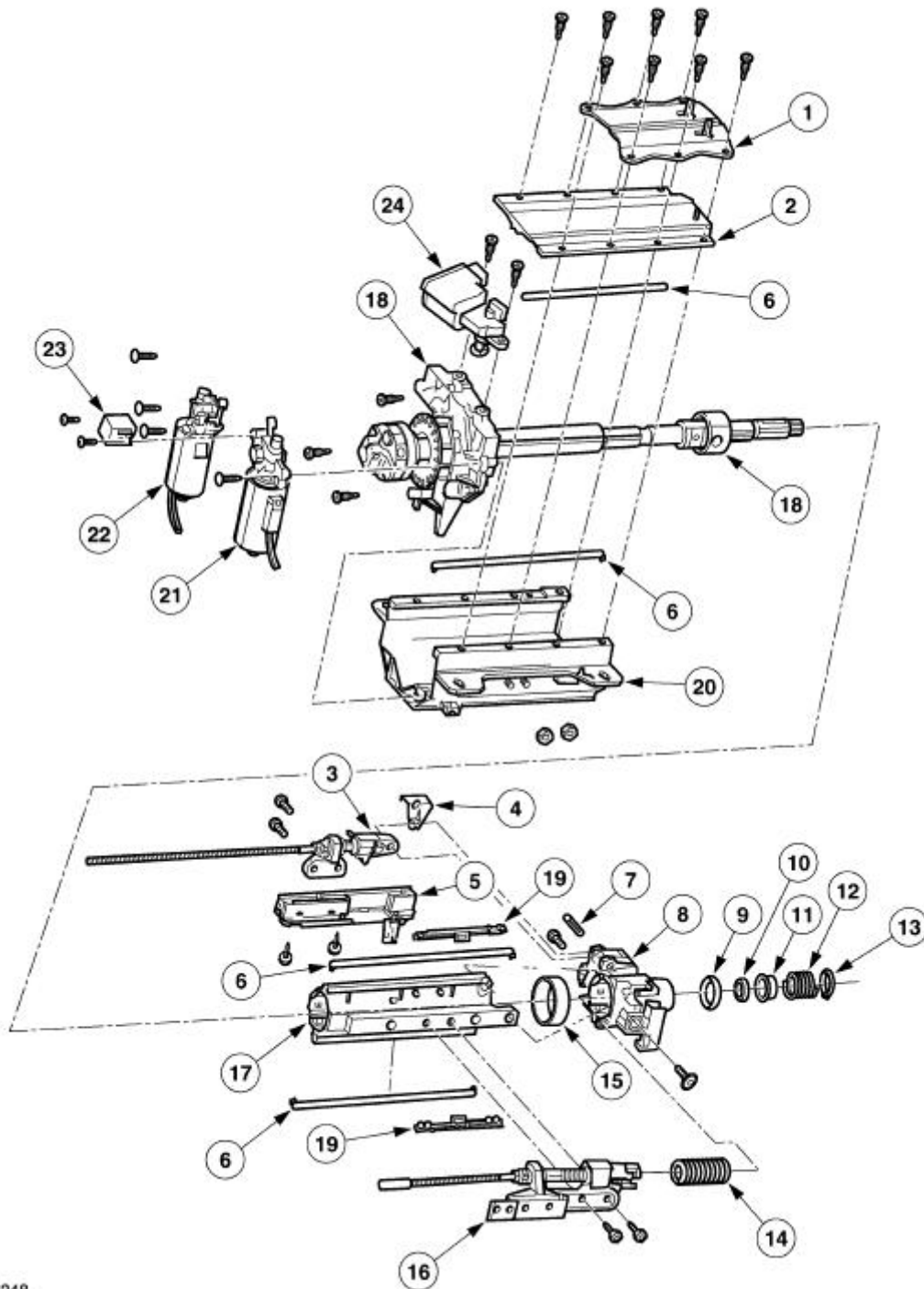
Steering Column

NOTE: All fasteners are important in that they can affect the performance of vital parts and systems, and their failure can result in major repair expenses. New fasteners of the same part number must be installed if the installation of new fasteners becomes necessary. Do not install a part of lesser quality or substitute design. Torque values must be used as specified during assembly to make sure these parts function correctly.

The vehicle is equipped with a power tilt/telescopic steering column that allows the steering wheel angle and length to be adjusted to suit the driver.

Power Tilt/Telescopic Steering Column

Exploded View— Power Tilt/Telescopic Steering Column



A0006248

Item	Part Number	Description
1	3F790	Steering column outer housing plate
2	3F789	Steering column outer housing
3	3F797	Steering column actuator assembly (tilt)
4	3A517	Steering column connector link
5	14A605	Steering column potentiometer assembly
6	3B628	Steering column track
7	3D545	Steering column release pin

8	3511	Steering column tube flange
9	3517	Steering column tube bearing assembly
10	3L539	Steering column upper bearing tolerance ring
11	3518	Steering column bearing sleeve
12	3520	Steering column upper bearing spring
13	97663	Steering column upper bearing retainer
14	3D655	Steering column position spring
15	3517	Steering column tube bearing assembly
16	3F797	Steering column actuator assembly (telescopic)
17	3F791	Steering column inner housing
18	3524	Steering column upper shaft assembly
19	3F795	Steering column inner track bearing retainer assembly
20	3B718	Steering column support assembly
21	3D538	Steering column release motor assembly (telescopic)
22	3D538	Steering column release motor assembly (tilt)
23	18B015	Steering wheel absorber electronic steering sensor
24	3K772	Steering wheel lock actuator (manual transmission only)

The power tilt/telescopic steering column is of modular construction that features easy to service electrical switches.

The power tilt/telescopic steering columns are equipped with an electric tilt and telescopic mechanisms that allow the steering wheel angle and length to be adjusted to suit the driver. Vehicles with the memory package, the steering wheel position is stored in memory in the same way as the driver seat position and retrieved as a personality feature. The steering column is controlled by the instrument cluster module.

Before carrying out work on or around any supplemental air bag system component, observe all supplemental air bag system conditions and warnings to avoid unnecessary air bag deployment and possible injury. Refer to [Section 501-20B](#) for supplemental air bag system.

Ignition Switch

The ignition lock cylinder and switch are two components. When the lock cylinder ignition key is turned to different positions, it is aligning electrical contacts in the ignition switch. Electrical contacts are made in the ACC (Accessory), RUN and START positions. In the OFF position the switch is open and the key can be removed.

The ignition switch and lock cylinder assembly is mounted to the right of the steering column in the instrument panel. An opening in the instrument panel provides key access to the lock cylinder.



Steering Column

Refer to [Section 211-00](#) .

Steering Column —Tilt/Telescopic Motors

Refer to Wiring Diagrams Section [211-04](#) for schematic and connector information.

Special Tool(s)

 ST1137-A	77 III Automotive Meter 105-R0056 or equivalent
 ST2332-A	Worldwide Diagnostic System (WDS) 418-F224 New Generation STAR (NGS) Tester 418-F052 or equivalent scan tool

Inspection and Verification

1. Verify the customer's concern by operating the steering column switch to duplicate the condition.
2. Inspect to determine if one of the following apply:

Visual Inspection Chart

Mechanical	Electrical
<ul style="list-style-type: none"> ● Binding steering column 	<ul style="list-style-type: none"> ● Damaged fuse central power distribution box fuse 19 (15A) ● Damaged multi-function switch ● Circuitry open/shorted ● Loose/corroded electrical connectors

3. If inspection reveals obvious concern(s) that can be readily identified, repair as required.
4. If the concern remains after the inspection, connect scan tool to the data link connector (DLC) located beneath the instrument panel to carry out DATA LINK DIAGNOSTIC TEST. Refer to [Section 418-00](#). If the scan tool responds with NO RESPONSE/NOT EQUIPPED for instrument cluster module (ICM), refer to [Section 413-01](#). If the DATA LINK DIAGNOSTIC TEST is passed for the ICM, retrieve continuous diagnostic trouble codes (DTCs) and execute Self Test Diagnostics for the ICM. Refer to [Section 418-00](#).
5. If the self test is passed and no diagnostic trouble codes (DTCs) are retrieved, GO to [Symptom Chart](#) to continue diagnostics.
6. If diagnostic trouble codes (DTCs) are retrieved, go to the Instrument Cluster Module (ICM) Diagnostic Trouble Code (DTC) Index to continue diagnostics.

7. If the instrument cluster module (ICM) cannot be accessed by the scan tool, refer to [Section 413-01](#).

Instrument Cluster Module (ICM) Diagnostic Trouble Code (DTC) Index

DTC	Description	Source	Action
B2328	Steering Column Reach Feedback Potentiometer Circuit Failure	ICM	Go To Pinpoint Test A .
B2332	Steering Column Tilt Feedback Potentiometer Circuit Failure	ICM	Go To Pinpoint Test B .
B2328 and B2332	B2328 and B2332 Steering Column Feedback Potentiometers Circuit Failure	ICM	Go To Pinpoint Test D .
B2351	Steering Column Switch Signal Circuit Failure	ICM	Go To Pinpoint Test C .


Symptom Chart

Symptom Chart

Condition	Possible Sources	Action
<ul style="list-style-type: none"> No communication with the instrument cluster module (ICM) 	<ul style="list-style-type: none"> Instrument cluster module (ICM). Circuitry. 	<ul style="list-style-type: none"> REFER to Section 413-00.
<ul style="list-style-type: none"> The tilt and telescope are inoperative 	<ul style="list-style-type: none"> Instrument cluster module (ICM). Multi-function switch. Circuitry. Steering column potentiometer assembly (14A605). 	<ul style="list-style-type: none"> Go To Pinpoint Test D.

Pinpoint Tests

PINPOINT TEST A: DTC B2328: STEERING COLUMN REACH FEEDBACK POTENTIOMETER CIRCUIT FAILURE

CONDITIONS	DETAILS/RESULTS/ACTIONS
A1 CHECK CONTINUOUS DTCs	
<p>1</p>  <p>Instrument Cluster Module (ICM) Continuous DTCs</p>	<ul style="list-style-type: none"> Is DTC B2328 present?

→ **Yes**
GO to [A2](#).

→ **No**
GO to [A11](#).

A2 CHECK FOR MOTION FAULTS

2



Instrument Cluster Module CLEAR DTCs

5



Instrument Cluster Module SELF-TEST

1 Disconnect and reconnect the battery.

3 Actuate the steering column to the full in position.

4 Actuate the steering column to the full out position.

● **Is DTC B2328 present?**

→ **Yes**
GO to [A3](#).

→ **No**
System was deactivated due to ICM registering an excessive number of motion faults. NOTIFY owner that concern has been corrected. REPEAT the self-test. CLEAR the DTCs.

A3 CHECK STEERING COLUMN BEARINGS

1 Remove the steering column shrouds.

2 Check the steering column bearings to make sure that they are fully seated back against the stops.

● **Are the steering column bearings correctly seated back against the stops?**

→ **Yes**
GO to [A4](#).

→ **No**
SEAT the steering column bearings back against the stops. REPEAT the self-test. CLEAR the DTCs.

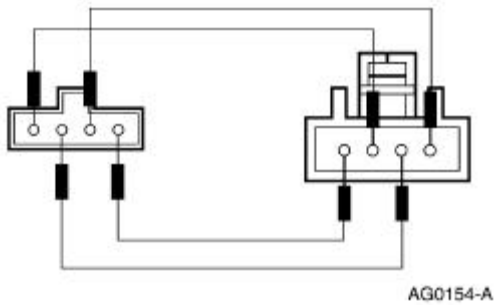
A4 ISOLATE THE POTENTIOMETERS

1



Steering Column Potentiometer Assembly C222

2



2

Connect a jumper wire between the steering column potentiometer assembly C222-1, circuit 9-AL17 (PK/OG), harness side and the steering column potentiometer assembly terminal 1.

3

Connect a jumper wire between the steering column potentiometer assembly C222-4, circuit 7-AL17 (DG/WH), harness side and the steering column potentiometer assembly terminal 4.

4

Connect a jumper wire between the steering column potentiometer assembly C222-2, circuit 8-AL17 (DB/YE) and the steering column potentiometer assembly terminal 3.

5

Connect a jumper wire between the steering column potentiometer assembly C222-3, circuit 8-AL16 (PK/LB) and the steering column potentiometer assembly terminal 2.

6



Instrument Cluster Module Self-Test

● Is DTC B2332 retrieved?

→ Yes

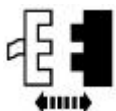
INSTALL a new steering column potentiometer assembly. REPEAT the self-test. CLEAR the DTCs.

→ No

GO to [A5](#).

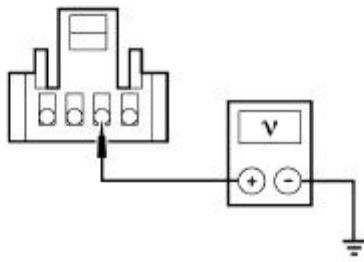
A5 CHECK CIRCUIT 8-AL16 (PK/LB) FOR A SHORT TO B+

1



Retractor Box C218

2



A0044054

2

Measure the voltage at the steering column potentiometer C222-3, circuit 8-AL16 (PK/LB), harness side.

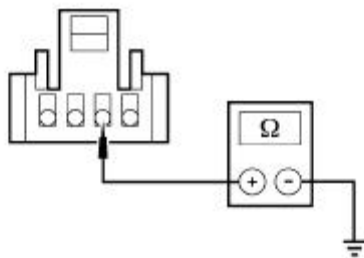
● Is voltage present?

→ **Yes**
REPAIR circuit 8-AL16. REPEAT the self-test. CLEAR the DTCs.

→ **No**
GO to [A6](#).

A6 CHECK CIRCUIT 8-AL16 (PK/LB) FOR A SHORT TO GROUND

1



A0043712

1

Measure the resistance between the steering column potentiometer C222-3, circuit 8-AL16 (PK/LB), harness side and ground.

● Is the resistance greater than 10,000 ohms?

→ **Yes**
GO to [A7](#).

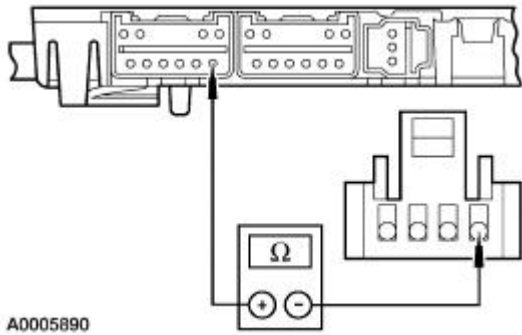
→ **No**
REPAIR circuit 8-AL16. REPEAT the self-test. CLEAR the DTCs.

A7 CHECK CIRCUIT 8-AL16 (PK/LB) FOR AN OPEN

1

1

Measure the resistance between the steering column potentiometer assembly C222-4, circuit 8-AL16 (PK/LB), harness side and the retractor box C218-6, circuit 8-AL16 (PK/LB).



● Is the resistance less than 5 ohms?

→ **Yes**
GO to [A8](#).

→ **No**
REPAIR circuit 8-AL16. REPEAT the self-test. CLEAR the DTCs.

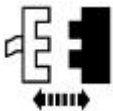
A8 CHECK CIRCUIT 8-AL16 (WH/BK) FOR A SHORT TO B+

1



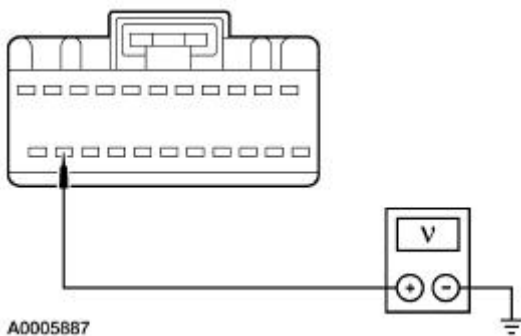
Steering Column Potentiometer Assembly C222

2



Instrument Cluster Module C220c

3



3 Measure the voltage at instrument cluster module C220c-21, circuit 8-AL16 (WH/BK), harness side.

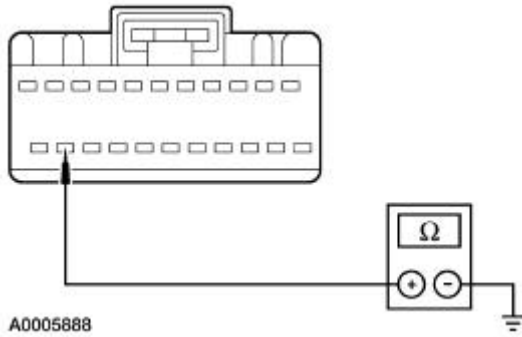
● Is voltage present?

→ **Yes**
REPAIR circuit 8-AL16. REPEAT the self-test. CLEAR the DTCs.

→ **No**
GO to [A9](#).

A9 CHECK CIRCUIT 8-AL16 (WH/BK) FOR A SHORT TO GROUND

1



1

Measure the resistance between the instrument cluster module C220c-21, circuit 8-AL16 (WH/BK), harness side and ground.

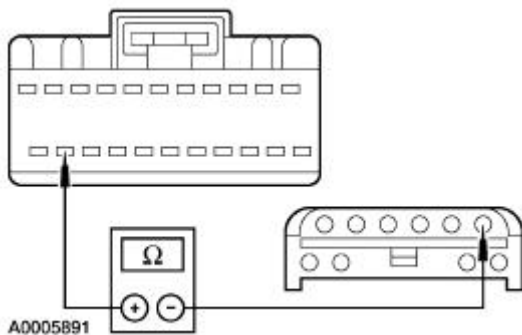
● **Is the resistance greater than 10,000 ohms?**

→ **Yes**
GO to [A10](#).

→ **No**
REPAIR circuit 8-AL16. REPEAT the self-test. CLEAR the DTCs.

A10 CHECK CIRCUIT 8-AL16 (WH/BK) FOR AN OPEN

1



1

Measure the resistance between the retractor box C218-6, circuit 8-AL16 (WH/BK), harness side and the instrument cluster C220c-21, circuit 8-AL16 (WH/BK), harness side.

● **Is the resistance less than 5 ohms?**

→ **Yes**
INSTALL an instrument cluster module. REFER to [Section 413-01](#). REPEAT the self-test. CLEAR the DTCs.

→ **No**
REPAIR circuit 8-AL16. REPEAT the self-test. CLEAR the DTCs.

A11 CHECK FOR STEERING COLUMN MOVEMENT

NOTE: This active command will only power motors for one second.

1



Instrument Cluster Module Active Command STEERING COLUMN CONTROL

2



Trigger TELES CP IN On, Then TELSCPOUT On

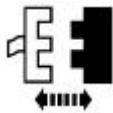
● Does the steering column telescope in and out?

→ Yes
GO to [A12](#).

→ No
GO to [A14](#).

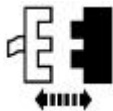
A12 CHECK CIRCUIT 8-AL16 (PK/LB) FOR AN OPEN

1



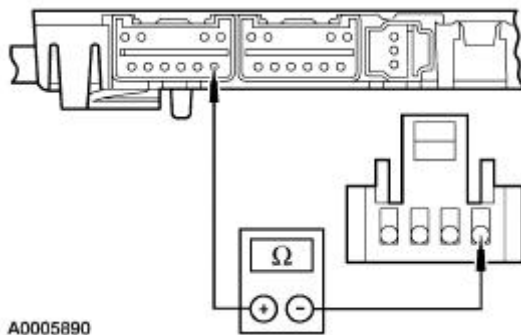
Steering Column Potentiometer C222

2



Retractor Box C218

3



3 Measure the resistance between the steering column potentiometer assembly C222-4, circuit 8-AL16 (PK/LB), harness side and the retractor box C218-6, circuit 8-AL16 (PK/LB).

● Is the resistance less than 5 ohms?

→ Yes
GO to [A13](#).

→ No
REPAIR circuit 8-AL16. REPEAT the self-test. CLEAR the DTCs.

A13 CHECK CIRCUIT 8-AL16 (WH/BK) FOR AN OPEN

1



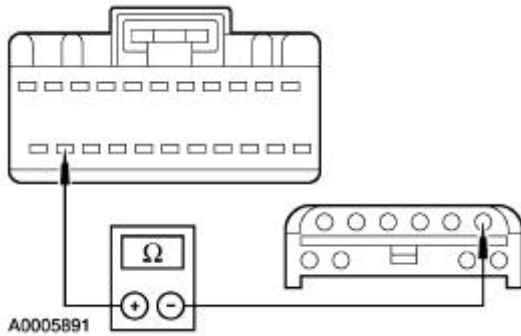
Steering Column Potentiometer Assembly C222

2



Instrument Cluster Module C220c

3



3

Measure the resistance between the retractor box C218-6, circuit 8-AL16 (WH/BK), harness side and the instrument cluster C220c-21, circuit 8-AL16 (WH/BK), harness side.

● Is the resistance less than 5 ohms?

→ Yes

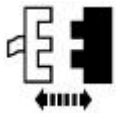
INSTALL a new steering column potentiometer assembly. REPEAT the self-test. CLEAR the DTCs.

→ No

REPAIR circuit 8-AL16. REPEAT the self-test. CLEAR the DTCs.

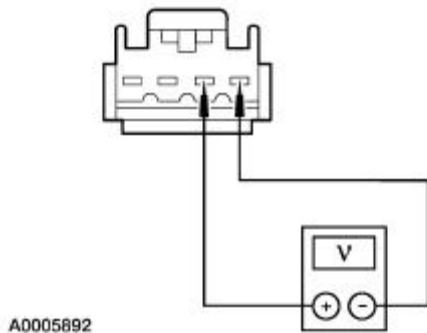
A14 ISOLATE THE MOTOR

1



Steering Column Motor Connector C227

2



3



Instrument Cluster Module Active Command STEERING COLUMN CONTROL

2

Connect a voltmeter between the steering column motor C227-3, circuit 35-AL7 (VT/BK), harness side, and the steering column motor C227-4, circuit 34-AL7 (BU/BK), harness side.

4



Trigger TELESCP IN On, Then TELSCPOUT On

5

Measure the voltage during the activate commands.

• **Is voltage present for one second after each command is sent?**

→ **Yes**

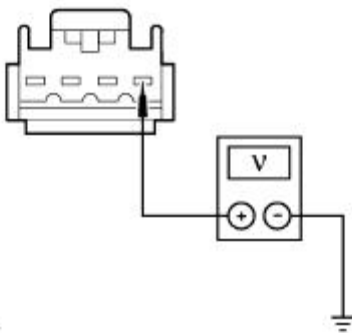
INSTALL a new telescope motor.
REPEAT the self-test. CLEAR the DTCs.

→ **No**

GO to [A15](#).

A15 CHECK CIRCUIT 34-AL7 (BU/BK) FOR VOLTAGE

1



A0005893

2



Instrument Cluster Module Active Command STEERING COLUMN CONTROL

3



Trigger TELSCPOUT On

1

Connect a voltmeter between steering column motor C227-4, circuit 34-AL7 (BU/BK), harness side and ground.

4

Measure the voltage during the activate command.

• **Is voltage present for one second after command is sent?**

→ **Yes**

GO to [A17](#).

→ **No**

GO to [A16](#).

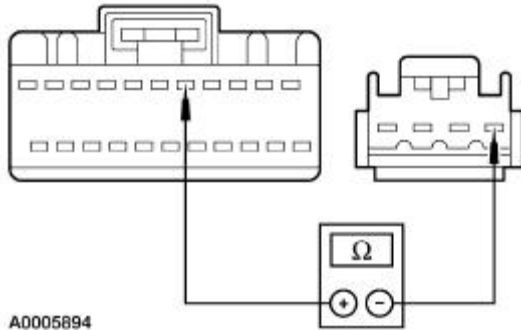
A16 CHECK CIRCUIT 34-AL7 (BU/BK) FOR AN OPEN

1



Instrument Cluster Module C220a

2



2

Measure the resistance between steering column motor C227-4, circuit 34-AL7 (BU/BK), harness side and the instrument cluster module C220a-5, circuit 34-AL7 (BU/BK), harness side.

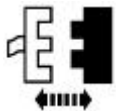
● Is the resistance less than 5 ohms?

→ **Yes**
INSTALL a new instrument cluster module. REFER to [Section 413-01](#). REPEAT the self-test. CLEAR the DTCs.

→ **No**
REPAIR circuit 34-AL7. REPEAT the self-test. CLEAR the DTCs.

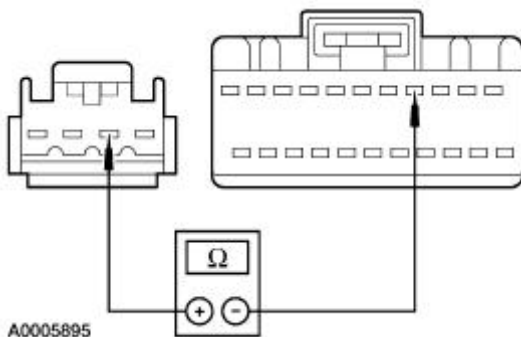
A17 CHECK CIRCUIT 35-AL7 (VT/BK) FOR AN OPEN

1



Instrument Cluster Module C220a

2



2




Measure the resistance between steering column motor C227-3, circuit 35-AL7 (VT/BK), harness side and the instrument cluster module C220a-4, circuit 35-AL7 (VT/BK), harness side.

● Is the resistance less than 5 ohms?

→ **Yes**
INSTALL a new instrument cluster module. REFER to [Section 413-01](#). REPEAT the self-test. CLEAR the DTCs.

→ **No**
REPAIR circuit 35-AL7. REPEAT the self-test. CLEAR the DTCs.

PINPOINT TEST B: DTC B2332: STEERING COLUMN TILT FEEDBACK POTENTIOMETER CIRCUIT FAILURE

CONDITIONS	DETAILS/RESULTS/ACTIONS
B1 CHECK CONTINUOUS DTCs	
<p>1</p>  <p>Instrument Cluster Module (ICM) Continuous DTCs</p>	<p>● Is DTC B2332 present?</p> <p>→ Yes GO to B2.</p> <p>→ No GO to B11.</p>
B2 CHECK FOR MOTION FAULTS	
<p>2</p>  <p>Instrument Cluster Module CLEAR DTCs</p> <p>5</p>  <p>Instrument Cluster Module SELF-TEST</p>	<p>1 Disconnect and reconnect the battery.</p> <p>3 Actuate the steering column to the full in position.</p> <p>4 Actuate the steering column to the full out position.</p> <p>● Is DTC B2328 present?</p> <p>→ Yes GO to B3.</p> <p>→ No System was deactivated due to ICM registering an excessive number of motion faults. NOTIFY owner that</p>

concern has been corrected. REPEAT the self-test. CLEAR the DTCs.

B3 CHECK STEERING COLUMN BEARINGS

- 1 Remove the steering column shrouds.
- 2 Check the steering column bearings to make sure that they are fully seated back against the stops.

- **Are the steering column bearings correctly seated back against the stops?**

→ **Yes**
GO to [B4](#).

→ **No**
SEAT the steering column bearings back against the stops. REPEAT the self-test. CLEAR the DTCs.

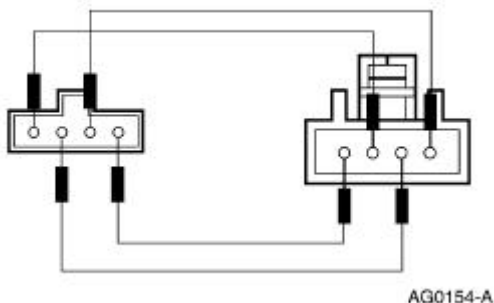
B4 ISOLATE THE POTENTIOMETERS

1



Steering Column Potentiometer Assembly C222

2



- 2 Connect a jumper wire between the steering column potentiometer assembly C222-1, circuit 9-AL17 (PK/OG), harness side and the steering column potentiometer assembly terminal 1.

- 3 Connect a jumper wire between the steering column potentiometer assembly C222-4, circuit 7-AL17 (DG/WH), harness side and the steering column potentiometer assembly terminal 4.

- 4 Connect a jumper wire between the steering column potentiometer assembly C222-2, circuit 8-AL17 (DB/YE) and the steering column potentiometer assembly terminal 3.

- 5 Connect a jumper wire between the steering column potentiometer assembly C222-3, circuit 8-AL16 (PK/LB) and the steering column potentiometer assembly terminal 2.

6



Instrument Cluster Module Self-Test

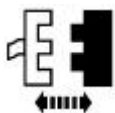
● Is DTC B2328 retrieved?

→ **Yes**
INSTALL a new steering column potentiometer assembly. REPEAT the self-test. CLEAR the DTCs.

→ **No**
GO to [B5](#).

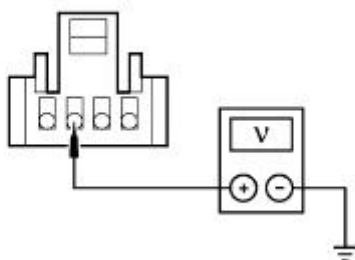
B5 CHECK CIRCUIT 8-AL17 (DB/YE) FOR A SHORT TO B+

1



Retractor Box C218

2



A0006120

2

Measure the voltage at the steering column potentiometer assembly C222-2, circuit 8-AL17 (DB/YE), harness side.

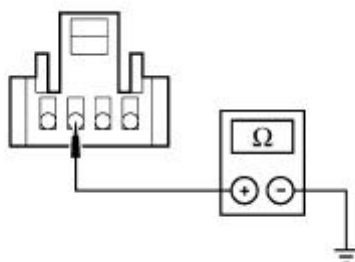
● Is voltage present?

→ **Yes**
REPAIR circuit 8-AL17. REPEAT the self-test. CLEAR the DTCs.

→ **No**
GO to [B6](#).

B6 CHECK CIRCUIT 8-AL17 (DB/YE) FOR A SHORT TO GROUND

1



A0006121

1

Measure the resistance between the steering column potentiometer assembly C222-2, circuit 8-AL17 (DB/YE), harness side and ground.

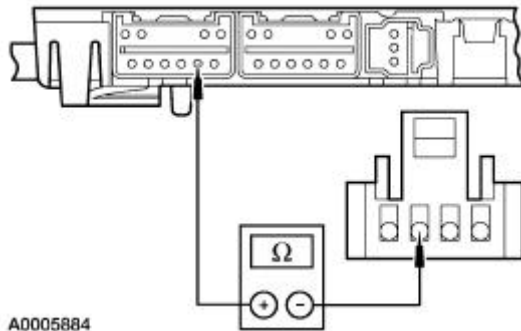
- Is the resistance greater than 10,000 ohms?

→ **Yes**
GO to [B7](#).

→ **No**
REPAIR circuit 8-AL17. REPEAT the self-test. CLEAR the DTCs.

B7 CHECK CIRCUIT 8-AL17 (DB/YE) FOR AN OPEN

1



1

Measure the resistance between the steering column potentiometer assembly C222-2, circuit 8-AL17 (DB/YE), harness side and the retractor box C218-5, circuit 8-AL17 (DB/YE).

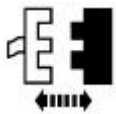
- Is the resistance less than 5 ohms?

→ **Yes**
GO to [B8](#).

→ **No**
REPAIR circuit 8-AL17. REPEAT the self-test. CLEAR the DTCs.

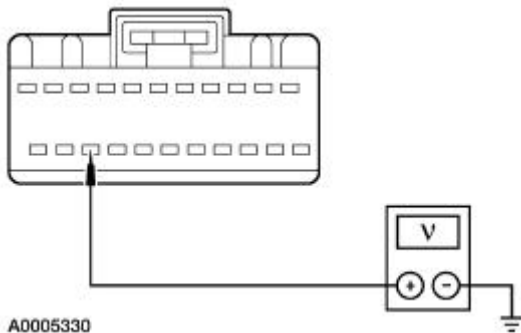
B8 CHECK CIRCUIT 8-AL17 (WH/VT) FOR A SHORT TO B+

1



Instrument Cluster Module C220c

2



2

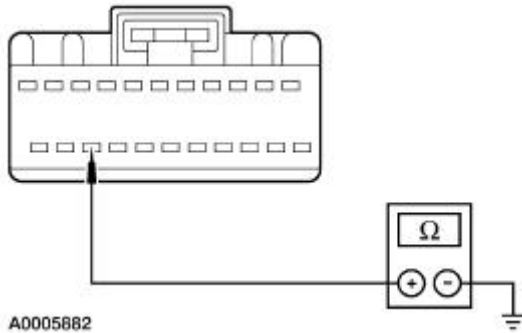
Measure the voltage at instrument cluster module C220c-20, circuit 8-AL17 (WH/VT), harness side.

- Is voltage present?

- **Yes**
REPAIR circuit 8-AL17. REPEAT the self-test. CLEAR the DTCs.
- **No**
GO to [B9](#).

B9 CHECK CIRCUIT 8-AL17 (WH/VT) FOR A SHORT TO GROUND

1



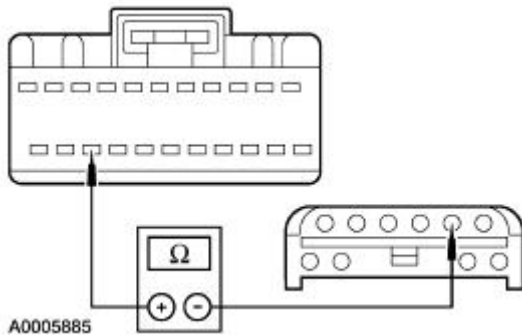
1 Measure the resistance between the instrument cluster module C220c-20, circuit 8-AL17 (WH/VT), harness side and ground.

- **Is the resistance greater than 10,000 ohms?**

- **Yes**
GO to [B10](#).
- **No**
REPAIR circuit 8-AL17. REPEAT the self-test. CLEAR the DTCs.

B10 CHECK CIRCUIT 8-AL17 (WH/VT) FOR AN OPEN

1



1 Measure the resistance between the retractor box C218-6, circuit 8-AL17 (WH/VT), harness side and the instrument cluster C220c-20, circuit 8-AL17 (WH/VT), harness side.

- **Is the resistance less than 5 ohms?**

- **Yes**
INSTALL a new instrument cluster module. REFER to [Section 413-01](#). REPEAT the self-test. CLEAR the DTCs.
- **No**
REPAIR circuit 8-AL17. REPEAT the self-test. CLEAR the DTCs.

B11 CHECK FOR STEERING COLUMN MOVEMENT

NOTE: This active command will only power motors for one second.

1



Instrument Cluster Module Active Command STEERING COLUMN CONTROL

2



Trigger TELES CP IN On, Then TELSCPOUT On

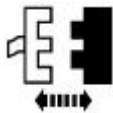
● Does the steering column telescope in and out?

→ Yes
GO to [B12](#).

→ No
GO to [B14](#).

B12 CHECK CIRCUIT 8-AL17 (DB/YE) FOR AN OPEN

1



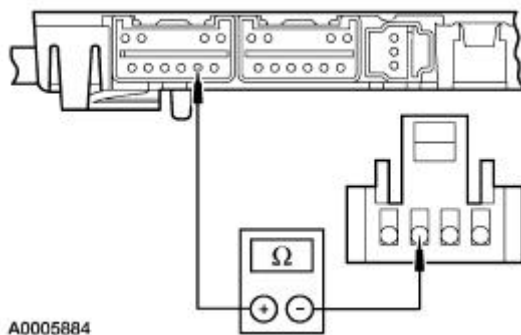
Steering Column Potentiometer Assembly C222

2



Retractor Box C218

3



3 Measure the resistance between the steering column potentiometer assembly C222-2, circuit 8-AL17 (DB/YE), harness side and the retractor box C218-5, circuit 8-AL17 (DB/YE).

● Is the resistance less than 5 ohms?

→ Yes
GO to [B13](#).

→ No

REPAIR circuit 8-AL17. REPEAT the self-test. CLEAR the DTCs.

B13 CHECK CIRCUIT 8-AL17 (WH/VT) FOR AN OPEN

1



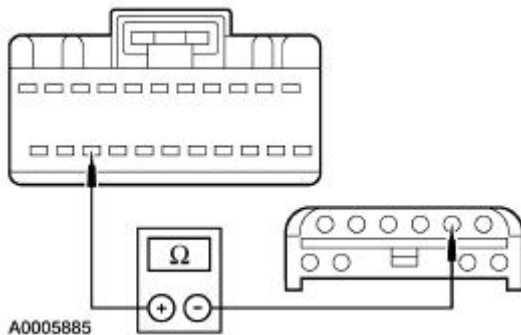
Steering Column Potentiometer Assembly C222

2



Instrument Cluster Module C220c

3



3 Measure the resistance between the retractor box C218-6, circuit 8-AL17 (WH/VT), harness side and the instrument cluster C220c-20, circuit 8-AL17 (WH/VT), harness side.

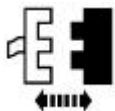
● Is the resistance less than 5 ohms?

→ **Yes**
INSTALL a new steering column potentiometer assembly. REPEAT the self-test. CLEAR the DTCs.

→ **No**
REPAIR circuit 8-AL17. REPEAT the self-test. CLEAR the DTCs.

B14 ISOLATE THE MOTOR

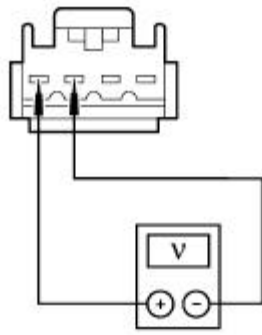
1



Steering Column Motor Connector C227

2

2 Connect a voltmeter between the steering column motor C227-2, circuit 32-AL6 (WH/BU), harness side, and the steering column motor C227-1, circuit 33-AL6 (YE/BU), harness side.



A0005886

3



Instrument Cluster Module Active Command STEERING COLUMN CONTROL

4



Trigger TELES CP IN On, Then TELES CPOUT On

5 Measure the voltage during the activate commands.

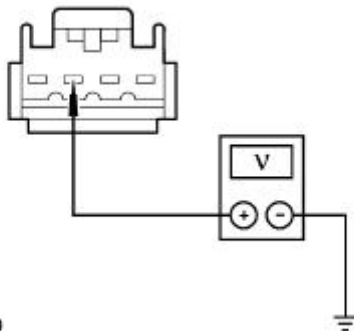
- Is voltage present for one second after each command is sent?

→ **Yes**
INSTALL a new telescope motor.
REPEAT the self-test. CLEAR the DTCs.

→ **No**
GO to [B15](#).

B15 CHECK CIRCUIT 32-AL6 (WH/BU) FOR VOLTAGE

1



A0003860

2



Instrument Cluster Module Active Command STEERING COLUMN CONTROL

3

1 Connect a voltmeter between steering column motor C227-2, circuit 32-AL6 (WH/BU), harness side and ground.



Trigger TILTDOWN On

4 Measure the voltage during the activate command.

• Is voltage present for one second after command is sent?

→ Yes
GO to [B17](#).

→ No
GO to [B16](#).

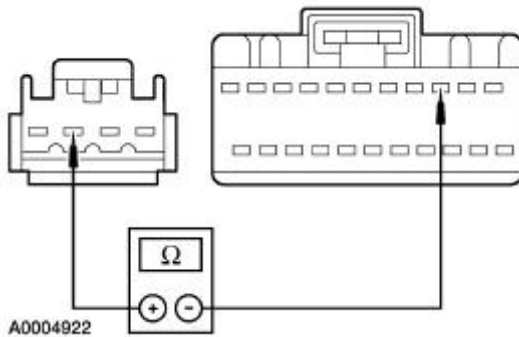
B16 CHECK CIRCUIT 32-AL6 (WH/BU) FOR AN OPEN

1



Instrument Cluster Module C220a

2



2

Measure the resistance between steering column motor C227-2, circuit 32-AL6 (WH/BU), harness side and the instrument cluster module C220a-3, circuit 32-AL6 (WH/BU), harness side.

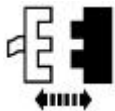
• Is the resistance less than 5 ohms?

→ Yes
INSTALL a new instrument cluster module. REFER to [Section 413-01](#).
REPEAT the self-test. CLEAR the DTCs.

→ No
REPAIR circuit 32-AL6. REPEAT the self-test. CLEAR the DTCs.

B17 CHECK CIRCUIT 33-AL6 (YE/BU) FOR AN OPEN

1

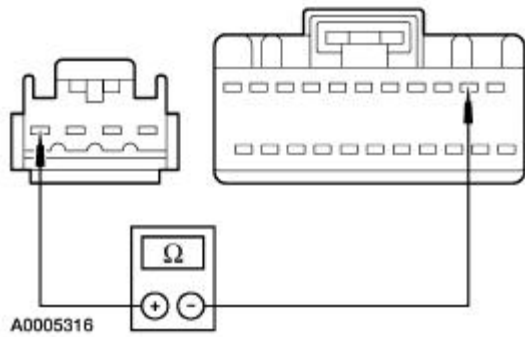


Instrument Cluster Module C220a

2

2

Measure the resistance between




steering column motor C227-1, circuit 33-AL6 (YE/BU), harness side and the instrument cluster module C220a-2, circuit 33-AL6 (YE/BU), harness side.

- **Is the resistance less than 5 ohms?**

→ **Yes**
 INSTALL a new instrument cluster module. REFER to [Section 413-01](#).
 REPEAT the self-test. CLEAR the DTCs.

→ **No**
 REPAIR circuit 33-AL6. REPEAT the self-test. CLEAR the DTCs.

PINPOINT TEST C: DTC B2351: STEERING COLUMN SWITCH SIGNAL CIRCUIT FAILURE

CONDITIONS	DETAILS/RESULTS/ACTIONS
C1 CHECK THE PIDs	
<p>1</p>  <p>Instrument Cluster Module PID TILT and PID TELESCP</p>	<p>2</p> <p>Actuate the steering column adjust switch to the tilt up, tilt down, telescope in, telescope out and neutral positions.</p> <ul style="list-style-type: none"> ● Does the PID TILT and the PID TELESCP read OFF in the neutral position and UP, DOWN, IN and OUT in the corresponding switch position? <p>→ Yes GO to C2.</p> <p>→ No GO to C4.</p>
C2 CHECK THE PID TILT	
<p>1</p>	



Instrument Cluster Module PID TILT

2 Actuate the steering column adjust switch to the tilt up and tilt down positions while monitoring the PID TILT.

- Does the PID TILT read UP with the switch in the up position and DOWN with the switch in the down position and OFF with the switch in the neutral position?

→ Yes
GO to C3.

→ No
INSTALL a new multi-function switch. REFER to Section 211-05. REPEAT the self-test. CLEAR the DTCs.

C3 CHECK THE PID TELES CP

1



Instrument Cluster Module PID TELES CP

2 Actuate the steering column adjust switch to the telescope out and the telescope in positions while monitoring the PID TELES CP.

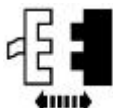
- Does the PID TELES CP read IN with the switch in the in position and OUT with the switch in the out position and OFF with the switch in the neutral position?

→ Yes
REPEAT the self-test. If DTC B2351 is retrieved, INSTALL a new instrument cluster module. REFER to Section 413-01. REPEAT the self-test. CLEAR the DTCs.

→ No
INSTALL a new multi-function switch. REFER to Section 211-05. REPEAT the self-test. CLEAR the DTCs.

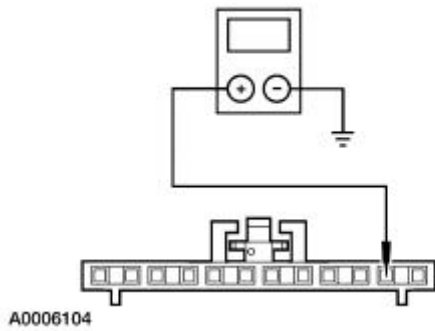
C4 CHECK CIRCUIT 9-AL10 (YE/RD) FOR A SHORT TO BATTERY/GROUND

1



Multi-Function Switch C202

2



2 Connect the multimeter positive lead to the multi-function switch C202-11, circuit 9-AL10 (YE/RD) and the negative lead to ground.

3 Measure the voltage and resistance.

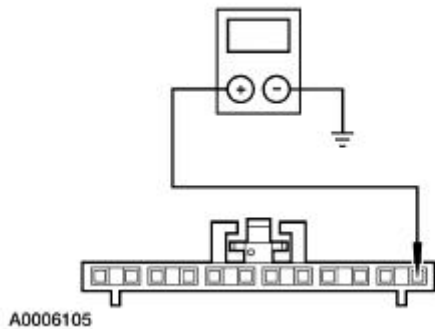
- Is the voltage greater than 11.5 volts or the resistance 5 ohms or less?

→ **Yes**
REPAIR circuit 9-AL10 (YE/RD).
REPEAT the self-test. CLEAR the DTCs.

→ **No**
GO to [C5](#).

C5 CHECK CIRCUIT 8-AL10 (BN) FOR A SHORT TO BATTERY/GROUND

1



1 Connect the multimeter positive lead to the multi-function switch C202-12, circuit 8-AL10 (BN) and the negative lead to ground.

2 Measure the voltage and resistance.

- Is the voltage greater than 11.5 volts or the resistance 5 ohms or less?

→ **Yes**
REPAIR circuit 8-AL10 (BN). REPEAT the self-test. CLEAR the DTCs.

→ **No**
GO to [C6](#).

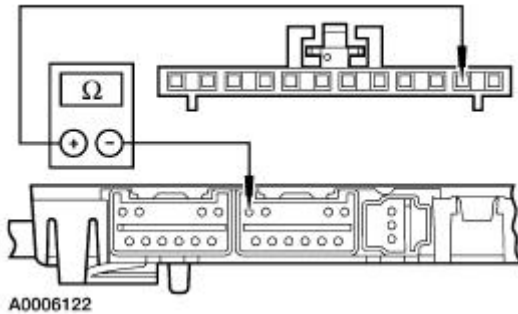
C6 CHECK CIRCUIT 9-AL10 (YE/RD) FOR AN OPEN

1



Retractor Box C217

2



2

Measure the resistance between the multi-function switch C202-11, circuit 9-AL10 (YE/RD), harness side and the retractor box C217-7, circuit 9-AL10 (YE/RD).

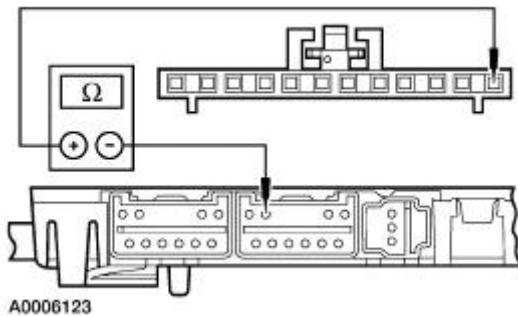
● Is the resistance less than 5 ohms?

→ **Yes**
GO to [C7](#).

→ **No**
REPAIR circuit 9-AL10 (YE/RD).
REPEAT the self-test. CLEAR the DTCs.

C7 CHECK CIRCUIT 8-AL10 (BN) FOR AN OPEN

1



1

Measure the resistance between the multi-function switch C202-12, circuit 8-AL10 (BN), harness side and the retractor box C217-7, circuit 8-AL10 (BN).

● Is the resistance less than 5 ohms?

→ **Yes**
GO to [C8](#).

→ **No**
REPAIR circuit 8-AL10 (BN). REPEAT the self-test. CLEAR the DTCs.

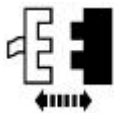
C8 CHECK CIRCUIT 9-AL10 (BN) FOR AN OPEN

1



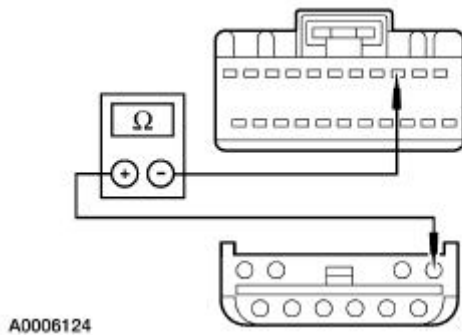
Multi-Function Switch C202

2



Instrument Cluster Module C220c

3



3

Measure the resistance between the retractor box C217-7, circuit 9-AL10 (BN), harness side and the instrument cluster module C220c-3, circuit 9-AL10 (BN), harness side.

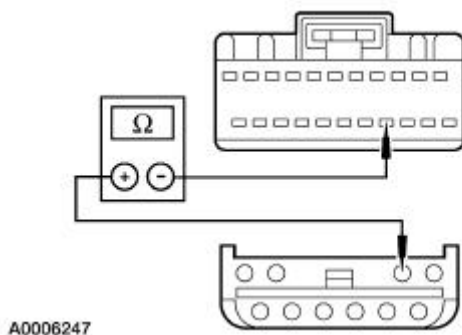
● Is the resistance less than 5 ohms?

→ **Yes**
GO to [C9](#).

→ **No**
REPAIR circuit 9-AL10. REPEAT the self-test. CLEAR the DTCs.

C9 CHECK CIRCUIT 8-AL10 (WH) FOR AN OPEN

1



1


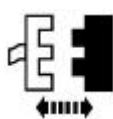

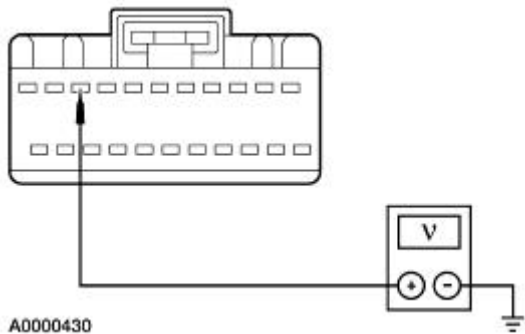
Measure the resistance between the retractor box C217-8, circuit 8-AL10 (WH), harness side and the instrument cluster module C220c-15, circuit 8-AL10 (WH), harness side.

● Is the resistance less than 5 ohms?

→ **Yes**
INSTALL a new instrument cluster module. REFER to [Section 413-01](#). REPEAT the self-test. CLEAR the DTCs.

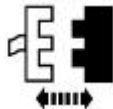
→ **No**
REPAIR circuit 8-AL10. REPEAT the self-test. CLEAR the DTCs.

PINPOINT TEST D: THE TILT AND TELESCOPE ADJUSTMENT ARE INOPERATIVE

CONDITIONS	DETAILS/RESULTS/ACTIONS
D1 CHECK CONTINUOUS DTCs	
<p>1</p>  <p>Instrument Cluster Module (ICM) Continuous DTCs</p>	<ul style="list-style-type: none"> • Are DTCs B2328 and B2332 present? <p>→ Yes Go To Pinpoint Test A or Go To Pinpoint Test B.</p> <p>→ No GO to D2.</p>
D2 CHECK CIRCUIT 9-AL17 (BN/WH) FOR A SHORT TO B+	
<p>1</p>  <p>Instrument Cluster Module Connector C220c</p> <p>2</p>  <p>3</p>  <p>A0000430</p>	<p>3</p> <p>Measure the voltage at the instrument cluster module C220c-9, circuit 9-AL17 (BN/WH), harness side.</p> <ul style="list-style-type: none"> • Is voltage reading B+? <p>→ Yes GO to D3.</p> <p>→ No GO to D4.</p>
D3 CHECK CIRCUIT 7-AL17 (YE/VT) FOR A SHORT TO B+	
<p>1</p>	



2

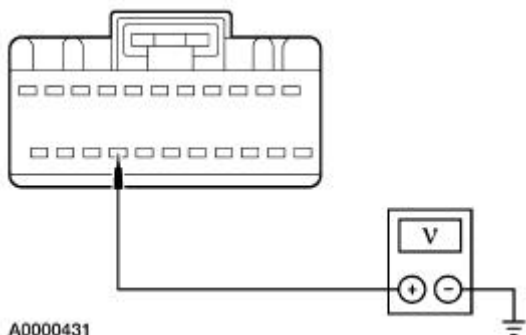


Steering Column Potentiometer Assembly C222

3



4



4 Measure the voltage at the instrument cluster module C220c-19, circuit 7-AL17 (YE/VT), harness side.

• Is the voltage reading B+?

→ Yes
REPAIR circuit 7-AL17. REPEAT the self-test. CLEAR the DTCs.

→ No
REPAIR circuit 9-AL17. REPEAT the self-test. CLEAR the DTCs.

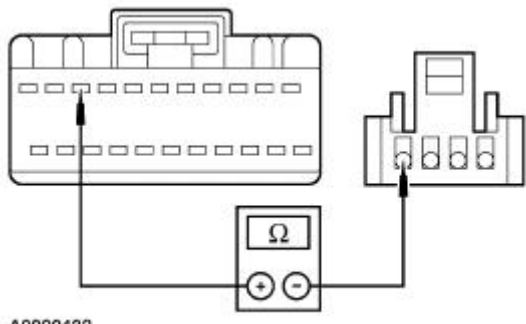
D4 CHECK CIRCUIT 9-AL17 (BN/WH) FOR AN OPEN

1



Steering Column Potentiometer Assembly C222

2



2 Measure the resistance between the instrument cluster module C220c-9, circuit 9-AL17 (BN/WH), harness side and the steering column potentiometer assembly C222-1, circuit 9-AL17 (BN/WH), harness side.

● Is the resistance less than 5 ohms?

→ **Yes**
GO to [D5](#).

→ **No**
REPAIR circuit 9-AL17. REPEAT the self-test. CLEAR the DTCs.

D5 CHECK FOR MOTOR MOTION SENSED

1



Instrument Cluster Module Active Command STEERING COLUMN CONTROL

2



Select PIDs TELEPOS and TILTPOS

3 **NOTE:** This active command will only power the motors for one second.

Trigger TILT UP, TILT DOWN, TELSCP IN and TELSCPOUT on, one at a time while monitoring the PID TELEPOS and TILTPOS.

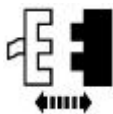
● Do the PIDs TELEPOS and TILTPOS read **SENSED** when the corresponding motors are triggered on?

→ **Yes**
INSPECT the steering column potentiometer assembly connection and the steering column/ignition/lighting control module connectors for loose or intermittent connections. REPEAT the self-test. CLEAR the DTCs.

→ **No**
GO to [D6](#).

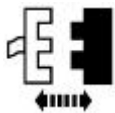
D6 CHECK CIRCUIT 9-AL17 (PK/OG) FOR AN OPEN

1



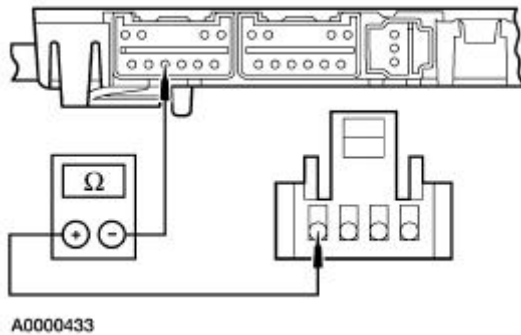
Steering Column Potentiometer Assembly C222

2



Retractor Box C218

3



3

Measure the resistance between the steering column potentiometer assembly C222-1, circuit 9-AL17 (PK/OG), harness side and retractor box C218-3, circuit 9-AL17 (PK/OG).

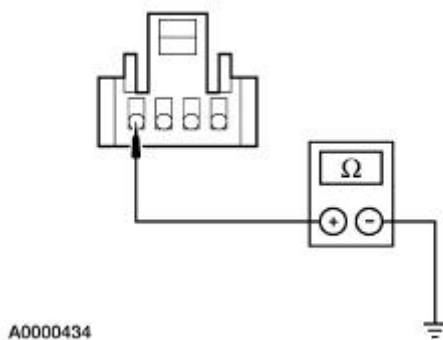
- Is the resistance less than 5 ohms?

→ **Yes**
GO to [D7](#).

→ **No**
REPAIR circuit 9-AL17. REPEAT the self-test. CLEAR the DTCs.

D7 CHECK CIRCUIT 9-AL17 (PK/OG) FOR A SHORT TO GROUND

1



1

Measure the resistance between the steering column potentiometer assembly C222-1, circuit 9-AL17 (PK/OG), harness side and ground.

- Is the resistance greater than 10,000 ohms?

→ **Yes**
GO to [D8](#).

→ **No**
REPAIR circuit 9-AL17. REPEAT the self-test. CLEAR the DTCs.

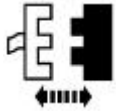
D8 CHECK CIRCUIT 9-AL17 (BN/WH) FOR AN OPEN

1



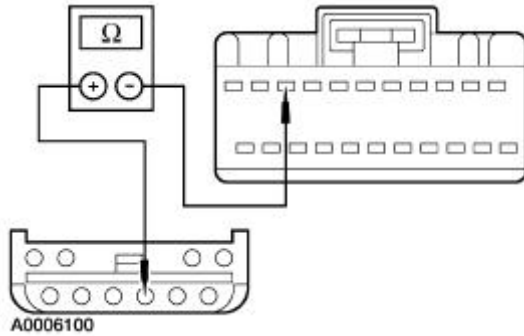
Steering Column Potentiometer Assembly C222

2



Instrument Cluster Module C220c

3



3

Measure the resistance between the retractor box C218a-3, circuit 9-AL17 (BN/WH), harness side and the instrument cluster module C220c-9, circuit 9-AL17 (BN/WH), harness side.

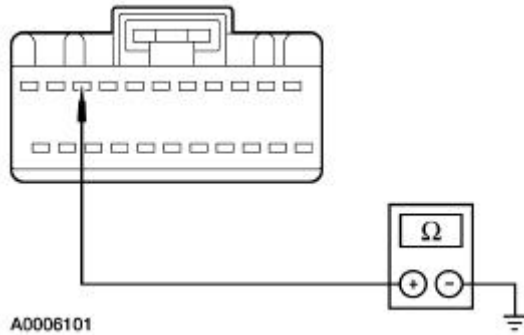
- Is the resistance less than 5 ohms?

→ **Yes**
GO to [D9](#).

→ **No**
REPAIR circuit 9-AL17. REPEAT the self-test. CLEAR the DTCs.

D9 CHECK CIRCUIT 9-AL17 (BN/WH) FOR A SHORT TO GROUND

1



1

Measure the resistance between the instrument cluster module C220c-9, circuit 9-AL17 (BN/WH), harness side and ground.

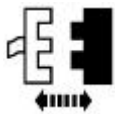
- Is the resistance greater than 10,000 ohms?

→ **Yes**
GO to [D10](#).

→ **No**
REPAIR circuit 9-AL17. REPEAT the self-test. CLEAR the DTCs.

D10 ISOLATE THE POTENTIOMETERS

1



Steering Column Potentiometer Assembly C222

2



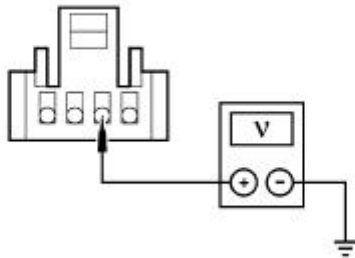
Instrument Cluster Module Active Command STEERING COLUMN CONTROL

3



Trigger TELESOP IN On

4



A0006113

- 4 Measure the voltage at steering column potentiometer assembly C222-4, circuit 7-AL17 (DG/WH), harness side during the active command.

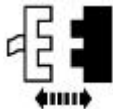
- Is the voltage greater than 10 volts?

→ **Yes**
INSTALL a new steering column potentiometer assembly. REPEAT the self-test. CLEAR the DTCs.

→ **No**
GO to [D11](#).

D11 CHECK CIRCUIT 7-AL17 (DG/WH) FOR A SHORT TO GROUND

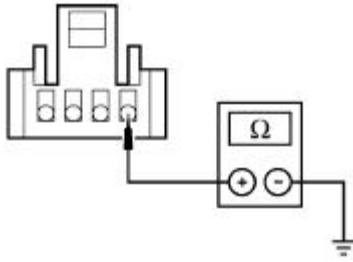
1



Retractor Box C218

2

- 2 Measure the resistance between steering column potentiometer assembly C222-4, circuit 7-AL17 (DG/WH), harness side and ground.



A0006119

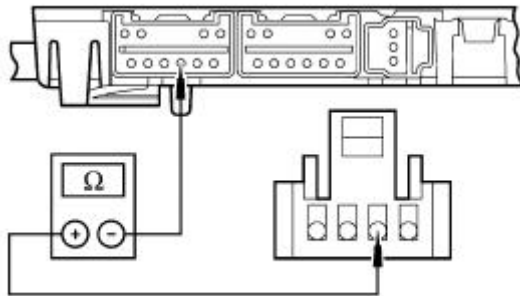
- Is the resistance greater than 10,000 ohms?

→ **Yes**
REPAIR circuit 7-AL17. REPEAT the self-test. CLEAR the DTCs.

→ **No**
GO to [D12](#).

D12 CHECK CIRCUIT 7-AL17 (DG/WH) FOR AN OPEN

1



A0006115

1

Measure the resistance between steering column potentiometer assembly C222-4, circuit 7-AL17 (DG/WH), harness side and retractor box C218 pin 4, circuit 7-AL17 (DG/WH).

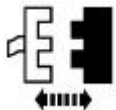
- Is the resistance less than 5 ohms?

→ **Yes**
GO to [D13](#).

→ **No**
REPAIR circuit 7-AL17. REPEAT the self-test. CLEAR the DTCs.

D13 CHECK CIRCUIT 7-AL17 (YE/VT) FOR A SHORT TO GROUND

1

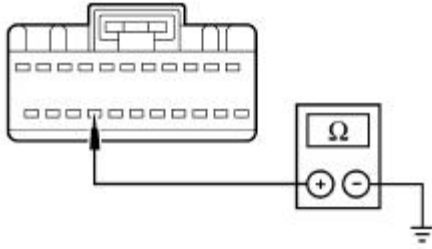


Retractor Box C218

2

2

Measure the resistance between instrument cluster module C220c-19, circuit 7-AL17 (YE/VT), harness side and ground.



A0006116

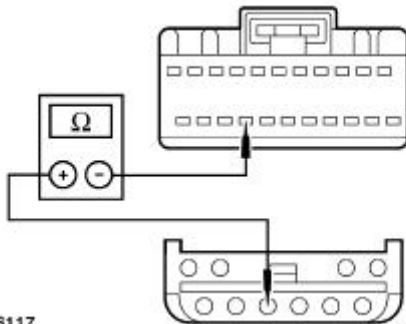
- Is the resistance greater than 10,000 ohms?

→ **Yes**
REPAIR circuit 7-AL17. REPEAT the self-test. CLEAR the DTCs.

→ **No**
GO to [D14](#).

D14 CHECK CIRCUIT 7-AL17 (YE/VT) FOR AN OPEN

1



A0006117

1

Measure the resistance between instrument cluster module C220c-19, circuit 7-AL17 (YE/VT), harness side and retractor box C218-4, circuit 7-AL17 (YE/VT), harness side.


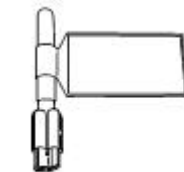
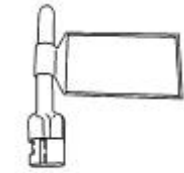
- Is the resistance less than 5 ohms?

→ **Yes**
INSTALL a new instrument cluster module. REPEAT the self-test. CLEAR the DTCs.


→ **No**
REPAIR circuit 7-AL17. REPEAT the self-test. CLEAR the DTCs.


Supplemental Restraint System (SRS) Deactivation and Reactivation

Special Tool(s)


 ST2502-A	Diagnostic Tool, Restraint System (1 Req'd) 418-F395
 ST2506-A	Diagnostic Tool, Restraint System (3 Req'd) 418-F088 (105-R0012)
 ST2507-A	Diagnostic Tool, Restraint System (2 Req'd) 418-133 (40-009)

Deactivation


 **WARNING:** Always wear safety glasses when repairing an air bag supplemental restraint system (SRS) vehicle and when handling an air bag module. This will reduce the risk of injury in the event of an accidental deployment.

 **WARNING:** Carry a live air bag module with the air bag and trim cover pointed away from your body. This will reduce the risk of injury in the event of an accidental deployment.

 **WARNING:** Do not set a live air bag module down with the trim cover face down. This will reduce the risk of injury in the event of an accidental deployment.

 **WARNING:** After deployment, the air bag surface can contain deposits of sodium hydroxide, a product of the gas generant combustion that is irritating to the skin. Wash your hands with soap and water afterwards.

 **WARNING:** Never probe the connectors on the air bag module. Doing so can result in air bag deployment, which can result in personal injury.

 **WARNING:** The safety belt buckle pretensioner and safety belt retractor pretensioner are pyrotechnic devices. Never probe a pretensioner electrical connector. Doing so could result in pretensioner or air bag deployment and could result in personal injury.



WARNING: Vehicle sensor orientation is critical for proper system operation. If a vehicle equipped with an air bag supplemental restraint system (SRS) is involved in a collision, inspect the sensor mounting bracket and wiring pigtail for deformation. Replace and properly position the sensor or any other damaged supplemental restraint system (SRS) components whether or not the air bag is deployed.



WARNING: The restraint system diagnostic tool is for restraint system service only. Remove from vehicle prior to road use. Failure to remove could result in injury and possible violation of vehicle safety standards.

NOTE: If a seat equipped with a seat mounted side air bag and/or a safety belt pretensioner (if equipped) system is being serviced, **the air bag system must be deactivated.**

NOTE: Restraint system diagnostic tools **MUST** be installed under the seats in the seat side air bag (if equipped) and safety belt pretensioner (if equipped) to floor connectors.

NOTE: Diagnostics or repairs are not to be performed on a seat equipped with a seat side air bag with the seat in the vehicle. Prior to attempting to diagnose or repair a seat concern when equipped with a seat side air bag, the seat must be removed from the vehicle and the restraint system diagnostic tools must be installed in the seat side air bag electrical connectors. **The restraint system diagnostic tools must be removed prior to operating the vehicle over the road.**

NOTE: After diagnosing or repairing an SRS, **the restraint system diagnostic tools must be removed before operating the vehicle over the road.**

NOTE: After diagnosing or repairing a seat system, **the restraint system diagnostic tools must be removed before operating the vehicle over the road.**

NOTE: The SRS must be fully operational and free of faults before releasing the vehicle to the customer.



- WARNING:** To avoid accidental deployment and possible personal injury, the backup power supply must be depleted before repairing or replacing any front or side air bag supplemental restraint system (SRS) components and before servicing, replacing, adjusting or striking components near the front or side air bag sensors, such as doors, instrument panel, console, door latches, strikers, seats and hood latches.

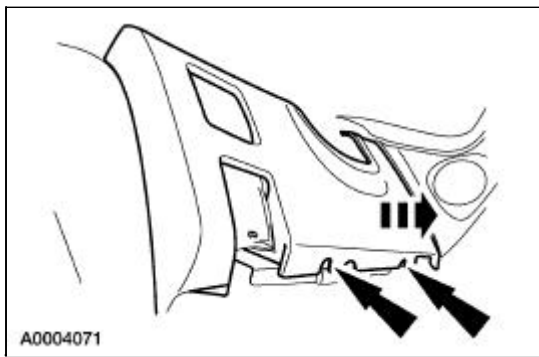
Please refer to the appropriate vehicle workshop manual to determine location of the front air bag sensors.

The side air bag sensors are located at or near the base of the B-pillar.

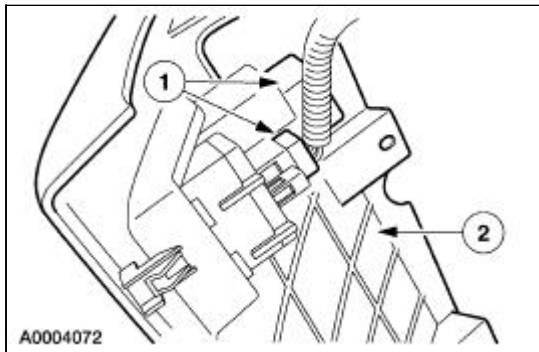
To deplete the backup power supply energy, Disconnect the battery ground cable and wait at least one minute to allow for the depletion of the restraint system backup power supply. Be sure to disconnect auxiliary batteries and power supplies (if equipped).

Disconnect the battery ground cable and wait at least one minute to allow for the depletion of the restraint system backup power supply. For additional information, refer to [Section 414-01](#).

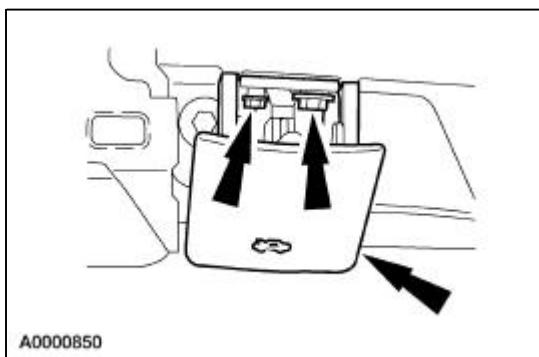
- Remove the two screws and pull out on the lower steering column opening finish panel enough to access the electrical connectors.



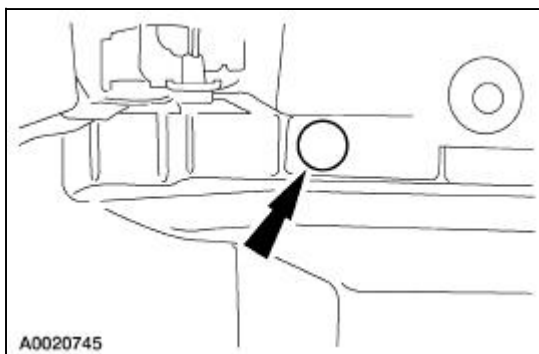
3. Remove the lower steering column opening finish panel.
 1. Disconnect the electrical connectors.
 2. Remove the lower steering column opening finish panel.



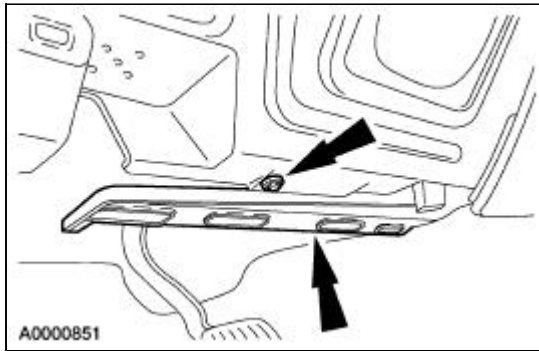
4. Remove the screws. Separate the hood latch release cable and handle assembly from the steering column opening reinforcement.



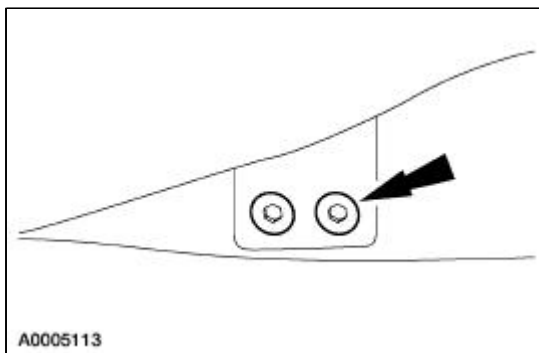
5. Remove the two pin-type retainers and the RH instrument panel insulator.
 - Disconnect the courtesy lamp.



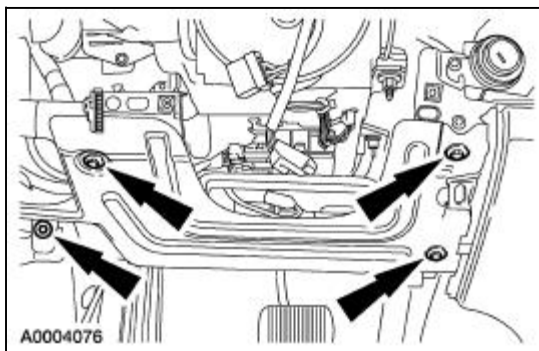
6. Remove the screw and the heater duct.



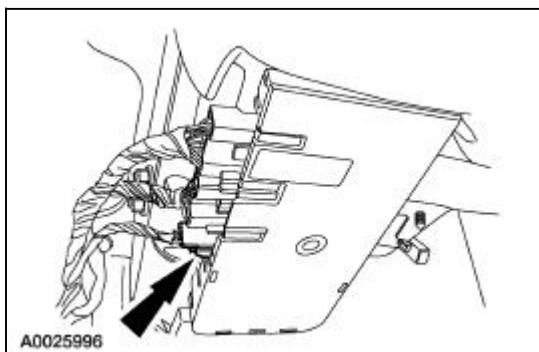
7. Loosen the two driver-side instrument panel tunnel brace bolts.
 - Position the carpet aside to gain access to the bolts.



8. Remove the screws and the steering column opening reinforcement.

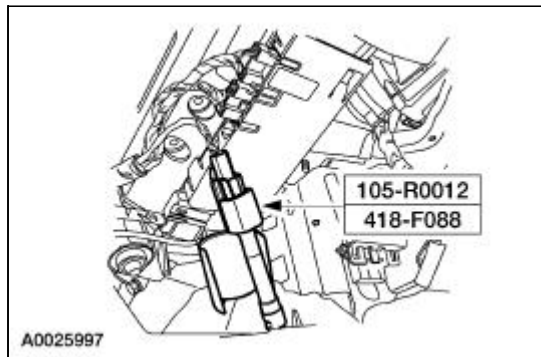


9. Disconnect the clockspring electrical connector at the base of the steering column.

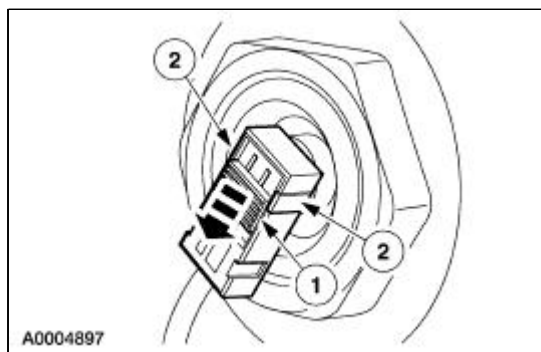


10. Attach the restraint system diagnostic tool to the vehicle harness side of the clockspring

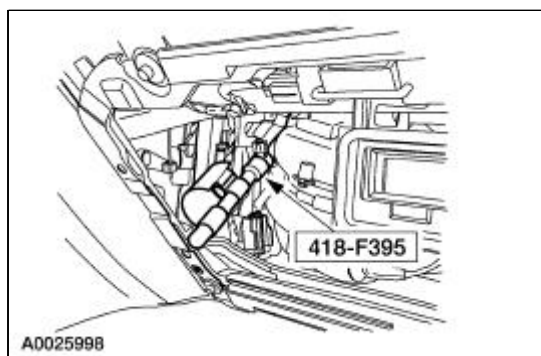
electrical connector.




11. Remove the glove compartment. For additional information, refer to [Section 501-12](#).
12. Disconnect the passenger air bag module electrical connector.
 1. Reaching into the glove box opening toward the center of the instrument panel, under the cross-car beam, slide and disengage the passenger air bag module electrical connector locking clip.
 2. Push in on the two release tabs and disconnect the passenger air bag module electrical connector.



13. Attach the restraint system diagnostic tool to the vehicle harness side of the passenger air bag electrical connector.



14. Connect the battery ground cable. For additional information, refer to [Section 414-01](#).
15. Move and tilt the front seats to their highest and most forward position.
16.  **WARNING:** To avoid accidental deployment and possible personal injury, the backup power supply must be depleted before repairing or replacing any front or side air bag supplemental restraint system (SRS) components and before servicing, replacing, adjusting or striking components near the front or side air bag sensors, such as doors,

instrument panel, console, door latches, strikers, seats and hood latches.

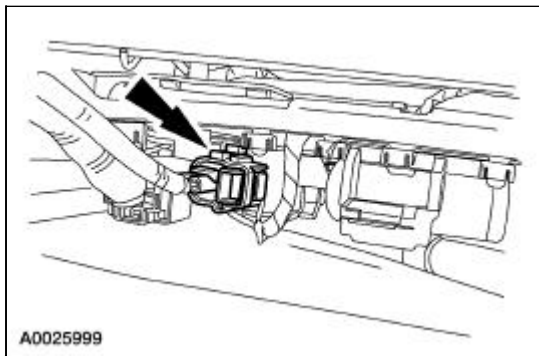
Please refer to the appropriate vehicle workshop manual to determine location of the front air bag sensors.

The side air bag sensors are located at or near the base of the B-pillar.

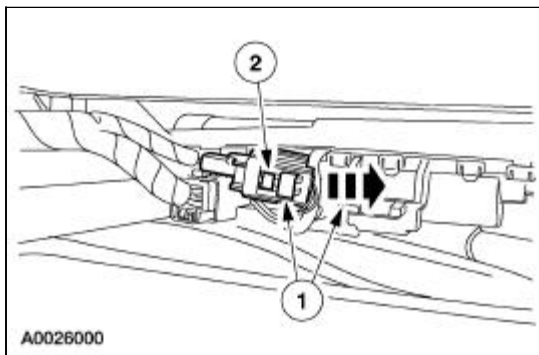
To deplete the backup power supply energy, Disconnect the battery ground cable and wait at least one minute to allow for the depletion of the restraint system backup power supply. Be sure to disconnect auxiliary batteries and power supplies (if equipped).

Disconnect the battery ground cable and wait at least one minute to allow for the depletion of the restraint system backup power supply. For additional information, refer to [Section 414-01](#).

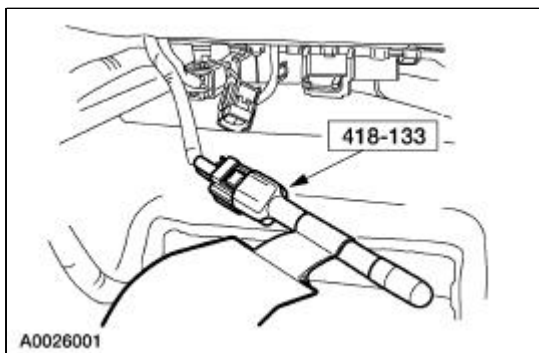
17. From under the passenger seat, release the tab on the connector bracket and remove the passenger seat side air bag electrical connector.



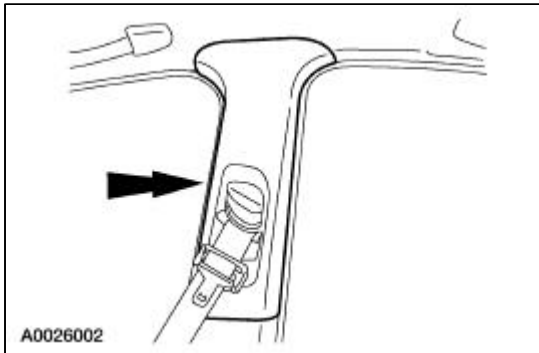
18. Disconnect the passenger seat side air bag electrical connector.
 1. Slide and disengage the passenger seat side air bag electrical connector locking clip.
 2. Push in to release the tab and disconnect the passenger seat side air bag electrical connector.



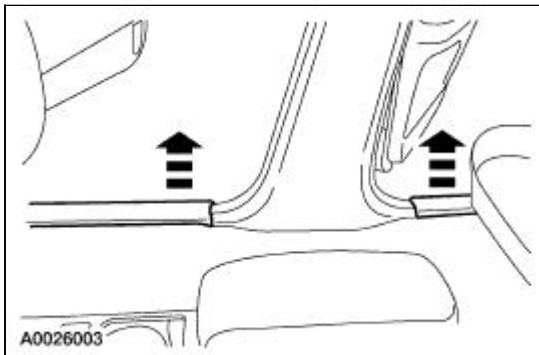
19. Attach the restraint system diagnostic tool to the passenger seat side air bag floor electrical connector.



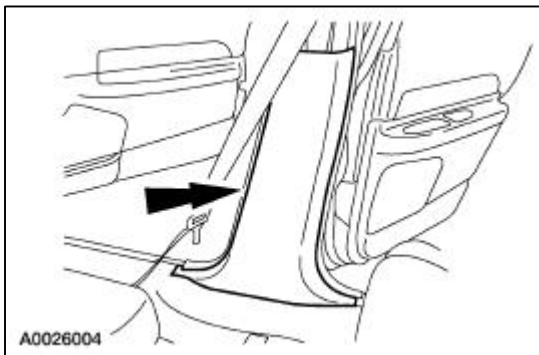
20. Remove the passenger side B-pillar weatherstripping.
21. Position the safety belt D-ring to its highest point.
22. Remove the passenger side B-pillar upper trim panel.



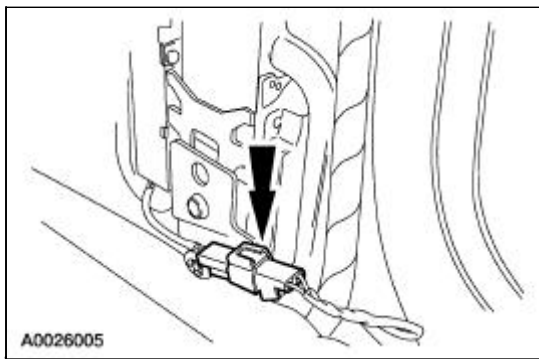
23. Remove the passenger side front and rear door scuff plates.



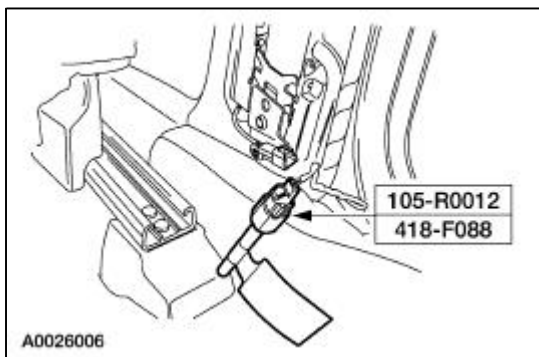
24. Remove the passenger side B-pillar lower trim panel.



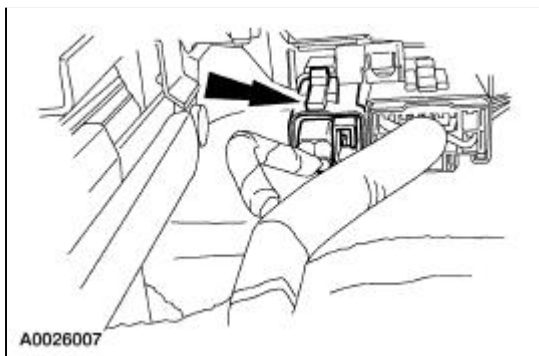
25. Disconnect the passenger side safety belt retractor pretensioner floor electrical connector.



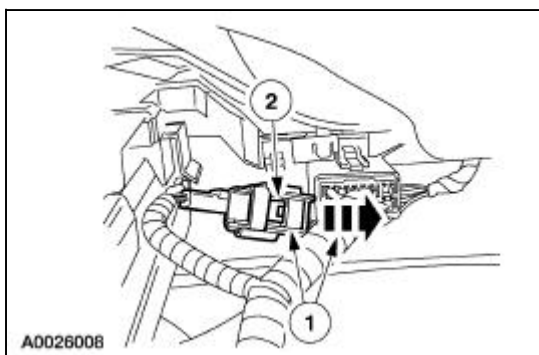
26. Attach the restraint system diagnostic tool to the passenger side safety belt retractor pretensioner floor electrical connector.



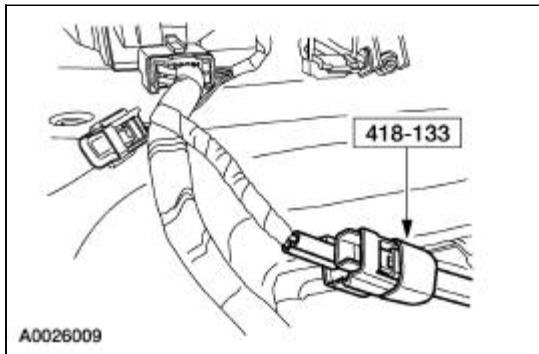
27. From under the driver seat, release the tab on the connector bracket and remove the driver seat side air bag electrical connector.



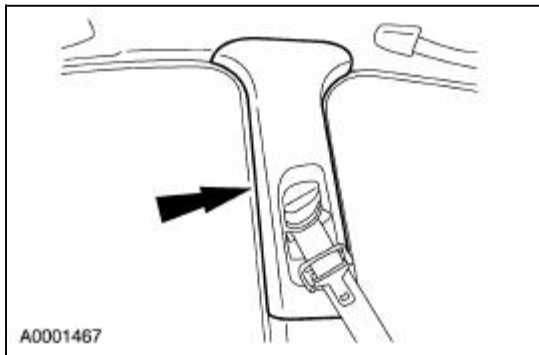
28. Disconnect the driver seat side air bag electrical connector.
1. Slide and disengage the driver seat side air bag electrical connector locking clip.
 2. Push down to release the tab and disconnect the driver seat side air bag electrical connector.



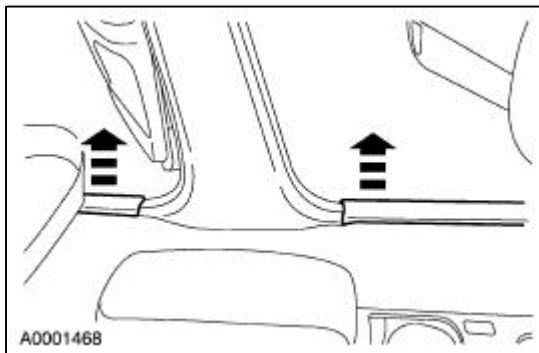
29. Attach the restraint system diagnostic tool to the driver seat side air bag floor electrical connector.



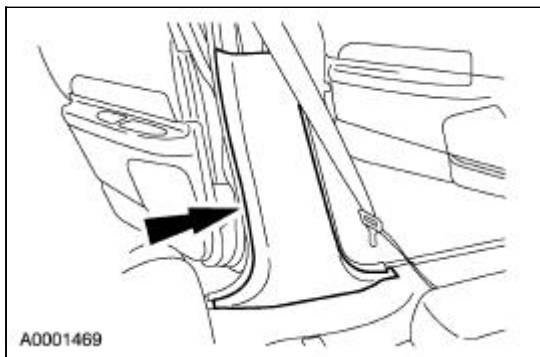
30. Remove the driver side B-pillar weatherstripping.
31. Position the safety belt D-ring to its highest point.
32. Remove the driver side B-pillar upper trim panel.



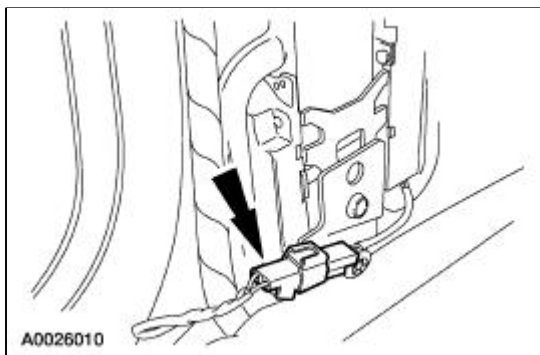
33. Remove the driver side front and rear door scuff plates.



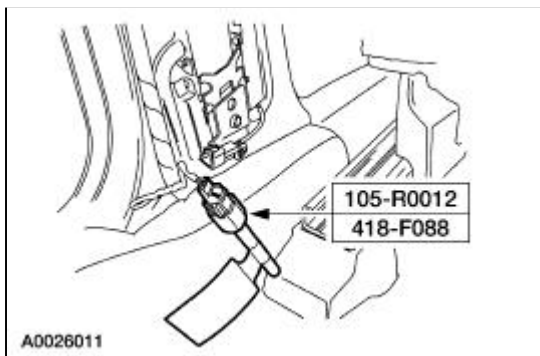
34. Remove the driver side B-pillar lower trim panel.



35. Disconnect the driver side safety belt retractor pretensioner electrical connector.



36. Attach the restraint system diagnostic tool to the driver side safety belt retractor pretensioner floor electrical connector.

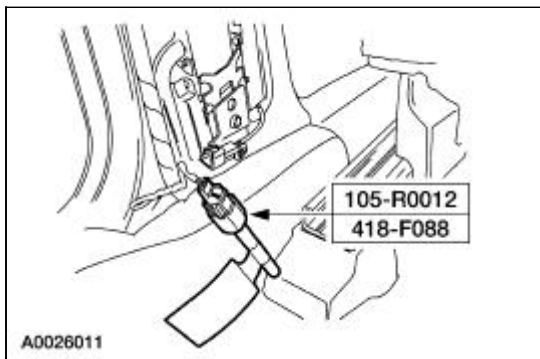


37. Connect the battery ground cable. For additional information, refer to [Section 414-01](#).
38. With the restraint system diagnostic tools installed at all deployable devices, prove out the supplemental restraint system (SRS). For additional information, refer to [Section 501-20B](#).
39. Disconnect the battery ground cable and wait at least one minute to allow for the depletion of the restraint system backup power supply. For additional information, refer to [Section 414-01](#).

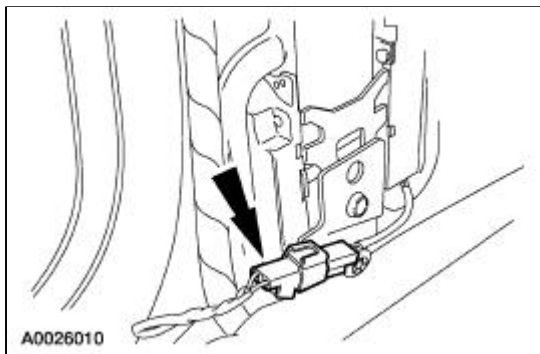
Reactivation

⚠ WARNING: To reduce the risk of serious personal injury, read and follow all warnings and notes at the beginning of the deactivation procedure.

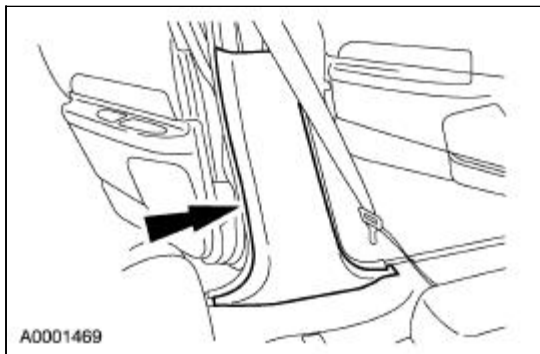
1. Remove the restraint system diagnostic tool from the driver side safety belt retractor pretensioner floor electrical connector.



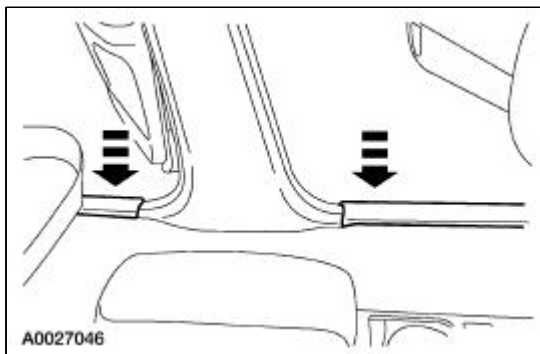
2. Connect the driver side safety belt retractor pretensioner electrical connector.



3. Install the driver side B-pillar lower trim panel.

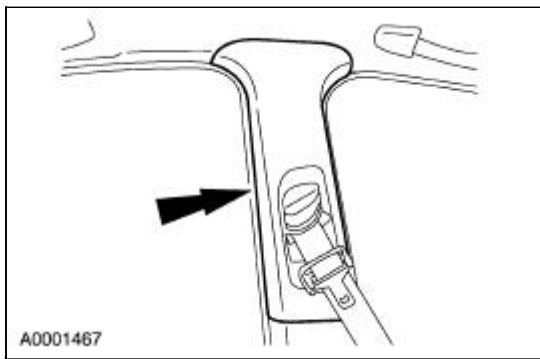


4. Install the driver side front and rear door scuff plates.

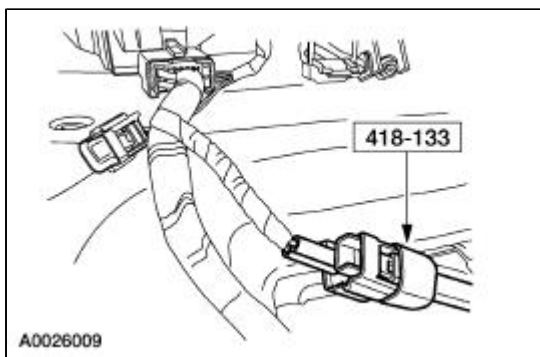


5. **NOTE:** Position the safety belt D-ring to its highest point.

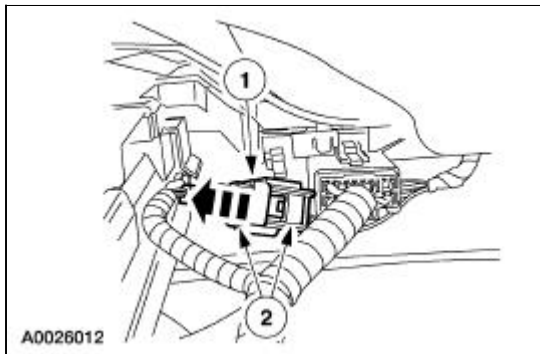
Install the driver side B-pillar upper trim panel.



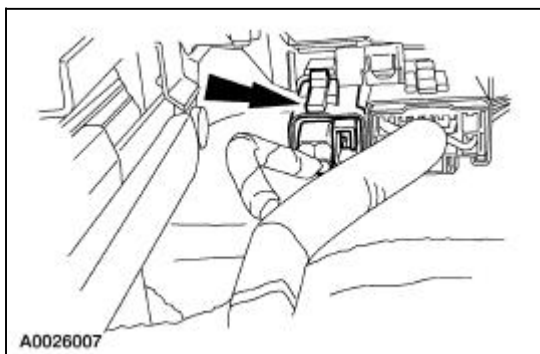
6. Install the driver side B-pillar weatherstripping.
7. Remove the restraint system diagnostic tool from the driver seat side air bag floor electrical connector.



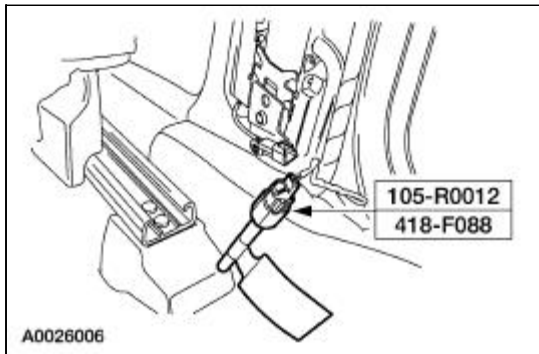
8. Connect the driver seat side air bag electrical connector.
 1. Connect the driver seat side air bag electrical connector.
 2. Slide and engage the driver seat side air bag electrical connector locking clip.



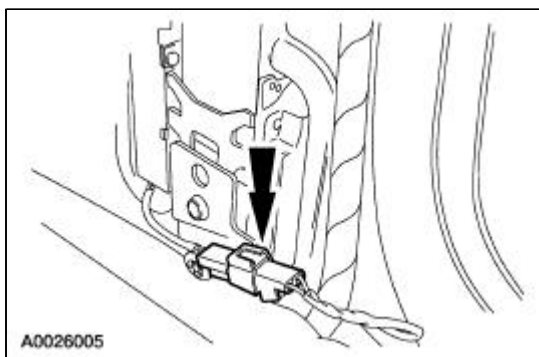
9. Install the driver seat side air bag electrical connector onto the connector bracket under the driver seat.



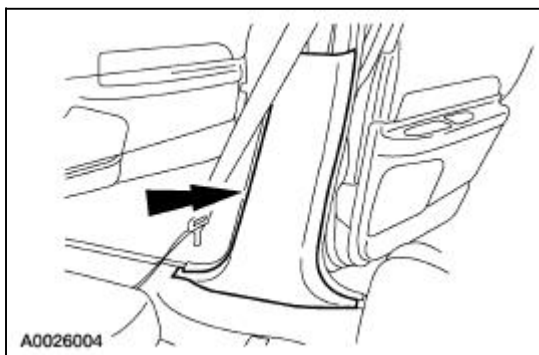
10. Remove the restraint system diagnostic tool from the passenger side safety belt retractor pretensioner electrical connector.



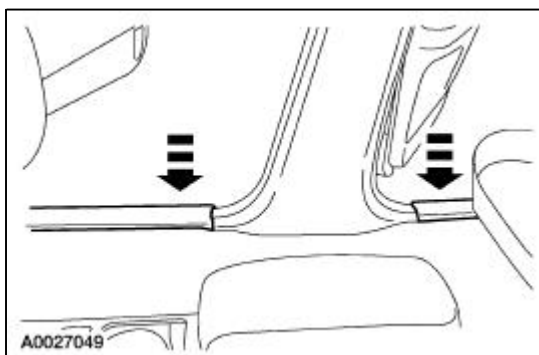
11. Connect the passenger side safety belt retractor pretensioner electrical connector.



12. Install the passenger side B-pillar lower trim panel.

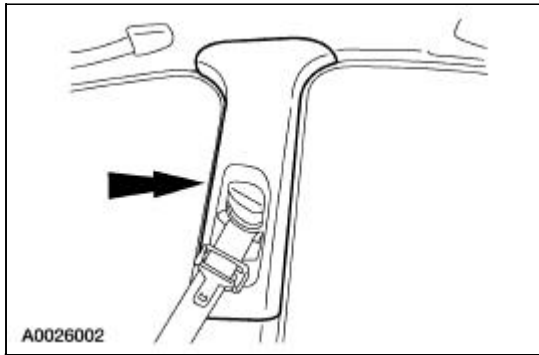


13. Install the passenger side front and rear door scuff plates.



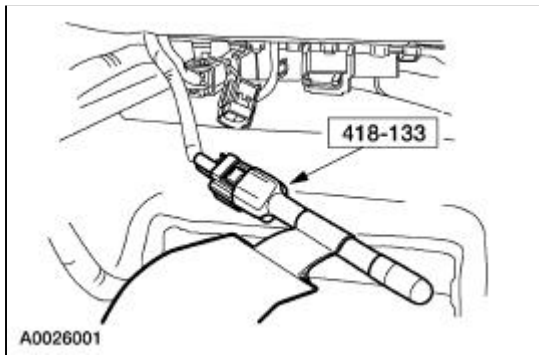
14. **NOTE:** Position the safety belt D-ring to its highest point.

Install the passenger side B-pillar upper trim panel.



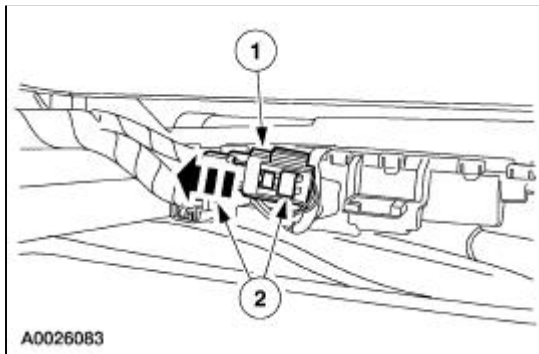
15. Install the passenger side B-pillar weatherstripping.

16. Remove the restraint system diagnostic tool from the passenger seat side air bag floor electrical connector.

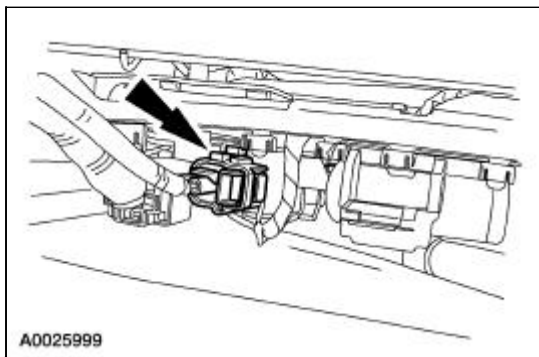


17. Connect the passenger seat side air bag electrical connector.

1. Connect the passenger seat side air bag electrical connector.
2. Slide and engage the passenger seat side air bag electrical connector locking clip.




18. Install the passenger seat side air bag electrical connector onto the connector bracket under the passenger seat.



19. Connect the battery ground cable. For additional information, refer to [Section 414-01](#).

20. Position the front seats rearward.

21.  **WARNING:** To avoid accidental deployment and possible personal injury, the backup power supply must be depleted before repairing or replacing any front or side air bag supplemental restraint system (SRS) components and before servicing, replacing, adjusting or striking components near the front or side air bag sensors, such as doors, instrument panel, console, door latches, strikers, seats and hood latches.

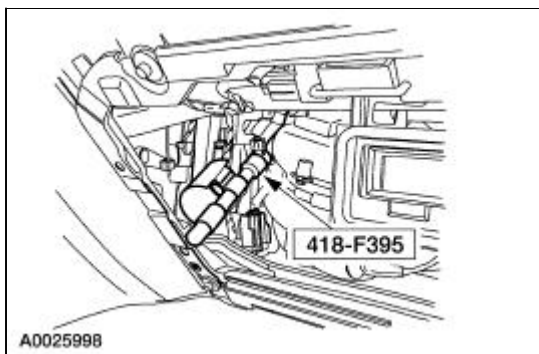
Please refer to the appropriate vehicle workshop manual to determine location of the front air bag sensors.

The side air bag sensors are located at or near the base of the B-pillar.

To deplete the backup power supply energy, Disconnect the battery ground cable and wait at least one minute to allow for the depletion of the restraint system backup power supply. Be sure to disconnect auxiliary batteries and power supplies (if equipped).

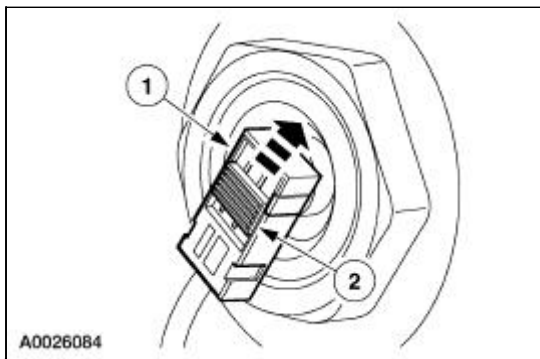
Disconnect the battery ground cable and wait at least one minute to allow for the depletion of the restraint system backup power supply. For additional information, refer to [Section 414-01](#).

22. Remove the restraint system diagnostic tool from the vehicle harness side of the passenger air bag electrical connector.

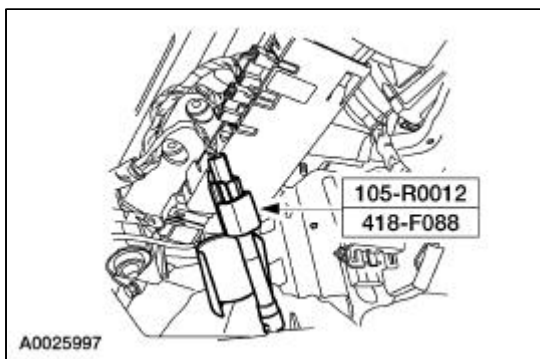


23. Connect the passenger air bag module electrical connector.

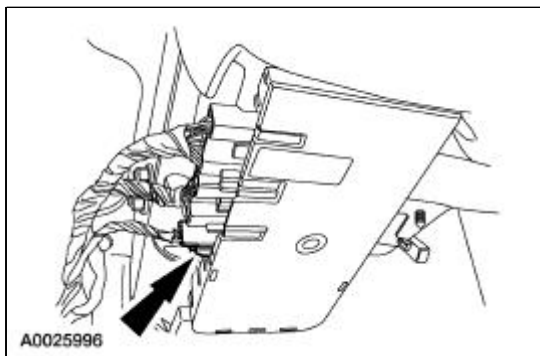
1. Reach into the glove box opening toward the center of the instrument panel, under the cross-car beam and connect the passenger air bag module electrical connector.
2. Slide and engage the passenger air bag module electrical connector locking clip.



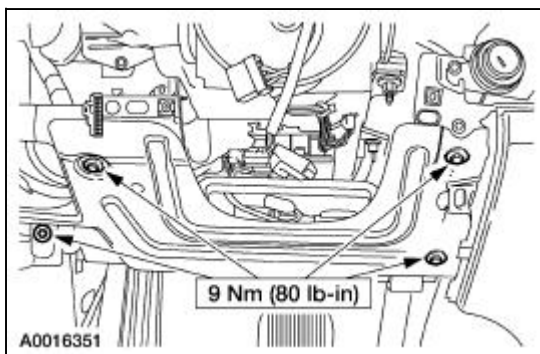
24. Install the glove compartment. For additional information, refer to [Section 501-12](#).
25. Remove the restraint system diagnostic tool from the vehicle harness side of the clockspring electrical connector.



26. Connect the clockspring electrical connector at the base of the steering column.

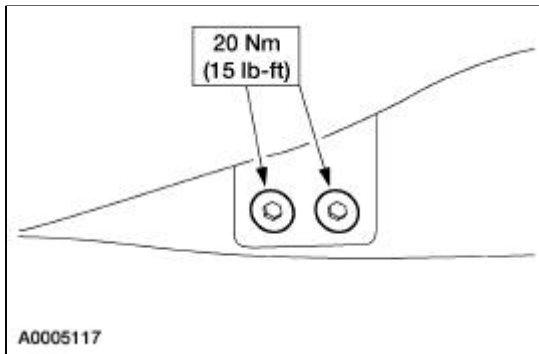


27. Position the steering column opening reinforcement and install the screws.

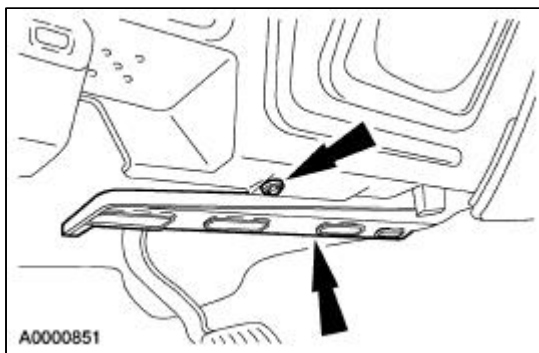


28. Tighten the two driver-side instrument panel tunnel brace bolts.

- Reposition the carpet.

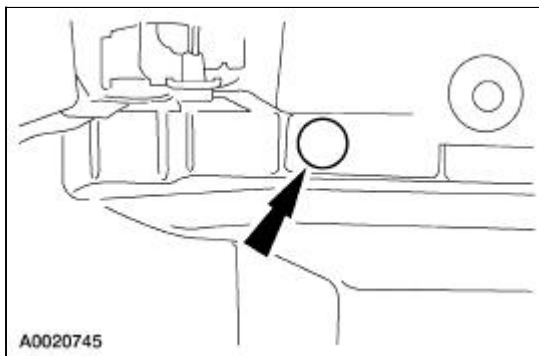


29. Position the heater duct and install the screw.

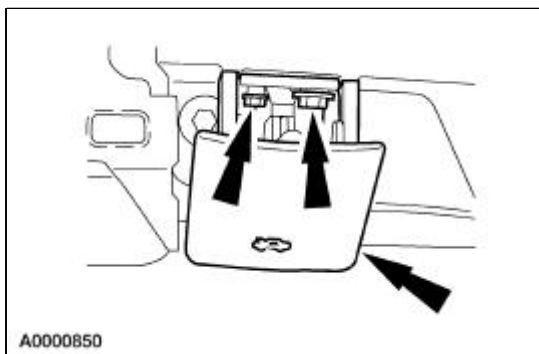


30. Install the RH instrument panel insulator and the two pin-type retainers.

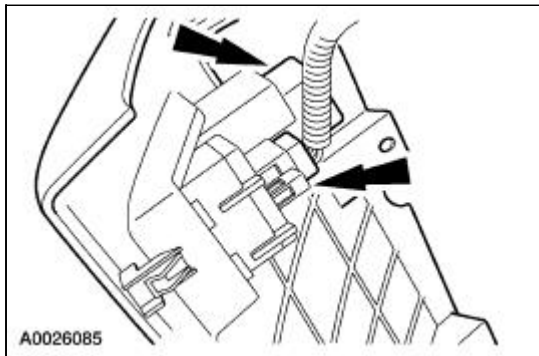
- Connect the courtesy lamp.



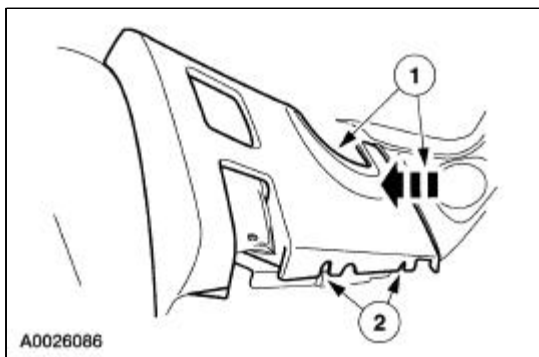
31. Position the hood latch release cable and handle assembly to the steering column opening reinforcement and install the screws.




32. Connect the electrical connectors to the switches in the lower steering column opening finish panel.



33. Install the lower steering column opening finish panel to the instrument panel.
1. Position the lower steering column opening finish panel to the instrument panel and push in, seating the retaining clips.
 2. Install the screws.



34. Connect the battery ground cable. For additional information, refer to [Section 414-01](#).

35.  **WARNING: The restraint system diagnostic tool is for restraint system service only. Remove from vehicle prior to road use. Failure to remove could result in injury and possible violation of vehicle safety standards.**

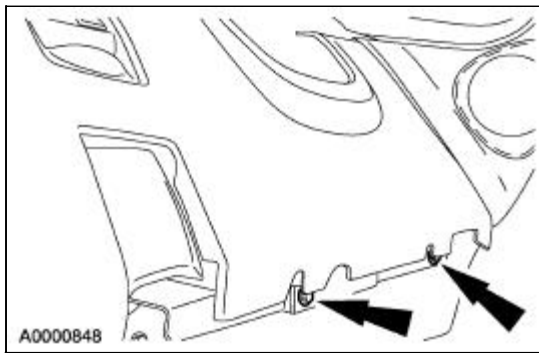
With all the restraint system diagnostic tools removed, prove out the supplemental restraint system (SRS). For additional information, refer to [Section 501-20B](#).

36. Check the active restraint system for correct operation. For additional information, refer to [Section 501-20A](#).
-

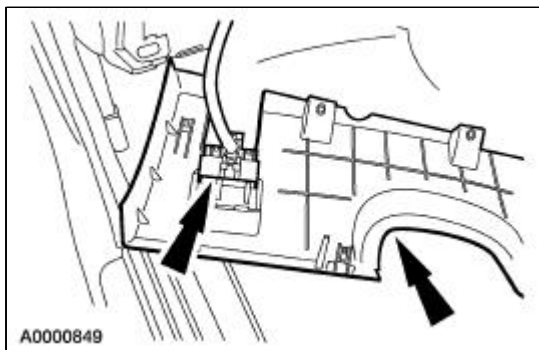
Ignition Switch Lock Cylinder

Removal and Installation

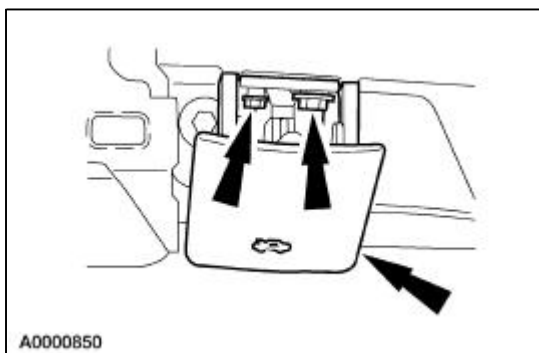
1. Disconnect the battery ground cable and wait at least one minute to allow for the depletion of the restraint system backup power supply. For additional information, refer to [Section 414-01](#).
2. Remove the bolts. Detach the steering column opening cover.



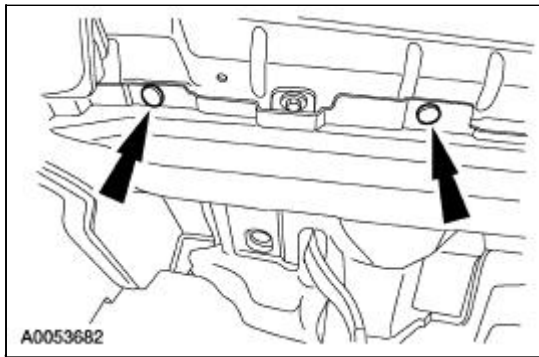
3. Disconnect the electrical connector. Remove the steering column opening cover.



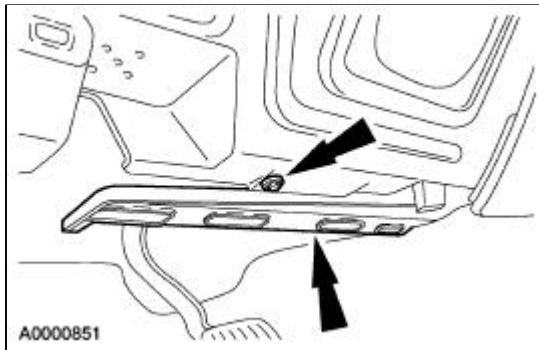
4. Remove the bolts and the hood release handle assembly.



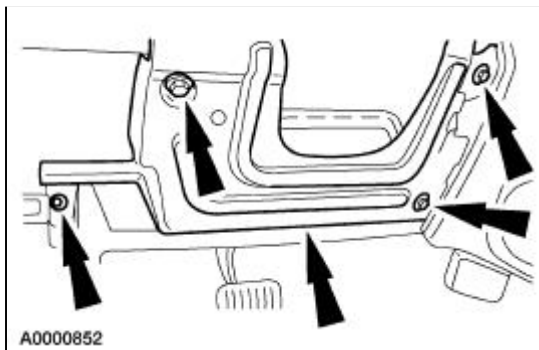
5. Remove the pushpins and the insulator panel.



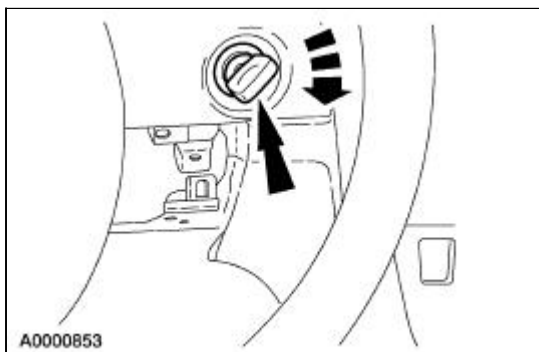
6. Remove the bolt and the heater duct.



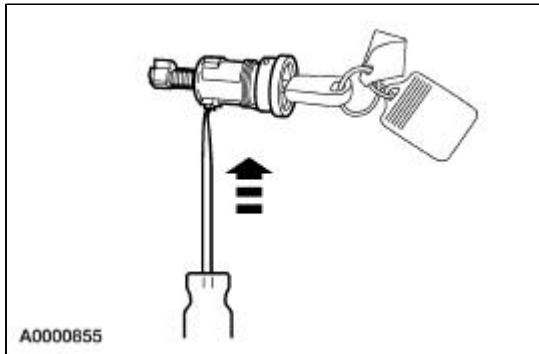
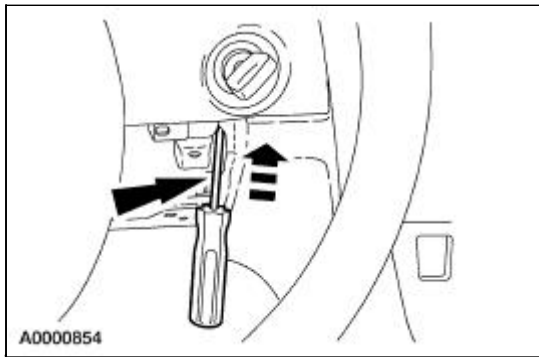
7. Remove the bolts and the steering column opening cover reinforcement.



8. Turn the ignition switch to the RUN position.



9. Using a small flat-blade screwdriver, depress the ignition switch lock cylinder tab. Remove the ignition switch lock cylinder.

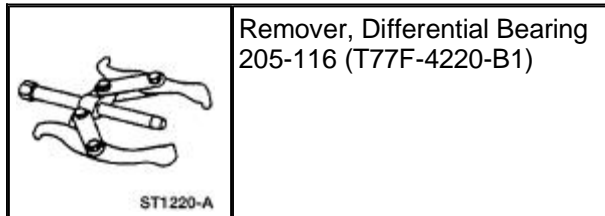


10. To install, reverse the removal procedure.


- Verify correct operation of the ignition switch lock cylinder.
-

Steering Wheel

Special Tool(s)

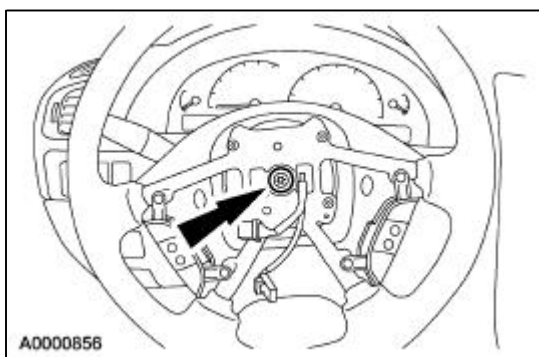


Removal

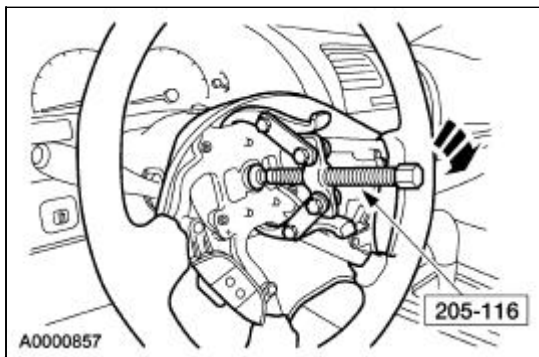
1. Center the steering wheel to the straight-ahead position.
2. Disconnect the battery ground cable and wait at least one minute to allow for the depletion of the restraint system backup power supply. For additional information, refer to [Section 414-01](#).
3.  **WARNING: To avoid the risk of serious personal injury, read and follow all warnings, cautions, notes and instructions in the supplemental restraint system (SRS) deactivation procedure.**

Deactivate the supplemental restraint system. For additional information, refer to [Supplemental Restraint System \(SRS\) Deactivation and Reactivation](#) in this section.

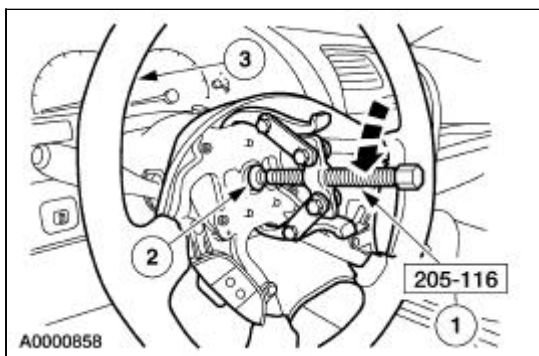
4. Remove the horn blow switch. For additional information, refer to [Section 413-06](#).
5. Loosen the steering wheel retaining bolt.



6. Using the special tool, loosen the steering wheel.

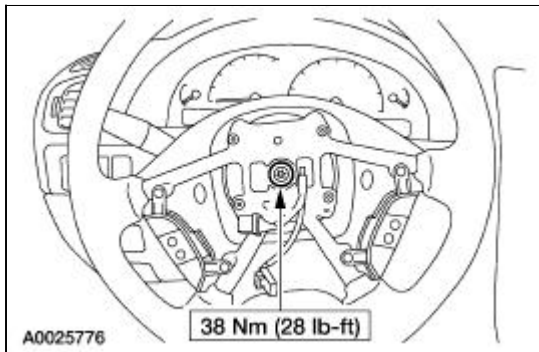



7. Remove the steering wheel.
 1. Remove the special tool.
 2. Remove and discard the steering wheel retaining bolt.
 3. Remove the steering wheel.



Installation

1. Install the steering wheel and a new steering wheel retaining bolt.



2. Install the horn blow switch. For additional information, refer to [Section 413-06](#).
3.  **WARNING:** To reduce the risk of serious personal injury, read and follow all warnings, cautions, notes and instructions in the supplemental restraint system (SRS) deactivation procedure.

Reactivate the supplemental restraint system (SRS). For additional information, refer to [Supplemental Restraint System \(SRS\) Deactivation and Reactivation](#) in this section.

Clockspring


Removal and Installation

For additional information, refer to [Section 501-20B](#).

Steering Column

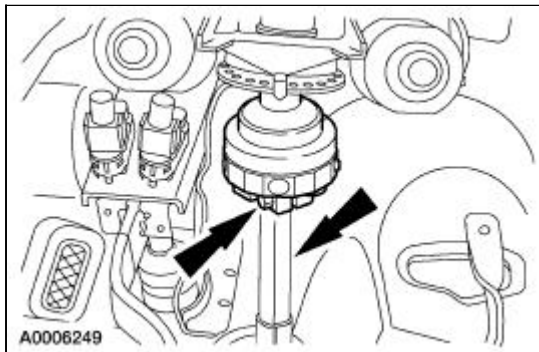
Removal

All vehicles

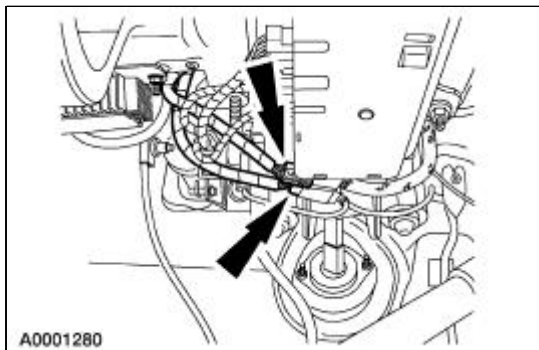
1. Prepare the vehicle for steering column removal.
 1. Disconnect the battery ground cable for at least one minute to allow for the depletion of the restraint system backup power supply. For additional information, refer to [Section 414-01](#).
 2.  **WARNING: To reduce the risk of serious personal injury, read and follow all warnings, cautions, notes and instructions in the supplemental restraint system (SRS) deactivation procedure.**

Deactivate the supplemental restraint system (SRS). For additional information, refer to [Supplemental Restraint System \(SRS\) Deactivation and Reactivation](#) in this section.

3. Remove the clockspring. For additional information, refer to [Section 501-20B](#).
2. Remove and discard the steering column shaft pinch bolt. Detach the intermediate shaft from the steering column yoke.

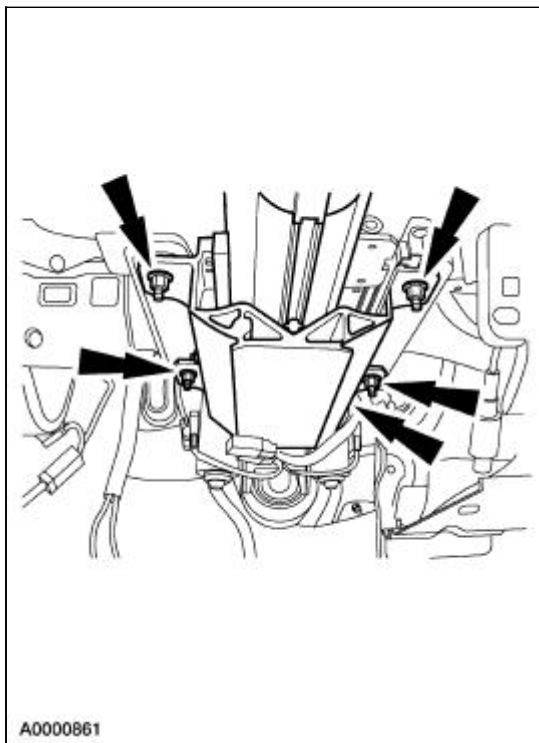


3. Disconnect the electronic steering sensor and steering column release motor harness electrical connectors.



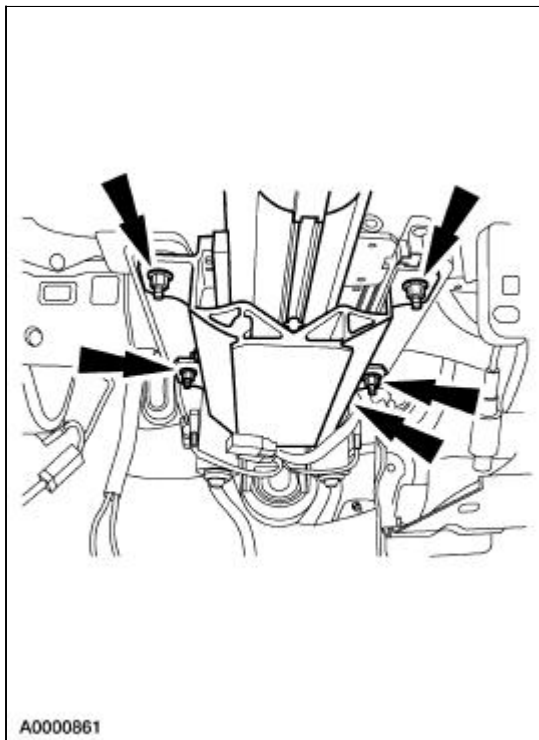
Vehicles with automatic transmission

4. While supporting the steering column, remove and discard the lock nuts. Remove the steering column.

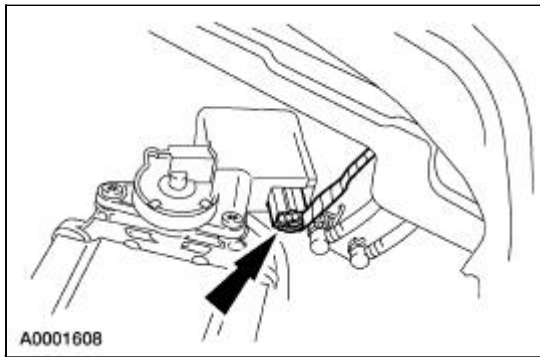


Vehicles with manual transmission

5. While supporting the steering column, remove and discard the lock nuts. Lower the steering column.



6. Disconnect the steering wheel lock actuator electrical connector.

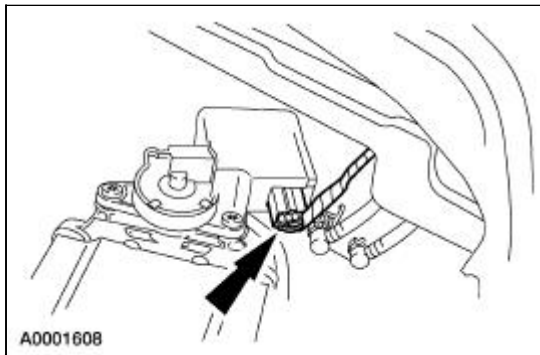


7. Remove the steering column.

Installation

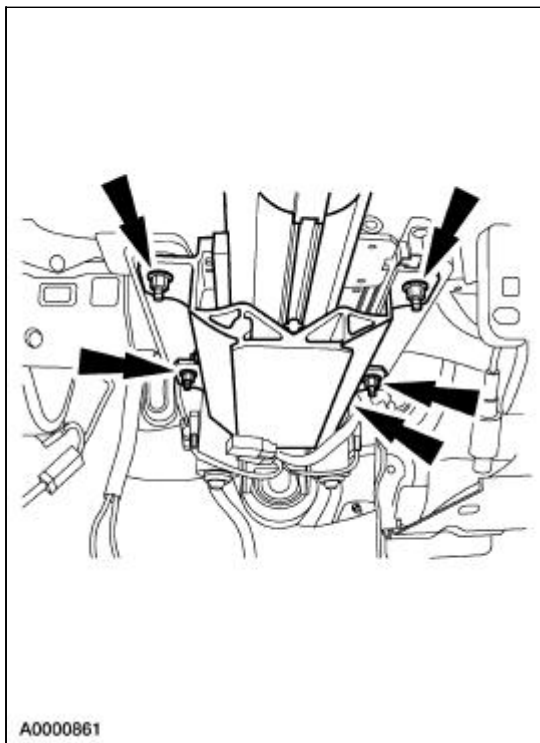
Vehicles with manual transmission

1. Connect the steering wheel lock actuator electrical connector.

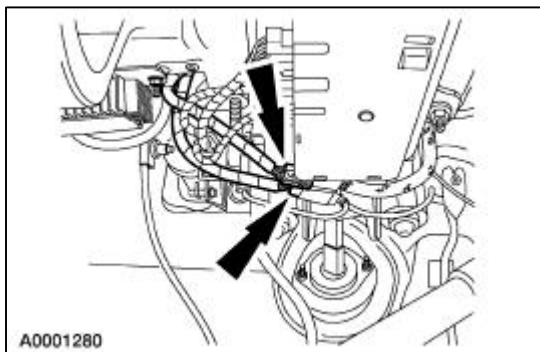


All vehicles

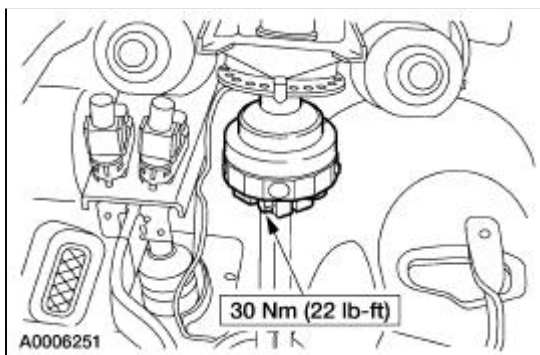
2. Position the steering column and loosely install the bolts.




3. Connect the electronic steering sensor and the steering column release motor electrical connectors.



4. Attach the intermediate shaft to the steering column yoke and install the pinch bolt.



5. Restore the vehicle to operating condition.
 1. Install the clockspring. For additional information, refer to [Section 501-20B](#).
 2.  **WARNING:** To reduce the risk of serious personal injury, read and follow all warnings, cautions, notes and instructions in the supplemental restraint system (SRS) deactivation procedure.

Reactivate the supplemental restraint system (SRS). For additional information, refer to [Supplemental Restraint System \(SRS\) Deactivation and Reactivation](#) in this section.

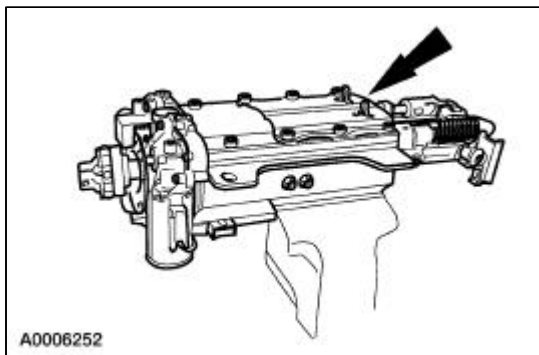
Tilt/Telescopic Motors

Removal and Installation

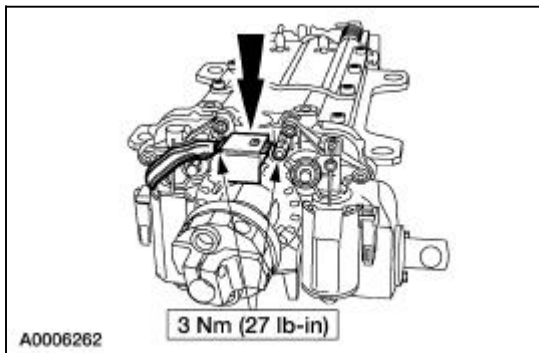
1.  **WARNING:** To reduce the risk of serious personal injury, read and follow all warnings, cautions, notes and instructions in the steering column removal and installation procedure.

Remove the steering column. For additional information, refer to [Steering Column](#) in this section.

2. Place the steering column in a vise.

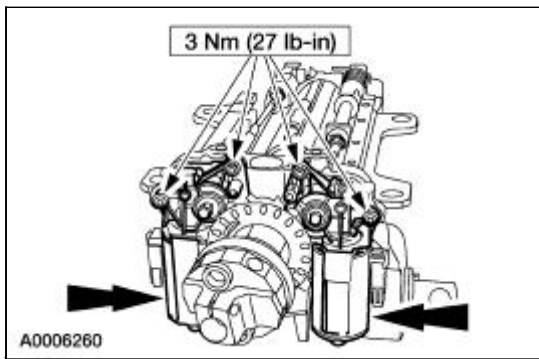


3. Remove the screws and the electronic steering sensor (18B015).



4. **NOTE:** Do not disconnect the steering column release motor harness electrical connectors from the steering column release motor assemblies (3D538).

Remove the screws and the steering column release motor assemblies.



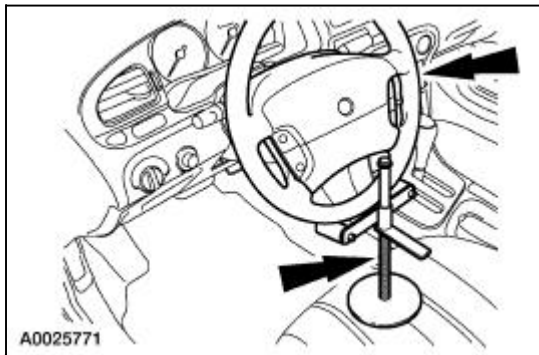
5.  **WARNING:** To reduce the risk of serious personal injury, read and follow all warnings, cautions, notes and instructions in the steering column procedure.

To install, reverse the removal procedure.

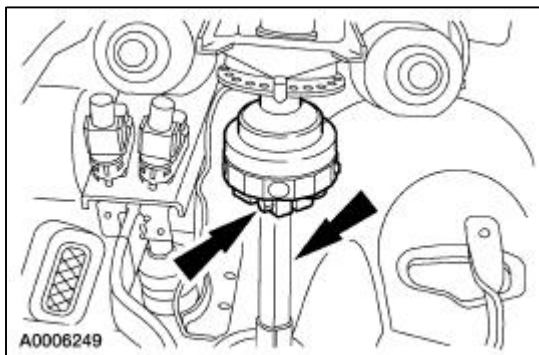
Steering Column Shaft —Intermediate


Removal and Installation

1. Hold the steering wheel in the straight forward position using a suitable holding device.



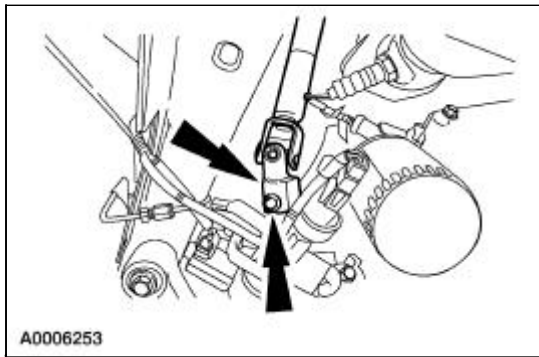
2. Remove the pinch bolt and detach the intermediate shaft from the steering column yoke.
 - Discard the bolt.



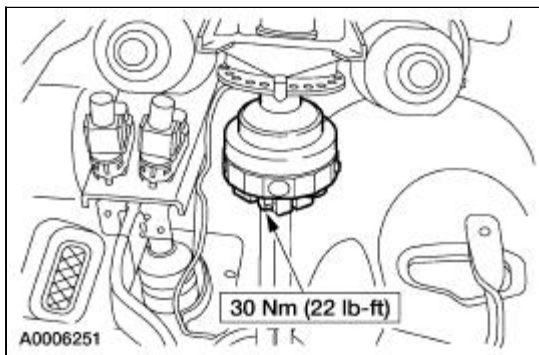
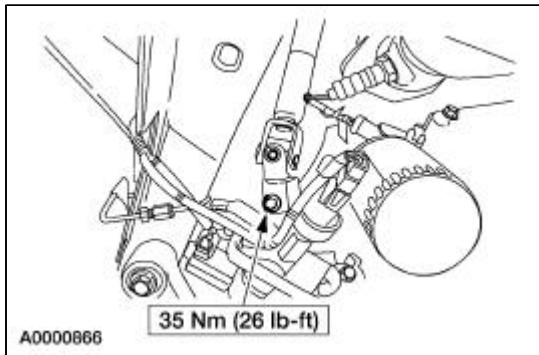
3. Raise and support the vehicle. For additional information, refer to [Section 100-02](#).
4.  **CAUTION:** Do not allow the steering wheel to rotate while the steering column intermediate shaft is disconnect or damaged to the clockspring can result. If there is evidence that the wheel has rotated, the clockspring must be removed and recentered. For additional information, refer to [Section 501-20B](#).

Remove the pinch bolt and detach the coupler.

- Discard the bolt.

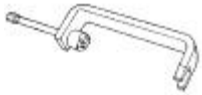


5. Remove the intermediate shaft.
6. To install, reverse the removal procedure.



Steering Column —Power Tilt/Telescopic

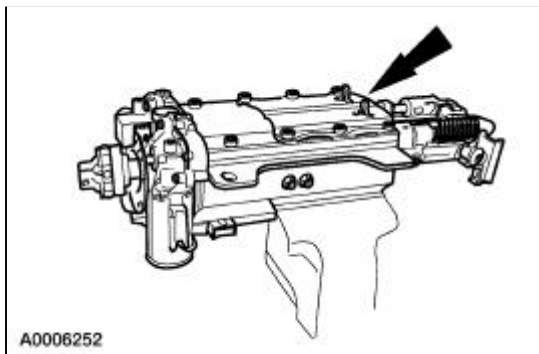
Special Tool(s)

 ST1692-A	Tilt Column Spring Compressor 211-201 (T97P-3D655-A)
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Disassembly

All vehicles

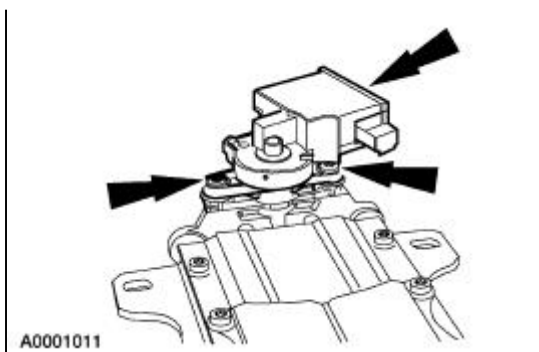
1. Place the steering column in a vise.



Vehicles with manual transmission

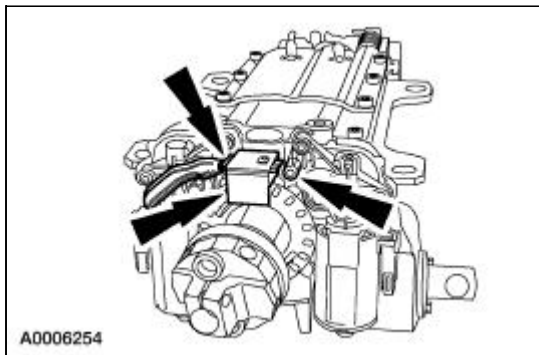
2.  **CAUTION:** Use care not damage the steering wheel lock actuator (3K772) when removing the heads from the shear bolts.


Using a suitable drill and 3/8-in drill bit, remove heads of the shear bolts. Remove the steering wheel lock actuator. Using locking pliers, remove the shear bolts from the steering column upper shaft assembly.




All vehicles

3. Remove the screws and the electronic steering sensor (18B015).

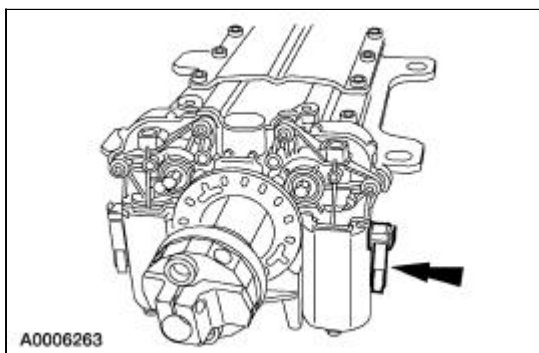


4.  **CAUTION:** Do not telescope the steering column manually or by any means other than those described below. Failure to do so can result in damage to the steering column potentiometer (14A605) and the steering column actuator assembly (3F797).

 **CAUTION:** Pay close attention to the travel of power steering potentiometer while operating the steering column with the battery charger. Overtravel of the steering column can damage the steering column potentiometer and cause other electrical failures.

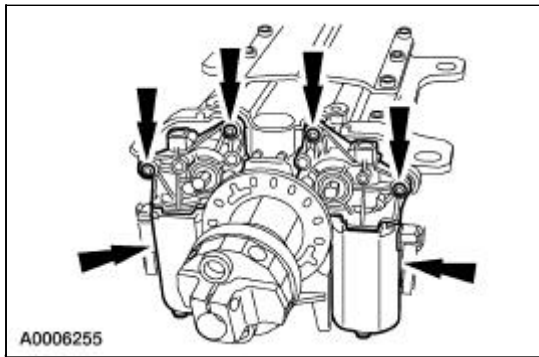
Disconnect the steering column release motor (telescopic) electrical connector. Using a suitable 1 amp 12 volt battery charger connected to the steering column release motor (telescopic) electrical terminals, telescope the steering column out until it reaches the stop (fully extended). Connect the steering column release motor (telescopic) electrical connector.

- If the steering column release motor (telescopic) is damaged or inoperable, a new steering column release motor (telescopic) must be installed before telescoping the steering column.



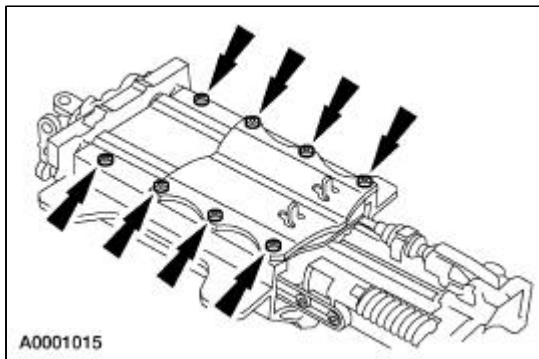
5. **NOTE:** Do not disconnect the steering column release motor harness electrical connectors from the steering column release motor assemblies (3D538).

Remove the screws and the steering column release motor assemblies.

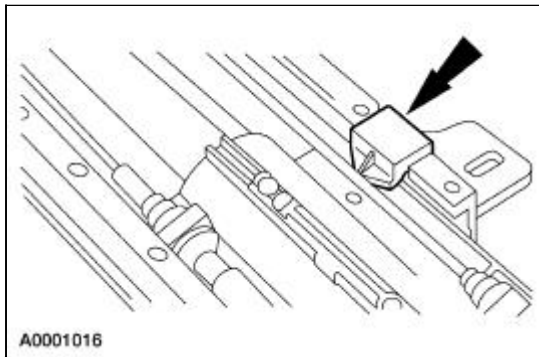


6. **NOTE:** The upper steering column track (3B628) will fall free when the steering column outer housing (3F789) is removed.

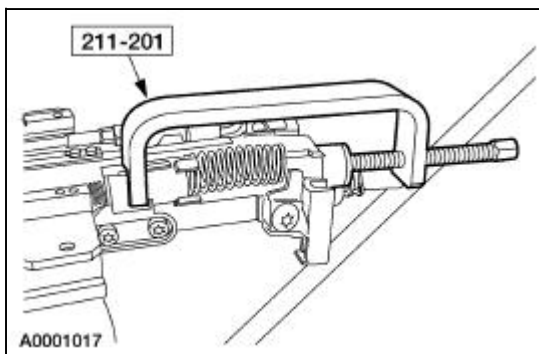
Remove the bolts, steering column outer housing cover plate (3F790), steering column outer housing and steering column track.



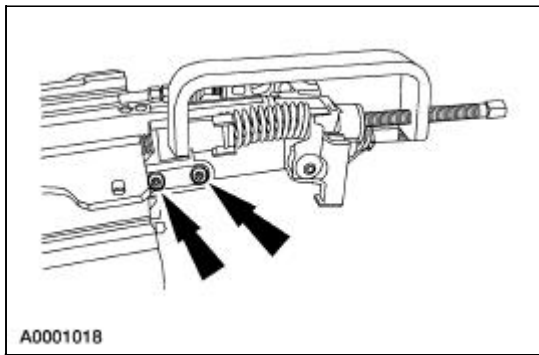
7. Remove the steering column connector link (3A517).



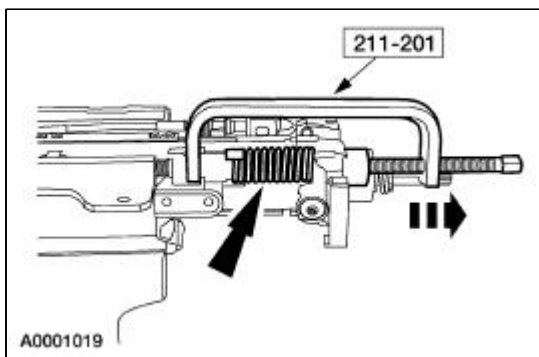
8. Install the special tool hand tight on the steering column position spring (3D655).



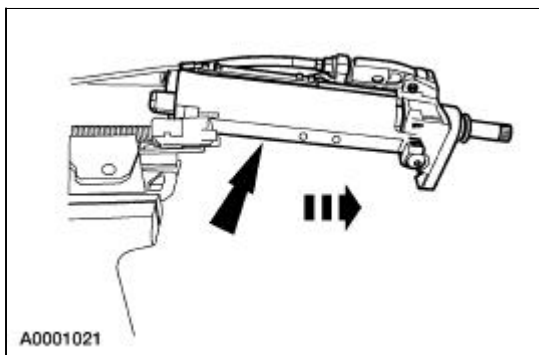
9. Remove the bolts.



10. Using the special tool, release the spring tension. Remove the special tool and the steering column position spring.

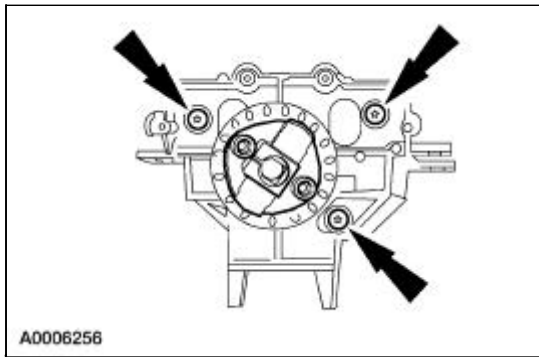



11. Separate the front and rear halves of the steering column upper shaft assembly and the steering column inner housing (3F791).



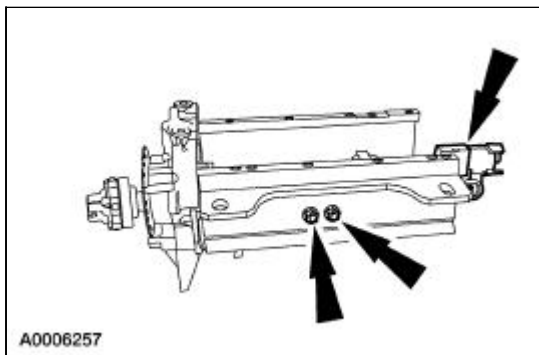
12. **NOTE:** The steering column upper shaft assembly, sensor ring and coupler are serviced as an assembly.

Remove the bolts. Remove the rear half of the steering column upper shaft assembly from the steering column support assembly (3B718).

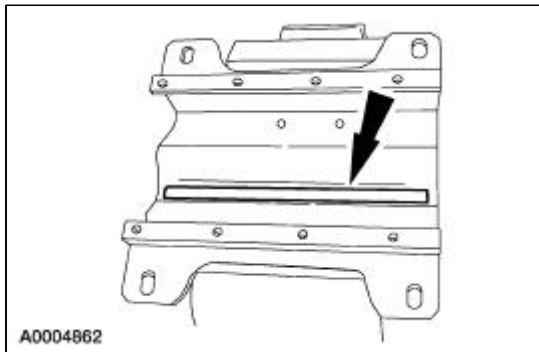


13.  **CAUTION: The curl strap on the steering column actuator assembly (telescopic) (3F797) must not be bent or altered under any circumstances.**

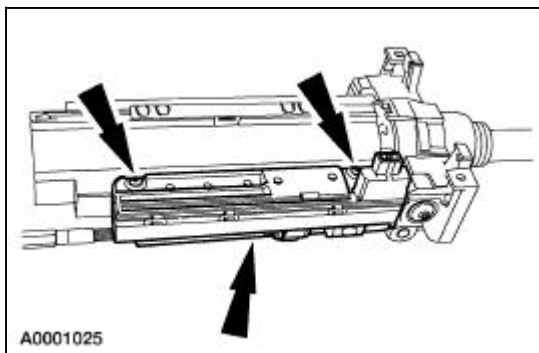
Remove the nuts and the steering column actuator assembly (telescopic). If the curl strap is damaged, a new steering column actuator assembly (telescopic) must be installed.



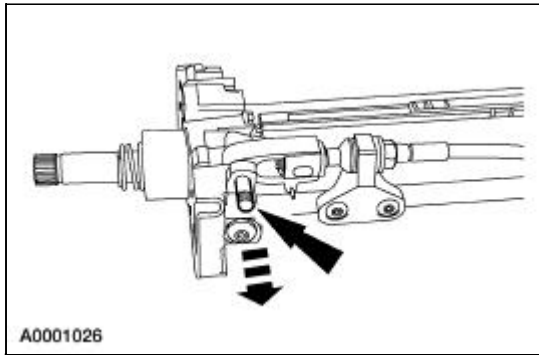
14. Remove the steering column track from the steering column support assembly.



15. Remove the screws and the steering column potentiometer assembly (14A605).

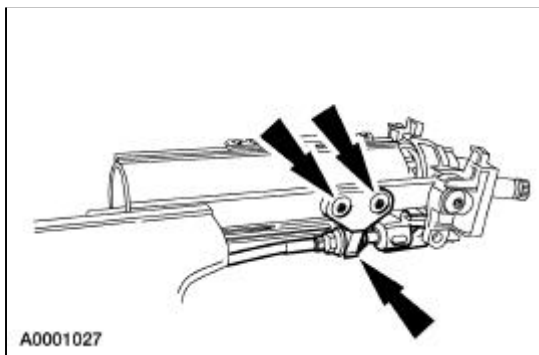


16. Remove the steering column release pin (3D545).



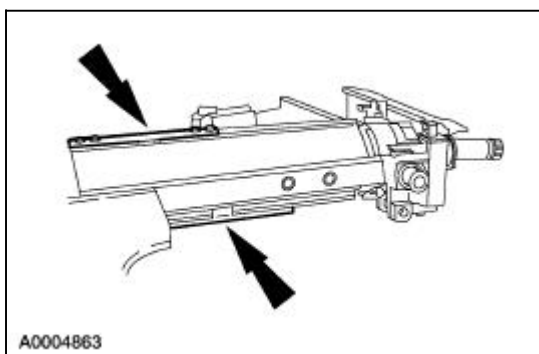
17. Place the steering column inner housing assembly (3F791) in a vise.

18. Remove the bolts and the steering column actuator assembly (tilt) (3F797).

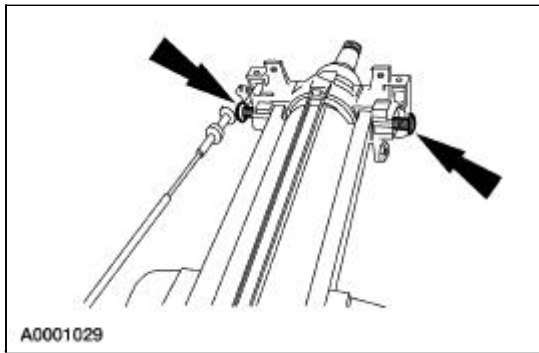


19. **NOTE:** The steering column inner track bearing retainer assemblies (3F795) snap into place and will hold the steering column tracks to the steering column inner housing.

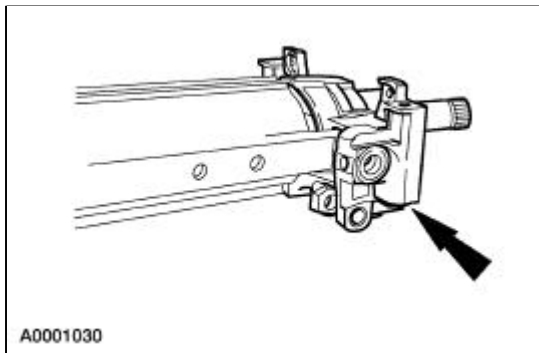
Remove the steering column inner track bearing retainer assemblies and steering column tracks.



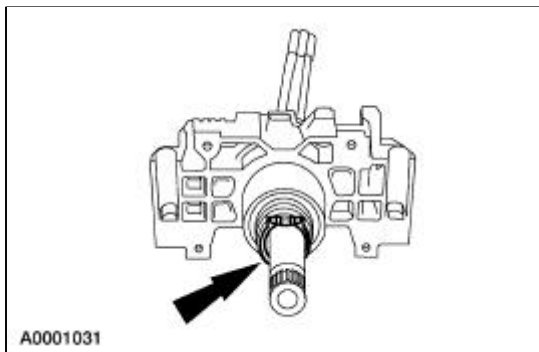
20. Remove the bolts.



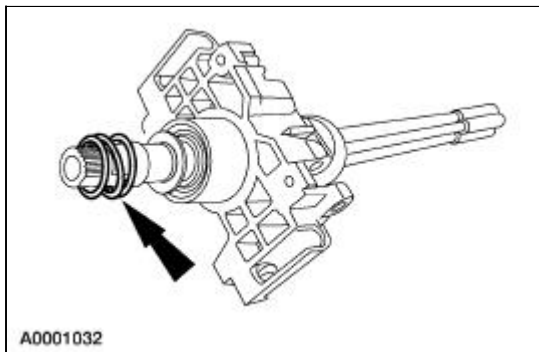
21. Remove the steering column tube flange (3511).



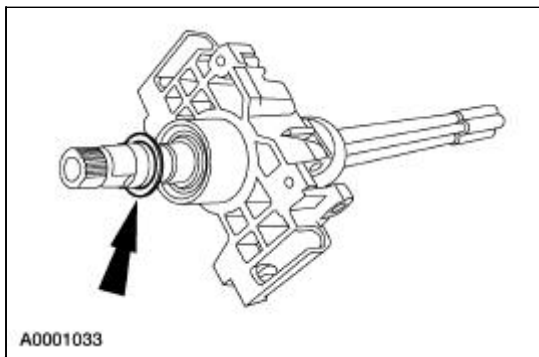
22. Remove the steering column upper bearing retainer (97663).



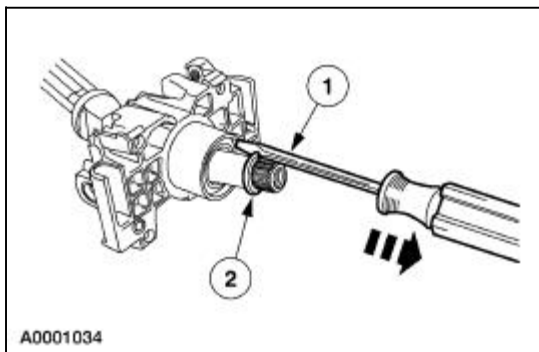
23. Remove the steering column upper bearing spring (3520).



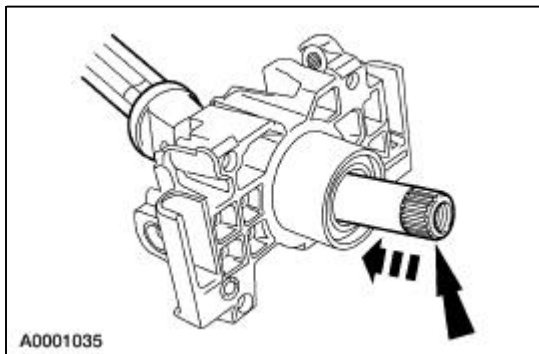
24. Remove the steering column bearing sleeve (3518).



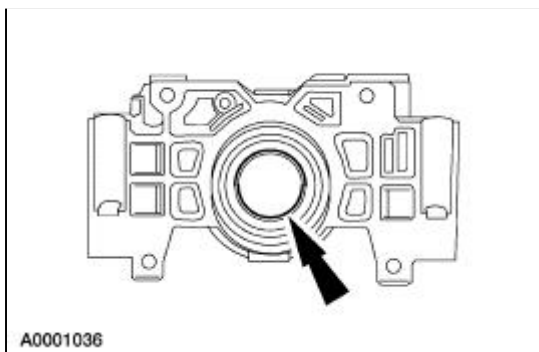
25. Remove the steering column upper bearing tolerance ring (3L539).
1. Using a flat-blade screwdriver, spread out the steering column upper bearing tolerance ring.
 2. Slide the steering column upper bearing tolerance ring from the steering column upper shaft assembly.



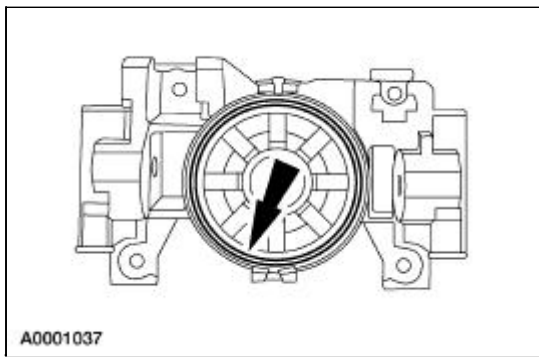
26. Remove the front half of the steering column upper shaft assembly.



27. Using a suitable brass drift, drive out the small steering column tube bearing assembly (3517).



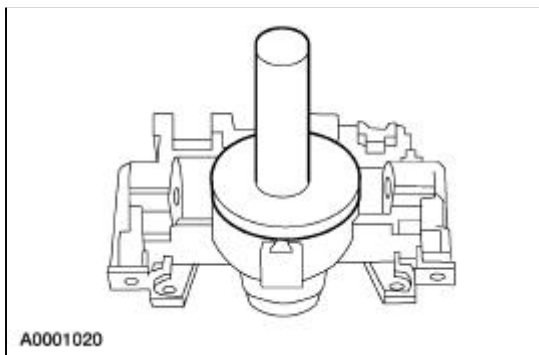
28. Using a suitable brass drift, drive out the large steering column tube bearing assembly (3517).



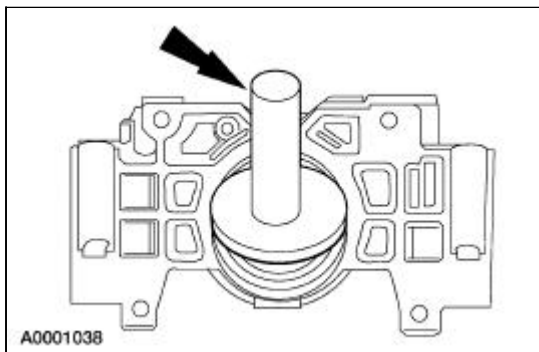
Assembly

All vehicles

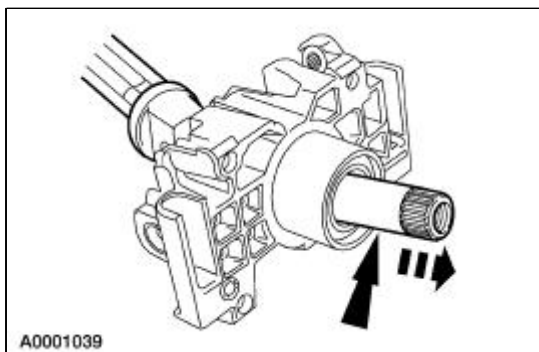
1. Using a suitable bearing installer tool, install the large steering column tube bearing assembly.



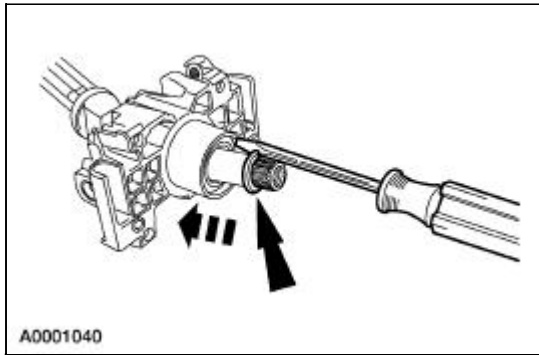
2. Using a suitable bearing installer tool, install the small steering column tube bearing assembly.



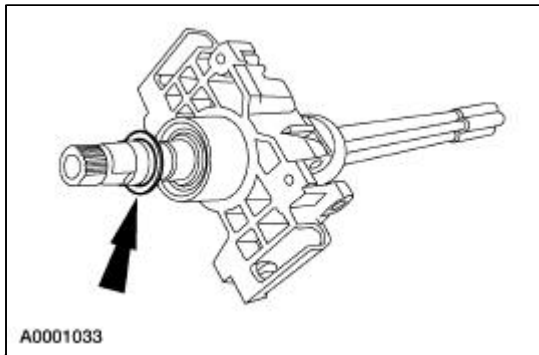
3. Slide the steering shaft into the tilt housing.



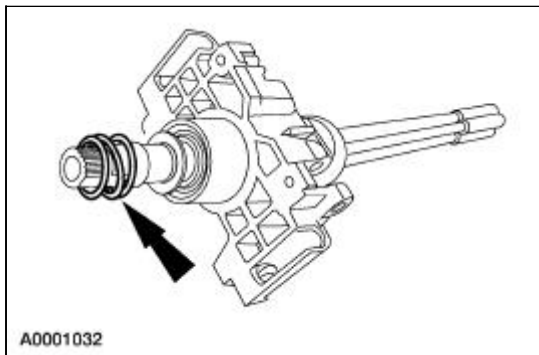
4. Install the steering column upper bearing tolerance ring.



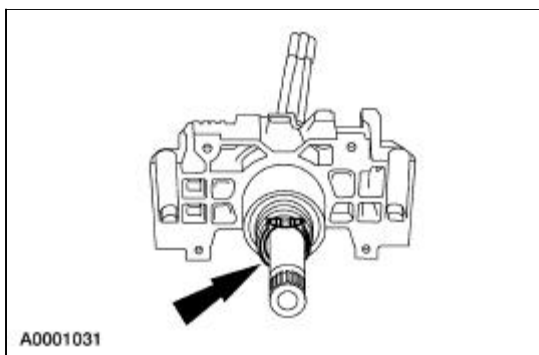
5. Install the steering column bearing sleeve.



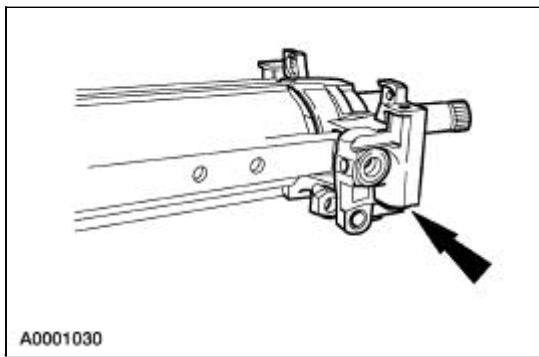
6. Install the steering column upper bearing spring.



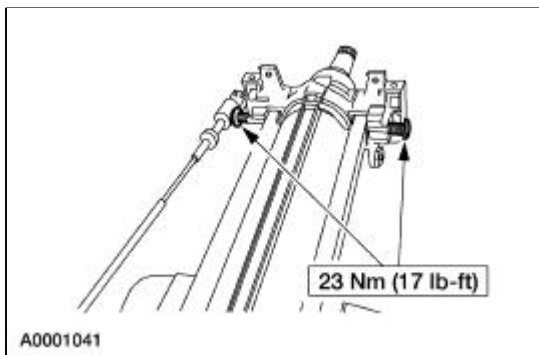
7. Install the steering column upper bearing retainer.



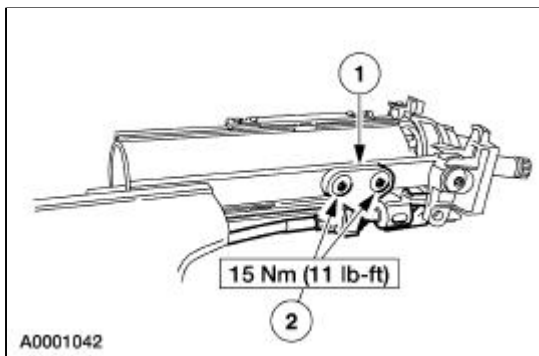
8. Install the steering column tube flange.



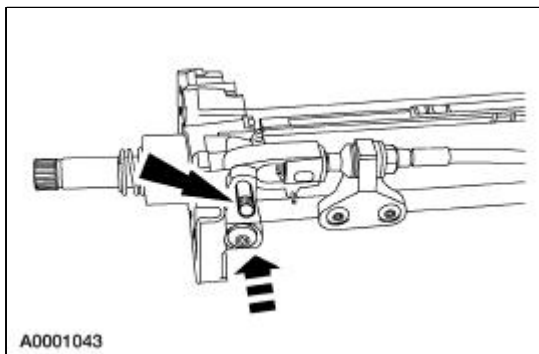
9. Install the bolts.



10. Install the steering column actuator assembly (tilt).
1. Position the steering column actuator assembly (tilt).
 2. Install the bolts.

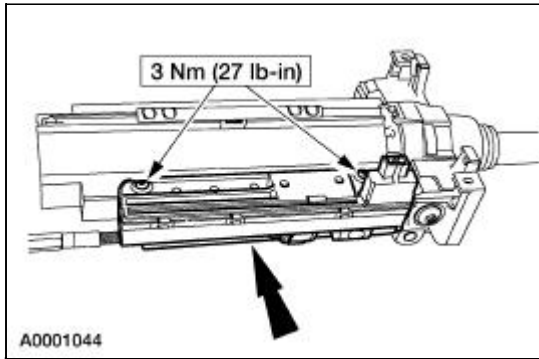


11. Install the steering column release pin.

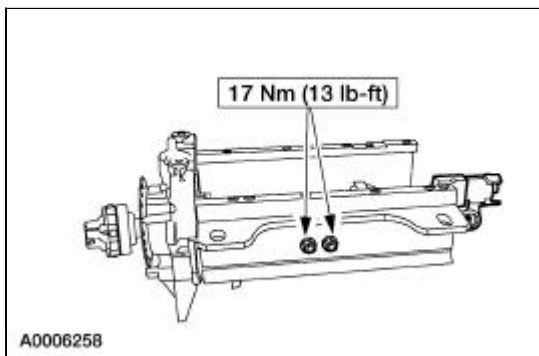


12. Install the steering column potentiometer assembly and screws.
- Line up the pin on the steering column actuator assembly (tilt) with the slot on the

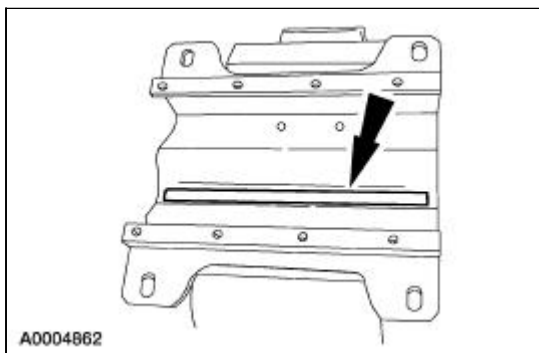
steering column potentiometer assembly.




13. Install the steering column actuator assembly (telescopic) and nuts. If the curl strap is damaged, a new steering column actuator assembly (telescopic) must be installed.



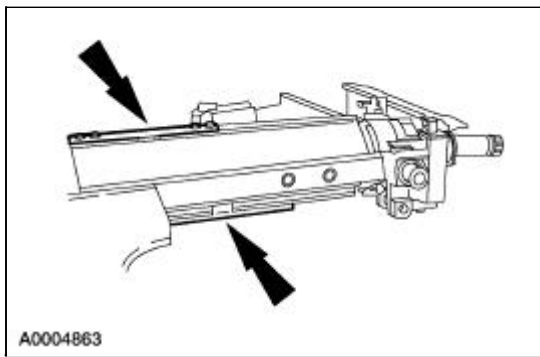
14. Install the steering column track on the steering column support assembly.
 - Apply Premium Long-Life Grease XG-1-C or equivalent meeting Ford specification ESA-M1C75-B to the bearing surface of the steering column track.



15.  **CAUTION: The staging of the steering column inner track bearing assemblies is very critical. The steering column inner track bearing assemblies must be installed against the rear steering column inner housing track bearing assembly retaining end. The steering column inner housing must be installed in the fully extended (out) position. Failure to correctly stage the steering column inner track bearing assemblies will result in damage to the steering column.**

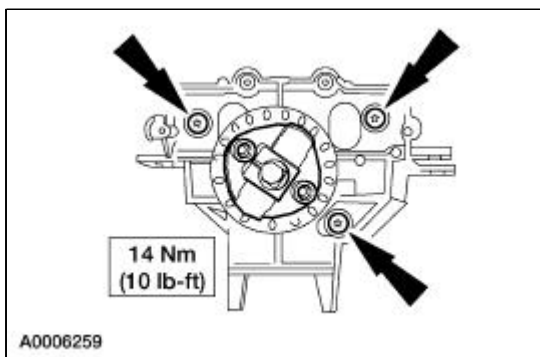
Attach the steering column tracks and steering column inner track bearing assemblies on the steering column inner housing.

- Apply Premium Long-Life Grease XG-1-C or equivalent meeting Ford specification ESA-M1C75-B to the steering column track bearing assemblies and the bearing surface of the steering column tracks.

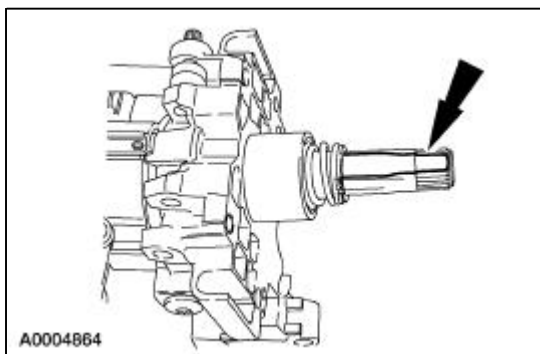


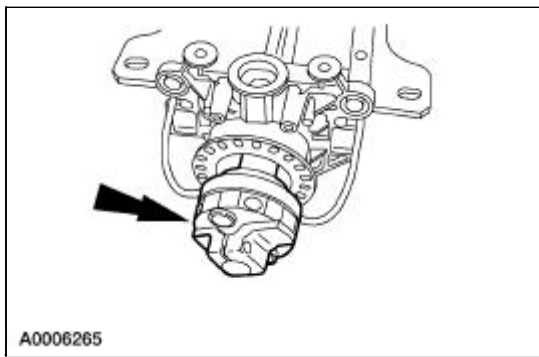
16. **NOTE:** The steering column upper shaft assembly, sensor ring and coupler are serviced as an assembly.

Install the rear half of the steering column upper shaft assembly into the steering column support assembly. Install the bolts.

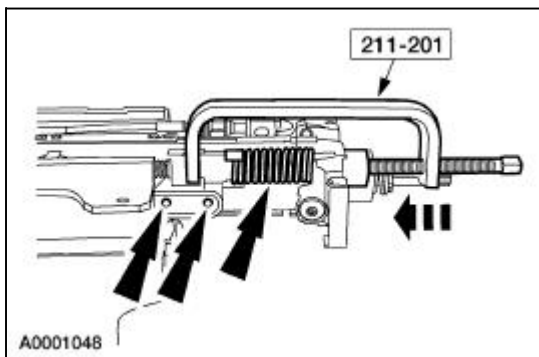


17. Join the front and rear halves of the steering column upper shaft assembly and the steering column inner housing in the steering column support housing.
- Position the front half of the upper steering column upper shaft assembly with flat portion up before installing.
 - Position the rear half of the upper steering column upper shaft assembly with smooth face of the coupling up (machined side down) before installing.

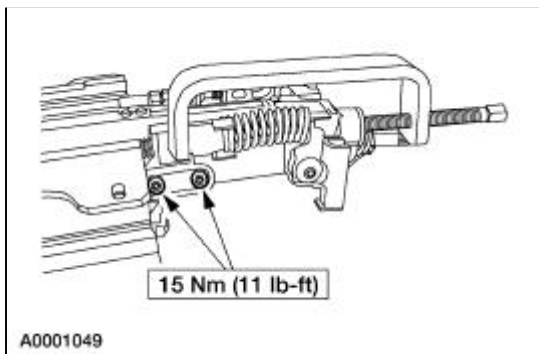




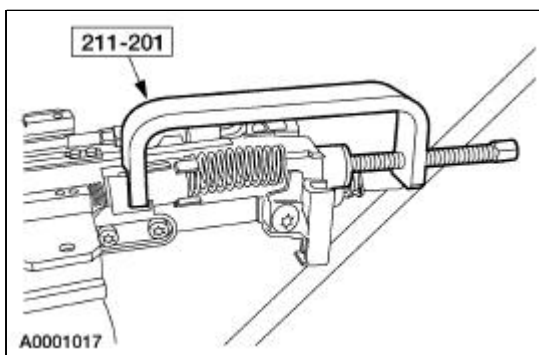
18. Position the steering column spring. Using the special tool, compress the steering column position spring until the steering column actuator assembly (telescopic) bolt holes align.



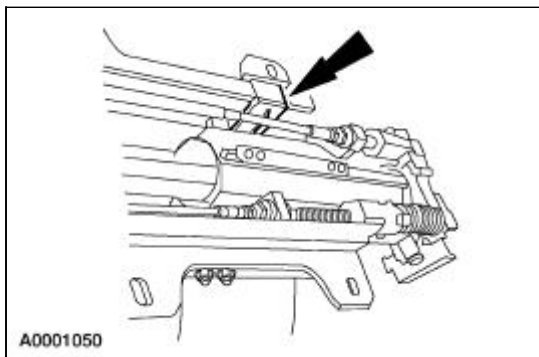
19. Install the bolts.




20. Remove the special tool.



21. Install the steering column connector link.



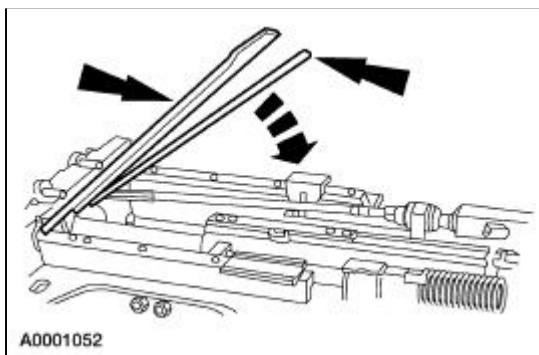
22. Install the steering column track on the steering column outer housing.
- Apply Premium Long-Life Grease XG-1-C or equivalent meeting Ford specification ESA-M1C75-B to the bearing surface of the steering column track.

23.  **CAUTION: The staging of the steering column inner track bearing assemblies is very critical. The steering column inner track bearing assemblies must be installed against the rear steering column inner housing track bearing assembly retaining end. The steering column inner housing must be installed in the fully extended (out) position. Failure to correctly stage the steering column inner track bearing assemblies will result in damage to the steering column.**

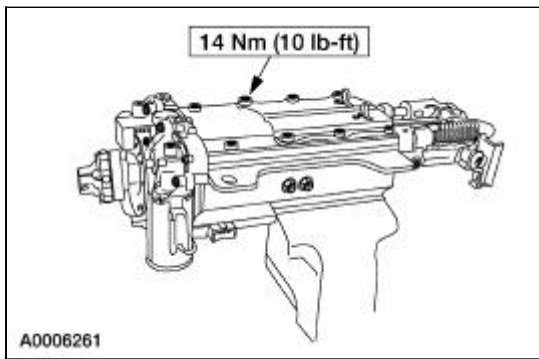
NOTE: Make sure that the steering column inner track bearing retainer assemblies are correctly staged before the steering column outer housing and steering column outer housing cover plate are installed.

Install the steering column outer housing, steering column outer housing cover plate and bolts. Loosely hand tighten the bolts. Check that the steering column inner track bearings are correctly staged, correct as necessary.

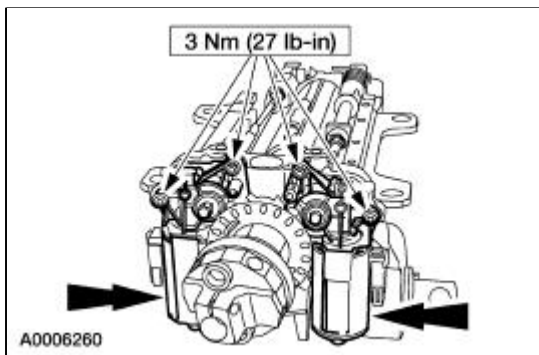
- Apply Threadlock 262, E2FZ-19554-B or equivalent meeting Ford specification WSK-M2G351-A6 to the bolt threads.



24. Tighten the bolts.



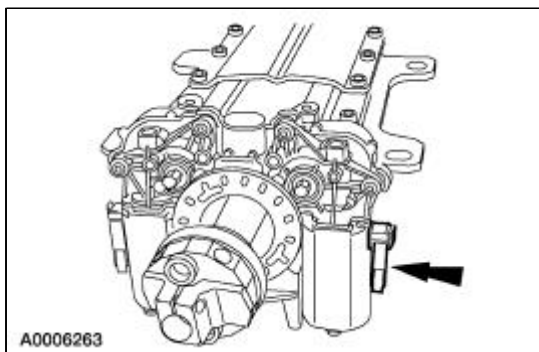
25. Install the steering column release motor assemblies and screws.



26. **⚠ CAUTION:** Do not telescope the steering column manually or by any means other than those described below. Failure to do so can result in damage to the steering column potentiometer and the steering column actuator assembly.

⚠ CAUTION: Pay close attention to the travel of power steering potentiometer while operating the steering column with the battery charger. Overtravel of the steering column can damage the steering column potentiometer and cause other electrical failures.

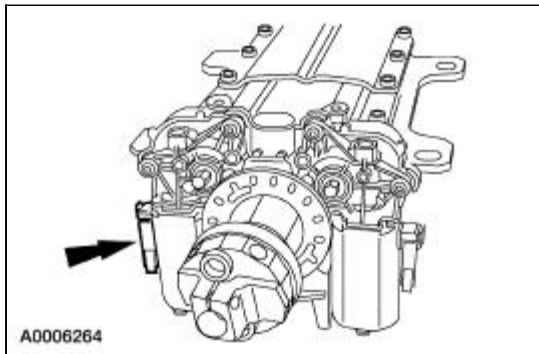
Disconnect the steering column release motor (telescopic) electrical connector. Using a suitable 1 amp 12 volt battery charger connected to the steering column release motor (telescopic) electrical terminals, test the steering column for normal operation. Connect the steering column release motor (telescopic) electrical connector.



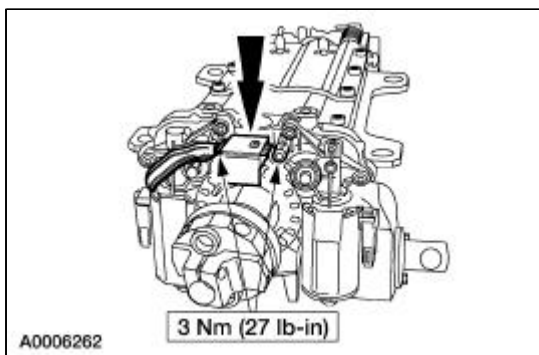
27. **⚠ CAUTION:** Pay close attention to the travel of power steering potentiometer while operating the steering column with the battery charger. Overtravel of the steering column can damage the steering column potentiometer and cause other electrical failures.

Disconnect the steering column release motor (tilt) electrical connector. Using a suitable 1 amp 12 volt battery charger connected to the steering column release motor (tilt) electrical terminals,

test the steering column for normal operation. Connect the steering column release motor (tilt) electrical connector.

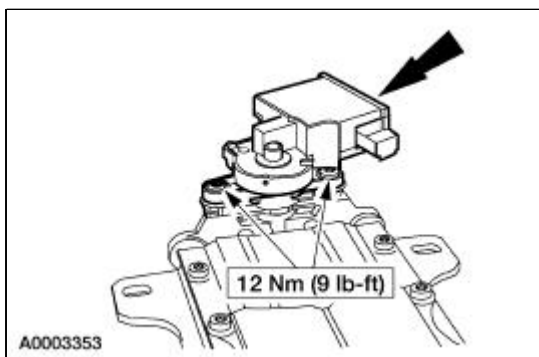


28. Install the electronic steering sensor and screws.



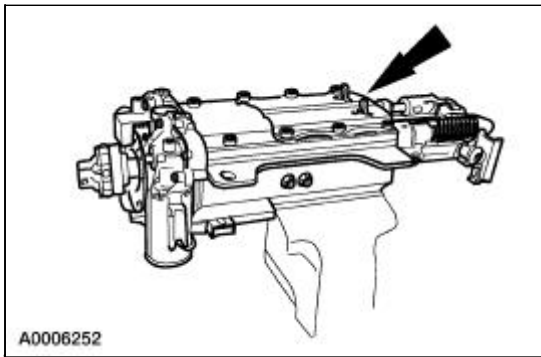
Vehicles with manual transmission

29. Install the steering wheel lock actuator and new shear bolts.



All vehicles

30. Remove the steering column from the vise.



A0006252

Torque Specifications

Description	Nm	lb-ft	lb-in
Battery ground cable bolt	10	—	89
Steering column lock actuator screw	14	10	—

Steering Column Switches

The steering column switches system consists of the following components:

- ignition switch (11572)
- multifunction switch (13K359)
- steering column lock actuator (manual transmission only)

The ignition switch is mounted in the instrument panel to the RH side of the steering column and is activated by rotating the ignition key in the ignition switch lock cylinder.



The integrated multifunction switch is mounted to the steering column and controls the turn signals, hazard flasher, windshield wiper/washer control, and headlamp dimmer/flash-to-pass.

The steering column lock actuator will unlock when a valid ignition key is inserted into the ignition switch lock cylinder. The steering column lock actuator will only lock when the ignition key is removed, and both the vehicle messages for vehicle speed and engine rpm are not present on the standard corporate protocol (SCP) link. Power must not be enabled to the steering column lock actuator while the engine is running. While the steering column lock actuator is in the locked position, the vehicle will be inhibited from cranking.

The steering column lock actuator receives power from the REM, ground from the FEM, and exchanges security-related communication messages with the instrument cluster (IC) module over the SCP link.

Steering Column Switches

Special Tool(s)

 ST1137-A	73 III Automotive Meter or equivalent 105-R0057
 ST2332-A	Worldwide Diagnostic System (WDS) 418-F224, New Generation STAR (NGS) Tester 418-F052, or equivalent diagnostic tool

Refer to the Wiring Diagrams Section 700-02-00 for schematic and connector information.

Refer to the Wiring Diagrams Section 417-01-00 for schematic and connector information.

Refer to the Wiring Diagrams Section 211-00-00 for schematic and connector information.

Inspection and Verification

1. Verify the customer's concern by operating the ignition switch, the multifunction switch, and the steering column lock actuator (if equipped) (manual transmission only) on the steering column.
2. Visually inspect for obvious signs of mechanical and electrical damage; refer to the following chart:

Visual Inspection Chart

Mechanical	Electrical
<ul style="list-style-type: none"> ● Multifunction switch ● Ignition key ● Ignition switch ● Steering column ● Wiper/washer switch ● Steering column lock (SCL) actuator (if equipped) 	<ul style="list-style-type: none"> ● Circuit ● Central junction box (CJB) Fuse: <ul style="list-style-type: none"> ■ 201 (5A) ■ 202 (5A) ■ 203 (5A) ■ 204 (5A) ■ 205 (5A) ■ 213 (5A) ■ 214 (10A) ■ 216 (5A) ■ 217 (5A) ■ 226 (3A)

- 227 (10A)
- 229 (5A)
- Underhood auxiliary junction box (AJB) Fuse:
 - 102 (10A)
 - 120 (30A)
- Battery junction box (BJB) Fuse:
 - 402 (10A)
 - 406 (10A)
 - 422 (20A)
- Relay

3. If an obvious cause for an observed or reported concern is found, correct the cause before proceeding to the next step.
4. If the diagnostic tool does not power up, refer to the diagnostic tool manual.
5. **NOTE:** The SCL actuator will only allow communication with a tester after the SCL actuator has been activated. To activate the SCL actuator, open the driver door and **do not** put the key in the ignition (or alternatively, you can press one of the buttons on the key fob while there is no key in the ignition). The SCL actuator will stay activated for 30 minutes after the driver door is opened (or a key fob button is pressed).

If equipped with SCL actuator (manual transmission vehicles only), and the concern remains after inspection, connect the diagnostic tool. The diagnostic tool will receive power through the diagnostic connector. If the diagnostic tool does not communicate, refer to the diagnostic tool manual.

6. Carry out the DATA LINK DIAGNOSTIC TEST. If the diagnostic tool responds with:
 - CKT914, CKT915 or CKT70-ALL ECUS NO RESP/NOT EQUIP, refer to [Section 418-00](#).
 - NO RESP/NOT EQUIP for front electronic module (FEM), go to Pinpoint Test A.
 - NO RESP/NOT EQUIP for rear electronic module (REM), go to Pinpoint Test B.
 - NO RESP/NOT EQUIP for instrument cluster (IC), go to Pinpoint Test D.
 - NO RESP/NOT EQUIP for steering column lock module (SCLM), ignore this message and proceed to specific data link diagnostic test for the steering column lock module as follows:

NOTE: Ignition key must be kept out of the ignition switch even though the diagnostic tool may request ignition to the RUN position.

NOTE: Ignore NO RESP/NOT EQUIP messages for all modules except the steering column lock module for this test.

Turn key to OFF, remove key from ignition switch, close the driver door, open the driver door. Carry out the DATA LINK DIAGNOSTIC TEST FOR THE SCL ACTUATOR. If the diagnostic tool responds with:

- NO RESP/NOT EQUIP for steering column lock module (SCLM), go to Pinpoint Test C.
- Otherwise, retrieve and record the continuous diagnostic trouble codes (DTCs) for the SCLM, , erase the continuous DTCs, insert the key into the ignition switch, turn the ignition switch to RUN, Turn the ignition switch to OFF, remove the key from the ignition switch, close the driver door, open the driver door, record new continuous DTCs for the SCLM.

7. If the DTCs retrieved are related to the concern, go to the SCL actuator Diagnostic Trouble Code (DTC) Index.

8. If no DTCs related to the concern are retrieved, proceed to Symptom Chart to continue diagnostics.

FEM Diagnostic Trouble Code (DTC) Index

DTC	Description	Source	Action
B1319	Driver Door Ajar Circuit Failure	FEM	REFER to Section 417-02 .
B1327	Passenger Door Ajar Circuit Failure	FEM	REFER to Section 417-02 .
B1342	ECU Is Defective	FEM	CLEAR the DTC. RETRIEVE the DTCs. If DTC B1342 is retrieved, INSTALL a new FEM. REFER to Section 419-10 . CLEAR the DTCs. REPEAT the self-test.
B1438	Wiper Mode Select Switch Circuit Failure	FEM	REFER to Section 501-16 .
B1446	Wiper Park Sense Circuit Failure	FEM	REFER to Section 501-16 .
B1479	Wiper Washer Fluid Level Sensor Circuit Failure	FEM	REFER to Section 413-01 .
B1499	Lamp Turn Signal Left Circuit Failure	FEM	REFER to Section 417-01 .
B1501	Lamp Turn Signal Left Circuit Short to Battery	FEM	REFER to Section 417-01 .
B1503	Lamp Turn Signal Right Circuit Failure	FEM	REFER to Section 417-01 .
B1505	Lamp Turn Signal Right Circuit Short to Battery	FEM	REFER to Section 417-01 .
B1519	Hood Switch Circuit Failure	FEM	REFER to Section 419-01A .
B1567	Lamp Headlamp High-Beam Circuit Failure	FEM	REFER to Section 417-01 .
B1676	Battery Pack Voltage Out of Range	FEM	REFER to Section 414-00 .
B1794	Lamp Headlamp Low-Beam Circuit Failure	FEM	REFER to Section 417-01 .
B2214	Window Passenger Front Up Switch Short to Battery	FEM	REFER to Section 501-11 .
B2215	Window Passenger Front Down Switch Short to Battery	FEM	REFER to Section 501-11 .
B2312	Mirror Passenger Horizontal Feedback Potentiometer Circuit Failure	FEM	REFER to Section 501-09 .
B2316	Mirror Passenger Vertical Feedback Potentiometer Circuit Failure	FEM	REFER to Section 501-09 .
B2443	Powertrain Performance Mode Switch Circuit Failure	FEM	Not Used
B2477	Module Configuration Failure	FEM	REFER to Section 418-01 .
C1284	Oil Pressure Switch Failure	FEM	REFER to Section 413-01 .

C1446	Brake Switch Circuit Failure	FEM	REFER to Section 413-01 .
C1924	VAPS Solenoid Actuator Output Circuit Short to Ground	FEM	REFER to Section 211-00 .
C1925	VAPS Solenoid Actuator Return Circuit Failure	FEM	REFER to Section 211-00 .
U1027	SCP (J1850) Invalid or Missing Data for Engine RPM	PCM	CARRY OUT the PCM self-test.
U1041	SCP (J1850) Invalid or Missing Data for Vehicle Speed	ABS	CARRY OUT the ABS self-test.
U1059	SCP (J1850) Invalid or Missing Data for Transmission / Transaxle / PRNDL	PCM	CARRY OUT the PCM self-test.
U1218	SCP (J1850) Invalid or Missing Data for External Lamps	ICM	CARRY OUT the ICM self-test.
U1222	SCP (J1850) Invalid or Missing Data for Interior Lamps	ICM	CARRY OUT the ICM self-test.
U1227	SCP (J1850) Invalid or Missing Data for Body Status Request	ICM	CARRY OUT the ICM self-test.

FEM Parameter Identification (PID) Index

PID	Description	Expected Value
AL_EVT1	Last 8 Alarm Events	DROPEN, HOODTR, IGNTAM, PANIC, T_AJAR, RR_SD, LR_SD, P_DOOR, D_DOOR, RADIO, WINDO, ULTRS, NOEVNT, BB_SND
AL_EVT2	Last 8 Alarm Events	DROPEN, HOODTR, IGNTAM, PANIC, T_AJAR, RR_SD, LR_SD, P_DOOR, D_DOOR, RADIO, WINDO, ULTRS, NOEVNT, BB_SND
AL_EVT3	Last 8 Alarm Events	DROPEN, HOODTR, IGNTAM, PANIC, T_AJAR, RR_SD, LR_SD, P_DOOR, D_DOOR, RADIO, WINDO, ULTRS, NOEVNT, BB_SND
AL_EVT4	Last 8 Alarm Events	DROPEN, HOODTR, IGNTAM, PANIC, T_AJAR, RR_SD, LR_SD, P_DOOR, D_DOOR, RADIO, WINDO, ULTRS, NOEVNT, BB_SND
AL_EVT5	Last 8 Alarm Events	DROPEN, HOODTR, IGNTAM, PANIC, T_AJAR, RR_SD, LR_SD, P_DOOR, D_DOOR, RADIO, WINDO, ULTRS, NOEVNT, BB_SND
AL_EVT6	Last 8 Alarm Events	DROPEN, HOODTR, IGNTAM, PANIC, T_AJAR, RR_SD, LR_SD, P_DOOR, D_DOOR, RADIO, WINDO, ULTRS, NOEVNT, BB_SND
AL_EVT7	Last 8 Alarm Events	DROPEN, HOODTR, IGNTAM, PANIC, T_AJAR, RR_SD, LR_SD, P_DOOR, D_DOOR, RADIO, WINDO, ULTRS, NOEVNT, BB_SND
AL_EVT8	Last 8 Alarm Events	DROPEN, HOODTR, IGNTAM, PANIC, T_AJAR, RR_SD, LR_SD, P_DOOR, D_DOOR, RADIO, WINDO, ULTRS, NOEVNT, BB_SND
CCNT	Number Of Continuous DTCs In Module	one count per bit
D_DOOR	Left Front Door Ajar Switch	CLOSED, AJAR

FLUID_1	Brake Fluid Level Switch #1	OFF, ON
HOOD_SW	Hood Ajar Switch	CLOSED, AJAR
IGN_R	Ignition Switch -RUN Position	NO, YES
L_HIGH	Left High Beam Lamp Driver	Off---, Off-B-, On---, On-B-
L_LOW	Left Low Beam Lamp	Off---, Off-B-, On---, On-B-
LF_TURN	Left Front Turn Lamp	Off---, Off-B-, On---, On-B-
LMRKOUT	Left Front Marker Lamp	Off---, Off-B-, On---, On-B-
OILWRN	Oil Level Warning Lamp	Off---, On---
P_DN_SW	Passenger Down Activated	OFF, DOWN
P_DOOR	Passenger Door Ajar Switch	CLOSED, AJAR
P_UP_SW	Passenger Up Activated	OFF, UP
PRK_BRK	Parking Brake Switch Input	OFF, ON
PSMRPSH	Passenger Mirror Position Sensor (Left/Right)	#####
PSMRPSV	Passenger Mirror Position	#####
PSPWAMP	Power Window Passenger's Peak Motor Current	#####
PWM_DC1	PWM Duty Cycle #1	%
R_HIGH	Right High Beam Lamp Driver	Off---, Off-B-, On---, On-B-
R_LOW	Right Low Beam Lamp	Off---, Off-B-, On---, On-B-
RADIO_SW	Security Input Switch Status	OFF, ON
RF_TURN	Right Front Turn Lamp	Off---, Off-B-, On---, On-B-
RMRKSTB	Right Front Marker Lamp	Off---, Off-B-, On---, On-B-
STLKOUT	Steering Column Lock Ground Output	OFF, ON
VBAT	Battery Voltage	Volts
WFLUID	Washer Fluid Level	LOW, OK
WPMODE	Wiper Control Mode Select	WASH, OPEN, INVLD, OFF, INTVL1, INTVL2, INTVL3, INTVL4, INTVL5, INTVL6, INTVL7, LOW, HIGH
WPPRKSW	Windshield Wiper Park Sense	notPRK, PARKED

FEM Active Command Index

Active Command	Display	Action
BACKLIGHTING INTENSITY CONTROL COMMAND	ILLUM	%

BRAKE SYSTEM CONTROL COMMAND	SHFT LOCK	OFF, ON
EXTERIOR LAMP CONTROL	PARKLAMPS	OFF, ON
FRONT WINDOW CONTROL	RR UP	OFF, ON
FRONT WINDOW CONTROL	PR DOWN	OFF, ON
FRONT WINDSHIELD WIPER/WASHER	SPEED RLY	OFF, ON
FRONT WINDSHIELD WIPER/WASHER	WASH RLY	OFF, ON
FRONT WINDSHIELD WIPER/WASHER	WIPER RLY	OFF, ON
HEAD/CORNERING LAMP CONTROL	HIGH BEAM	OFF, ON
HEAD/CORNERING LAMP CONTROL	LOW BEAM	OFF, ON
INDICATOR LAMP CONTROL	NON MIL	OFF, ON
LAMP CONTROL COMMAND	HDLMPWSH	OFF, ON
POWER MIRROR CONTROL	PR DOWN	OFF, ON
POWER MIRROR CONTROL	PR LEFT	OFF, ON
POWER MIRROR CONTROL	PR RIGHT	OFF, ON
POWER MIRROR CONTROL	PR UP	OFF, ON
STEERING COLUMN CONTROL COMMAND	LOCK_GND	OFF, ON
TURN SIGNAL AND MARKER LAMPS	HAZARD	OFF, ON
VAPS II OUTPUT PULSE CONTROL	VAPSIIOUT	%

REM Diagnostic Trouble Code (DTC) Index

DTC	Description	Source	Action
B1201	Fuel Sender Circuit Failure	REM	REFER to Section 413-01 .
B1300	Power Door Lock Circuit Failure	REM	REFER to Section 501-14B .
B1310	Power Door Unlock Circuit Failure	REM	REFER to Section 501-14B .
B1331	Decklid Ajar Rear Door Circuit Failure	REM	REFER to Section 417-02 .
B1335	Door Ajar RR Circuit Failure	REM	REFER to Section 417-02 .
B1342	ECU Is Defective	REM	CLEAR the DTC. RETRIEVE the DTCs. If DTC B1342 is retrieved, INSTALL a new REM. REFER to Section 419-10 . CLEAR the DTCs. REPEAT the self-test.
B1483	Brake Pedal Input Circuit Failure	REM	REFER to Section 417-01 .
B1499	Lamp Turn Signal Left Circuit Failure	REM	REFER to Section 417-01 .
B1501	Lamp Turn Signal Left Circuit Short to Battery	REM	REFER to Section 417-01 .
B1503	Lamp Turn Signal Right Circuit Failure	REM	REFER to Section 417-01 .
B1505	Lamp Turn Signal Right Circuit Short to Battery	REM	REFER to Section 417-01 .
B1551	Decklid Release Circuit Failure	REM	REFER to Section 501-14B .
B1571	Door Ajar LR Circuit Failure	REM	REFER to Section 417-02 .

B1676	Battery Pack Voltage Out of Range	REM	REFER to Section 414-00 .
B2172	Inertia Switch Input Circuit Open	REM	REFER to Powertrain Control/Emissions Diagnosis (PC/ED) manual.
B2174	Window Driver Rear Remote Up Switch Short to Battery	REM	REFER to Section 501-11 .
B2178	Window Driver Rear Remote Down Switch Short to Battery	REM	REFER to Section 501-11 .
B2190	Window Passenger Rear Remote Up Switch Short to Battery	REM	REFER to Section 501-11 .
B2194	Window Passenger Rear Remote Down Switch Short to Battery	REM	REFER to Section 501-11 .
B2477	Module Configuration Failure	REM	REFER to Section 418-01 .
U1041	SCP (J1850) Invalid or Missing Data for Vehicle Speed	ABS	CARRY OUT the ABS self-test.
U1059	SCP (J1850) Invalid or Missing Data for Transmission/Transaxle/PRNDL	PCM	CARRY OUT the PCM self-test.
U1218	SCP (J1850) Invalid or Missing Data for External Lamps	ICM	CARRY OUT the ICM self-test

REM Parameter Identification (PID) Index

PID	Description	Expected Value
BOO	Brake Switch Input	OFF, ON
DECKLID	Decklid Ajar Switch	CLOSED, AJAR
DL_DSRM	Decklid Disarm	NO, YES
DLIDOUT	Decklid Driver	Off---, Off--G, Off-B-, Off-BG, OffO--, OffO-G, OffOB-, OffOBG, On---, On--G, On-B-, On-BG, OnO--, OnO-G, OnOB-, OnOBG
DLIDRLS	Deck Lid Release	OFF, ON
L_TAIL	Left & Right Tail Lamp	Off---, Off--G, Off-B-, Off-BG, OffO--, OffO-G, OffOB-, OffOBG, On---, On--G, On-B-, On-BG, OnO--, OnO-G, OnOB-, OnOBG
LMRKOUT	Left Marker Lamp Driver Output State	OFF, ON
LMRKSTB	Left Marker Lamp Driver Short To Battery	NO, YES
LR_TURN	Left & Right Rear Turn Lamp	Off---, Off--G, Off-B-, Off-BG, OffO--, OffO-G, OffOB-, OffOBG, On---, On--G, On-B-, On-BG, OnO--, OnO-G, OnOB-, OnOBG
LRDN_SW	Left Rear Window Down Switch	OFF, UP
LRDR_SW	Left Rear Door Ajar Switch	CLOSED, AJAR
LRUP_SW	Left Rear Window Up Switch	OFF, DOWN

PD_LOCK	Passenger Door Lock	NO, YES
PD_UNLK	Passenger Door Unlock	NOTLOC, LOCK
R_TAIL	Left & Right Tail Lamp	Off---, Off--G, Off-B-, Off-BG, OffO--, OffO-G, OffOB-, OffOBG, On---, On--G, On-B-, On-BG, OnO--, OnO-G, OnOB-, OnOBG
RR_TURN	Left & Right Rear Turn Lamp	Off---, Off--G, Off-B-, Off-BG, OffO--, OffO-G, OffOB-, OffOBG, On---, On--G, On-B-, On-BG, OnO--, OnO-G, OnOB-, OnOBG
RRDN_SW	Right Rear Window Down Switch	OFF, UP
RRDR_SW	Right Rear Door Ajar Switch	CLOSED, AJAR
RRUP_SW	Right Rear Window Up Switch	OFF, DOWN

REM Active Command Index

Active Command	Display	Action
EXTERIOR LAMP CONTROL	BACKUPLMP	OFF, ON
EXTERIOR LAMP CONTROL	H MNT STP	OFF, ON
EXTERIOR LAMP CONTROL	L STOP	OFF, ON
EXTERIOR LAMP CONTROL	PARKLAMPS	OFF, ON
EXTERIOR LAMP CONTROL	R DEF RLY	OFF, ON
EXTERIOR LAMP CONTROL	R FOG LMP	OFF, ON
EXTERIOR LAMP CONTROL	R STOP	OFF, ON
POWER WINDOW ENABLE COMMAND	PSGR RLY	OFF, ON
REAR DOOR LOCK CONTROL	LR LOCK	OFF, ON
REAR DOOR LOCK CONTROL	LR UNLOCK	OFF, ON
REAR DOOR LOCK CONTROL	RELEASE	OFF, ON
REAR WINDOW CONTROL	LR DOWN	OFF, ON
REAR WINDOW CONTROL	LR UP	OFF, ON
REAR WINDOW CONTROL	RR DOWN	OFF, ON
REAR WINDOW CONTROL	RR UP	OFF, ON
STEERING COLUMN CONTROL	LOCK_PWR	OFF, ON
TURN SIGNAL AND MARKER LAMPS	HAZARD	OFF, ON

SCL Actuator Diagnostic Trouble Code (DTC) Index

DTC	Description	Source	Action
B1342	ECU Is Defective	SCL Actuator	CLEAR the DTCs. RETRIEVE the DTCs. If DTC B1342 is retrieved, INSTALL a new SCL actuator. REFER to Steering Column Lock Actuator .

B2162	Data Mismatch #2 (received data does not match what was expected)	SCL Actuator	CARRY OUT the steering column lock module parameter reset. Refer to Steering Column Lock Module Parameter Reset .
B2168	Unable to Confirm Unlock Condition	SCL Actuator	GO to Pinpoint Test I .
B2169	Unable to Confirm Lock Condition	SCL Actuator	GO to Pinpoint Test I .
B2170	Steering Column Lock Switch Circuit Failure	SCL Actuator	INSTALL a new SCL actuator. REFER to Steering Column Lock Actuator .

Instrument Cluster Diagnostic Trouble Code (DTC) Index

DTC	Description	Source	Action
B1201	Fuel Sender Circuit Failure	ICM	REFER to Section 413-01 .
B1205	EIC Switch-1 Assembly Circuit Failure	ICM	INSTALL a new instrument cluster; REFER to Section 413-01 . TEST the system for normal operation.
B1209	EIC Switch-2 Assembly Circuit Failure	ICM	INSTALL a new instrument cluster; REFER to Section 413-01 . TEST the system for normal operation.
B1213	Anti-Theft Number of Programmed Keys Is Below Minimum	ICM	REFER to Section 419-01B .
B1246	Dim Panel Potentiometer Switch Circuit Failure	ICM	REFER to Section 413-00 .
B1342	ECU Is Defective	ICM	REFER to Section 413-01 .
B1352	Ignition Key-In Circuit Failure	ICM	REFER to Section 413-09 .
B1470	Lamp Headlamp Input Circuit Failure	ICM	REFER to Section 417-01 .
B1567	Lamp Headlamp High Beam Circuit Failure	ICM	REFER to Section 417-01 .
B1600	PATS Ignition Key Transponder Signal Is Not Received	ICM	REFER to Section 419-01B .
B1601	PATS Received Incorrect Key-Code From Ignition Key Transponder	ICM	REFER to Section 419-01B .
B1602	PATS Received Invalid Format of Key-Code From Ignition Key Transponder	ICM	REFER to Section 419-01B .
B1676	Battery Pack Voltage Out of Range	ICM	REFER to Section 413-01 .
B1681	PATS Transceiver Module Signal Is Not Received	ICM	REFER to Section 419-01B .
B1689	Autolamp Delay Circuit Failure	ICM	REFER to Section 417-01 .
B1875	Turn Signal / Hazard Switch Signal Circuit Failure	ICM	REFER to Section 417-01 .
B2103	Antenna Not Connected	ICM	REFER to Section 419-01B .
B2139	Security Data Mismatch (Receive Data Does Not Match What Was Expected)	ICM	REFER to Section 419-01A .
B2141	NVM Configuration Failure	ICM	REFER to Section 419-01B .
B2143	NVM Memory Failure	ICM	REFER to Section 419-01B .

B2162	Security Data Mismatch #2 (Receive Data Does Not Match What Was Expected)	ICM	REFER to Section 419-01B .
B2328	Column Reach Feedback Potentiometer Circuit Failure	ICM	REFER to Section 211-04 .
B2332	Column Tilt Feedback Potentiometer Circuit Failure	ICM	REFER to Section 211-04 .
B2351	Steering Column Switch Circuit Failure	ICM	REFER to Section 211-04 .
B2431	Transponder Programming Failed	ICM	REFER to Section 419-01A .
B2472	Fog Lamp Switch Failure	ICM	REFER to Section 417-01 .
B2477	Module Configuration Failure	ICM	REFER to Section 418-01 .
U1041	SCP (J1850) Invalid or Missing Data for Vehicle Speed	ABS/TC/IVD	CARRY OUT the ABS/TC/IVD self-test.
U1059	SCP (J1850) Invalid or Missing Data for Transmission/Transaxle/PRNDL	PCM	CARRY OUT the PCM self-test.
U1073	SCP (J1850) Invalid or Missing Data for Engine Coolant Fluid Temperature	PCM	CARRY OUT the PCM self-test.
U1123	SCP (J1850) Invalid or Missing Data for Odometer Rolling Count	ABS/TC/IVD	CARRY OUT the ABS/TC/IVD self-test.
U1131	SCP (J1850) Invalid or Missing Data for Fuel System	ICM	REFER to Section 413-01 .
U1147	SCP (J1850) Invalid or Missing Data for Vehicle Security System	PCM	CARRY OUT the PCM self-test.

Instrument Cluster Parameter Identification (PID) Index

PID	Description	Expected Value
ABCHIME	Air Bag Chime	OFF, ON
ANTISCN	Anti-Scan Function	DISABL, ENABLE
ASWSTAT	Autolamp Switch Input Status	OFF, DELAY7, DELAY6, DELAY5, DELAY4, DELAY3, DELAY2, DELAY1, INVLD
CCNT	Number Of Continuous DTCs In Module	one count per bit
D_SBELT	Driver Seat Belt	OUT, IN
DSWSTAT	Dimmer Switch Input Status	ON, LVL1, LVL2, LVL3, LVL4, LVL5, LVL6, LVL7, LVL8, LVL9, LVL10, LVL11, LVL12, LVL13, LVL14, LVL15, LVL16, LVL17, LVL18, LVL19, LVL20, LVL21, Invalid
ENABL_S	Vehicle Enable Status	DISABL, ENABLE
FOG_SW, HZ_SW	Fog Lamp Switch, Hazard Switch	OFF, ON, OFF, ON
HEAD_L	Headlamp Switch Input Status	OFF, PARK, HEADLP, R_FOG, INVLD, (OPEN/SHORT)
HIBEAM	High Beam Switch Input Status	OFF, HIGH, PASS, INVLD, (SHORT)
HORN_SW	Horn Input Switch	OFF, ON

IGN_A	Ignition Switch - ACCY Position	NO, YES
IGN_KEY	Ignition Key In / Out	OUT, IN
IGN_O/U	Ignition Switch - OFF/Unlock Position	NO, YES
IGN_R	Ignition Switch - RUN Position	NO, YES
IGN_S	Ignition Switch - START Position	NO, YES
LIGHTSN	Night (True) / Day (False)	NO, YES
LTURN	Left Turn Switch	OFF, ON
MIN#KEY	Minimum Number Of Keys Required	0-67
M_KEY	Master Key Present	notPRE, PRESNT
NUMKEYS	Number Of Keys Stored In Module	one count per bit
PCM_ID	PCM ID Status	notSTR, STORED
PCM_VFY	PCM Verify OK	NO, YES
RESETSW	Reset Switch	OFF, ON
RTURN	Right Turn Switch	OFF, ON
SELECT	Select/Mode Switch	OFF, ON
SERVMOD	Service Module	NO, YES
SPAREKY	Spare key programming: 0 = Enabled, 1 = Disabled	0-14
TILT	Steering Column Tilt Switch	SHORT, UP, DOWN, OFF
TELEPOS	Telescope Position Sensor	notSEN, SENSED
TELESCP	Steering Column Telescope Switch	SHORT, IN, OUT, OFF
TILTPOS	Tilt Position Sensor	notSEN, SENSED
TR_PARK	Transmission Select Lever In Park Pos	NO, YES

Instrument Cluster Active Command Index

Active Command	Display	Action
ANTI-THEFT INDICATOR LAMP	THEFT LAMP	OFF, ON
DISPLAY DIMMING CONTROL	ILLUMINAT	OFF, ON
DISPLAY SEGMENT CONTROL II	SEGMENTS	OFF, ON
ENGINE COOLANT GAUGE CONTROL	ENGCOOLNT	0%-100%
FUEL GAUGE CONTROL	FUELLEVEL	0%-100%
MEMORY SELECT CONTROL	MEMORY 1	OFF, ON

MEMORY SELECT CONTROL	MEMORY 2	OFF, ON
PRNDL DISPLAY CONTROL COMMAND	SEGMENTS	OFF, ON
RF SIGNAL	RF	OFF, ON
SPEEDOMETER CONTROL	SPDOMETER	0%-100%
TACHOMETER CONTROL	TCHOMETER	0%-100%
WARNING LAMPS AND CHIME	ALL LAMPS	OFF, ON
WARNING LAMPS AND CHIME	CHIME	OFF, ON

Symptom Chart


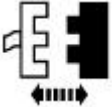
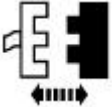

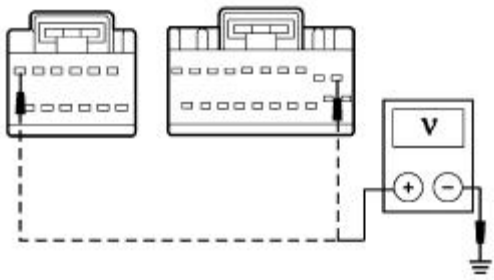
Symptom Chart

Condition	Possible Sources	Action
<ul style="list-style-type: none"> No communication with the front electronic module 	<ul style="list-style-type: none"> BJB Fuse 425 (40A). BJB Fuse 422 (20A). FEM. 	<ul style="list-style-type: none"> GO to Pinpoint Test A.
<ul style="list-style-type: none"> No communication with the rear electronic module 	<ul style="list-style-type: none"> Circuit. REM. 	<ul style="list-style-type: none"> GO to Pinpoint Test B.
<ul style="list-style-type: none"> No communication with the steering column lock actuator 	<ul style="list-style-type: none"> SCL actuator not activated SCL actuator. Circuit. 	<ul style="list-style-type: none"> REMOVE the ignition key from the ignition switch, open the driver door, and restart diagnosis. GO to Pinpoint Test C.
<ul style="list-style-type: none"> No communication with the instrument cluster module 	<ul style="list-style-type: none"> CJB Fuse 220 (10A). BJB Fuse 425 (40A). Circuitry. J1850 Communication Network (SCP). IC. 	<ul style="list-style-type: none"> GO to Pinpoint Test D.
<ul style="list-style-type: none"> The ignition switch is inoperative 	<ul style="list-style-type: none"> BJB Fuse 422 (20A). Ignition switch. Circuit. 	<ul style="list-style-type: none"> GO to Pinpoint Test E.
<ul style="list-style-type: none"> No power in ACC 	<ul style="list-style-type: none"> Ignition switch. Circuit. 	<ul style="list-style-type: none"> Go to Pinpoint Test F.
<ul style="list-style-type: none"> No power in RUN 	<ul style="list-style-type: none"> Ignition switch. Circuit. 	<ul style="list-style-type: none"> GO to Pinpoint Test F.
<ul style="list-style-type: none"> No power in START 	<ul style="list-style-type: none"> Ignition switch. Circuit. 	<ul style="list-style-type: none"> GO to Pinpoint Test G.
<ul style="list-style-type: none"> The multifunction switch/hazard switch does not operate correctly 	<ul style="list-style-type: none"> Underhood auxiliary junction box (AJB) Fuse 102 (10A), Fuse 120 (30A). Battery junction box (BJB) Fuse 402 (10A), Fuse 406 (10A). Relay. 	<ul style="list-style-type: none"> CARRY OUT the Multifunction Switch Component Test. REFER to Wiring Diagrams, Section 700-09 Component Testing. If the test is OK, GO to Pinpoint Test H.

	<ul style="list-style-type: none"> ● Circuit. ● Multifunction switch. 	
<ul style="list-style-type: none"> ● The steering column lock actuator does not operate correctly 	<ul style="list-style-type: none"> ● Circuit(s). ● SCL actuator. ● FEM. ● REM. 	<ul style="list-style-type: none"> ● GO to Pinpoint Test I.

Pinpoint Tests

PINPOINT TEST A: NO COMMUNICATION WITH THE FRONT ELECTRONIC MODULE

CONDITIONS	DETAILS/RESULTS/ACTIONS
A1 CHECK CIRCUITS 29-DK20 (OG/GN) AND 29S-DK22 (OG/YE) FOR VOLTAGE	
NOTE: Cycle ignition switch from OFF to RUN to enable the switched system power feature.	
<p>1</p>  <p>2</p>  <p>FEM C201c</p> <p>3</p>  <p>FEM C201f</p> <p>4</p>  <p>5</p>  <p>A0006297</p>	<p>5</p> <p>Measure the voltage between FEM C201c pin 6, circuit 29-DK20 (OG/GN), harness side and ground; and between FEM C201f pin 1, circuit 29S-DK22 (OG/YE) harness side and ground.</p> <ul style="list-style-type: none"> ● Are the voltages greater than 10 volts?

→ **Yes**
GO to [A2](#).

→ **No**
REPAIR the circuit(s) in question. TEST the system for normal operation.

A2 CHECK CIRCUITS 31-DK20 (BK/RD), 31-DK20A (BK/RD), 31-DK20B (BK/RD), 31-DK20C (BK/RD) AND 31-DK20D (BK/RD) FOR OPENS

1

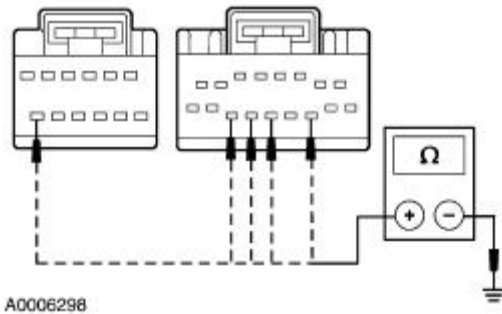


2



FEM C201a

3



3 Using the following table, measure the resistance between FEM connectors, harness side and ground:

FEM	Pin	Circuit
C201c	12	31-DK20 (BK/RD)
C201a	11	31-DK20A (BK/RD)
C201a	13	31-DK20B (BK/RD)
C201a	14	31-DK20C (BK/RD)
C201a	15	31-DK20D (BK/RD)

● **Is the resistance less than 5 ohms?**

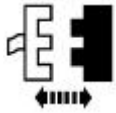
→ **Yes**
REFER to [Section 418-00](#) .

→ **No**
REPAIR the circuit(s) in question. TEST the system for normal operation.

PINPOINT TEST B: NO COMMUNICATION WITH THE REAR ELECTRONIC MODULE

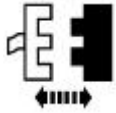
CONDITIONS	DETAILS/RESULTS/ACTIONS
B1 CHECK CIRCUIT 29-DK31 (OG/BK) FOR VOLTAGE	
NOTE: Cycle ignition switch from OFF to RUN to enable the switched system power feature.	
1	

2



REM C420d

3

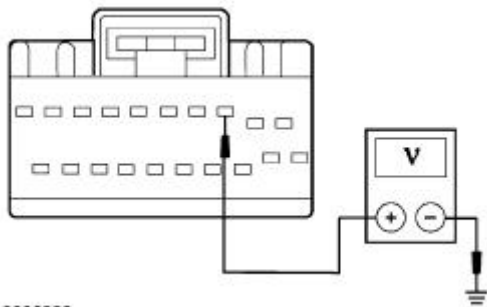


REM C420c

4



5



A0006299

5

Measure the voltage between REM C420d pin 3, circuit 29-DK31 (OG/BK), harness side and ground.

• Is the voltage greater than 10 volts?

→ Yes
GO to [B2](#).

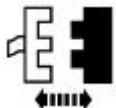
→ No
REPAIR the circuit. TEST the system for normal operation.

B2 CHECK CIRCUITS 29S-DK31 (OG/BK), 31-DK30D (BK), 31-DK30E (BK), 31-DK30F (BK), 31-DK30G (BK) AND 31-DK30H (BK/OG), FOR OPENS

1



2



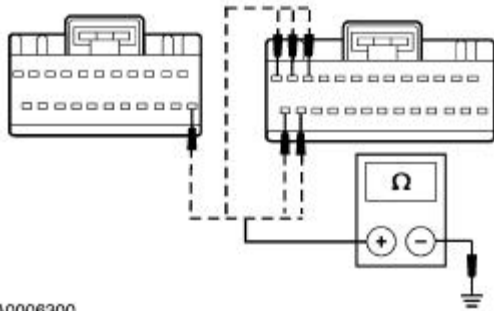
REM C420b

3

3

Using the following table, measure the resistance between REM connectors, harness side and ground:

REM	Pin	Circuit



C420c	13	29S-DK31 (OG/BK)
C420c	12	31-DK30E (BK)
C420c	11	31-DK30D (BK)
C420c	26	31-DK30G (BK)
C420c	25	31-DK30F (BK)
C420b	12	31-DK30H (BK/OG)

● Is the resistance less than 5 ohms?

→ **Yes**

REFER to [Section 418-00](#).

→ **No**

REPAIR the circuit(s) in question. TEST the system for normal operation.

PINPOINT TEST C: NO COMMUNICATION WITH THE STEERING COLUMN LOCK ACTUATOR

CONDITIONS	DETAILS/RESULTS/ACTIONS
<p>NOTE: The SCL actuator will only allow communication with a tester after the SCL actuator has been activated. To activate the SCL actuator, open the driver door and do not put the key in the ignition (or alternatively, you can press one of the buttons on the key fob while there is no key in the ignition). The SCL actuator will stay activated for 30 minutes after the driver door is opened (or a key fob button is pressed).</p>	
<p>C1 CHECK STEERING COLUMN LOCK ACTUATOR OPERATION</p>	
	<p>1 NOTE: The ignition key must be out of the ignition before proceeding with this test.</p> <p>Insert the ignition key into the ignition switch.</p> <p>2 Remove the ignition key from the ignition switch.</p> <p>● Does the steering column lock actuator unlock and lock?</p> <p>→ Yes REFER to Section 418-00.</p> <p>→ No GO to Pinpoint Test I.</p>

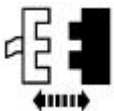
PINPOINT TEST D: NO COMMUNICATION WITH THE INSTRUMENT CLUSTER MODULE

CONDITIONS	DETAILS/RESULTS/ACTIONS
<p>D1 CHECK HOT AT ALL TIMES POWER SUPPLY CIRCUIT</p>	

1

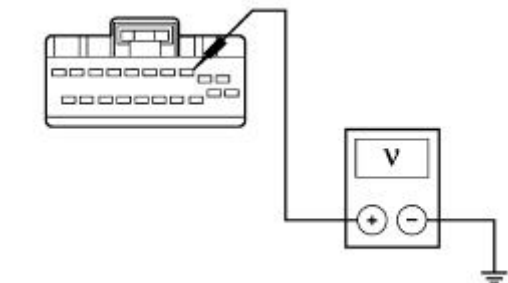


2



Instrument Cluster C220b

3



A0002792

3

Measure the voltage between instrument cluster C220b pin 3, circuit 29-GG11 (OG/BU), harness side and ground.

• Is the voltage greater than 10 volts?

→ Yes
GO to [D2](#).

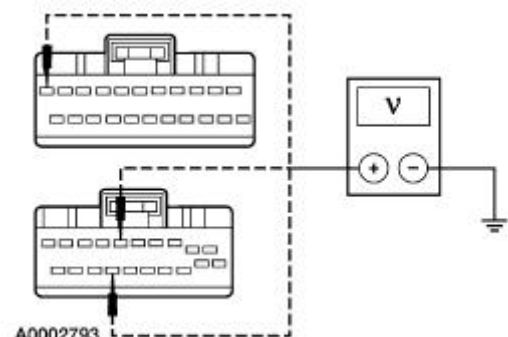
→ No
REPAIR the circuit. TEST the system for normal operation.

D2 CHECK HOT IN RUN POWER SUPPLY CIRCUITS

1



2



A0002793

2

Measure the voltage between the instrument cluster and ground as follows:

Connector Pin	Circuit
C220a pin 11	15-JA14 (GN/BK)
C220b pin 6	15-GG14 (GN/RD)
C220b pin 17	75-GG15 (YE/GN)

• Are the voltages greater than 10 volts?

→ Yes
GO to [D3](#).

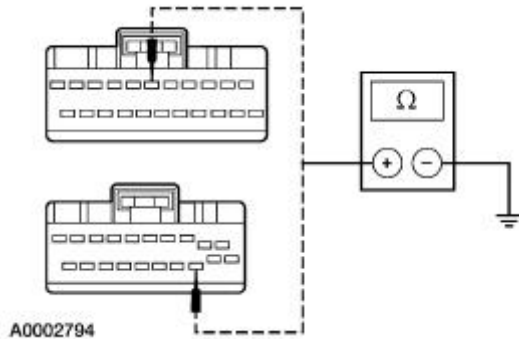
→ **No**
REPAIR the circuit(s). TEST the system for normal operation.

D3 CHECK GROUND CIRCUITS

1



2



2 Measure the resistance between the instrument cluster and ground as follows:

Connector Pin	Circuit
C220a pin 6	31-AL11 (BK)
C220b pin 13	91-GG11 (BN/RD)

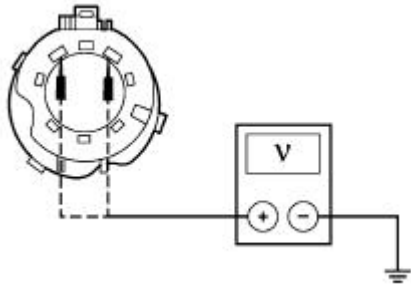
- Are the resistances less than 5 ohms?

→ **Yes**
REFER to [Section 418-00](#).

→ **No**
REPAIR the circuit(s). TEST the system for normal operation.

PINPOINT TEST E: THE IGNITION SWITCH IS INOPERATIVE

CONDITIONS	DETAILS/RESULTS/ACTIONS
E1 CHECK CIRCUIT 30-BB20 (RD) AND CIRCUIT 30-BB9 (RD)	
<p>1</p> <p>2</p> <p>Ignition Switch C250</p> <p>3</p>	<p>3 Measure the voltage between ignition switch C250, pin 7 circuit 30-BB20 (RD), harness side, and ground; and between ignition switch C250, pin 1 circuit 30-BB9 (RD), harness side, and ground.</p>




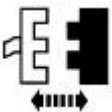
A0000315

● Is the voltage greater than 10 volts?

→ **Yes**
 INSTALL a new ignition switch; REFER to [Ignition Switch](#) .

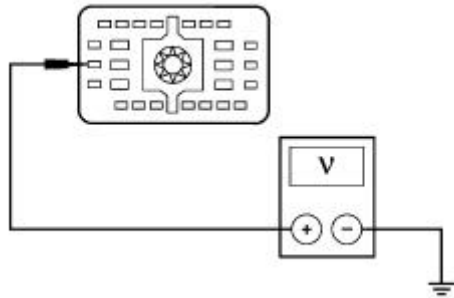
→ **No**
 REPAIR circuit 30-BB20 (RD), Circuit 30-BB9 (RD) or Circuit 30-DA5 (RD) as necessary. TEST the system for normal operation.

PINPOINT TEST F: NO POWER IN ACC

CONDITIONS	DETAILS/RESULTS/ACTIONS
F1 CHECK IGNITION SWITCH	
	<p>1 Carry out the Ignition Switch Component Test; refer to Wiring Diagrams, Section 700-09, Component Testing.</p> <p>● Is the ignition switch OK?</p> <p>→ Yes GO to F2 .</p> <p>→ No INSTALL a new ignition switch; REFER to Ignition Switch .</p>
F2 CHECK CIRCUIT 75-DD1 (YE)	
<p>1 </p> <p>2 </p> <p>3</p>	



4



A0001613

4

Measure the voltage between the CJB C270a, pin 15 circuit 75-DD1 (YE), and ground.

● Is the voltage greater than 10 volts?

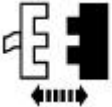
→ Yes

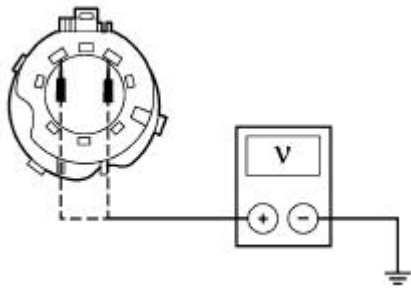
REFER to the appropriate Section. REPAIR the circuit in question. TEST the system for normal operation.

→ No

REPAIR the circuit. TEST the system for normal operation.

PINPOINT TEST G: NO POWER IN START

CONDITIONS	DETAILS/RESULTS/ACTIONS
G1 CHECK IGNITION SWITCH	
	<p>1 Carry out the Ignition Switch Component Test. Refer to Wiring Diagrams Section 700-09, Component Testing.</p> <p>● Is the ignition switch OK?</p> <p>→ Yes GO to G2.</p> <p>→ No INSTALL a new ignition switch; REFER to Ignition Switch. TEST the system for normal operation.</p>
G2 CHECK CIRCUIT 30-BB20 (RD) AND CIRCUIT 30-BB9 (RD)	
<p>1</p>  <p>Ignition Switch C250</p> <p>2</p>	<p>2 Measure the voltage between ignition switch C250, pin 7 circuit 30-BB20 (RD),</p>



A0000315

harness side, and ground; and between ignition switch C250, pin 1 circuit 30-BB9 (RD), harness side, and ground.

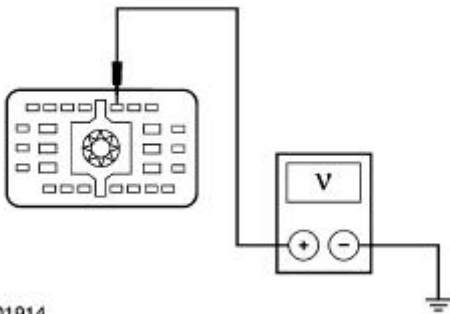
● Is the voltage greater than 10 volts?

→ **Yes**
GO to [G3](#).

→ **No**
REPAIR circuit 30-BB20 (RD), circuit 30-BB9 (RD) or circuit 30-DA5 (RD) as necessary. TEST the system for normal operation.

G3 CHECK CIRCUIT 50-DD5 (GN/BK)

1



A0001914

1

Measure the voltage between the CJB C270a pin 3, circuit 50-DD5 (GN/BK), and ground.

● Is the voltage greater than 10 volts?

→ **Yes**
REFER to [Section 303-06](#).

→ **No**
REPAIR the circuit. TEST the system for normal operation.

PINPOINT TEST H: THE MULTIFUNCTION SWITCH/HAZARD SWITCH DOES NOT OPERATE CORRECTLY

CONDITIONS	DETAILS/RESULTS/ACTIONS
H1 CHECK TURN SIGNAL LEVER POSITIONS	
NOTE: Prior to testing, make sure the hazard knob is pushed in fully to the OFF position.	
1	



- 2 Check the turn signal lever in the RH and LH turn positions with the steering wheel locked in the straight-ahead position. Lock the lever in position for each.
- 3 Check the lever by slightly holding it in the RH and LH turn positions. When releasing, observe that the lever springs back to normal position.
- 4 Road test the vehicle and observe the turn signals for the RH and LH turn positions while manually turning the steering wheel for each position. Verify the lever cancels when the steering returns from the desired turn position.

● **Does the turn signal lever operate correctly?**

→ **Yes**
GO to [H2](#).

→ **No**
If the lever will not cancel, CHECK the turn indicator cancel cam for damage. If the lever is worn or damaged, INSTALL a new multifunction switch. REFER to [Multifunction Switch](#). TEST the system for normal operation.

H2 CHECK HAZARD SWITCH

- 1 Fully press the hazard switch and release to turn ON the hazard lamps. Verify the switch operation.
- 2 Fully press the hazard switch and release to turn OFF the hazard lamps. Verify the switch operation.

● **Does the hazard switch operate correctly?**

→ **Yes**
GO to [H3](#).

→ **No**
If the hazard switch is worn or damaged, INSTALL a new multifunction switch. REFER to [Multifunction Switch](#). TEST the system for normal operation.


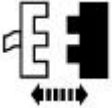

H3 CHECK HIGH BEAM AND FLASH-TO-PASS

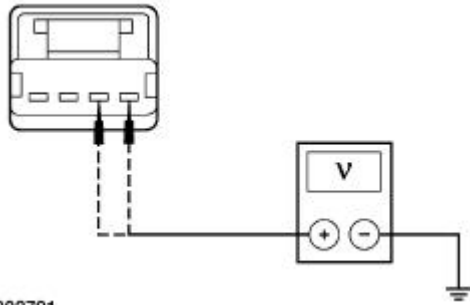
- 1 Turn the headlamps ON.
- 2 Press the turn signal lever towards the instrument panel to the STOP position. Release the lever. Verify the high beams.
- 3 Move the lever back toward the seat. Release the lever. Verify the low beams.
- 4 Pull the lever toward the driver seat gently to the flash-to-pass position. Hold the position, and verify both the high and low beams illuminate.
- 5 Release the lever. Verify the low beams.
- 6 Turn the headlamps OFF.
- 7 Pull the lever to the flash-to-pass again and hold. Verify the high beams illuminate. Release the lever. Verify no high beams.

● **Does the high beam, low beam and flash-to-pass operate?**

	<p>→ Yes GO to H4.</p> <p>→ No If the lever is worn or damaged, INSTALL a new multifunction switch. REFER to Multifunction Switch. TEST the system for normal operation.</p>
<p>H4 CHECK WINDSHIELD WIPER AND WASH</p>	
	<p>1 Rotate the windshield wiper switch to LOW, HIGH and intermittent positions. Verify the rotation of the switch and wiper operation.</p> <p>2 Turn the switch to the OFF position. Verify the switch rotates to OFF and the wipers stop operating.</p> <p>3 Push the end of the switch in toward the center of the steering column to the WASH position. Release the wash position. Verify the wipers operate for a few cycles and return to OFF.</p> <p>4 Operate WASH in all speeds of the wiper switch. Verify the wipers return to selected speed after releasing from the WASH position.</p> <p>● Does the windshield wiper switch and WASH operate correctly?</p> <p>→ Yes Multifunction switch is OK.</p> <p>→ No If the switch or lever is worn or damaged, INSTALL a new switch; REFER to Section 501-16.</p>

PINPOINT TEST I: THE STEERING COLUMN LOCK DOES NOT OPERATE CORRECTLY

CONDITIONS	DETAILS/RESULTS/ACTIONS
<p>NOTE: This test assumes that the instrument cluster (IC) module is sending the correct engine rpm, and vehicle speed to the FEM and REM over the standard corporate protocol (SCP) communication network. Refer to Section 418-00.</p>	
<p>I1 CHECK CIRCUIT 31-GL58 (BK) AND 75-GL58 (YE/GN) FOR SHORT TO POWER</p>	
<p>1 </p> <p>2  SCL Actuator C267</p> <p>3 </p> <p>4</p>	<p>4 Measure the voltage between the SCL</p>



A0002791

actuator C267 pin 1, circuit 31-GL58 (BK), harness side, and ground; and between SCL actuator C267 pin 2, circuit 75-GL58 (YE/GN), harness side, and ground.

● Is the voltage greater than 10 volts?

→ **Yes**

If circuit 31-GL58 (BK) is greater than 10 volts, GO to [12](#). If circuit 75-GL58 (YE/GN) is greater than 10 volts, GO to [13](#).

→ **No**

GO to [14](#).

12 CHECK FEM FOR INTERNAL SHORT TO POWER

1



2

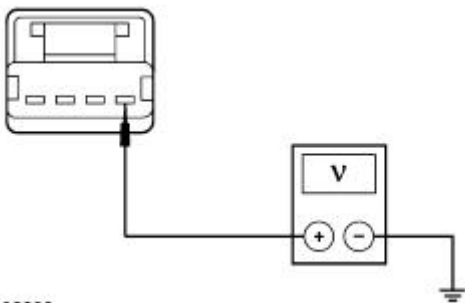


FEM C201a

3



4



A0002808

4

Measure the voltage between the SCL actuator C267 pin 1, circuit 31-GL58 (BK) and ground.

● Is the voltage greater than 10 volts?

→ **Yes**

REPAIR the circuit in question. TEST the system for normal operation.

→ **No**
INSTALL a new FEM; REFER to [Section 419-10](#). TEST the system for normal operation.

I3 CHECK REM FOR INTERNAL SHORT TO POWER

1



2

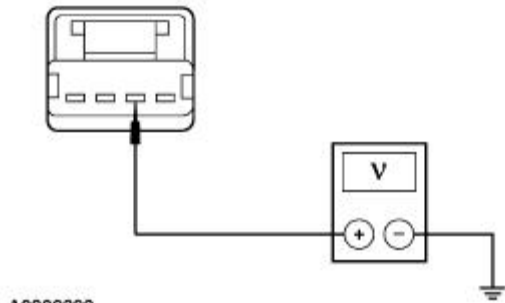


REM C420

3



4



A0002809

4 Measure the voltage between SCL actuator C267 pin 2, circuit 75-GL58 (YE/GN), harness side, and ground.

● Is the voltage greater than 10 volts?

→ **Yes**
REPAIR the circuit in question. TEST the system for normal operation.

→ **No**
INSTALL a new REM; REFER to [Section 419-10](#). TEST the system for normal operation.

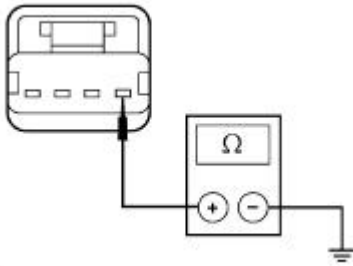
I4 CHECK FEM FOR CORRECT OPERATION

1



2

2 Measure the resistance between SCL actuator C267 pin 1, circuit 31-GL58 (BK), harness side, and ground, while triggering the FEM active command LOCK_GND ON.



A0001918

- Does the resistance change to less than 50 ohms when commanded?

→ **Yes**
GO to [15](#).

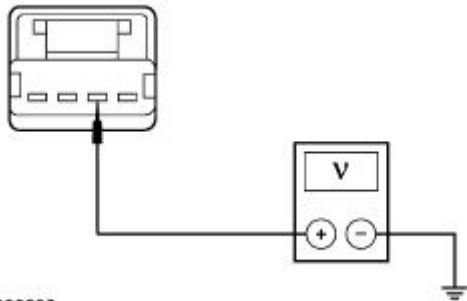
→ **No**
GO to [16](#).

15 CHECK REM FOR CORRECT OPERATION

1



2



A0002809

- 3 Measure the voltage between SCL actuator C267 pin 2, circuit 75-GL58 (YE/GN), harness side, and ground while triggering the REM active command LOCK_PWR ON.

- Is the voltage greater than 10 volts when commanded?

→ **Yes**
INSTALL a new SCL actuator; REFER to [Steering Column Lock Actuator](#) . Test the system for normal operation.

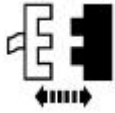
→ **No**
GO to [17](#) .

16 CHECK CIRCUIT 31-GL58 (BK) FOR OPEN

1

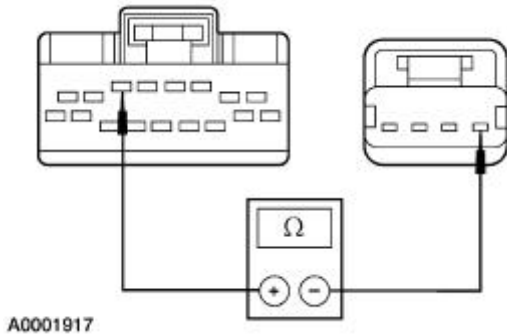


2



FEM C201a

3



3 Measure the resistance between SCL actuator C267 pin 1, circuit 31-GL58 (BK), harness side, and the FEM C201a pin 6, circuit 31-GL58 (BK), harness side.

● Is the resistance less than 5 ohms?

→ **Yes**
INSTALL a new FEM; REFER to [Section 419-10](#). TEST the system for normal operation.

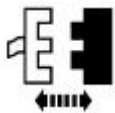
→ **No**
REPAIR the circuit in question. TEST the system for normal operation.

I7 CHECK CIRCUIT 75-GL58 (YE/GN) FOR OPEN

1

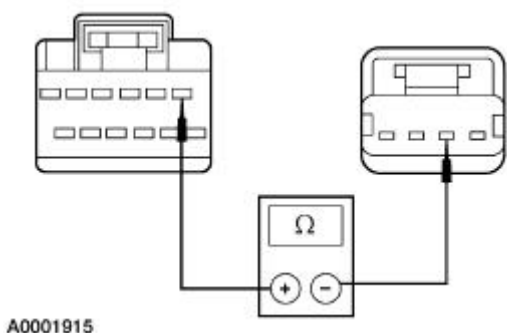


2



REM C420a

3



3 Measure the resistance between SCL actuator C267 pin 2, circuit 75-GL58 (YE/GN), harness side, and the REM C420a pin 1, circuit 75-GL58 (YE/GN) harness side.

● **Is the resistance less than 5 ohms?**

→ **Yes**


INSTALL a new REM; REFER to [Section 419-10](#). TEST the system for normal operation.

→ **No**

REPAIR the circuit in question. TEST the system for normal operation.

Steering Column Lock Module Parameter Reset

Special Tool(s)

 ST2332-A	Worldwide Diagnostic System (WDS) 418-F224, New Generation STAR (NGS) Tester 418-F052, or equivalent diagnostic tool
---	---

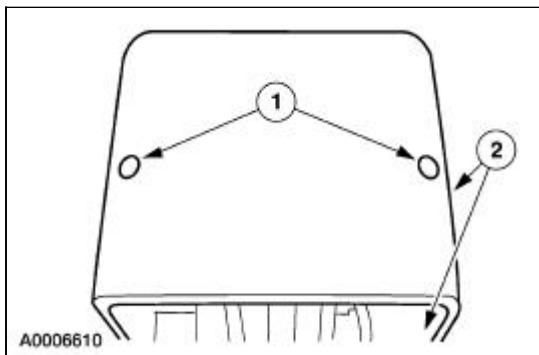
NOTE: The SCL actuator will only allow communication with a tester after the SCL actuator has been activated. To activate the SCL actuator, open the driver door and **do not** put the key in the ignition (or alternatively, you can press one of the buttons on the key fob while there is no key in the ignition). The SCL actuator will stay activated for 30 minutes after the driver door is opened (or a key fob button has been pressed).

1. Remove the ignition key from the ignition switch.
2. Close and open the driver door (must complete steps 3-6 within 30 minutes of completing step 2).
3. Connect the diagnostic tool (use service function card).
4. Select SCLM.
5. Select ENTER SECURITY ACCESS. Wait eight minutes for security access to be granted.
6. Select PARAMETER RESET.
7. Insert key into ignition switch and place in the RUN position.
8. Select ICM.
9. Select ENTER SECURITY ACCESS. Wait 10 minutes for security access to be granted.
10. Select RESET SCLM PARAMETER.
11. Disconnect the diagnostic tool.
12. Place ignition key in the OFF position.
13. Remove ignition key from ignition switch.
14. Insert ignition key into ignition switch.
15. Place ignition key in the RUN position.
16. Remove the ignition key.

Multifunction Switch

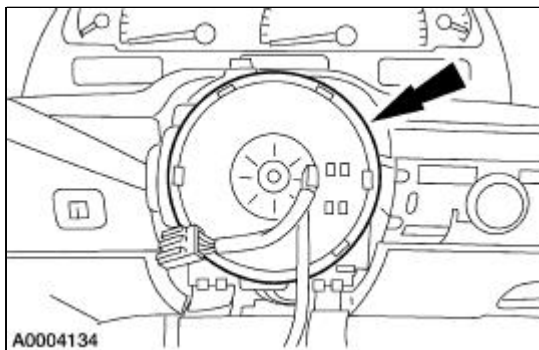
Removal and Installation

1. Remove the steering wheel. For additional information, refer to [Section 211-04](#).
2. Remove the instrument panel cluster finish panel. For additional information, refer to [Section 501-12](#).
3. Remove the upper and lower steering column shrouds.
 1. Remove the screws.
 2. Remove the upper and lower steering column shrouds.

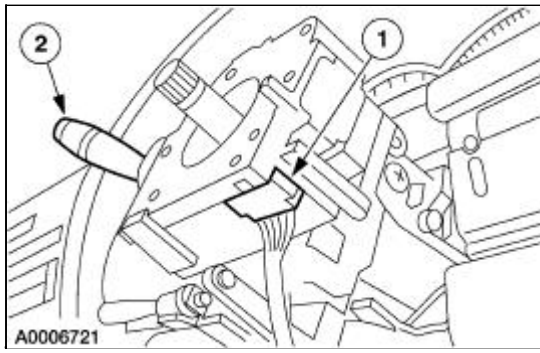


4.  **CAUTION:** Apply two strips of masking tape across the air bag sliding contact to prevent rotation.

Depress the three clips and position the air bag sliding contact aside.



5. Remove the multifunction switch.
 1. Disconnect the electrical connector.
 2. Remove the multifunction switch.

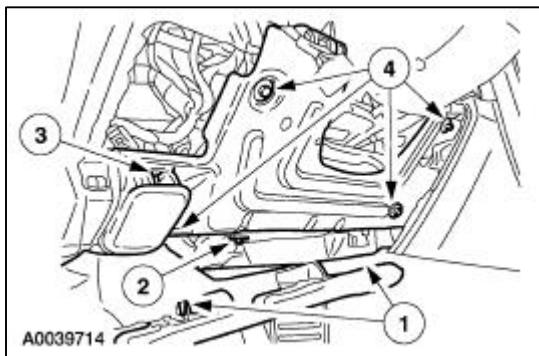


6. To install, reverse the removal procedure.

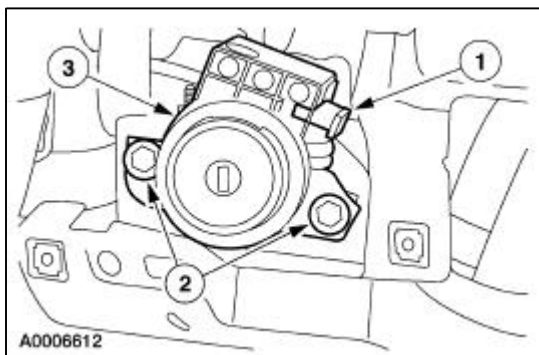
Ignition Switch

Removal and Installation

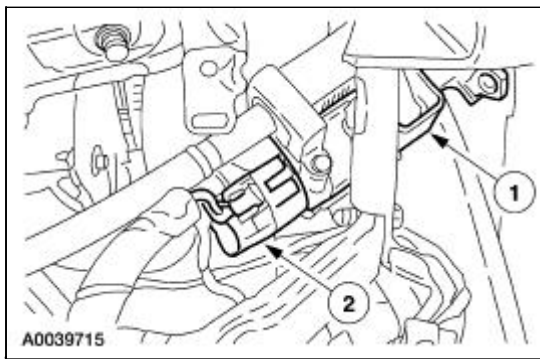
1. Remove the instrument panel cluster finish panel. For additional information, refer to [Section 501-12](#).
2. Remove the steering column reinforcement.
 1. Remove the two screws and position the lower instrument panel insulator aside.
 2. Remove the bolt and position the air duct aside.
 3. Remove the hood release handle from the reinforcement and position it aside.
 4. Remove the five bolts and the reinforcement.



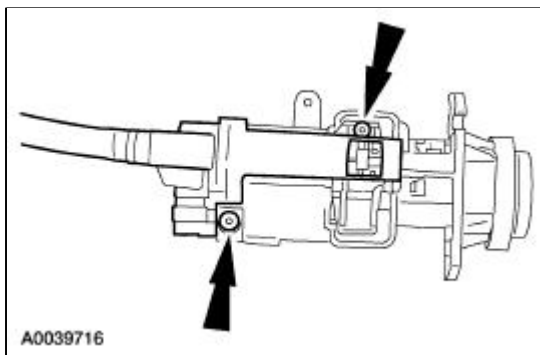
3. Disconnect the ignition lock cylinder.
 1. Disconnect the electrical connector.
 2. Remove the two front screws.
 3. Remove the rear screw.



4. Remove the ignition lock cylinder.
 1. Remove the lock cylinder from the housing.
 2. Disconnect the electrical connector.



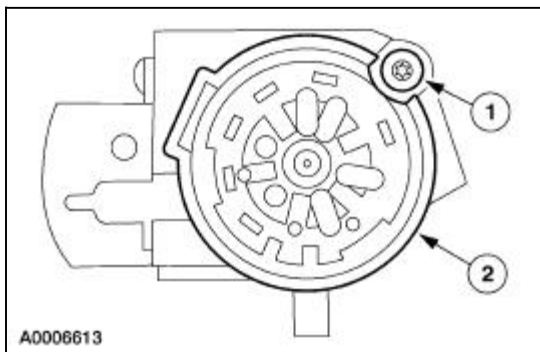
5. Remove the screws and position the shift lock cable aside.



6. **NOTE:** The ignition key should be in the OFF position.

Remove the ignition switch.

1. Remove the screw.
2. Remove the ignition switch.

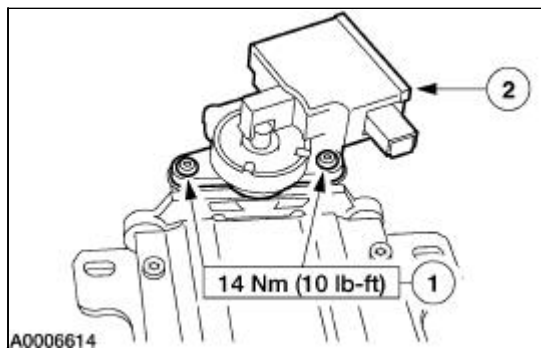


7. To install, reverse the removal procedure.
-

Steering Column Lock Actuator

Removal

1. Remove the steering column. For additional information, refer to [Section 211-04](#).
2. Remove the steering column lock actuator.
 1. Remove the screws.
 2. Remove the steering column lock actuator.



Installation

1. To install, reverse the removal procedure.
 - After the installation is complete, carry out the steering column lock module parameter reset. Refer to [Steering Column Lock Module Parameter Reset](#).
-

General Specifications

Item	Specification
Epoxy Sealer	M3D35-A (E)
Threadlock® 262 E2FZ-19554-B	WSK-M2G351-A6
Lubricants	
Super Premium SAE 5W30 XO-5W30-QSP	WSS-M2C153-G
Gasoline Engine Oil Dye 164-R3705	ESE-M99C103-B1

Engine

NOTE: This section contains information, steps and procedures that may not be specific to your engine.

This section covers general procedures and diagnosis and testing of the engine system, except for exhaust emission control devices, which are covered in the Powertrain Control/Emissions Diagnosis (PC/ED) manual.

The engines incorporate the following features:

- a closed positive crankcase ventilation (PCV) system. For additional information, refer to [Section 303-08](#).
- an exhaust emission control system. For additional information, refer to [Section 303-08](#).
- an evaporative emission control system. For additional information, refer to [Section 303-13](#).








The engine, fuel system, ignition system, emissions system and exhaust system all affect exhaust emission levels and must be maintained according to the maintenance schedule. For additional information, refer to the Scheduled Maintenance Guide.

Correct engine identification is necessary to order parts. Refer to the appropriate section in Group [303](#) for the procedure.

For complete vehicle and engine identification codes, refer to [Section 100-01](#).

Engine

Special Tool(s)

 <p>ST1299-A</p>	<p>Quick Disconnect Compression Tester 134-R0212 or equivalent</p>
 <p>ST1272-A</p>	<p>Cup Shaped Adapter 303-007 (TOOL-6565-AB) or equivalent</p>
 <p>ST1214-A</p>	<p>Dial Indicator with Bracketry 100-002 (TOOL-4201-C) or equivalent</p>
 <p>ST1298-A</p>	<p>Engine Cylinder Leak Detection/Air Pressurization Kit 014-00708 or equivalent</p>
 <p>ST1296-A</p>	<p>Engine Oil Pressure Gauge 303-088 (T73L-6600-A)</p>
 <p>ST1300-A</p>	<p>12 Volt Master UV Diagnostic Inspection Kit 164-R0756 or equivalent (Leak Detector)</p>
 <p>ST1297-A</p>	<p>Vacuum/Pressure Tester 164-R0253 or equivalent</p>

Inspection and Verification

1. Verify the customer concern by operating the engine to duplicate the condition.
2. Visually inspect for obvious signs of mechanical damage. Refer to the following chart.

Visual Inspection Chart

Mechanical
<ul style="list-style-type: none"> ● Engine coolant leaks ● Engine oil leaks ● Fuel leaks ● Damaged or severely worn parts ● Loose mounting bolts, studs and nuts

3. If the inspection reveals obvious concerns that can be readily identified, repair as necessary.
4. If the concerns remain after the inspection, determine the symptoms and go to the Symptom Chart.

Symptom Chart

Symptom Chart

Condition	Possible Sources	Action
<ul style="list-style-type: none"> ● Difficult starting 	<ul style="list-style-type: none"> ● Inoperative or damaged ignition system. ● Inoperative or damaged fuel system. ● Inoperative or damaged starting system. ● Damaged charging system/battery. ● Burnt valve. ● Worn piston. ● Worn piston rings. ● Worn cylinder. ● Damaged head gasket. ● Inoperative or damaged cooling system (failsafe cooling invoked). 	<ul style="list-style-type: none"> ● Refer to the appropriate section in Group 303 for the procedure. REFER to the Powertrain Control/Emissions Diagnosis (PC/ED) manual. ● Refer to the appropriate section in Group 303 for the procedure. REFER to the Powertrain Control/Emissions Diagnosis (PC/ED) manual. ● Refer to the appropriate section in Group 303 for the procedure. REFER to the Powertrain Control/Emissions Diagnosis (PC/ED) manual. ● REFER to Section 414-00. ● INSTALL a new valve. ● INSTALL a new piston. ● INSTALL a new piston ring. ● INSTALL a new cylinder block. ● INSTALL a new cylinder head gasket. ● Refer to the appropriate section in Group 303 for the procedure. REFER to the Powertrain Control/Emissions Diagnosis (PC/ED) manual.
<ul style="list-style-type: none"> ● Poor idling 	<ul style="list-style-type: none"> ● Vacuum leaks. 	<ul style="list-style-type: none"> ● Refer to the appropriate section in Group 303 for the procedure. REFER to the Powertrain Control/Emissions Diagnosis

	<ul style="list-style-type: none"> ● Inoperative or damaged ignition system. ● Inoperative or damaged cooling system (failsafe cooling invoked). ● Inoperative or damaged fuel system. ● Misadjusted valve lash. ● Incorrect valve-to-valve seat contact. ● Damaged head gasket. 	<p>(PC/ED) manual.</p> <ul style="list-style-type: none"> ● Refer to the appropriate section in Group 303 for the procedure.. ● Refer to the appropriate section in Group 303 for the procedure. REFER to the Powertrain Control/Emissions Diagnosis (PC/ED) manual ● Refer to the appropriate section in Group 303 for the procedure. REFER to the Powertrain Control/Emissions Diagnosis (PC/ED) manual. ● ADJUST valve lash. REFER to the appropriate section in Group 303 for procedure. ● INSTALL a new cylinder head. ● INSTALL a new cylinder head gasket.
<ul style="list-style-type: none"> ● Abnormal combustion 	<ul style="list-style-type: none"> ● Inoperative or damaged fuel system. ● Inoperative or damaged cooling system (failsafe cooling invoked). ● Inoperative or damaged ignition system. ● Burnt or sticking valve. ● Weak or broken valve spring. ● Carbon accumulation in combustion chamber. 	<ul style="list-style-type: none"> ● Refer to the appropriate section in Group 303 for the procedure. REFER to the Powertrain Control/Emissions Diagnosis (PC/ED) manual. ● Refer to the appropriate section in Group 303 for the procedure. REFER to the Powertrain Control/Emissions Diagnosis (PC/ED) manual. ● Refer to the appropriate section in Group 303 for the procedure. REFER to the Powertrain Control/Emissions Diagnosis (PC/ED) manual. ● INSTALL a new valve. ● INSTALL a new valve spring. ● ELIMINATE carbon buildup.
<ul style="list-style-type: none"> ● Excessive oil consumption 	<ul style="list-style-type: none"> ● Leaking oil. ● Inoperative PCV system. ● Worn valve stem seal. ● Worn valve stem or valve guide. ● Sticking piston rings. ● Worn piston ring groove. 	<ul style="list-style-type: none"> ● REPAIR oil leakage. ● REPAIR or INSTALL new the necessary components. ● INSTALL a new valve stem seal. ● INSTALL a new valve and cylinder head. ● REPAIR or INSTALL new piston rings. ● INSTALL a new piston and piston pin.

	<ul style="list-style-type: none"> ● Worn piston or cylinder. 	<ul style="list-style-type: none"> ● REPAIR or INSTALL a new piston or cylinder block.
<ul style="list-style-type: none"> ● Engine noise 	<ul style="list-style-type: none"> ● Leaking exhaust system. ● Incorrect drive belt tension. ● Worn generator bearing. ● Worn or damaged water pump bearing. ● Inoperative or damaged cooling system. ● Inoperative or damaged fuel system. ● Loose timing chain (6268). ● Damaged timing chain tensioner (6L266). ● Excessive main bearing clearance. ● Seized or heat damaged crankshaft main bearing. ● Excessive crankshaft end play. ● Excessive connecting rod bearing clearance. ● Heat damaged connecting rod bearing (6211). ● Damaged connecting rod bushing (6207). ● Worn cylinder. ● Worn piston (6108) or piston pin (6135). ● Damaged piston rings. ● Bent connecting rod. ● Worn or damaged valve tappet. ● Excessive valve tappet or lash adjuster clearance. ● Broken valve spring (6513). ● Excessive valve 	<ul style="list-style-type: none"> ● REPAIR exhaust leakage. ● REFER to Section 303-05. ● Refer to the appropriate section in Group 414 for the procedure. ● REFER to Section 303-03. ● REFER to Section 303-03. ● Refer to the appropriate section in Group 303 for the procedure. REFER to the Powertrain Control/Emissions Diagnosis (PC/ED) manual. ● ADJUST or INSTALL a new timing chain. ● INSTALL a new timing chain tensioner. ● INSTALL a new crankshaft main bearing (6333). ● INSTALL a new crankshaft main bearing. ● INSTALL a new thrust bearing or crankshaft (6303). ● INSTALL a new connecting rod bearing or connecting rod (6200). ● INSTALL a new connecting rod bearing. ● INSTALL a new connecting rod bushing. ● INSTALL a new cylinder block (6010). ● INSTALL a new piston or piston pin. ● INSTALL new piston rings. ● INSTALL a new connecting rod. ● INSTALL a new valve tappet. ● ADJUST clearance or INSTALL a new valve tappet. ● INSTALL a new valve spring. ● INSTALL a new cylinder head.

	guide clearance.	
<ul style="list-style-type: none"> ● Insufficient power 	<ul style="list-style-type: none"> ● Inoperative or damaged ignition system. ● Inoperative or damaged fuel system. ● Inoperative or damaged cooling system (failsafe cooling invoked). ● Damaged or plugged exhaust system. ● Incorrect tire size. ● Dragging brakes. ● Slipping transmission. ● Misadjusted valve lash. ● Worn or damaged valve tappet. ● Damaged valve tappet guide. ● Compression leakage at valve seat. ● Seized valve stem. ● Weak or broken valve spring. ● Worn or damaged cam. ● Damaged head gasket (6051). ● Cracked or distorted cylinder head. ● Damaged, worn or sticking piston ring(s). ● Worn or damaged piston. 	<ul style="list-style-type: none"> ● Refer to the appropriate section in Group 303 for the procedure. REFER to the Powertrain Control/Emissions Diagnosis (PC/ED) manual. ● Refer to the appropriate section in Group 303 for the procedure. REFER to the Powertrain Control/Emissions Diagnosis (PC/ED) manual. ● Refer to the appropriate section in Group 303 for the procedure. REFER to the Powertrain Control/Emissions Diagnosis (PC/ED) manual. ● INSPECT exhaust system. ● REFER to Section 204-04 . ● REFER to Section 206-00 . ● Refer to the appropriate section in Group 307 for the procedure. ● ADJUST valve lash. REFER to the appropriate section in Group 303 for the procedure. ● INSTALL a new valve tappet. ● INSTALL a new cylinder head. ● INSTALL a new valve, or cylinder head. ● INSTALL a new valve. ● INSTALL a new valve spring. ● INSTALL a new camshaft. ● INSTALL a new head gasket. ● INSTALL a new cylinder head. ● REPAIR or INSTALL new piston ring(s). ● INSTALL a new piston and piston pin.

Component Tests

Engine Oil Leaks

NOTE: When diagnosing engine oil leaks, the source and location of the leak must be positively identified prior to repair.

Prior to carrying out this procedure, clean the cylinder block, cylinder heads, valve covers, oil pan and flywheel with a suitable solvent to remove all traces of oil.

Engine Oil Leaks—Fluorescent Oil Additive Method

Use the 12 Volt Master UV Diagnostic Inspection Kit to carry out the following procedure for oil leak diagnosis.

1. Clean the engine with a suitable solvent to remove all traces of oil.
2. Add Gasoline Engine Oil Dye 164-R3705 meeting Ford specification ESE-M99C103-B1 or equivalent. Use a minimum 14.8 ml (0.5 ounce) to a maximum 29.6 ml (1 ounce) of fluorescent additive to all engines. If the oil is not premixed, fluorescent additive must first be added to the case.
3. Run the engine for 15 minutes. Stop the engine and inspect all seal and gasket areas for leaks using the 12 Volt Master UV Diagnostic Inspection Kit. A clear bright yellow or orange area will identify the leak. For extremely small leaks, several hours may be necessary for the leak to appear.

Leakage Points—Underhood

Examine the following areas for oil leakage:

- valve cover gaskets
- cylinder head gaskets
- oil cooler, if equipped
- oil filter adapter
- engine front cover
- oil filter adapter and filter body
- oil level indicator tube connection
- oil pressure sensor

Leakage Points—Under Engine—With Vehicle on Hoist

- oil pan gaskets (6710)
- oil pan sealer
- sump sealer — 8 cyl.
- engine front cover gasket
- crankshaft front seal (6700)
- crankshaft rear oil seal (6701)
- crankshaft main bearing cap side bolts
- oil filter adapter and filter body
- oil cooler, if equipped

Leakage Points—With Transmission and Flywheel Removed

- crankshaft rear oil seal
- rear main bearing cap parting line

- rear main bearing cap and seals
- flywheel mounting bolt holes (with flywheel (6375) installed)
- camshaft rear bearing covers (6266) or pipe plugs at the end of oil passages

Oil leaks at crimped seams in sheet metal parts and cracks in cast or stamped parts can be detected when using the dye method.

Compression Test—Compression Gauge Check

1. Make sure the oil in the crankcase is of the correct viscosity and at the correct level and that the battery (10655) is correctly charged. Operate the vehicle until the engine is at normal operating temperature. Turn the ignition switch to the OFF position, then remove all the spark plugs (12405).
2. Set the throttle plates in the wide-open position.
3. Install a compression gauge such as the Compression Tester in the No. 1 cylinder.
4. Install an auxiliary starter switch in the starting circuit. With the ignition switch in the OFF position, and using the auxiliary starter switch, crank the engine a minimum of five compression strokes and record the highest reading. Note the approximate number of compression strokes necessary to obtain the highest reading.
5. Repeat the test on each cylinder, cranking the engine approximately the same number of compression strokes.

Compression Test—Test Results

The indicated compression pressures are considered within specification if the lowest reading cylinder is within 75 percent of the highest reading. For additional information, refer to the Compression Pressure Limit Chart.

Compression Pressure Limit Chart

Maximum Pressure	Minimum Pressure	Maximum Pressure	Minimum Pressure	Maximum Pressure	Minimum Pressure	Maximum Pressure	Minimum Pressure
924 kPa (134 psi)	696 kPa (101 psi)	1131 kPa (164 psi)	848 kPa (123 psi)	1338 kPa (194 psi)	1000 kPa (146 psi)	1544 kPa (224 psi)	1158 kPa (168 psi)
938 kPa (136 psi)	703 kPa (102 psi)	1145 kPa (166 psi)	855 kPa (124 psi)	1351 kPa (196 psi)	1014 kPa (147 psi)	1558 kPa (226 psi)	1165 kPa (169 psi)
952 kPa (138 psi)	717 kPa (104 psi)	1158 kPa (168 psi)	869 kPa (126 psi)	1365 kPa (198 psi)	1020 kPa (148 psi)	1572 kPa (228 psi)	1179 kPa (171 psi)
965 kPa (140 psi)	724 kPa (106 psi)	1172 kPa (170 psi)	876 kPa (127 psi)	1379 kPa (200 psi)	1034 kPa (150 psi)	1586 kPa (230 psi)	1186 kPa (172 psi)
979 kPa (142 psi)	738 kPa (107 psi)	1186 kPa (172 psi)	889 kPa (129 psi)	1393 kPa (202 psi)	1041 kPa (151 psi)	1600 kPa (232 psi)	1200 kPa (174 psi)
993 kPa (144 psi)	752 kPa (109 psi)	1200 kPa (174 psi)	903 kPa (131 psi)	1407 kPa (204 psi)	1055 kPa (153 psi)	1614 kPa (234 psi)	1214 kPa (176 psi)
1007 kPa (146 psi)	766 kPa (111 psi)	1214 kPa (176 psi)	917 kPa (133 psi)	1421 kPa (206 psi)	1069 kPa (155 psi)	1628 kPa (236 psi)	1228 kPa (178 psi)

1020 kPa (148 psi)	765 kPa (111 psi)	1227 kPa (178 psi)	917 kPa (133 psi)	1434 kPa (208 psi)	1075 kPa (156 psi)	1641 kPa (238 psi)	1227 kPa (178 psi)
1034 kPa (150 psi)	779 kPa (113 psi)	1241 kPa (180 psi)	931 kPa (135 psi)	1448 kPa (210 psi)	1083 kPa (157 psi)	1655 kPa (240 psi)	1241 kPa (180 psi)
1048 kPa (152 psi)	786 kPa (114 psi)	1255 kPa (182 psi)	936 kPa (136 psi)	1462 kPa (212 psi)	1089 kPa (158 psi)	1669 kPa (242 psi)	1248 kPa (181 psi)
1062 kPa (154 psi)	793 kPa (115 psi)	1269 kPa (184 psi)	952 kPa (138 psi)	1476 kPa (214 psi)	1103 kPa (160 psi)	1682 kPa (244 psi)	1262 kPa (183 psi)
1076 kPa (156 psi)	807 kPa (117 psi)	1282 kPa (186 psi)	965 kPa (140 psi)	1489 kPa (216 psi)	1117 kPa (162 psi)	1696 kPa (246 psi)	1269 kPa (184 psi)
1089 kPa (158 psi)	814 kPa (118 psi)	1296 kPa (188 psi)	972 kPa (141 psi)	1503 kPa (218 psi)	1124 kPa (163 psi)	1710 kPa (248 psi)	1202 kPa (186 psi)
1103 kPa (160 psi)	827 kPa (120 psi)	1310 kPa (190 psi)	979 kPa (142 psi)	1517 kPa (220 psi)	1138 kPa (165 psi)	1724 kPa (250 psi)	1289 kPa (187 psi)
1110 kPa (161 psi)	834 kPa (121 psi)	1324 kPa (192 psi)	993 kPa (144 psi)	1631 kPa (222 psi)	1145 kPa (166 psi)	—	—

If one or more cylinders reads low, squirt approximately one tablespoon of Super Premium SAE 5W30 Motor Oil, XO-5W30-QSP meeting Ford specification WSS-M2C153-G on top of the pistons in the low-reading cylinders. Repeat the compression pressure check on these cylinders.

Compression Test—Interpreting Compression Readings

1. If compression improves considerably, piston rings are worn or damaged.
2. If compression does not improve, valves are sticking or not seating correctly.
3. If two adjacent cylinders indicate low compression pressures and squirting oil on each piston does not increase compression, the head gasket may be leaking between cylinders. Engine oil or coolant in cylinders could result from this condition.
Use the Compression Pressure Limit Chart when checking cylinder compression so that the lowest reading is within 75 percent of the highest reading.

Cylinder Leakage Detection

When a cylinder produces a low reading, use of the Engine Cylinder Leak Detection/Air Pressurization Kit will be helpful in pinpointing the exact cause.

The leakage detector is inserted in the spark plug hole, the piston is brought up to dead center on the compression stroke, and compressed air is admitted.

Once the combustion chamber is pressurized, a special gauge included in the kit will read the percentage of leakage. Leakage exceeding 20 percent is excessive.

While the air pressure is retained in the cylinder, listen for the hiss of escaping air. A leak at the intake valve (6507) will be heard in the throttle body (9E926). A leak at the exhaust valve (6505) can be heard at the tailpipe. Leakage past the piston rings will be audible at the positive crankcase ventilation (PCV) connection. If air is passing through a blown head gasket to an adjacent cylinder, the noise will be evident at the spark plug hole of the cylinder into which the air is leaking. Cracks in the cylinder block or gasket leakage into the cooling system may be detected by a stream of bubbles in the radiator (8005).

Oil Consumption Test

The following diagnostic procedure is used to determine the source of excessive internal oil consumption.

1. **NOTE:** Oil use is normally greater during the first 16,100 km (10,000 miles) of usage. As mileage increases, oil use generally decreases. Vehicles in normal usage should get at least 1,450 km per liter (900 miles per quart) after 16,100 km (10,000 miles) of service. High speed driving, towing, high ambient temperature and other factors may result in greater oil use.

Define excessive oil consumption, such as the number of miles driven per liter (quart) of oil used. Also determine customer's driving habits, such as sustained high speed operation, towing, extended idle and other considerations.

2. Verify that the engine has no external oil leak as described under Engine Oil Leaks in the Diagnosis and Testing portion of this section.
3. Verify that the engine has the correct oil level dipstick (6750).
4. Verify that the engine is not being run in an overfilled condition. Check the oil level at least five minutes after a hot shutdown with the vehicle parked on a level surface. In no case should the level be above MAX or the letter F in FULL. If significantly overfilled, carry out steps 6a through 6d.
5. Verify the spark plugs are not oil saturated. If the spark plugs are oil saturated and compression is good it can be assumed the valve seals or valve guides are at fault.
6. Carry out an oil consumption test:
 - a. Drain the engine oil, remove the oil filter (6714) and refill with one liter (quart) less than the recommended amount.
 - b. Run the engine for three minutes (10 minutes if cold), and allow the oil to drain back for at least five minutes with the vehicle on a level surface.
 - c. Remove oil level dipstick and wipe clean. (Do not wipe with anything contaminated with silicone compounds.) Reinstall the oil level dipstick, being sure to seat it firmly in the oil level indicator tube (6754). Remove the oil level dipstick and draw a mark on the back (unmarked) surface at the indicated oil level. This level should be about the same as the MIN or ADD mark on the face of the oil level dipstick.
 - d. Add one liter (quart) of oil. Restart the engine and allow to idle for at least two minutes. Shut off the engine and allow the oil to drain back for at least five minutes. Mark the oil level dipstick, using the procedure above.
 - e. Record the vehicle mileage.
 - f. Instruct the customer to drive the vehicle as usual and carry out the following:
 - Check the oil level regularly at intervals of 160 to 240 km (100-150 miles).
 - Return to the repair point when the oil level drops below the lower (MIN or ADD) mark on the oil level dipstick.
 - Add only full liters (quarts) of the same oil in an emergency. Note the mileage at which the oil is added.
 - g. Check the oil level under the same conditions and at the same location as in Steps 5c and 5d.
 - Measure the distance from the oil level to the UPPER mark on the oil level dipstick and record.
 - Measure the distance between the two scribe marks and record.
 - Divide the first measurement by the second.
 - Divide the distance driven during the oil test by the result. This quantity is the approximate oil consumption rate in kilometers per liter or in miles per quart.
 - h. If the oil consumption rate is unacceptable, go to Step 7.

7. Check the positive crankcase ventilation (PCV) system. Make sure the system is not plugged.
8. Check for plugged oil drain-back holes in the cylinder heads and cylinder block.
9. If the condition still exists after carrying out the above steps, go to Step 10.
10. Carry out a cylinder compression test or cylinder leak detection test with Engine Cylinder Leak Detection/Air Pressurization Kit. This can help determine the source of oil consumption such as valves, piston rings or other areas.
11. **NOTE:** After determining if worn parts should be replaced, make sure correct new parts are used.

Check valve guides for excessive guide clearance. Install new valve stem seals (6571) after verifying valve guide clearance.

12. Worn or damaged internal engine components can cause excessive oil consumption. Small deposits of oil on the tips of spark plugs can be a clue to internal oil consumption. If internal oil consumption still persists, proceed as follows:
 - a. Remove the engine from the vehicle and place it on an engine work stand. Remove the intake manifolds (9424), cylinder heads, oil pan (6675) and oil pump (6600).
 - b. Check piston ring clearance, ring gap and ring orientation. Repair as necessary.
 - c. Check for excessive bearing clearance. Repair as necessary.
13. Repeat the oil consumption test (Step 6) to confirm the oil consumption concern has been resolved.

Intake Manifold Vacuum Test

Bring the engine to normal operating temperature. Connect the Vacuum/Pressure Tester to the intake manifold. Run the engine at the specified idle speed.

The vacuum gauge should read between 51-74 kPa (15-22 in-Hg) depending upon the engine condition and the altitude at which the test is conducted. Subtract 4.0193 kPa (1 in-Hg) from the specified reading for every 304.8 m (1,000 feet) of elevation above sea level.

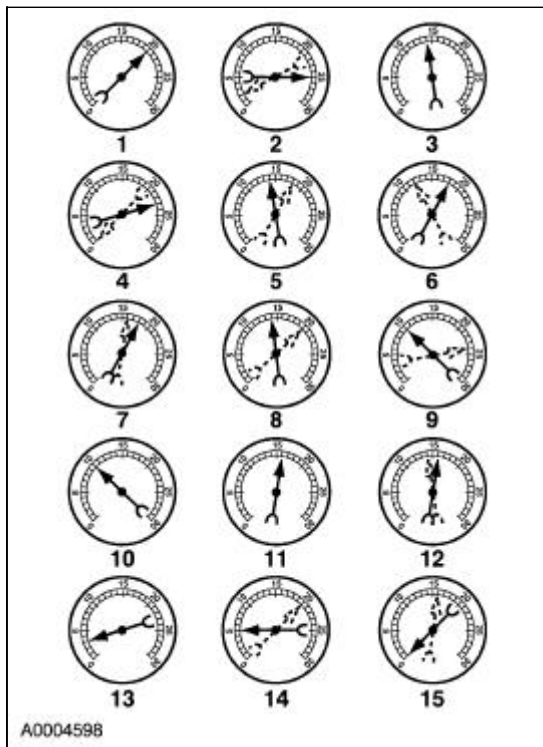
The reading should be steady. If necessary, adjust the gauge damper control (where used) if the needle is fluttering rapidly. Adjust the damper until the needle moves easily without excessive flutter.

Intake Manifold Vacuum Test—Interpreting Vacuum Gauge Readings

A careful study of the vacuum gauge reading while the engine is idling will help pinpoint trouble areas. Always conduct other appropriate tests before arriving at a final diagnostic decision. Vacuum gauge readings, although helpful, must be interpreted carefully.

Most vacuum gauges have a normal band indicated on the gauge face.

The following are potential gauge readings. Some are normal; others should be investigated further.



1. **NORMAL READING:** Needle between 51-74 kPa (15-22 in-Hg) and holding steady.
2. **NORMAL READING DURING RAPID ACCELERATION AND DECELERATION:** When the engine is rapidly accelerated (dotted needle), the needle will drop to a low reading (not to zero). When the throttle is suddenly released, the needle will snap back up to a higher than normal figure.
3. **NORMAL FOR HIGH-LIFT CAMSHAFT WITH LARGE OVERLAP:** The needle will register as low as 51 kPa (15 in-Hg) but will be relatively steady. Some oscillation is normal.
4. **WORN RINGS OR DILUTED OIL:** When the engine is accelerated (dotted needle), the needle drops to 0 kPa (0 in-Hg). Upon deceleration, the needle runs slightly above 74 kPa (22 in-Hg).
5. **STICKING VALVES:** When the needle (dotted) remains steady at a normal vacuum but occasionally flicks (sharp, fast movement) down and back about 13 kPa (4 in-Hg), one or more valves may be sticking.
6. **BURNED OR WARPED VALVES:** A regular, evenly-spaced, downscale flicking of the needle indicates one or more burned or warped valves. Insufficient valve clearance will also cause this reaction.
7. **POOR VALVE SEATING:** A small but regular downscale flicking can mean one or more valves are not seating.
8. **WORN VALVE GUIDES:** When the needle oscillates over about a 13 kPa (4 in-Hg) range at idle speed, the valve guides could be worn. As engine speed increases, the needle will become steady if guides are responsible.
9. **WEAK VALVE SPRINGS:** When the needle oscillation becomes more violent as engine rpm is increased, weak valve springs are indicated. The reading at idle could be relatively steady.
10. **LATE VALVE TIMING:** A steady but low reading could be caused by late valve timing.
11. **IGNITION TIMING RETARDING:** Retarded ignition timing will produce a steady but somewhat low reading.

12. **INSUFFICIENT SPARK PLUG GAP:** When spark plugs are gapped too close, a regular, small pulsation of the needle can occur.
13. **INTAKE LEAK:** A low, steady reading can be caused by an intake manifold or throttle body gasket leak.
14. **BLOWN HEAD GASKET:** A regular drop of fair magnitude can be caused by a blown head gasket or warped cylinder head-to-cylinder block surface.
15. **RESTRICTED EXHAUST SYSTEM:** When the engine is first started and is idled, the reading may be normal, but as the engine rpm is increased, the back pressure caused by a clogged muffler (5230), kinked tailpipe or other concerns will cause the needle to slowly drop to 0 kPa (0 in-Hg). The needle then may slowly rise. Excessive exhaust clogging will cause the needle to drop to a low point even if the engine is only idling.
16. When vacuum leaks are indicated, search out and correct the cause. Excess air leaking into the system will upset the fuel mixture and cause concerns such as rough idle, missing on acceleration or burned valves. If the leak exists in an accessory unit such as the power brake booster (2005), the unit will not function correctly. Always fix vacuum leaks.

Excessive Engine Oil Consumption

The amount of oil an engine uses will vary with the way the vehicle is driven in addition to normal engine-to-engine variation. This is especially true during the first 16,100 km (10,000 miles) when a new engine is being broken in or until certain internal engine components become conditioned. Vehicles used in heavy-duty operation may use more oil. The following are examples of heavy-duty operation:

- trailer towing applications
- severe loading applications
- sustained high speed operation

Engines need oil to lubricate the following internal components:

- cylinder block cylinder walls
- pistons and piston, pin and rings (6102)
- intake and exhaust valve stems
- intake and exhaust valve guides
- all internal engine components

When the pistons move downward, a thin film of oil is left on the cylinder walls. As the vehicle is operated, some oil is also drawn into the combustion chambers past the intake and exhaust valve stem seals and burned.

The following is a partial list of conditions that can affect oil consumption rates:

- engine duty cycle
- operator driving habits
- ambient temperature
- quality and viscosity of the oil
- oil filler cap not seated

- oil level indicator not seated

Operation under varying conditions can frequently be misleading. A vehicle that has been run for several thousand miles on short trips or in below-freezing ambient temperatures may have consumed a "normal" amount of oil. However, when checking the engine oil level, it may measure up to the FULL or MAX on the oil level dipstick due to dilution (condensation and fuel) in the engine crankcase. The vehicle might then be driven at high speeds on the highway where the condensation and fuel boil off. The next time the engine oil is checked, it may appear that a liter (quart) of oil was used in about 160 km (100 miles). This perceived 160 km (100 miles) per liter (quart) oil consumption rate causes customer concern even though the actual overall oil consumption rate is about 2400 km (1500 miles) per liter (quart).

Make sure the selected engine oil meets the current recommended API performance category with SAE viscosity grade as shown in the vehicle Owner Literature. It is also important that the engine oil is changed at the intervals specified. Refer to the Vehicle Owner Literature.

Oil Pressure Test

1. Disconnect and remove the oil pressure sensor (9278) from the engine.
2. Connect the Engine Oil Pressure Gauge to the oil pressure sender oil galley port.
3. Run the engine until normal operating temperature is reached.
4. Run the engine at the specified rpm and record the gauge reading.
5. The oil pressure should be within specifications; refer to the specification chart in the appropriate engine section.
6. If the pressure is not within specification, check the following possible sources:
 - insufficient oil
 - oil leakage
 - worn or damaged oil pump
 - oil pump screen cover and tube (6622)
 - excessive main bearing clearance
 - excessive connecting rod bearing clearance

Valve Train Analysis—Engine Off—Valve Cover Removed

Check for damaged or severely worn parts and correct assembly. Make sure correct parts are used with the static engine analysis as follows.

Valve Train Analysis—Engine Off

- Check for loose mounting bolts on camshaft caps.
- Check valve shim to camshaft gap.

Valve Train Analysis—Engine Off, Camshaft—Engines

- Check for broken or damaged parts.

Valve Train Analysis—Valve Springs

- Check for broken or damaged parts.

Valve Train Analysis—Engine Off, Valve Spring Retainer and Valve Spring Retainer Keys

- Check for correct seating of the valve spring retainer key (6518) on the valve stem and in valve spring retainer (6514).
- Check for correct seating on the valve stem.

Valve Train Analysis—Engine Off, Valves and Cylinder Head

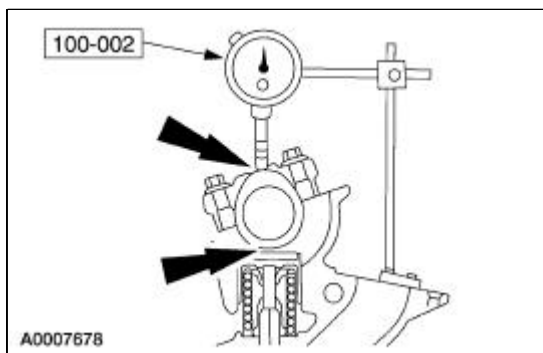
- Check for plugged oil drain back holes.
- Check for worn or damaged valve tips.
- Check for missing or damaged valve stem seals or guide-mounted valve stem seal.
- Check valve tappet shim gap.
- Check for missing or worn valve spring seats.
- Check for plugged oil metering orifice in cylinder head oil reservoir (if equipped).

Static checks (engine off) are to be made on the engine prior to the dynamic procedure.

Valve Train Analysis—Engine Off, Camshaft Lobe Lift—OHC Engines

Check the lift of each camshaft lobe in consecutive order and make a note of the readings.

1. Remove the valve covers.
2. Remove the spark plugs.
3. Install the special tool so the rounded tip of indicator is on top of the camshaft lobe and on the same plane as the valve tappet.
4. Rotate the crankshaft using a breaker bar and socket attached to the crankshaft pulley retainer bolt. Rotate the crankshaft until the base circle of the camshaft lobe is reached.



5. Zero the dial indicator. Continue to rotate the crankshaft until the high-lift point of the camshaft lobe is in the fully-raised position (highest indicator reading).
6. To check the accuracy of the original indicator reading, continue to rotate crankshaft until the base circle is reached. The indicator reading should be zero. If zero reading is not obtained, repeat Steps 1 through 6.

7. Install the spark plugs.

8. Install the valve covers.

Valve Train Analysis—Engine Off, Valve Tappet


Valve tappet noise can be caused by any of the following:

- excessive valve tappet shim gap
- excessive valve guide wear

Excessive collapsed valve tappet shim gap can be caused by loose rocker arm seat bolts/nuts, incorrect initial adjustment or wear of valve tappet shim face.

Refer to valve train shim and gap inspection procedure in the appropriate engine section.

Sprockets

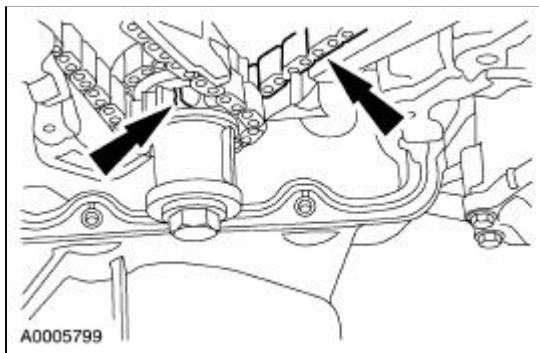
1.  **WARNING:** To avoid the possibility of personal injury or damage to the vehicle, do not operate the engine with the hood open until the fan blade has been examined for possible cracks and separation. Failure to follow these instructions may result in personal injury.

NOTE: Specifications show the expected minimum or maximum condition.

NOTE: If a component fails to meet the specifications, it is necessary to install a new component or refinish the component. If the component can be refinished, wear limits are provided as an aid to making a decision. If a component fails to meet specifications and cannot be refinished, a new component must be installed.

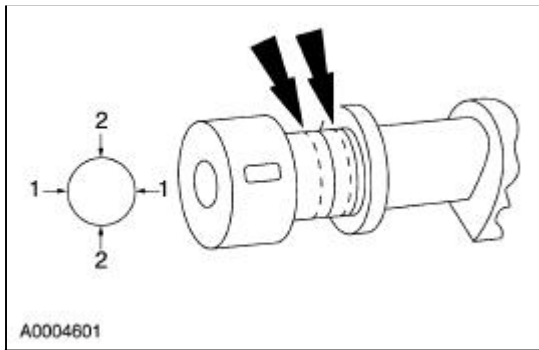
Inspect the timing chain/belt and the sprockets.

- Install new components as necessary. Refer to the appropriate section in Group [303](#) for the procedure.



Camshaft Journal — Diameter

1. Measure each camshaft journal diameter in two directions.
 - If it is out of specification, install a new camshaft. Refer to the appropriate section in Group [303](#) for the procedure.



A0004601

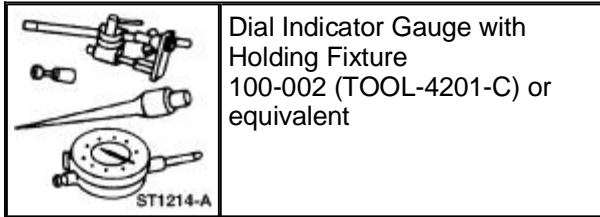
Camshaft Journal

NOTE: The camshaft journals must meet specifications before checking camshaft journal clearance.

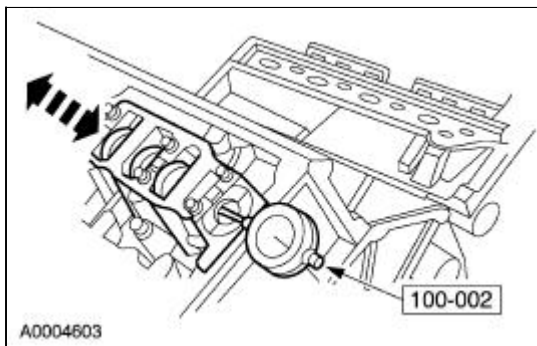
Refer to the appropriate section in Group [303](#) for the procedure.

Camshaft —End Play, OHC Engines

Special Tool(s)

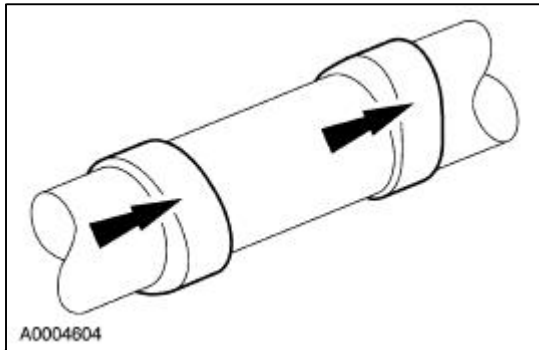


1. Use the special tool to measure camshaft end play.
2. Position the camshaft to the rear of the cylinder head.
3. Zero the indicator.
4. Move the camshaft to the front of the cylinder head. Note and record the camshaft end play. Refer to the appropriate section in Group [303](#) for the procedure.
 - If camshaft end play exceeds specifications, install new camshaft thrust bearing washers.



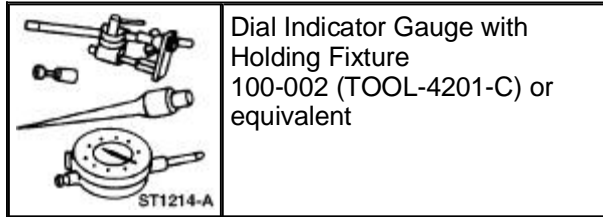
Camshaft —Lobe Surface

1. Inspect camshaft lobes for pitting or damage in the active area. Minor pitting is acceptable outside the active area.
 - If excessive pitting or damage is present, install a new camshaft. Refer to the appropriate section in Group [303](#) for the procedure.

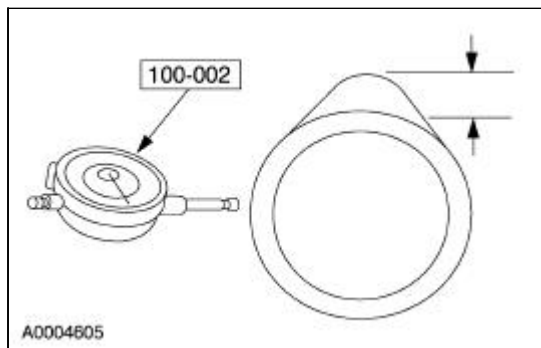


Camshaft —Lobe Lift

Special Tool(s)

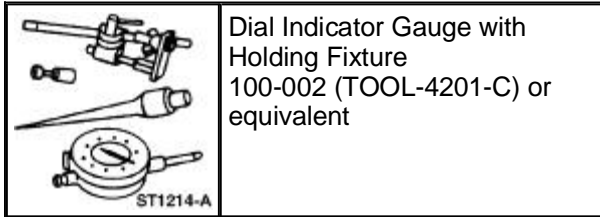


1. Use the special tool to measure camshaft intake/exhaust lobe lift.
 - Rotate the camshaft and subtract the lowest indicator reading from the highest indicator reading to figure the camshaft lobe lift.
 - For additional information, refer to base engine section for specification.



Camshaft —Runout

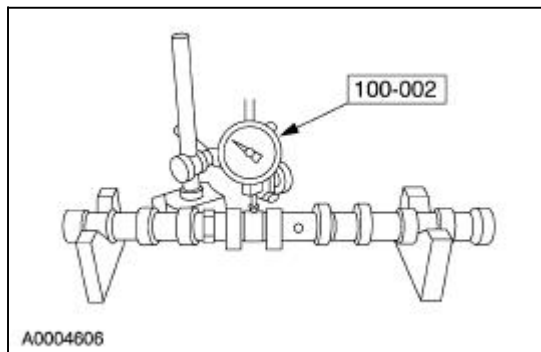
Special Tool(s)



1. **NOTE:** Camshaft journals must be within specifications before checking runout.

Use the special tool to measure the camshaft runout.

- Rotate the camshaft and subtract the lowest indicator reading from the highest indicator reading.
- For additional information, refer to the Specifications chart in the appropriate engine section.
- If it is out of specification, install a new camshaft. Refer to the appropriate section in Group [303](#) for the procedure.

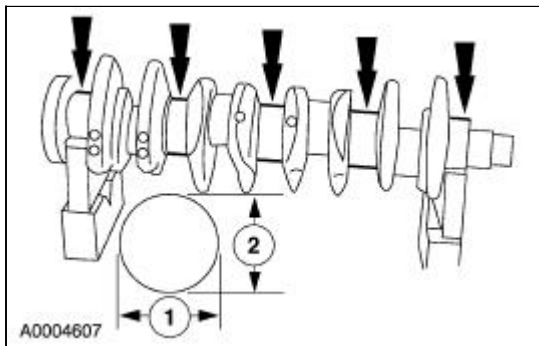


Crankshaft Main Bearing Journal —Diameter

1. **NOTE:** Check part availability before engine disassembly.

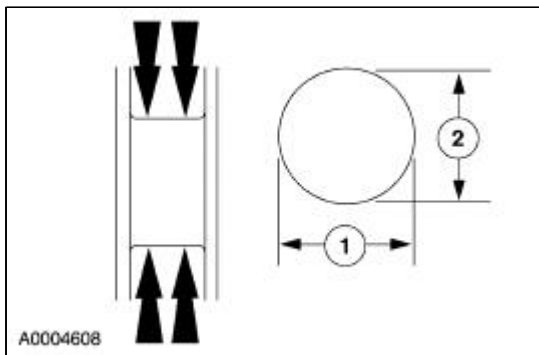
Measure each of the crankshaft main bearing journal diameters in at least two directions.

- For additional information, refer to the Specifications chart in the appropriate engine section.
- If it is out of specification, install new components as necessary. Refer to the appropriate section in Group [303](#) for the procedure.



Crankshaft Main Bearing Journal —Taper

1. Measure each of the crankshaft main bearing journal diameters in at least two directions at each end of the main bearing journal.
 - For additional information, refer to the Specifications chart in the appropriate engine section.
 - If it is out of specification, install new components as necessary. Refer to the appropriate section in Group [303](#) for the procedure.



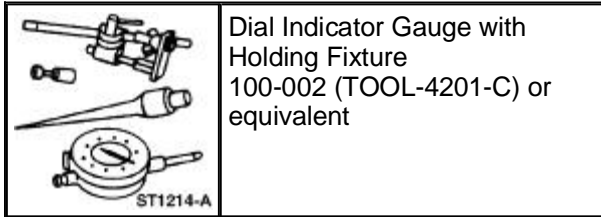
Crankshaft Main Bearing Journal — Clearance

NOTE: Crankshaft main bearing journals must be within specifications before checking journal clearance.

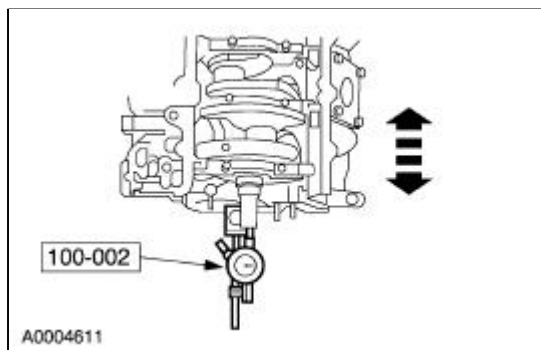
Refer to the appropriate section in Group [303](#) for the procedure.

Crankshaft —End Play

Special Tool(s)

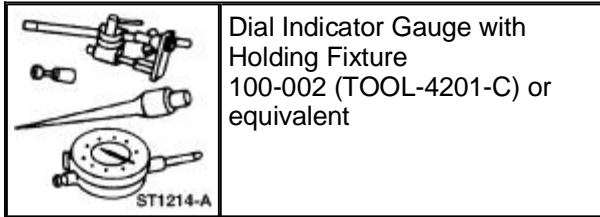


1. Measure the crankshaft end play.
 - Use the special tool to measure crankshaft end play.
2. Position the crankshaft to the rear of the cylinder block.
3. Zero the indicator.
4. Move the crankshaft to the front of the cylinder block. Using the special tool, note and record the crankshaft end play.
 - If crankshaft end play exceeds specifications, install a new crankshaft thrust washer (6334) or crankshaft thrust main bearing (6337). Refer to the appropriate section in Group [303](#) for the procedure.



Crankshaft —Runout

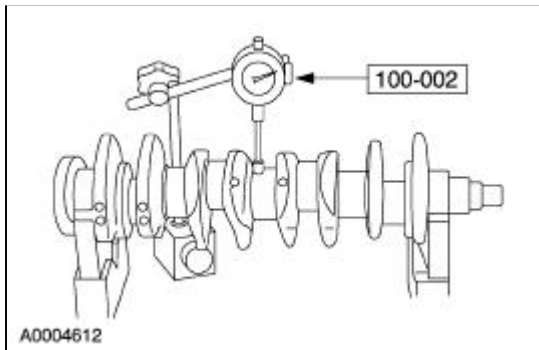
Special Tool(s)



1. **NOTE:** Crankshaft main bearing journals must be within specifications before checking runout.

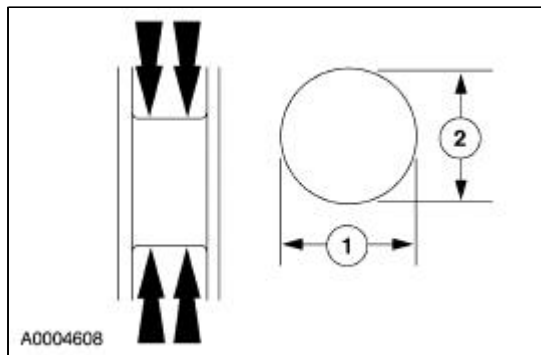
Use the special tool to measure the crankshaft runout.

- For additional information, refer to the Specifications chart in the appropriate engine section. Rotate the crankshaft and subtract the lowest dial indicator reading from the highest dial indicator reading to figure the crankshaft runout. If it is out of specification, install new components as necessary. Refer to the appropriate section in Group [303](#) for the procedure.



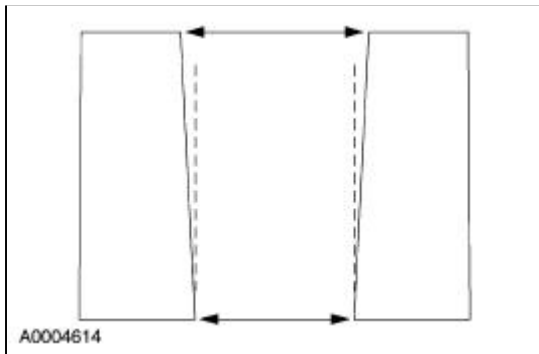
Crankshaft —Connecting Rod Journal Taper, Out of Round

1. Measure the crankshaft connecting rod journal diameters in two directions perpendicular to one another at each end of the connecting rod journal. The difference in the measurements from one end to the other is the taper. Verify measurement is within the wear limit.
 - For additional information, refer to the appropriate engine section Specifications chart.
 - If it is out of specification, install new components as necessary. Refer to the appropriate section in Group [303](#) for the procedure.



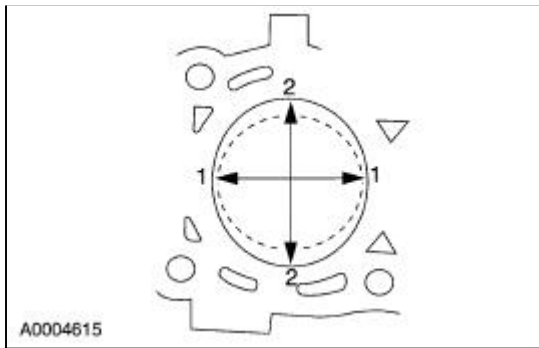
Cylinder Bore —Taper

1. Measure the cylinder bore at the top and bottom. Verify the cylinder bore is within the wear limit. The difference indicates the cylinder bore taper. Bore the cylinder to the next oversize.
 - For additional information, refer to the appropriate engine section Specifications chart.



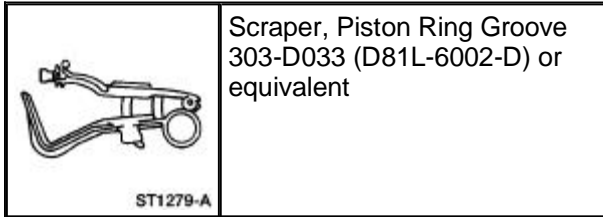
Cylinder Bore —Out-of-Round


1. Measure the cylinder bore in two directions. The difference is the out-of-round. Verify the out-of-round is within the wear limit and bore the cylinder to the next oversize limit.
 - For additional information, refer to the appropriate engine section Specifications Chart.



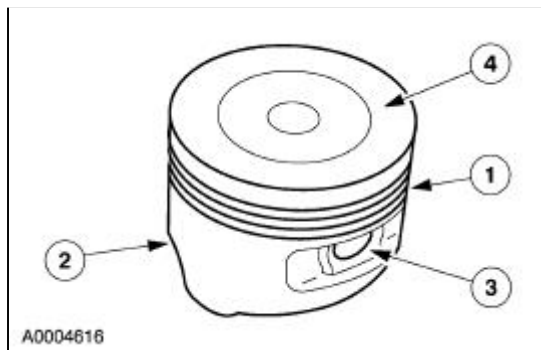
Piston — Inspection

Special Tool(s)

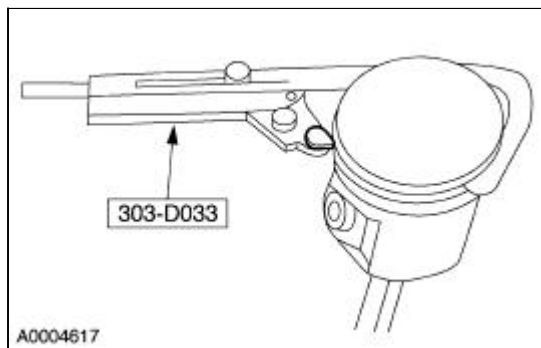


 **CAUTION:** Do not use a caustic cleaning solution or a wire brush to clean the pistons or damage can occur.


1. Clean and inspect the (1) ring lands, (2) skirts, (3) pin bosses, and the (4) tops of the pistons. If wear marks, scores or glazing is found on the piston skirt, check for a bent or twisted connecting rod.



2. Use the special tool to clean the piston ring grooves.
 - Make sure the oil ring holes are clean.



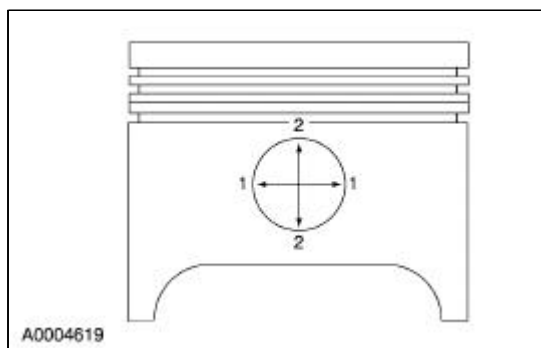
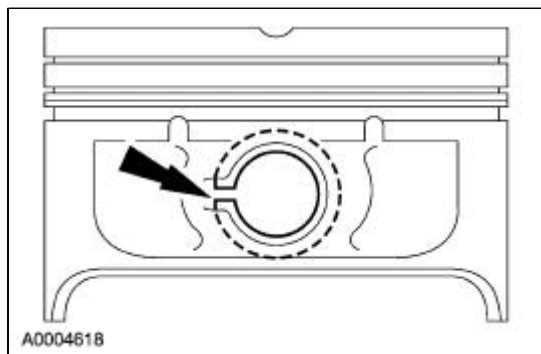
Piston —Pin to Bore Diameter

1.  **WARNING:** Cover the end of the pin bore with a hand or shop rag when removing the retainer ring, since it has a tendency to spring out. Wear eye protection. Failure to follow these instructions may result in personal injury.

NOTE: Piston and piston pins are a matched set and should not be interchanged.

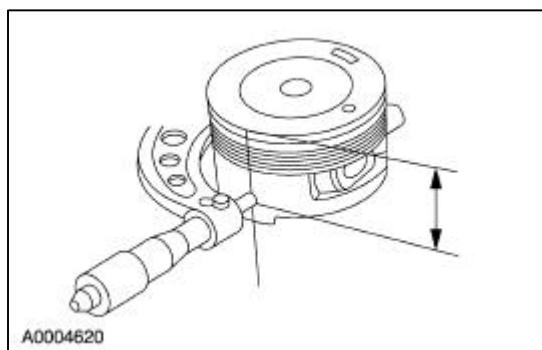
Measure the piston pin bore diameter in two directions on each side. Verify the diameter is within specification.

- If it is out of specification, install new components as necessary. Refer to the appropriate section in Group [303](#) for the procedure.



Piston — Diameter

1. Measure the piston dome and skirt diameter 90 degrees from the piston pin at the points indicated. For additional information, refer to the Specifications Chart in the appropriate engine section.
 - If it is out of specification, install new components as necessary. Refer to the appropriate section in Group [303](#) for the procedure.



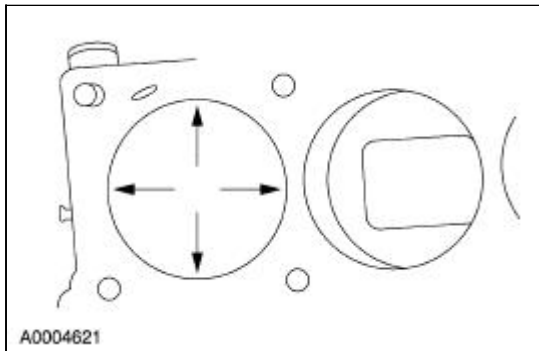
Piston —to Cylinder Bore Clearance

1. Subtract the piston diameter from the cylinder bore diameter to find the piston-to-cylinder bore clearance.
-

Piston — Selection

NOTE: The cylinder bore must be within the specifications for taper and out-of-round before fitting a piston.

1. Select a piston size based on the cylinder bore.



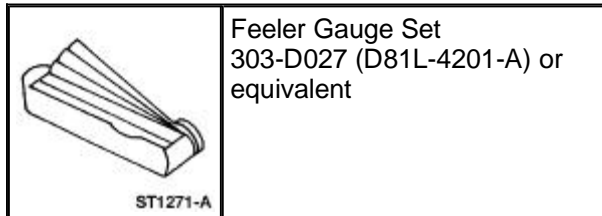
2. **NOTE:** For precision fit, new pistons are divided into three categories within each size range based on their relative position within the range. A number on the new pistons indicates the position within the size range.

Choose the piston with the correct grade size.


- Refer to the appropriate section in Group [303](#) for the procedure.
-

Piston — Ring End Gap

Special Tool(s)

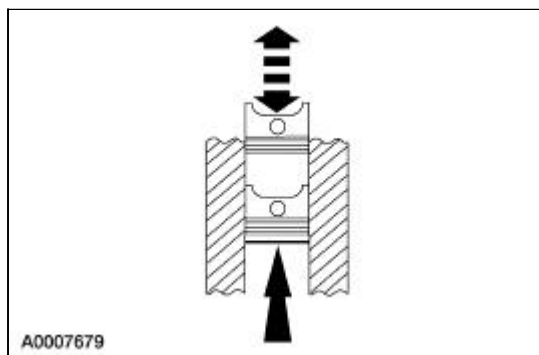


 **CAUTION:** Use care when fitting piston rings to avoid possible damage to the piston ring or the cylinder bore.

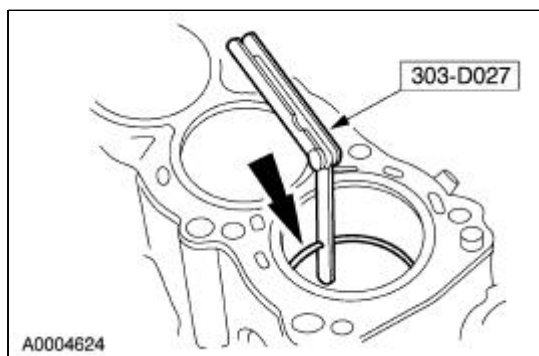
 **CAUTION:** Piston rings should not be transferred from one piston to another.

NOTE: Cylinder bore must be within specification for taper and out-of-round.

1. Use a piston without rings to push a piston ring in a cylinder to the bottom of ring travel.

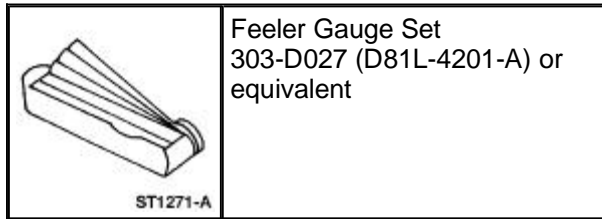


2. Use the special tool to measure the top piston ring end gap and the second piston ring end gap.
 - For additional information, refer to the appropriate engine section Specifications chart.

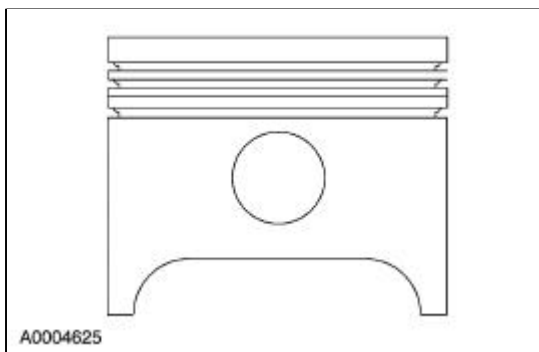


Piston — Ring-to-Groove Clearance

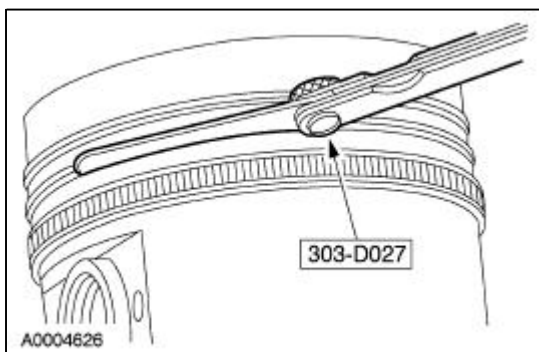
Special Tool(s)



1. Inspect for a step in the grooves.

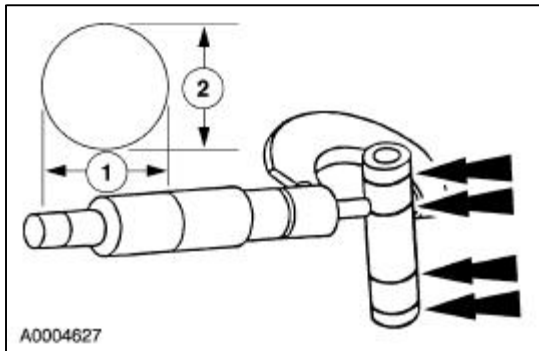


2. Measure the piston ring-to-groove clearance.
 - For additional information, refer to the appropriate engine section Specifications chart.
 - If out of specification, install new components as necessary. Refer to the appropriate section in Group [303](#) for the procedure.




Piston —Pin Diameter

1. Measure the piston pin diameter in two directions at the points shown. Verify the diameter is within specification.
 - For additional information, refer to the appropriate engine section Specifications chart.
 - If out of specification, install new components as necessary. Refer to the appropriate section in Group [303](#) for the procedure.

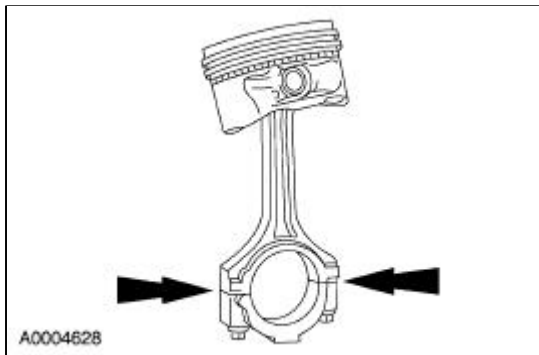


Connecting Rod —Cleaning

 **CAUTION:** Do not use a caustic cleaning solution or damage to connecting rods can occur.

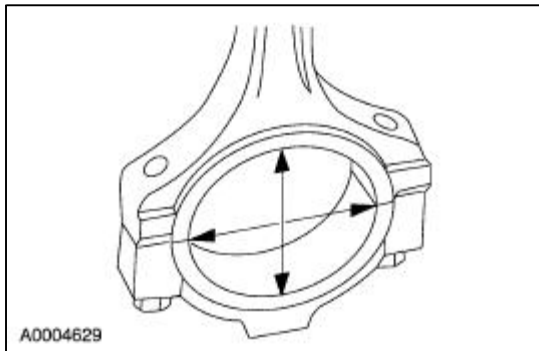
1. **NOTE:** If the connecting rod large end is mechanically split or cracked to produce a unique parting face, a locking joint is produced. Parts are not interchangeable.

Mark and separate the parts and clean with solvent. Clean the oil passages.



Connecting Rod —Large End Bore

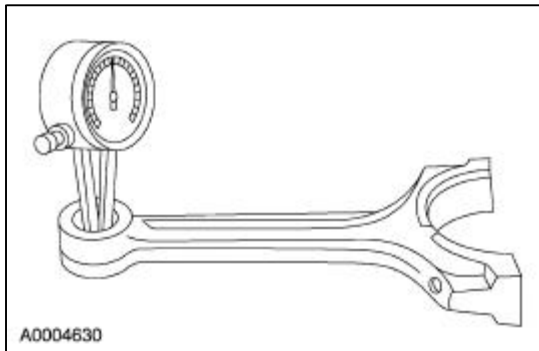
1. Measure the bore in two directions. The difference is the connecting rod bore out-of-round. Verify the out-of-round is within specification.
 - For additional information, refer to the appropriate engine section Specifications chart.
 - If out of specification, install new components as necessary. Refer to the appropriate section in Group [303](#) for the procedure.



A0004629

Connecting Rod — Bushing Diameter

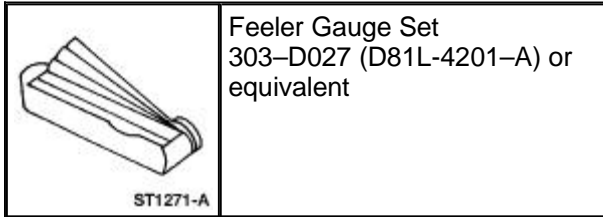
1. Measure the inner diameter of the connecting rod bushing, if equipped. Verify the diameter is within specification.
 - For additional information, refer to the appropriate engine section Specifications chart.
 - If out of specification, install new components as necessary. Refer to the appropriate section in Group [303](#) for the procedure.



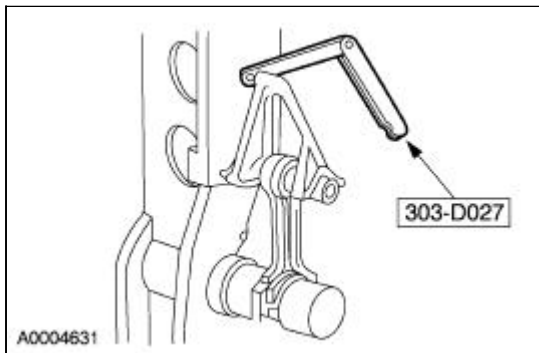
A0004630

Connecting Rod — Bend

Special Tool(s)

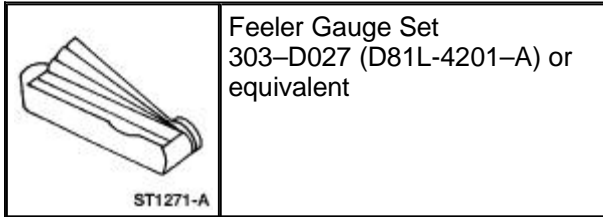


1. Measure the connecting rod bend on a suitable alignment fixture. Follow the instructions of the fixture manufacturer. Verify the bend measurement is within specification.
 - For additional information, refer to the appropriate engine section Specifications chart.
 - If out of specification, install new components as necessary. Refer to the appropriate section in Group [303](#) for the procedure.

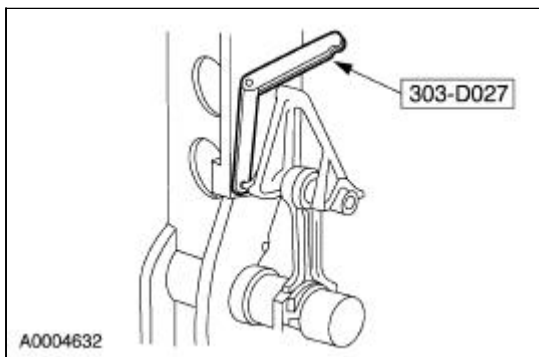


Connecting Rod —Twist

Special Tool(s)

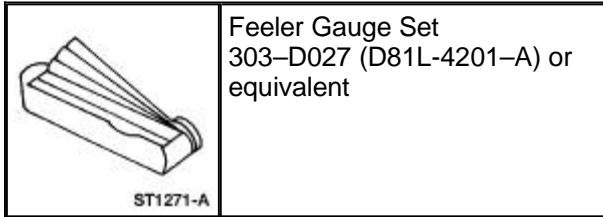


1. Measure the connecting rod twist on a suitable alignment fixture. Follow the instructions of the fixture manufacturer. Verify the measurement is within specification.
 - For additional information, refer to the appropriate engine section Specifications chart.
 - If out of specification, install new components as necessary. Refer to the appropriate section in Group [303](#) for the procedure.

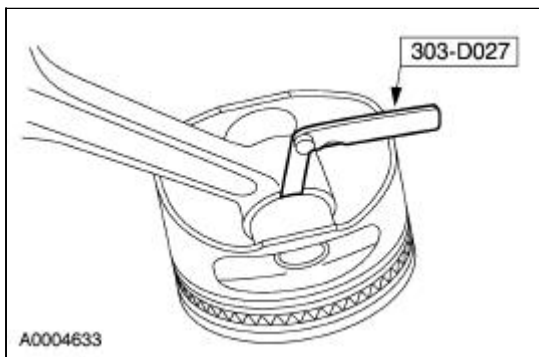


Connecting Rod —Piston Pin Side Clearance

Special Tool(s)



1. Measure the clearance between the connecting rod and the piston. Verify the measurement is within specification.
 - For additional information, refer to the appropriate engine section Specifications chart.
 - If out of specification, install new components as necessary. Refer to the appropriate section in Group [303](#) for the procedure.

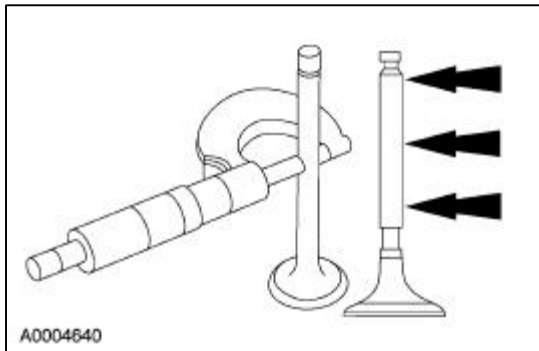


Connecting Rod —Bearing Journal Clearance

Refer to the appropriate section in Group [303](#) for the procedure.

Valve — Stem Diameter


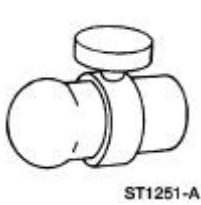
1. Measure the diameter of each intake and exhaust valve stem at the points shown. Verify the diameter is within specification.
 - Refer to the appropriate engine section Specifications chart.
 - If out of specification, install new components as necessary. Refer to the appropriate section in Group [303](#) for the procedure.



A0004640

Valve — Stem to Valve Guide Clearance

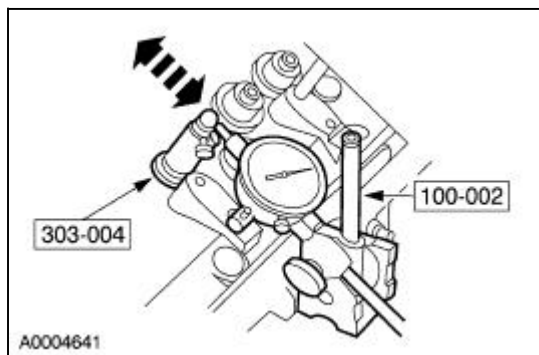
Special Tool(s)

	Dial Indicator Gauge with Holding Fixture 100-002 (TOOL-4201-C) or equivalent
	Clearance Gauge, Valve Guide 303-004 (TOOL-6505-E) or equivalent

NOTE: Valve stem diameter must be within specifications before checking valve stem to valve guide clearance.

1. **NOTE:** If necessary, use a magnetic base.

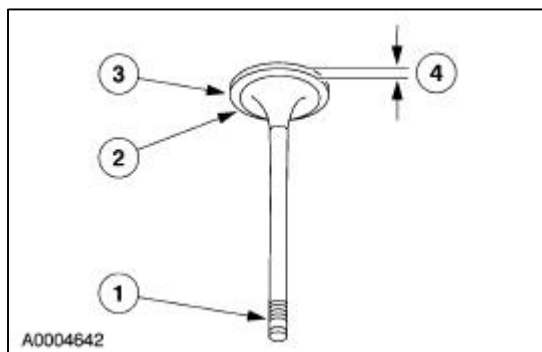
Using special tool Valve Stem Checking Tool and Dial Indicator with Bracketry, lower the valve until the Valve Stem Checking Tool contacts the upper surface of the valve guide.



2. Move the Valve Stem Checking Tool toward the indicator and zero the indicator. Move the Valve Stem Checking Tool away from the indicator and note the reading. The reading will be **DOUBLE** the valve stem-to-valve guide clearance.

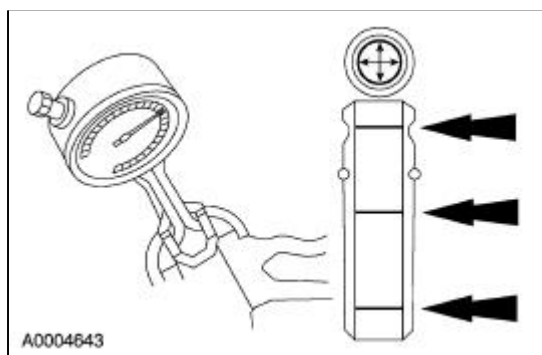
Valve — Inspection

1. Inspect the following valve areas:
 1. the end of the stem for grooves or scoring
 2. the valve face and the edge for pits, grooves or scores
 3. the valve head for signs of burning, erosion, warpage and cracking
 4. the valve margin for wear



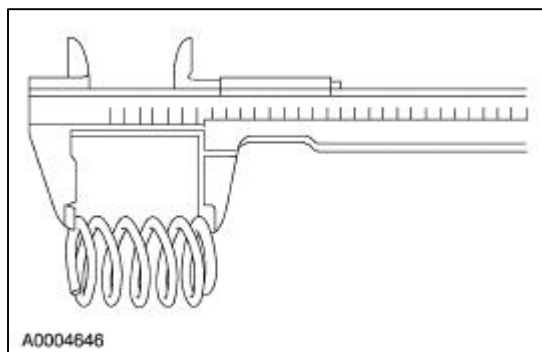
Valve —Guide Inner Diameter

1. Measure the inner diameter of the valve guides in two directions where indicated.
 - Refer to the appropriate engine section Specifications chart.



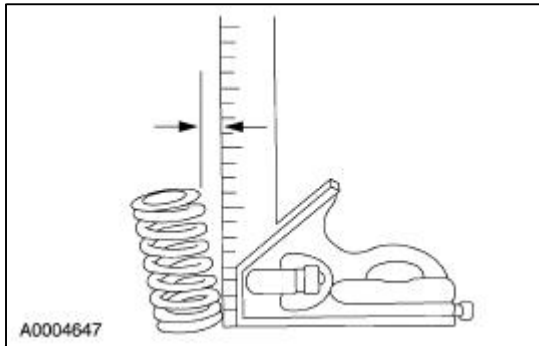
Valve — Spring Free Length

1. Measure the free length of each valve spring.
 - Refer to the Specifications chart in the appropriate engine section.
 - If out of specification, install new components as necessary. Refer to the appropriate section in Group [303](#) for the procedure.



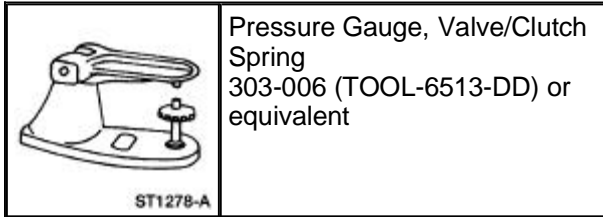
Valve —Spring Squareness

1. Measure the out-of-square on each valve spring.
 - Turn the valve spring and observe the space between the top of the valve spring and the square. Install a new valve spring if out of square. Refer to the appropriate section in Group [303](#) for the procedure.

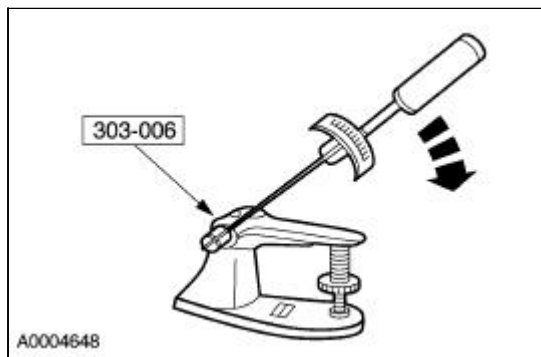


Valve — Spring Strength

Special Tool(s)



1. Use the special tool to check the valve spring for correct strength at the specified valve spring length.
 - Refer to the appropriate engine section Specifications chart.
 - If out of specification, install new components as necessary. Refer to the appropriate section in Group [303](#) for the procedure.



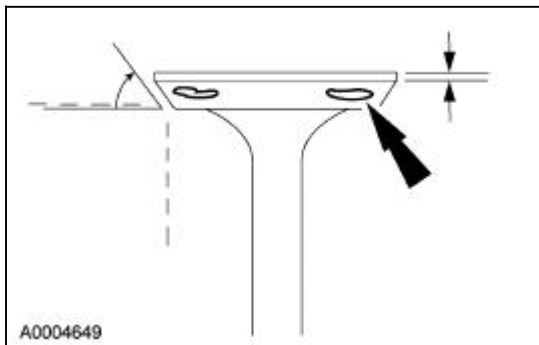
Valve — Seat Inspection

Valve and Seat Refacing Measurements



CAUTION: After grinding valves or valve seats, check valve clearance.

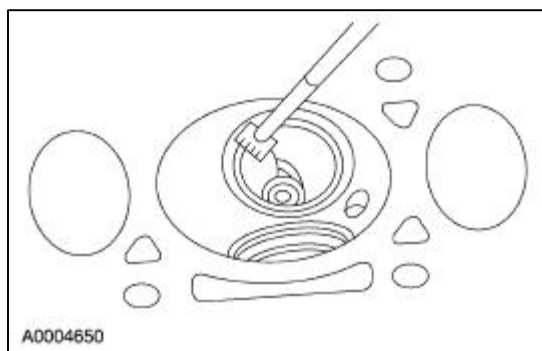
1. Check the valve head and seat.
 - Check valve angles.
 - Check margin width.
 - Refer to the Specifications chart in the appropriate engine section.
 - Be sure margin width is within specification.



2. Inspect for abnormalities on the valve face and seat.
-

Valve — Seat Width

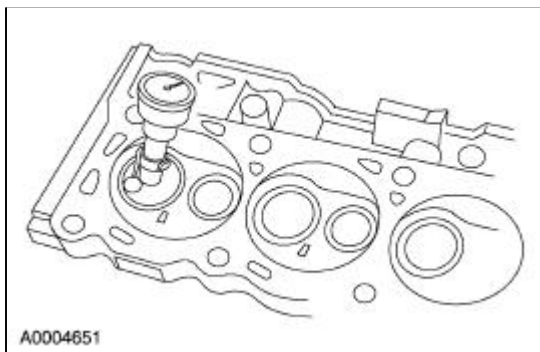
1. Measure the valve seat width. Install a new cylinder head if measurements are not within specification. Refer to the appropriate section in Group [303](#) for the procedure.
 - Measure the intake valve seat width.
 - Measure the exhaust valve seat width.
 - Refer to the Specifications chart in the appropriate engine section.



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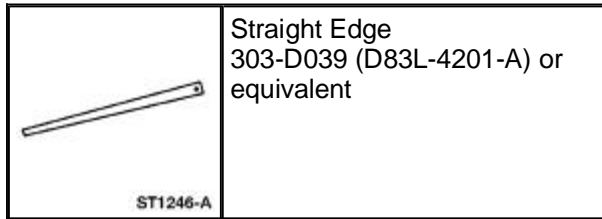
Valve — Seat Runout

1. Check valve seat runout.
 - Verify that the runout is within specification.

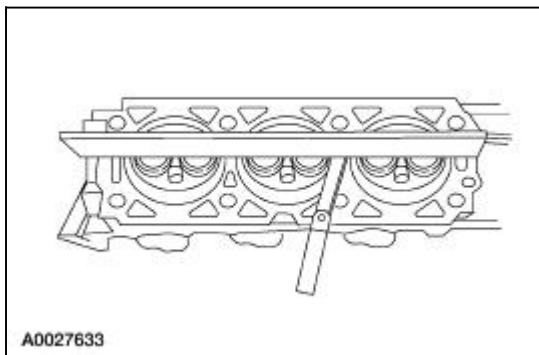


Cylinder Head —Distortion


Special Tool(s)



1. Use a straight edge and a feeler gauge to inspect the cylinder head for flatness. If the cylinder head is distorted, install a new cylinder head.



Cylinder Bore —Cleaning

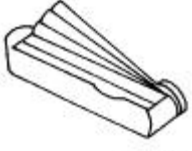

1.  **CAUTION:** If these procedures are not followed, rusting of the cylinder bores may occur.

Clean the cylinder bores with soap or detergent and water.

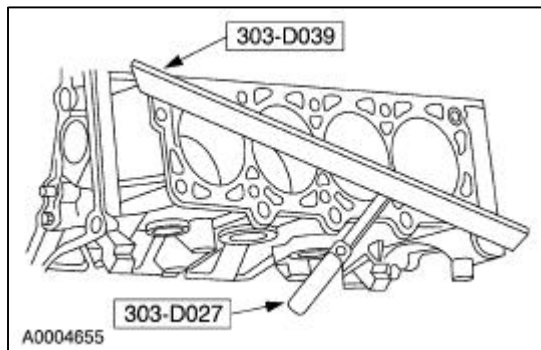
2. Thoroughly rinse with clean water and wipe dry with a clean, lint-free cloth.
 3. Use a clean, lint-free cloth and lubricate the cylinder bores.
 - Use engine oil meeting Ford specification.
-

Cylinder Block —Distortion

Special Tool(s)

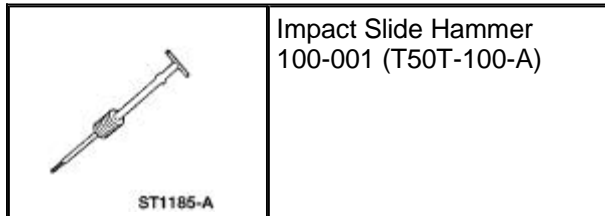
 ST1271-A	Feeler Gauge Set 303-D027 (D81L-4201-A) or equivalent
 ST1246-A	Straight Edge 303-D039 (D83L-4201-A) or equivalent

1. Use the special tools to inspect the cylinder block for flatness. If the cylinder block is distorted, install a new cylinder block. Refer to the appropriate section in Group [303](#) for the procedure.

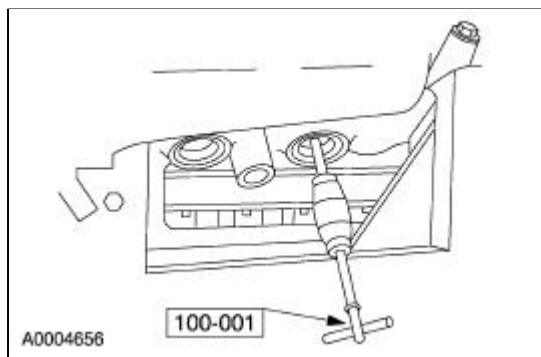


Cylinder Block —Core Plug Replacement

Special Tool(s)



1. Use the special tool to remove the cylinder block core plug.



2. Inspect the cylinder block plug bore for any damage that would interfere with the correct sealing of the plug. If the cylinder block plug bore is damaged, bore for the next oversize plug.
3. **NOTE:** Oversize plugs are identified by the OS stamped in the flat located on the cup side of the plug.

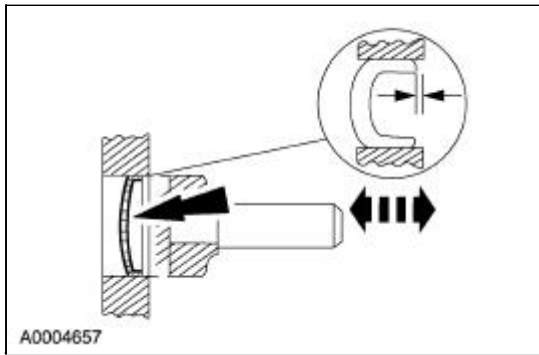
Coat the cylinder block core plug and bore lightly with Threadlock® 262 E2FZ-19554-B or equivalent meeting Ford specification WSK-M2G351-A6 and install the cylinder block core plug.

Cup-Type

4.  **CAUTION:** Use care during this procedure so as not to disturb or distort the cup sealing surface.

 **CAUTION:** When installed, the flanged edge must be below the chamfered edge of the bore to effectively seal the bore.

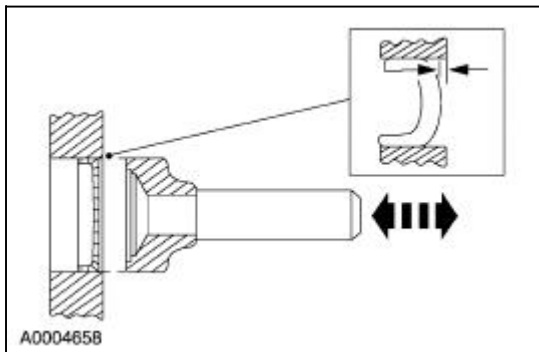
Use a tooling suitable to seat the cup type cylinder block core plug.



Expansion-Type


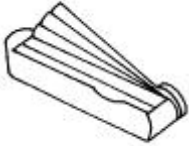
1.  **CAUTION:** Do not contact the crown when installing an expansion type cylinder block core plug. This could expand the plug before seating and result in leakage.

Use tooling suitable to seat the expansion type cylinder block core plug.

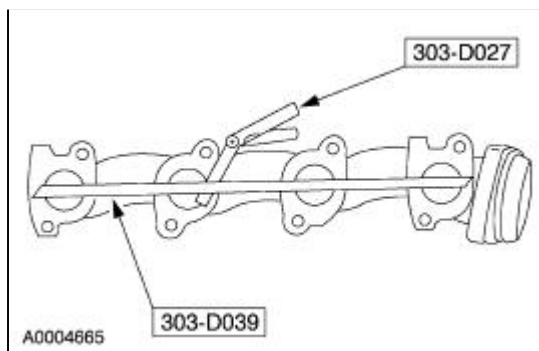


Exhaust Manifold — Inspection

Special Tool(s)

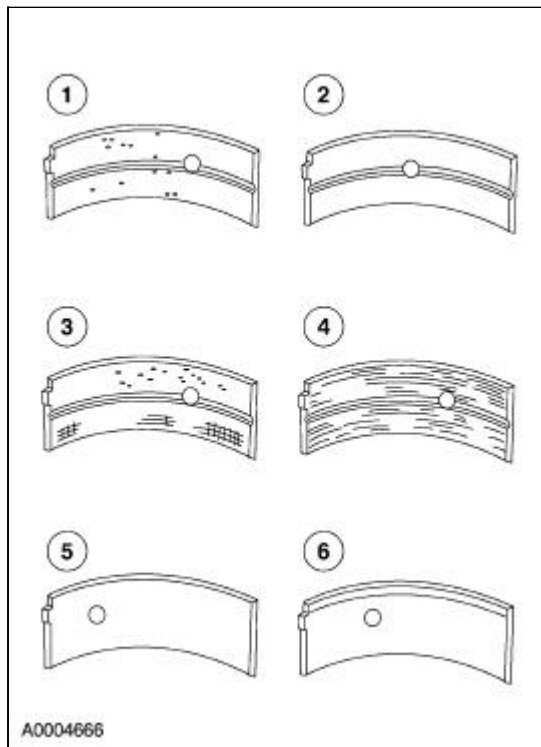
 ST1246-A	Straight Edge 303-D039 (D83L-4201-A) or equivalent
 ST1271-A	Feeler Gauge Set 303-D027 (D81L-4201-A) or equivalent

1. Use the special tools to check for warping.



Bearing — Inspection

1. Inspect bearings for the following defects. Possible causes are shown:
 1. cratering—fatigue failure
 2. spot glazing—incorrect seating
 3. scratching—dirty
 4. base exposed—poor lubrication
 5. both edges worn—journal damaged
 6. one edge worn—journal tapered or bearing not seated



General Specifications

Item	Specification
Metal Surface Cleaner F4AZ-19A536-RA	WSE-M5B392-A
Silicone Gasket and Sealant F7AZ-19554-EA	WSE-M4G323-A4
Super Premium SAE 5W-30 Motor Oil XO-5W30-QSP	WSS-M2C153-G
Engine oil capacity (with filter change)	6.5 Liters (6.9 Quarts)

General Specifications

Item	Specification
Intake valve clearance	0.175 mm - 0.225 mm (0.0069 in - 0.0089 in)
Exhaust valve clearance	0.325 mm - 0.375 mm (0.0128 in - 0.0148 in)

Torque Specifications

Description	Nm	lb-ft	lb-in
Ignition coil bolts	6	—	53
Valve cover studs and bolts	10	—	89
Upper intake manifold bolts	10	—	89
Front intake manifold support nut	10	—	89
Lower intake manifold bolts	10	—	89
Differential pressure feedback EGR nuts	6	—	53
Coolant outlet tube bolts	25	18	—
Coolant inlet tube bolts	25	18	—
Crankshaft position sensor bolts	10	—	89
Camshaft journal cap bolts	11	1	—
Camshaft position sensor bolt	10	—	89
Exhaust manifold nuts	20	15	—
Oil level indicator tube stud bolt	10	—	89
Oil pan bolts	25	18	—
Oil pressure switch	14	10	—
Oil pump bolts	10	—	89
Oil separator bolts	10	—	89
Oil pump screen tube bolts	10	—	89
Oil filter adapter bolts	25	18	—

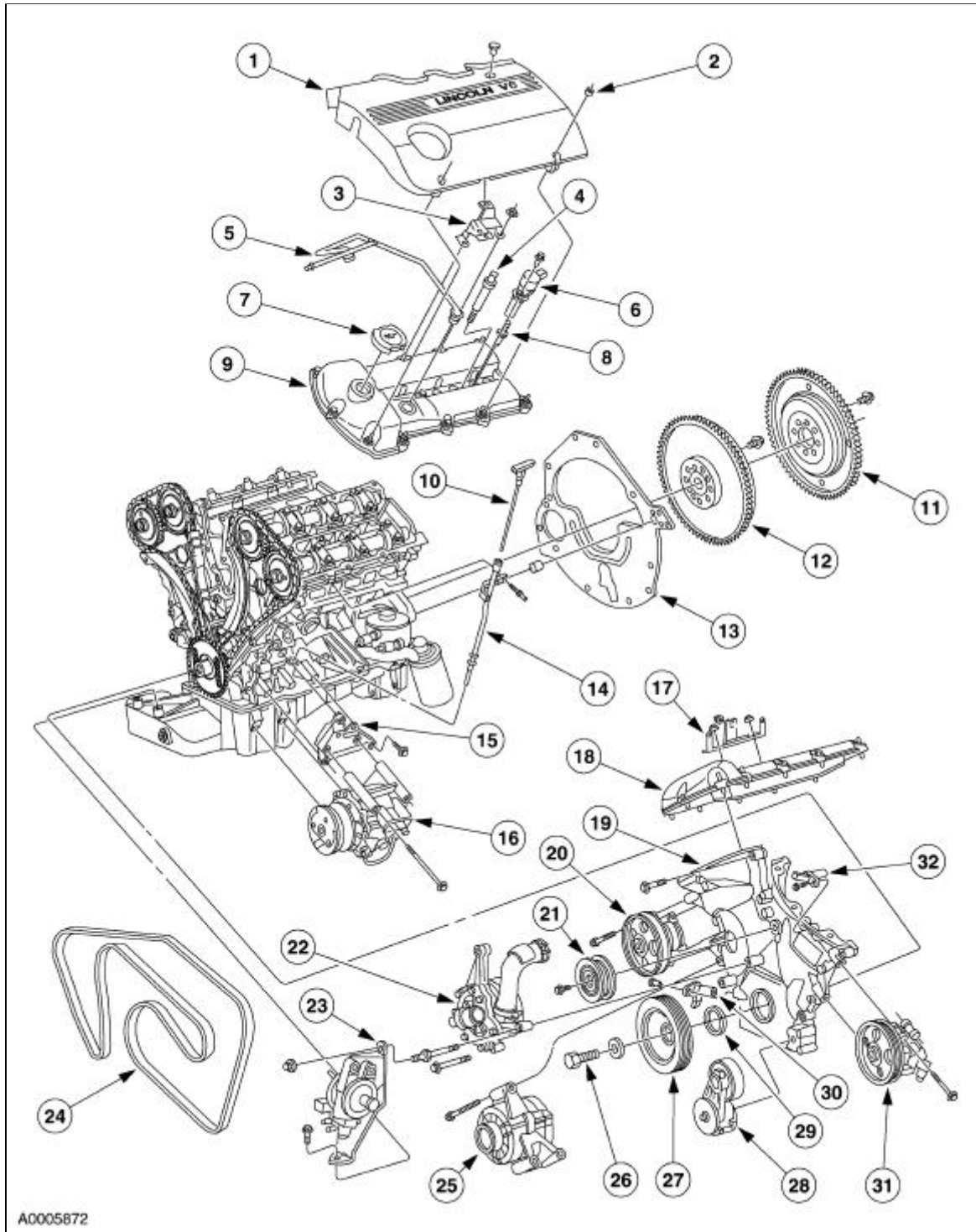
Oil filter adapter bolt (large single)	1	1	—
EGR to exhaust manifold tube	40	30	—
Upper intake support bolt	10	—	89
Upper intake support bracket nuts	6	—	53
Oil cooler bolt	57	42	—
Spark plugs	15	11	—
Upper intake support bracket nut	10	—	89
LH and RH engine mount nuts	63	46	—
Power steering pump bolts	25	18	—
Cable bracket nut	10	—	89
A/C manifold bolt	21	15	—
A/C line bracket	10	—	89
Secondary air tube connector	38	28	—
Cylinder head bolts	1	1	—
Lower cylinder block bolts	1	1	—
Generator mounting bolts	48	35	—
A/C compressor mounting bracket bolts	25	18	—
Engine mount bolts	63	46	—
Engine mount nuts	63	46	—
Engine mount bracket bolts	25	18	—
Flywheel bolts	80	59	—
Connecting rod cap nuts	1	1	—
Front cover bolts and studs	25	18	—
Crankshaft damper bolts	1	1	—
Belt tensioner bolt	48	35	—
Belt idler pulley bolt	25	18	—
Transmission cooler line bracket bolt	11	—	8
Torque converter nuts	31-39	23-28	—
Cylinder head temperature sensor	15	11	—
Timing chain guide bolts	25	18	—
Timing chain tensioner bolts	25	18	—
Exhaust manifold heat shield bolts	10	—	89
Power steering reservoir bolts	12	9	—
Power steering pump bolts	25	18	—
Power steering line bracket bolt	10	—	89
Hydraulic cooling fan pump bolts	25	18	—
Hydraulic cooling fan reservoir bolts	12	9	—
Water pump bolts and studs	25	18	—
Cross vehicle support bolts	20	15	—
Ground strap to body bolt	10	—	89
Ground strap to engine stud bolt and nut	10	—	89

Steering shaft clamp bolt	25	18	—
Starter studs and bolt	25	18	—
Transmission oil cooler lines	20	15	—
Engine to transmission bolts	45	35	—
Radio ignition interference capacitor bolts	10	—	89
Knock sensor bolts	25	18	—
Front crossmember bolts	103	76	—
Center crossmember bolts	103	76	—
Lower strut mount bolts	175	129	—
Upper ball joint nuts	90	66	—
Lower stabilizer link nut	55	41	—
Front brake caliper bolts	103	76	—
Throttle cable bracket bolts	10	—	89
Upper radiator support bracket bolts	10	—	89
Fuel pressure sensor shield bolts	10	—	89
Fuel pressure sensor shield nut	6	—	53
Wiring harness to valve cover bracket nuts	6	—	53
Fuel line bracket bolt	10	—	89
Appearance cover bracket nuts	6	—	53
Transmission to oil pan bolts	45	35	—
Transmission cooler line bracket nut	10	—	89
A/C compressor bolts	25	18	—
Subframe bolts	104	77	—
Lower control arm through bolt	175	129	—
Steering gear nuts	103	76	—
Engine mount nuts (upper)	40	30	—
Main engine wiring harness connector bolt	10	—	89
Cable bracket nut	10	—	89

¹ Refer to the procedure in this section.

Engine

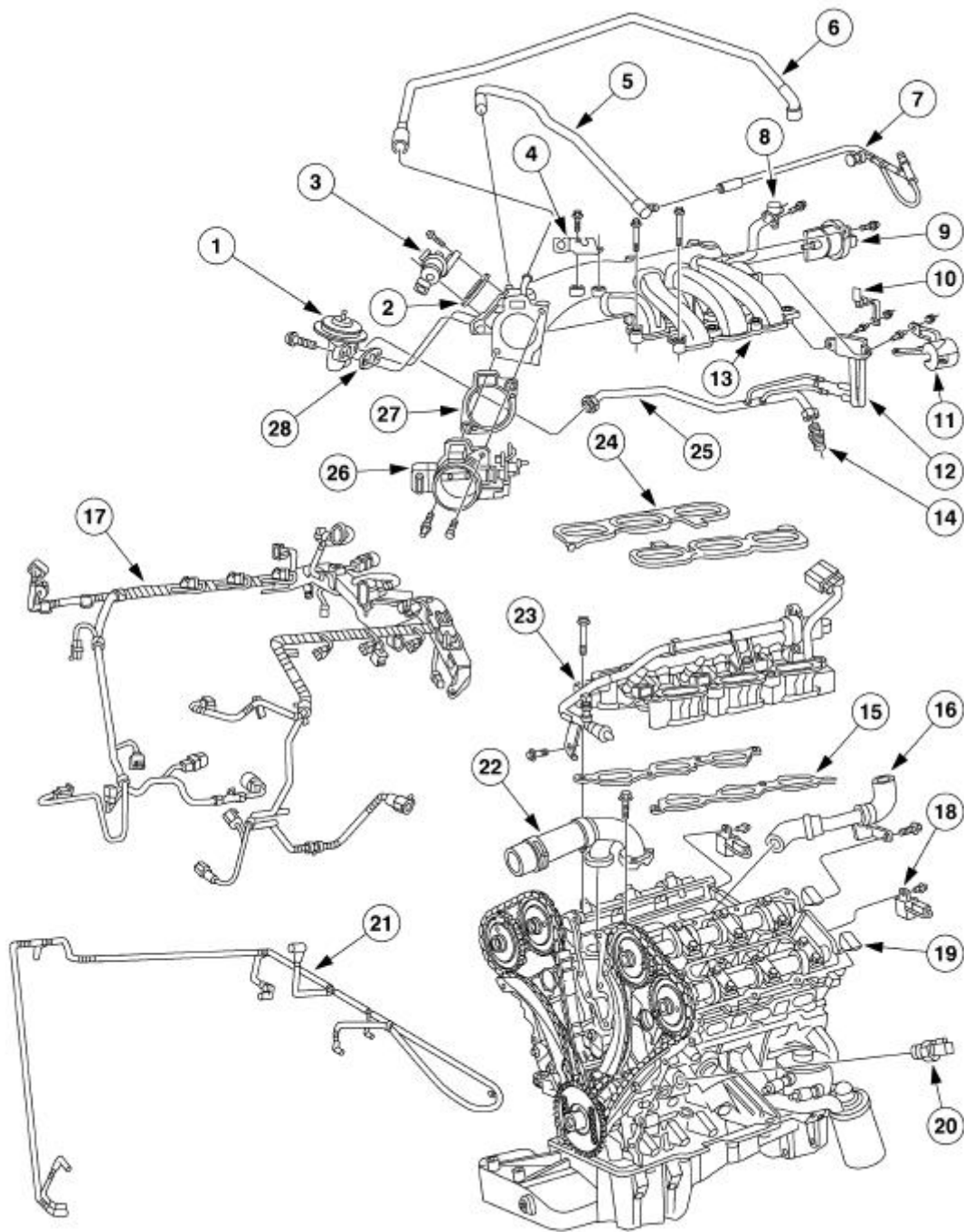
Engine Disassembled View



Item	Part Number	Description
1	6P068	Engine cover
2	6N030	Engine cover grommet

3	9J444	Appearance cover support bracket
4	6G004	Cylinder head temperature (CHT) sensor
5	6758	Crankcase vent tube
6	12A663	Ignition coil assembly
7	6766	Engine oil filler cap
8	12405	Spark plug
9	6A505	Valve cover — LH
10	6750	Engine oil level indicator
11	6375	Flexplate assy.
12	6477	Dual mass flywheel assy.
13	6A373	Engine rear plate
14	6754	Engine oil level indicator tube
15	19N586	A/C compressor mounting bracket
16	19D269	A/C compressor
17	9J444	Intake support bracket
18	6582	Valve cover — RH
19	6C086	Engine front cover assy.
20	8C648	Radiator cooling fan pump assy.
21	9C348	Accessory drive belt idler pulley
22	8501	Water pump assy.
23	9G442	Electronic thermactor air (ETA) valve and bracket
24	8620	Accessory drive belt
25	10300	Generator
26	W701512	Crankshaft pulley bolt
27	6316	Crankshaft pulley/damper
28	6B209	Accessory drivebelt tensioner
29	6700	Crankshaft front oil seal
30	6C315	Crankshaft position (CKP) sensor
31	3A696	Power steering pump
32	6B288	Camshaft position (CMP) sensor

Engine Disassembled View

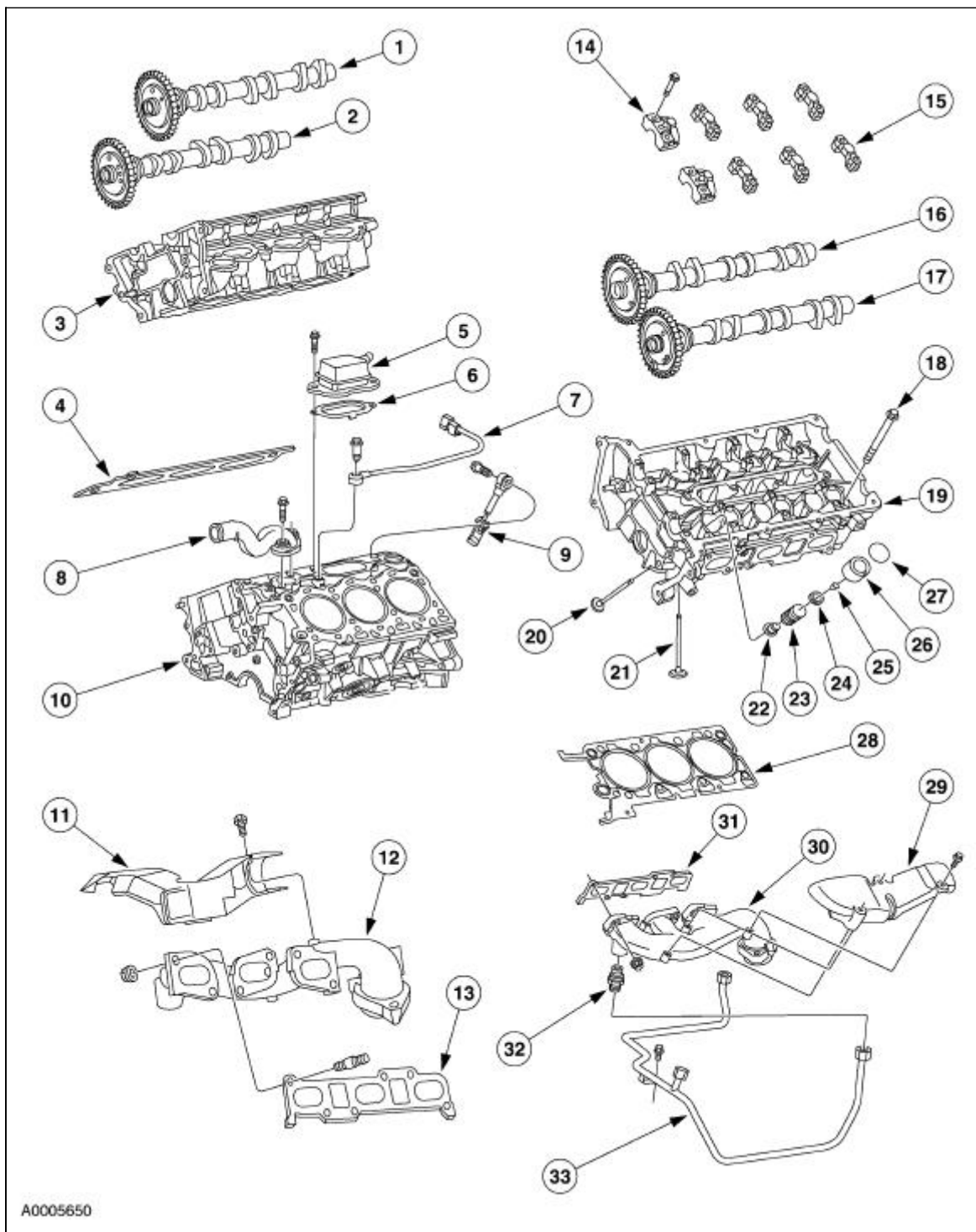


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Item	Part Number	Description
1	9D960	Exhaust gas recirculation (EGR) valve
2	9F560	Air bypass valve gasket
3	9F716	Air bypass valve
4	9728	Accelerator cable bracket
5	9D289	Fuel vapor tube assy.
6	6C324	Positive crankcase ventilation (PCV) tube and valve assy.
7	9D289	Fuel vapor tube assy.

8	9J459	Electronic vacuum regulator (EVR) solenoid
9	9L490	Intake air control valve
10	9D736	Accelerator cable support bracket
11	9G609	Fuel pressure sensor shield
12	9J433	Differential pressure feedback EGR transducer
13	9424	Upper intake manifold
14	9F485	EGR tube to exhaust manifold connector
15	9439	Lower intake manifold gasket
16	6C661	Crankcase vent tube and hose assy.
17	12B637	Wire harness assy.
18	18801	Radio ignition interference capacitor
19	6G017	Cap
20	9278	Oil pressure switch
21	9E498	Emission vacuum control harness
22	8548	Water bypass tube assy.
23	95447	Lower intake manifold assy.
24	9H486	Upper intake manifold gasket
25	9D477	EGR tube
26	9E926	Throttle body assy.
27	9E936	Throttle body gasket
28	9D476	EGR valve gasket

Engine Disassembled View



A0005650

Item	Part Number	Description
1	6A268	Intake camshaft
2	6A266	Exhaust camshaft
3	6049	Cylinder head
4	6051	Cylinder head gasket
5	6B673	Crankcase vent oil separator assy.
6	6B752	Oil separator to cylinder block gasket
7	12A699	Knock sensor
8	6A560	Water inlet tube assembly

9	12A699	Knock sensor
10	6010	Cylinder block
11	9A462	Exhaust manifold heat shield
12	9430	RH exhaust manifold
13	9448	Exhaust manifold gasket
14	6B280	Camshaft bearing cap
15	6B280	Camshaft bearing cap
16	6A267	Intake camshaft
17	6A269	Exhaust camshaft
18	6065	Cylinder head bolt
19	6050	Cylinder head
20	6507	Intake valve
21	6505	Exhaust valve
22	6A517	Seal and seat assy.
23	6513	Valve spring
24	6514	Retainer
25	6518	Key
26	6500	Tappet
27	6K514	Shim
28	6083	Cylinder head gasket
29	9Y427	Exhaust manifold heat shield
30	9431	LH exhaust manifold
31	9448	Exhaust manifold gasket
32	9D439	ETA tube adapter
33	9B480	ETA tube

The 3.0L (4V) (182 CID) is a 60 degree V-6 engine with dual overhead camshafts (DOHC), four valves per cylinder and sequential multiport fuel injection (SFI). The engine has:

- an aluminum upper intake manifold.
- a lower intake manifold.
- aluminum cylinder heads.
- a cast aluminum upper cylinder block.

The ignition system is electronic (distributorless) with a single ignition coil located above each spark plug. This high energy ignition system is required for fast-burn combustion.

A unique intake air system utilizes two separate plenums, one for each side of the engine. The plenums can be connected through the operation of a special intake manifold tuning valve (IMTV) to improve upper rpm power.

Identification

For quick identification refer to the safety certification decal:

- The decal is located on the LH front door lock face panel.
- An engine identification label is also attached to the engine.
- The symbol code on the identification tag identifies each engine for determining parts usage; for instance, engine displacement in liters or cubic inch displacement and model year.

Engine Code Information

The engine code information label is located on the front fender. The label contains, among other information:

- the engine calibration number
- the engine build date
- the engine plant code
- the engine code

Emission Calibration Label

NOTE: The engine codes and the calibration numbers must be used when making inquiries or ordering parts.

The emission calibration number label is located on the LH side door or LH door post pillar. It identifies:

- the engine calibration number
- the engine code number
- the revision level

These numbers are used to determine if parts are unique to specific engines.

Exhaust Emission Control System

Refer to the Powertrain Control/Emissions Diagnosis (PC/ED) manual.

Induction System

The fuel needed for burning in the cylinders is provided by a returnless, sequential multiport fuel injection (SFI).

- Fuel is supplied from the vehicle fuel tank by a high-pressure electric fuel pump mounted in the fuel tank.
- The fuel is filtered and sent to the fuel injection supply manifold.
- Fuel pressure is regulated by modulating pump output based upon readings from the fuel pressure sensor, located on the fuel rail.
- Fuel is metered into the intake air stream in accordance with engine by six solenoid operated fuel injectors mounted in the lower intake manifolds.
- The six fuel injectors are mounted above the intake valves and connected in series with the fuel pressure regulator.
- These fuel induction systems are mounted on a phenolic resin intake manifold.

Crankshaft

The crankshaft is supported on the bottom of the cylinder block by four steel-backed, over-plated, aluminum crankshaft main bearings.

To provide smooth engine operation, the piston crankpins are positioned to provide a power impulse every 120 degrees of crankshaft rotation. The spacing provides smooth and quiet operation.

Two sprockets and timing chains connect the crankshaft with the camshafts and provide a 2:1 drive ratio.

Camshaft

The camshafts:

- are supported on four bearing inserts.
- thrust loads and end play are limited by a camshaft thrust plate.

Cylinder Head

The spark plug is installed in the center of the fuel/air roof-shaped combustion chamber to ignite the mixture in the combustion chamber. The central location of the spark plug causes the flame front to be evenly spread across the chamber, which also reduces spark knock.

Valve Train

Both camshafts are driven by a shared timing chain, and operate four valves per cylinder by means of an selective shim setting on the top of a tappet. One spring on each valve is used to close the valve. The adjusting shims in the valve tappets can be changed to correct the valve clearance. These are available in 44 different thicknesses. The shim thickness is ink printed on the back of the shim. Using a special procedure, the camshafts can be lifted without timing chain disassembly to change the shims. A high degree of accuracy is required during adjusting to avoid repeated changing of the shims. The camshaft cams run concentrically on the valve tappets. At engine speeds of about 3,000 rpm this causes the tappets to rotate, and they in turn transfer the rotation to the valves. This valve rotation is required because it produces an even valve seating and prevents the valves from wearing in a certain position which could cause them to leak.

Positive Crankcase Ventilation System

The engine is equipped with a positive, closed-type crankcase ventilation system which recycles the crankcase vapors to the throttle body.

Engine Lubrication System

The engine lubrication system is of the force-feed type in which oil is supplied under full pressure to the crankshaft, connecting rod bearings and timing chain tensioners. The flow of oil to the valve tappets and valve train is controlled by a restricting orifice located in the head gaskets.

Oil Pump

The lubrication system is designed to provide optimum oil flow to critical components of the engine through its entire operating range.

The heart of the system is a positive displacement internal gear oil pump. Generically this design is known as a G-rotor pump.

- The oil pump is mounted on the front face of the cylinder block.
- The inner rotor is piloted on the crankshaft post and is driven through the crankshaft.

System pressure is limited by an integral, internally vented relief valve which directs the bypassed oil back to the inlet side of the oil pump.

- Oil pump displacement has been selected to provide adequate volume so there is correct oil pressure both at hot idle and maximum speed.
- Relief valve calibration protects the system from excessive pressure during high viscosity conditions, yet is designed to provide adequate connecting rod bearing lubrication under high temperature and high speed conditions.

Engine Cooling System

The engine is liquid-cooled:

- by a centrifugal water pump driven through the front engine accessory drive by the crankshaft.

A water thermostat is used to restrict coolant flow until the engine reaches normal operating temperature.

Oil Pan

The oil pan is cast aluminum and is attached to the cylinder block and transmission.

- The oil pan acts as a reservoir holding lubricating oil that is pumped through the engine by the oil pump after start up.

Drive Belt System

Accessories mounted on the front of the engine are belt-driven by the crankshaft and an automatically tensioned serpentine drive belt is routed over the following components:

- water pump
 - A/C compressor
 - generator
 - drive belt tensioner
 - drive belt idler pulley
 - crankshaft pulley
 - power steering pump pulley
 - cooling fan pump pulley
-

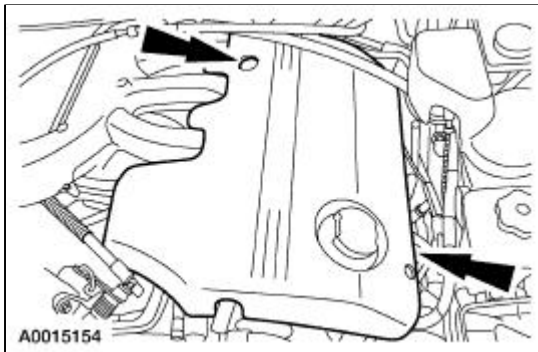
Engine

Refer to [Section 303-00](#) .

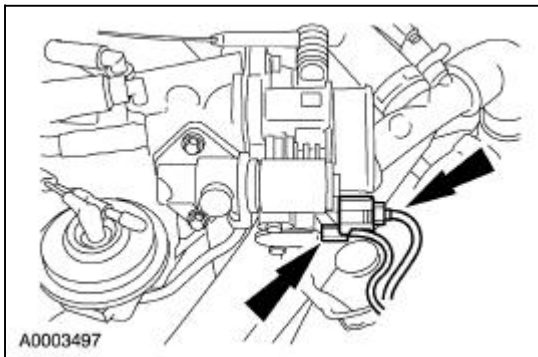
Intake Manifold —Upper

Removal

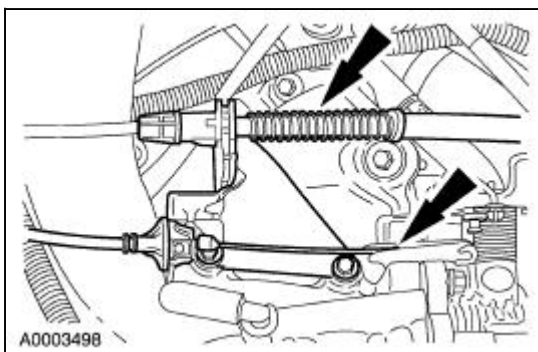
1. Disconnect the battery ground cable. For additional information, refer to Section 414-01.
2. Drain the engine cooling system. For additional information, refer to [Section 303-03](#).
3. Remove the engine appearance cover.



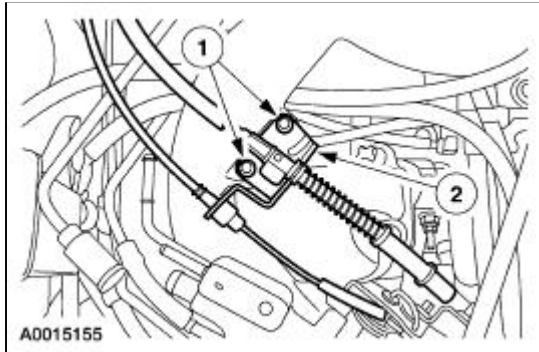
4. Remove the air cleaner outlet tube. For additional information, refer to [Section 303-12](#).
5. Disconnect the throttle position (TP) sensor and the idle air control (IAC) solenoid electrical connectors.



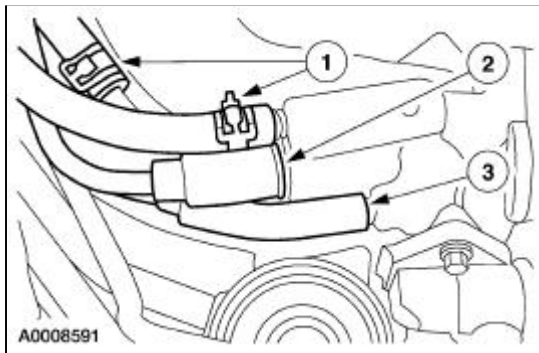
6. Disconnect the accelerator and speed control cables.



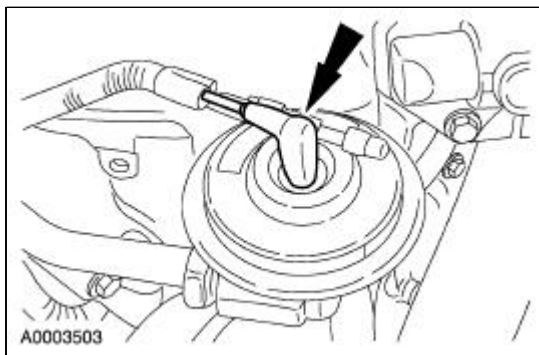
7. Remove the cable bracket.
 1. Remove the bolts.
 2. Remove the bracket.



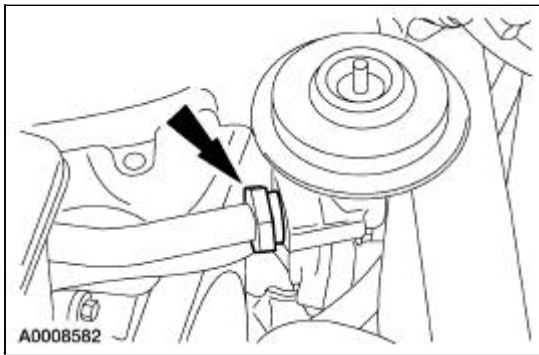
8. Disconnect the throttle body hoses.
 1. Disconnect the coolant hoses.
 2. Disconnect the positive crankcase ventilation (PCV) hose.
 3. Disconnect the vapor purge hose.



9. Disconnect the vacuum hose.

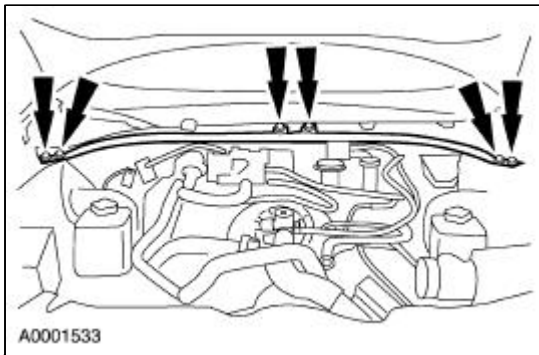


10. Disconnect the EGR to exhaust manifold tube nut.

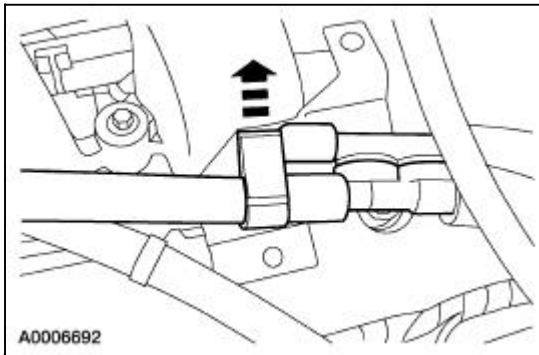


11. Remove the cowl vent screen. For additional information, refer to [Section 501-02](#).

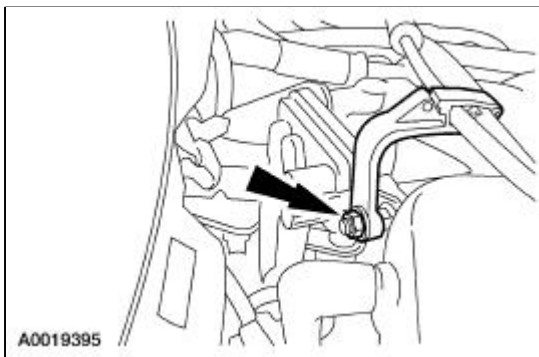
12. Remove the brace.



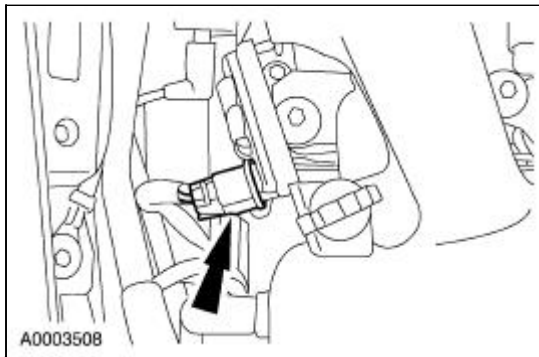
13. Remove the vacuum hoses from the mounting bracket.



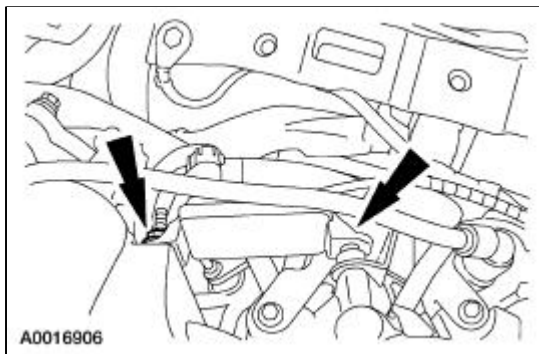
14. Remove the bracket and position the accelerator and cruise control cables aside.



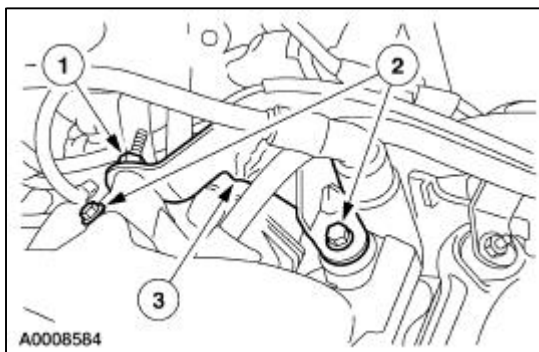
15. Disconnect the differential pressure feedback EGR electrical connector.



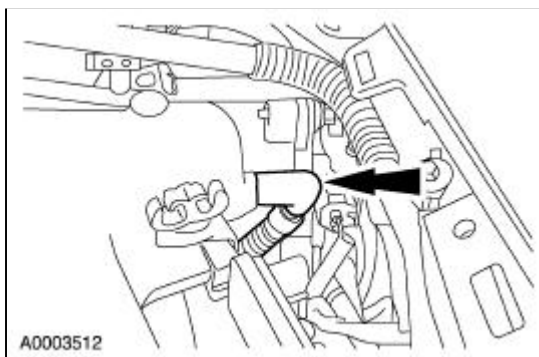
16. Remove the stud and nut and position the differential pressure feedback EGR transducer aside.



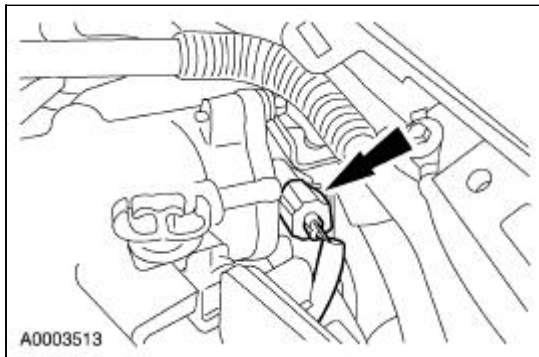
17. Remove the fuel pressure sensor shield.
 1. Remove the nut.
 2. Remove the bolts.
 3. Remove the shield.



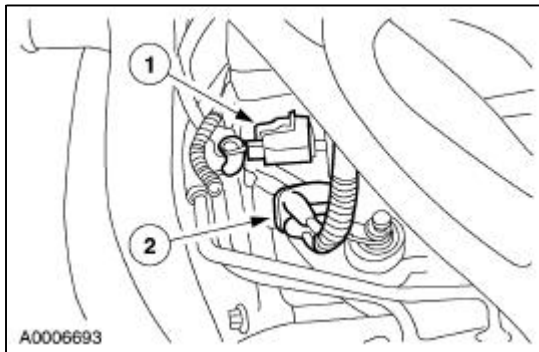
18. Disconnect the vacuum hose from the rear of the upper intake manifold.



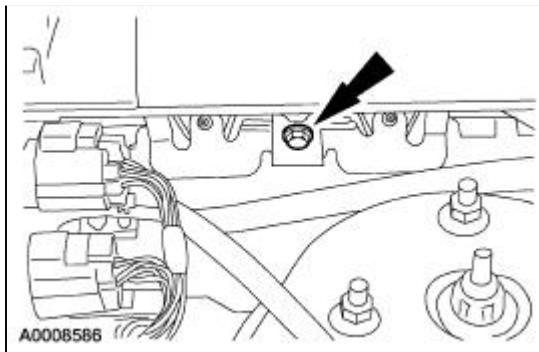
19. Disconnect the intake manifold tuning valve (IMTV) electrical connector.



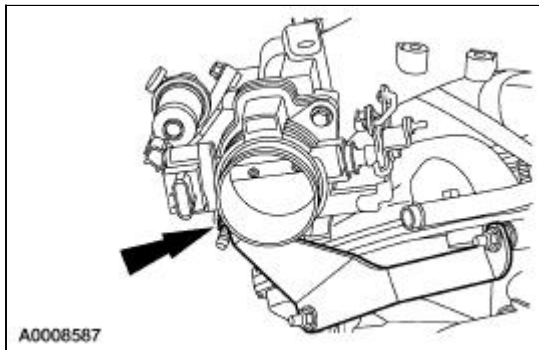
20. Disconnect the exhaust vacuum regulator (EVR).
 1. Disconnect the electrical connector.
 2. Disconnect the vacuum line.



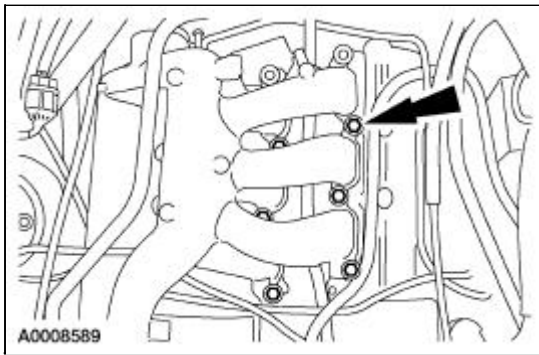
21. Remove the upper intake support bolt.



22. Remove the front intake manifold support bolt.

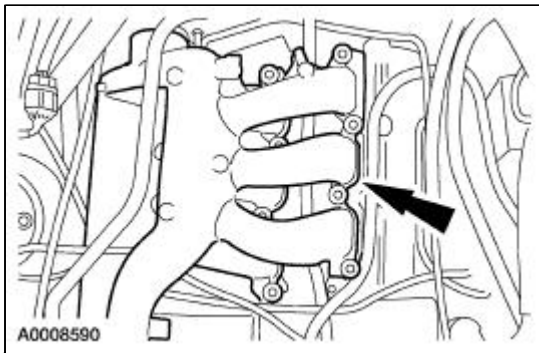


23. Remove the bolts and the upper intake manifold.
 - Inspect the gaskets and discard as necessary.

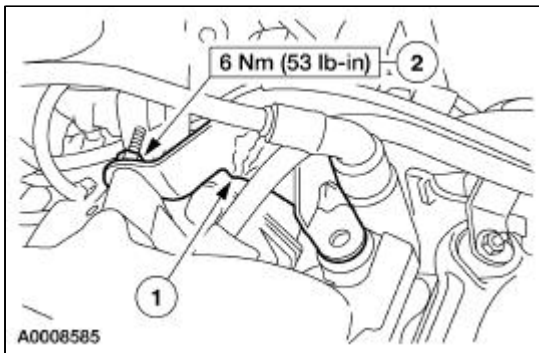


Installation

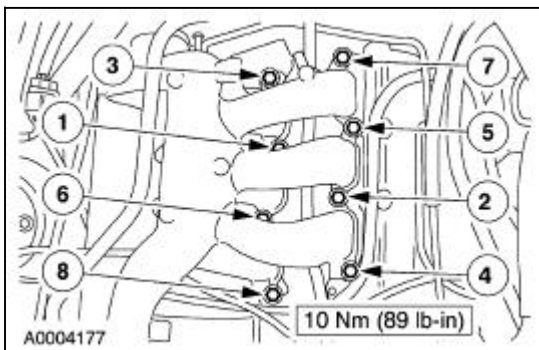
1. Position the upper intake manifold and gaskets.



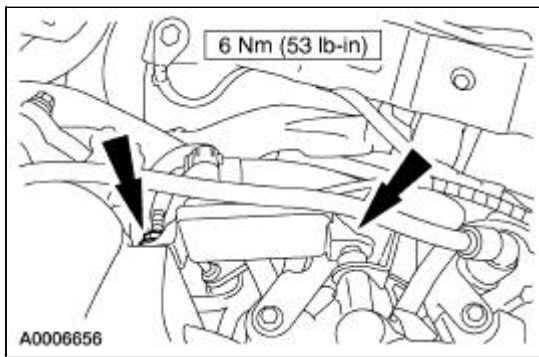
2. Install the fuel pressure sensor shield.
 1. Position the shield.
 2. Install the nut.



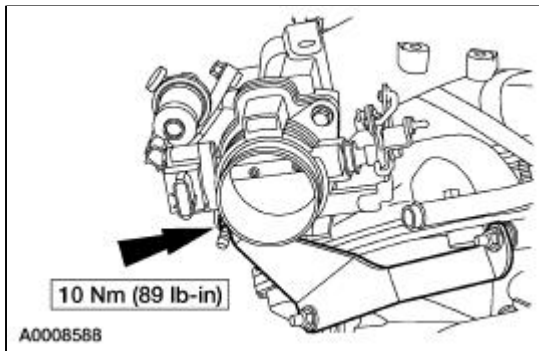
3. Install the upper intake manifold bolts and tighten in the sequence shown.



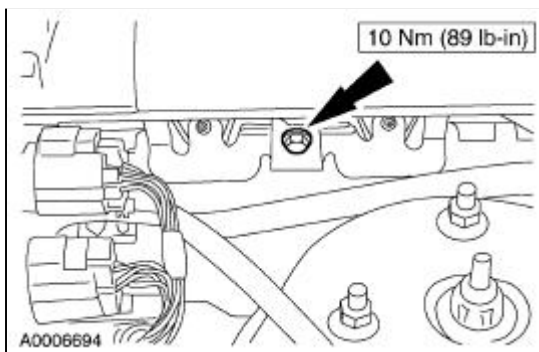
4. Position the differential pressure feedback EGR and install the nut and stud.



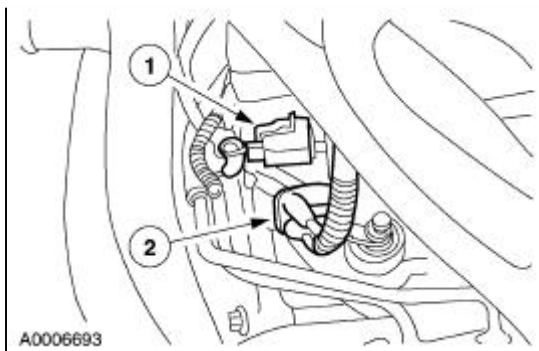
5. Install the upper intake manifold support bolt.



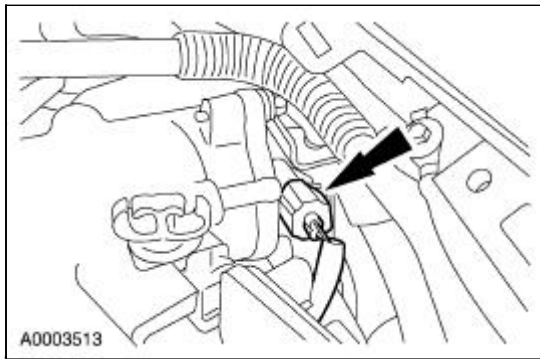
6. Install the upper intake support bolt.



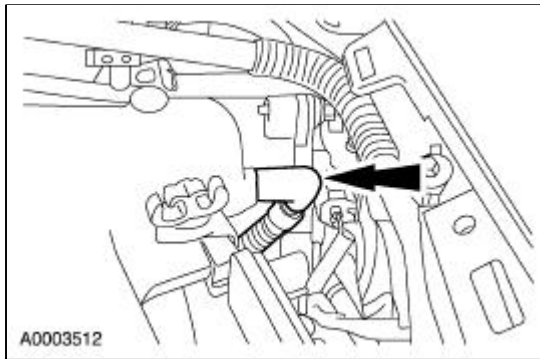
7. Connect the exhaust vacuum regulator (EVR).
 1. Connect the electrical connector.
 2. Connect the vacuum line.



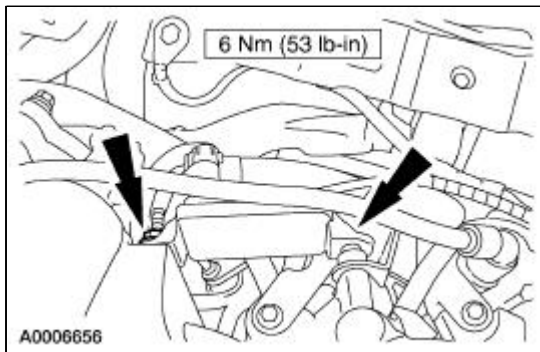
8. Connect the intake manifold tuning valve (IMTV) electrical connector.



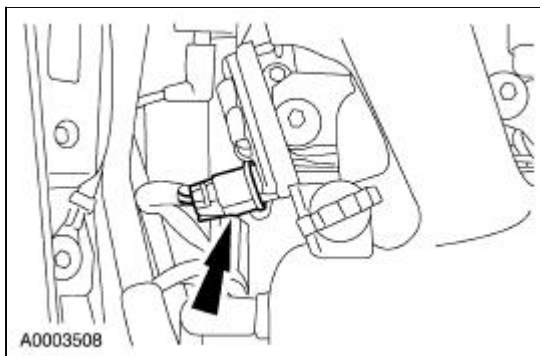
9. Connect the vacuum hose to the rear of the upper intake manifold.



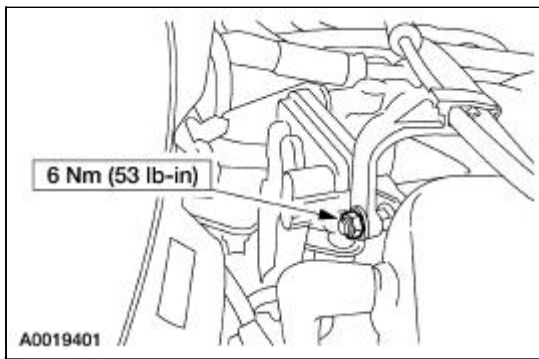
10. Position the differential pressure feedback EGR electrical connector.



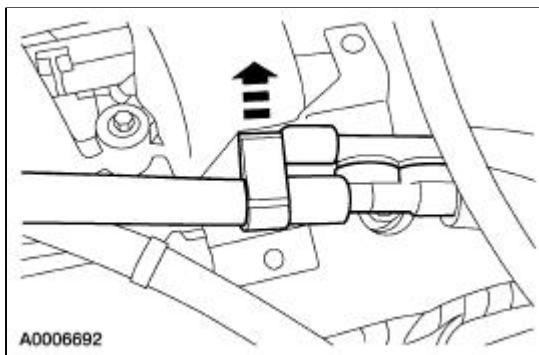
11. Connect the differential pressure feedback EGR electrical connector.



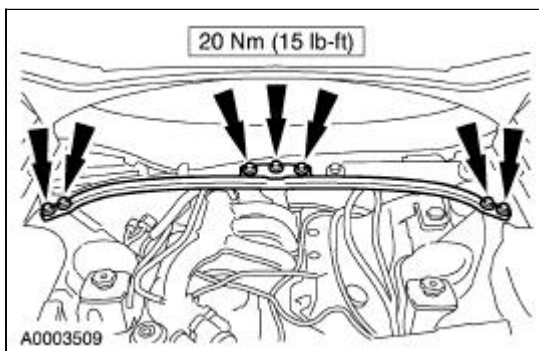
12. Position the accelerator and cruise control cables and install the bracket.



13. Clip the vacuum hoses into the mounting bracket.

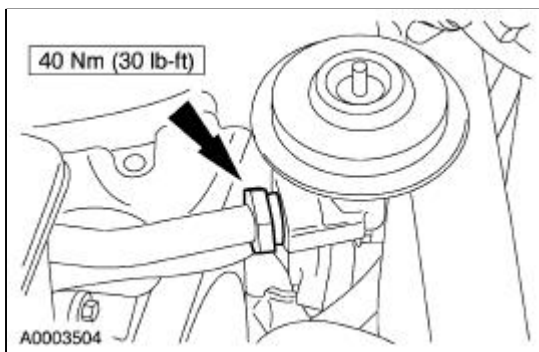


14. Install the brace.

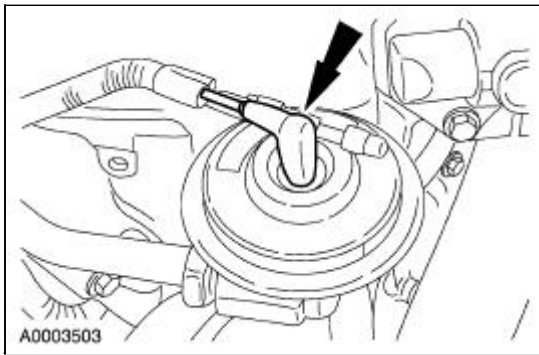


15. Install the cowl vent screen. Refer to [Section 501-02](#).

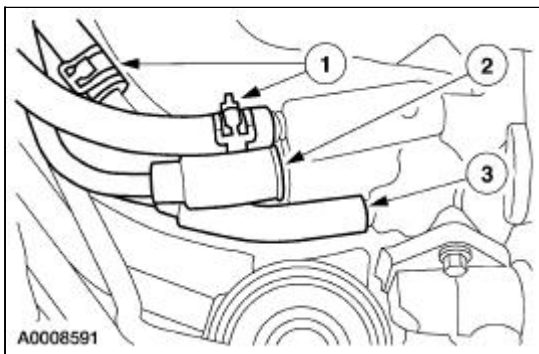
16. Connect the EGR to exhaust manifold tube nut.



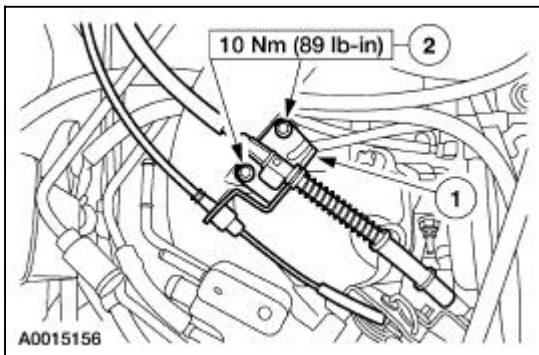
17. Connect the vacuum hose.



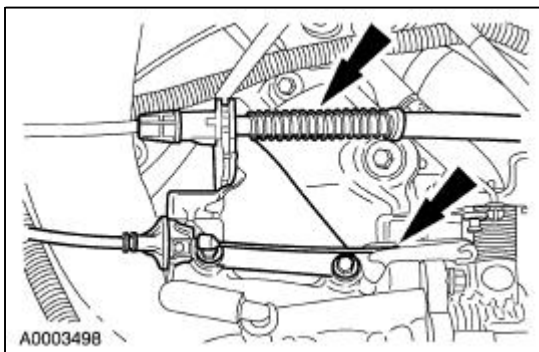
18. Connect the throttle body hoses.
 1. Connect the coolant hoses.
 2. Connect the PCV hose.
 3. Connect the vapor purge hose.



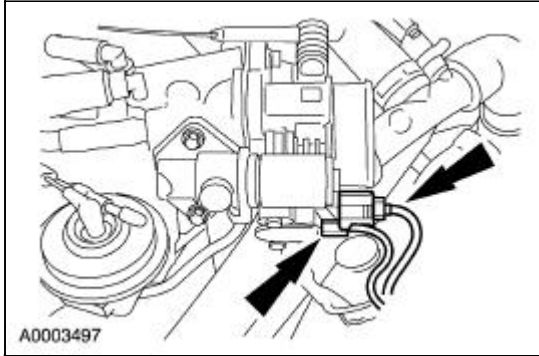
19. Install the cable bracket.
 1. Position the bracket.
 2. Install the bolts.



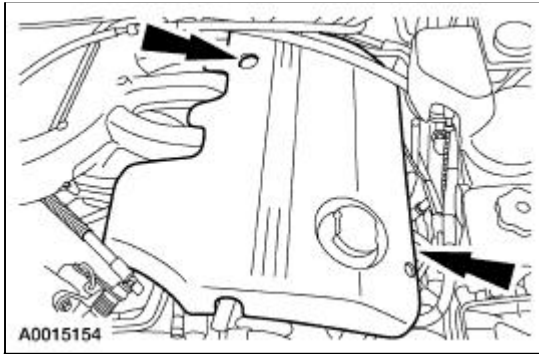
20. Connect the accelerator and speed control cables.



21. Connect the TP sensor and the IAC solenoid electrical connectors.



22. Install the air cleaner outlet tube. For additional information, refer to [Section 303-12](#).
23. Install the engine appearance cover.

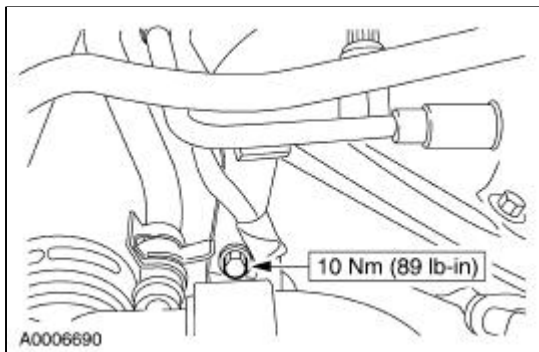


24. Fill the engine cooling system. For additional information, refer to [Section 303-03](#).
 25. Connect the battery ground cable. For additional information, refer to [Section 414-01](#).
-

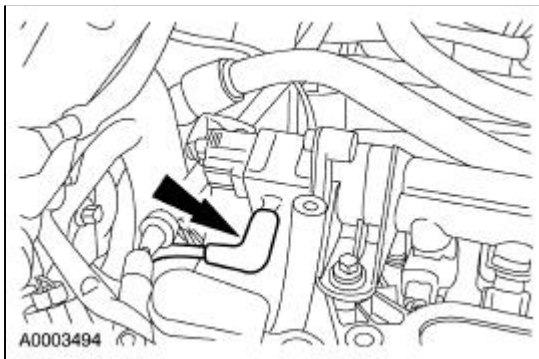
Intake Manifold —Lower

Removal

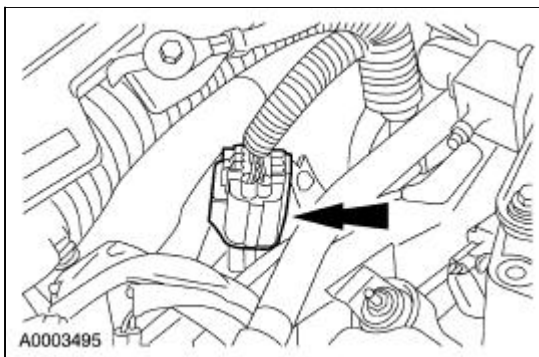
1. Remove the upper intake manifold. Refer to [Intake Manifold—Upper](#).
2. Disconnect the fuel line. For additional information, refer to [Section 310-00](#).
3. Remove the fuel line bracket bolt.



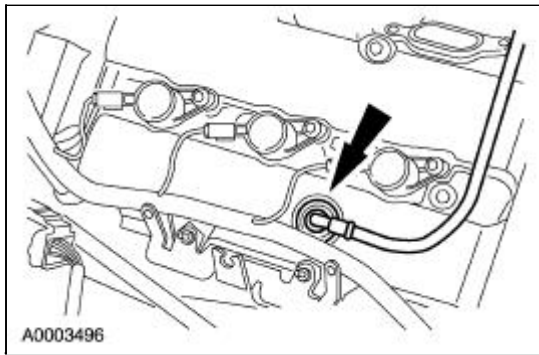
4. Disconnect the fuel pressure sensor vacuum line.



5. Disconnect the fuel charging wiring harness connector.

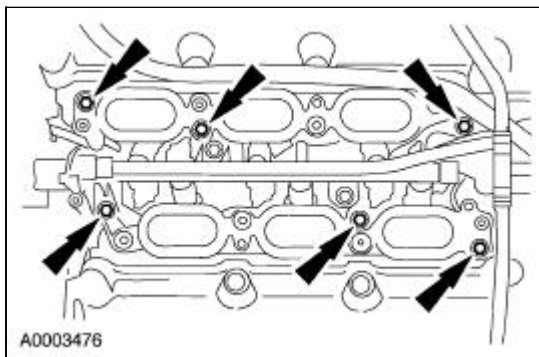


6. Disconnect the crankcase ventilation tube and position out of the way.

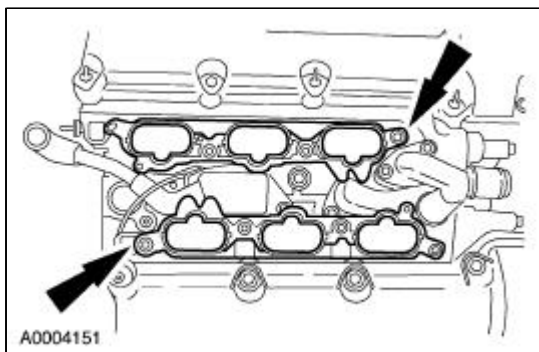


7.  **CAUTION:** Lower intake manifold and fuel injection supply manifold must be removed as an assembly.

Remove the bolts and the lower intake manifold.

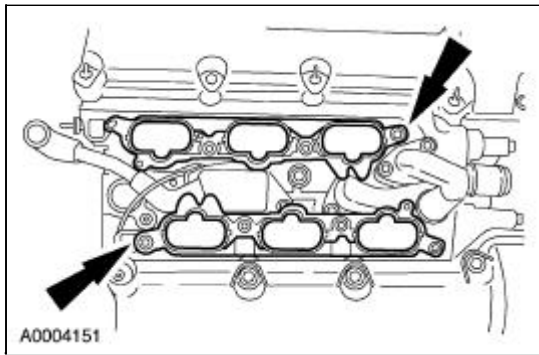


8. Remove the lower intake manifold gaskets.
- Inspect the gaskets and install new gaskets if necessary.

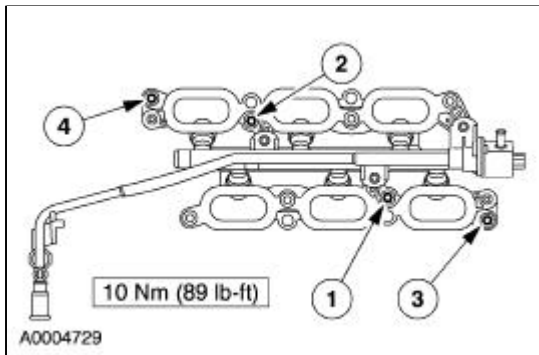


Installation

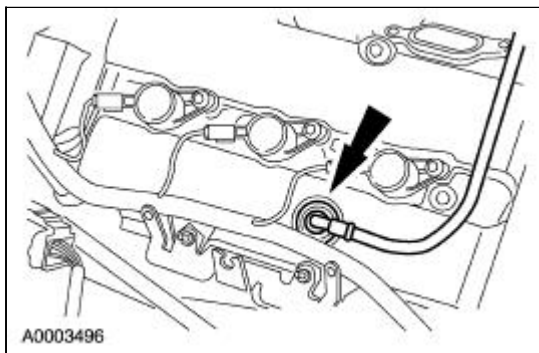
1. Position the lower intake manifold gaskets.



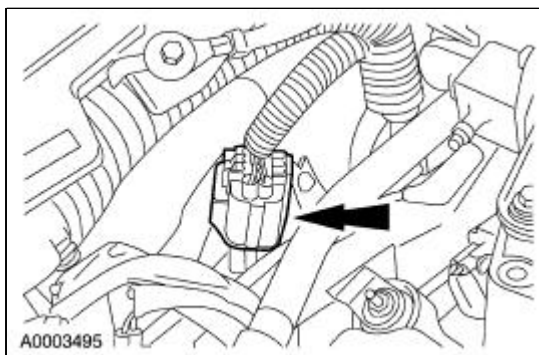
2. Position the lower intake manifold and install the bolts in the sequence shown.



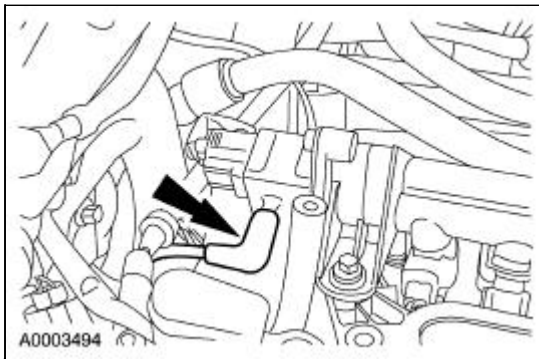
3. Connect the crankcase ventilation tube.



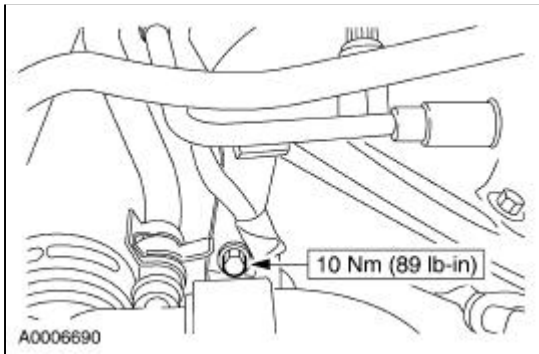
4. Connect the fuel charging wiring harness connector.



5. Connect the fuel pressure sensor vacuum line.



6. Install the fuel line bracket bolt.

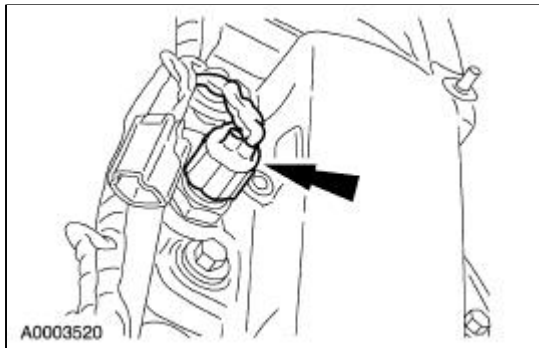


7. Connect the fuel line. For additional information, refer to [Section 310-00](#).
 8. Install the upper intake manifold. For additional information, refer to [Intake Manifold—Upper](#).
-

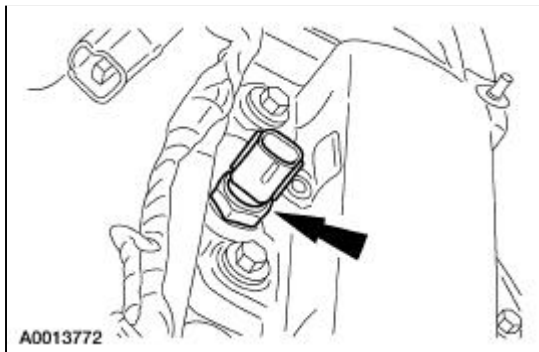
Valve Cover —LH

Removal

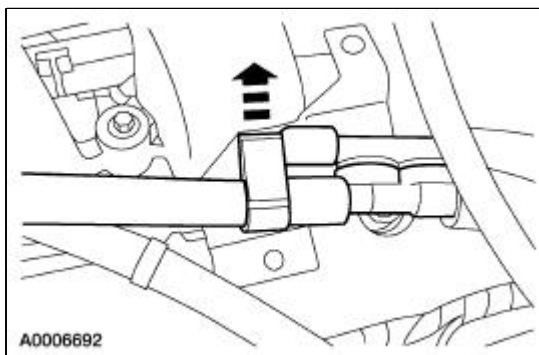
1. Disconnect the battery ground cable. For additional information, refer to [Section 414-01](#).
2. Remove the LH ignition coils. For additional information, refer to [Section 303-07A](#).
3. Disconnect the cylinder head temperature (CHT) electrical connector.



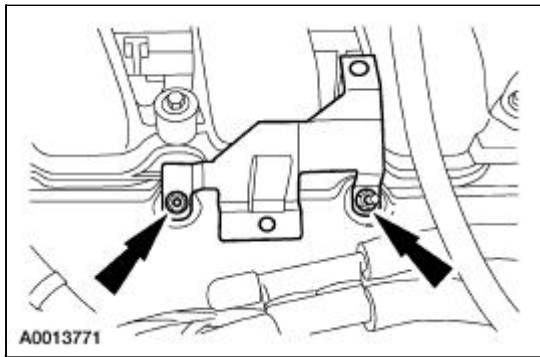
4. Remove the CHT sensor.



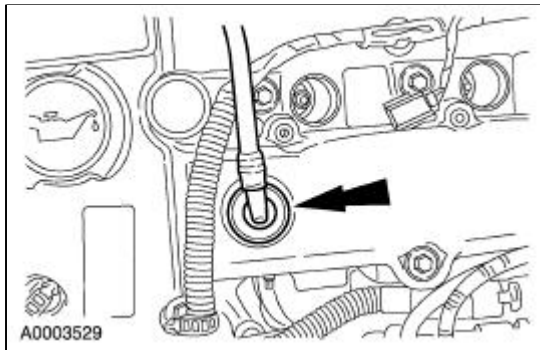
5. Remove the vacuum hoses from the appearance cover support bracket.



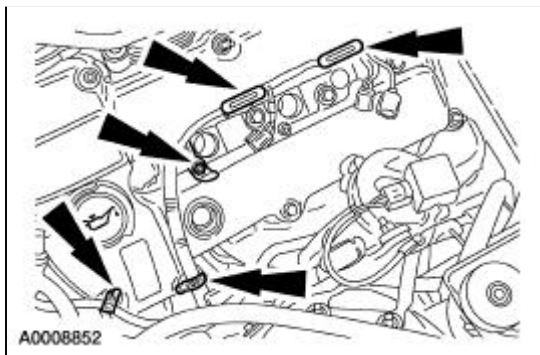
6. Remove the nuts and the appearance cover support bracket.



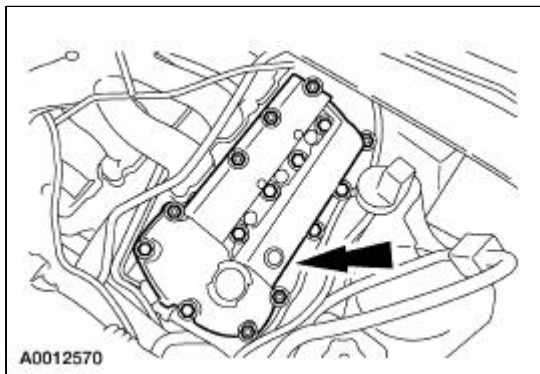
7. Disconnect the positive crankcase ventilation (PCV) tube and position aside.



8. Remove the ignition coil wiring harness from the retainers.



9. Remove the studs, bolts, and the valve cover.
 - Discard the gasket.

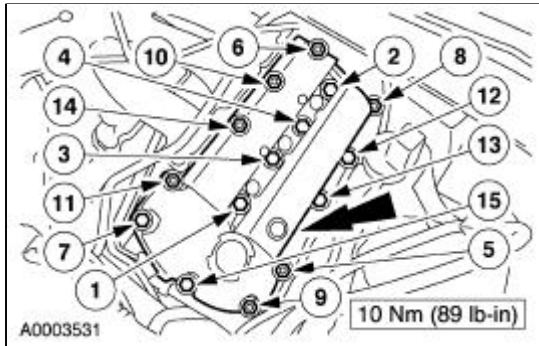


Installation

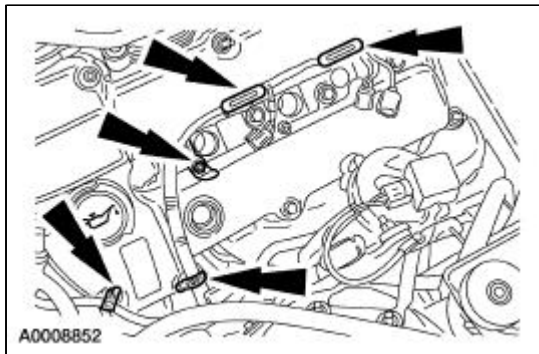
1. **NOTE:** Apply a 5 mm (0.2 in) bead of Silicone Gasket and Sealant F7AZ-19554-EA or equivalent meeting Ford specification WSE-M4G323 to the front cover joints.

Install a new gasket.

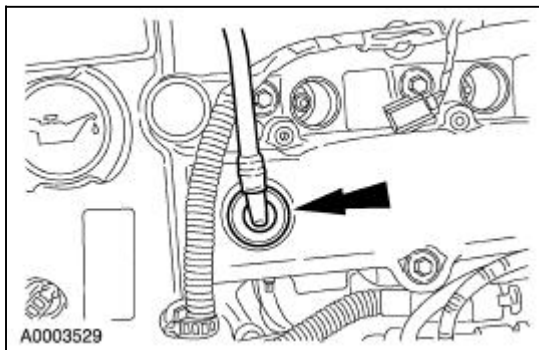
2. Position the valve cover and install the bolts and studs in the sequence shown.



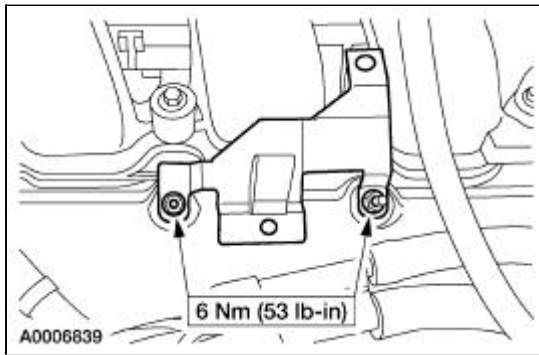
3. Install the ignition coil wiring harness onto the retainers.



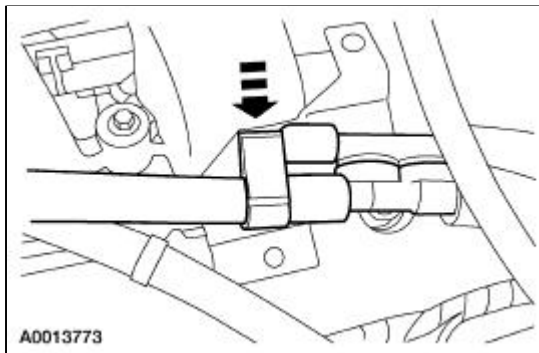
4. Connect the PCV tube.



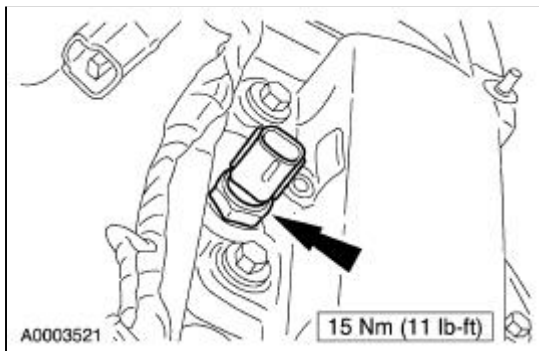
5. Install the appearance cover support bracket.



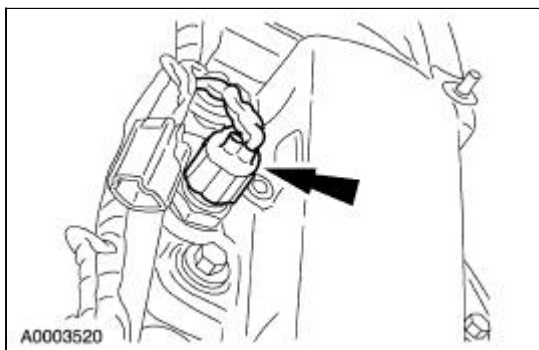
6. Install the vacuum hoses to the appearance cover support bracket.



7. Install the CHT sensor.



8. Connect the CHT electrical connector.

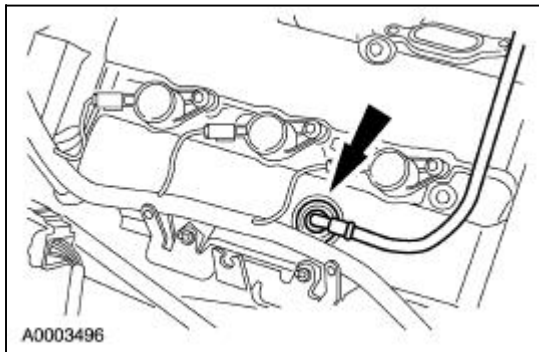


9. Install the LH ignition coils. For additional information, refer to [Section 303-07A](#).
-

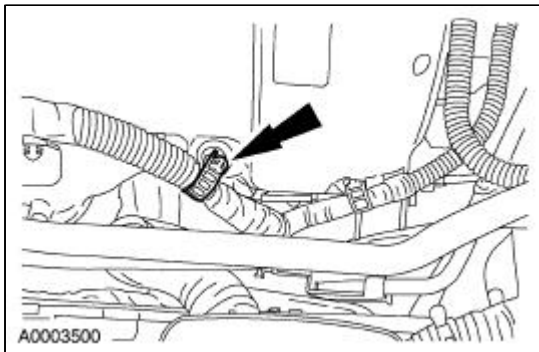
Valve Cover —RH

Removal

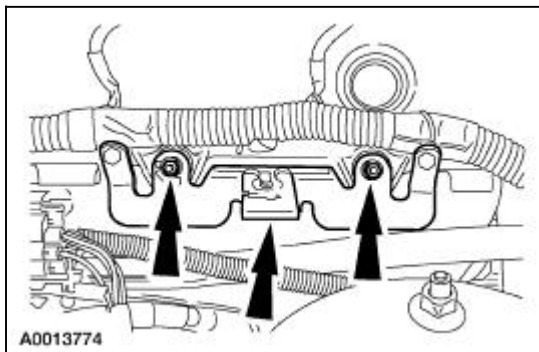
1. Disconnect the positive crankcase ventilation (PCV) tube and position aside.



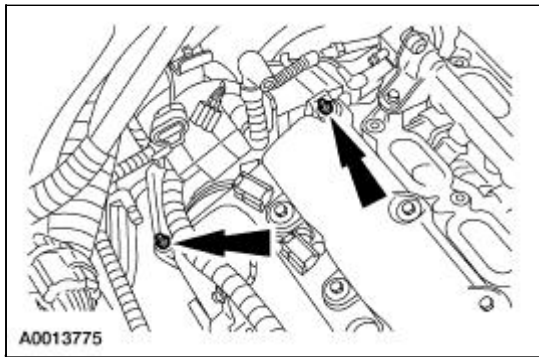
2. Remove the RH ignition coils. For additional information, refer to [Section 303-07A](#).
3. Remove the wiring harness retainer from the stud.



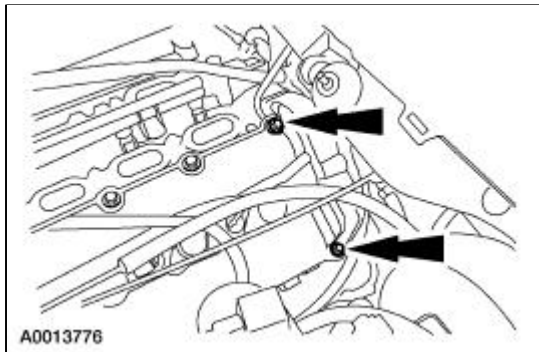
4. Remove the nuts and position the upper intake manifold support bracket aside.



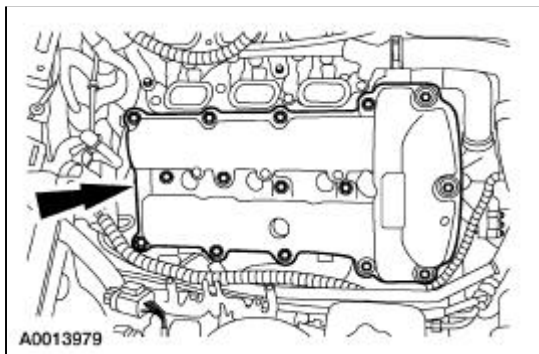
5. Remove the wiring harness bracket nuts.



6. Remove the wiring harness bracket nuts and position the wiring harness aside.



7. Remove the studs, bolts, and the valve cover.
 - Discard the gasket.

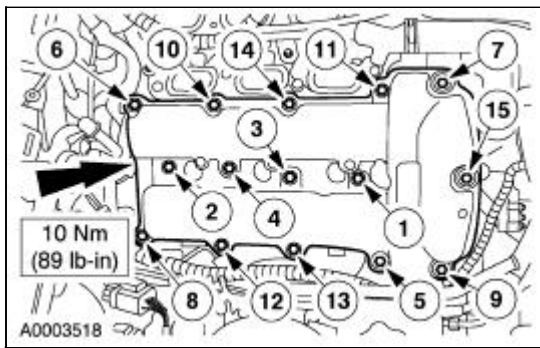


Installation

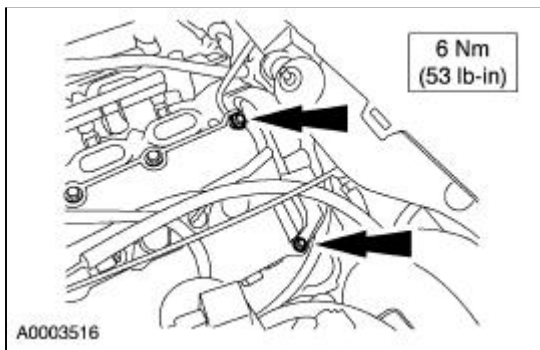
1. **NOTE:** Apply a 5 mm (0.2 in) bead of Silicone Gasket and Sealant F7AZ-19554-EA or equivalent meeting Ford specification WSE-M4G323-A4 to the front cover joints.

Install a new gasket.

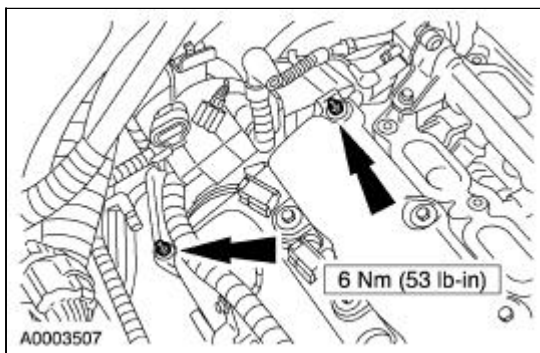
2. Position the valve cover and install the bolts and studs in the sequence shown.



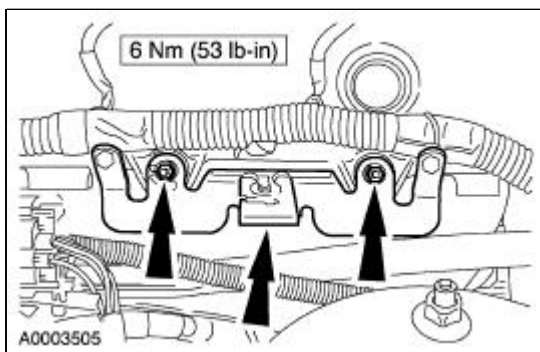
3. Install the wiring harness bracket and nuts.



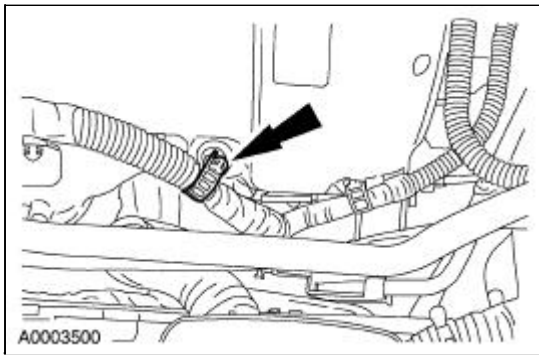
4. Install the wiring harness bracket nuts.



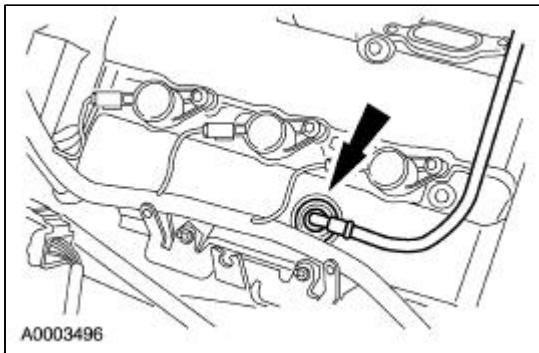
5. Install the upper intake manifold support bracket.



6. Install the wiring harness retainer onto the stud.




7. Install the RH ignition coils. For additional information, refer to [Section 303-07A](#).
8. Connect the PCV tube.



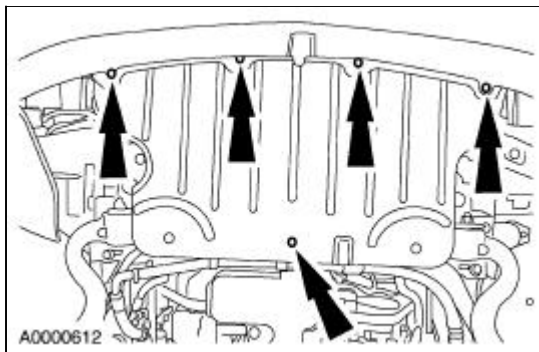
Crankshaft Pulley

Special Tool(s)

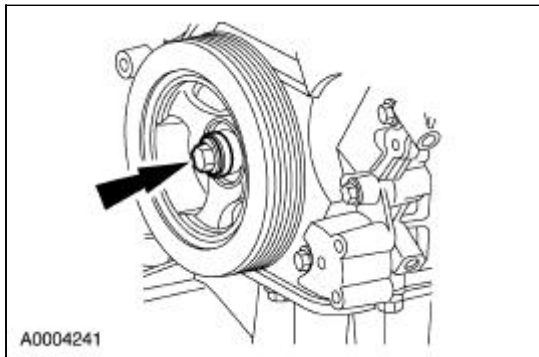
 ST1287-A	Crankshaft Damper Replacer 303-102 (T74P-6316-B)
 ST1184-A	Crankshaft Damper Remover 303-D121
 ST1438-A	Strap Wrench 303-D055 (D85L-6000-A)


Removal

1. Remove the accessory drive belt. For additional information, refer to [Section 303-05](#).
2. If equipped, remove the secondary air valve, bracket and tube. For additional information, refer to [Section 303-08](#).
3. Raise and support the vehicle. For additional information, refer to [Section 100-02](#).
4. Remove the front center splash panel.

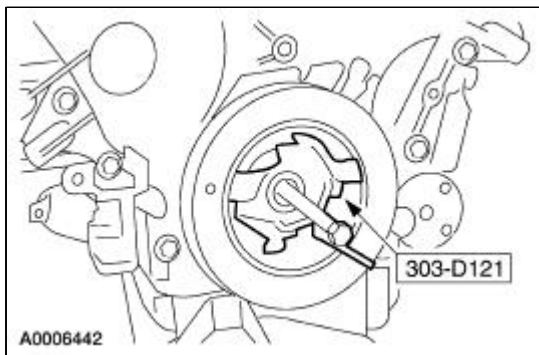


5. Remove the crankshaft pulley bolt and washer.
 - Discard the bolt.



6.  **CAUTION:** The special tool must grab the inside of the damper, or damage to the damper may occur.

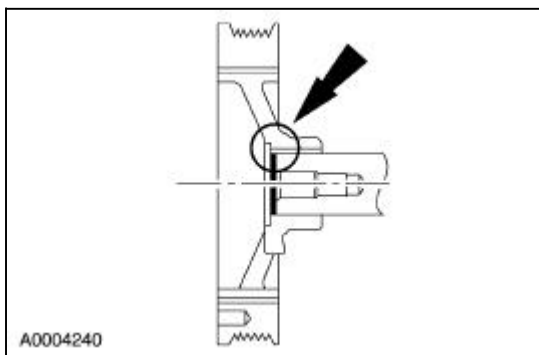
Using the special tool, remove the crankshaft damper.



Installation

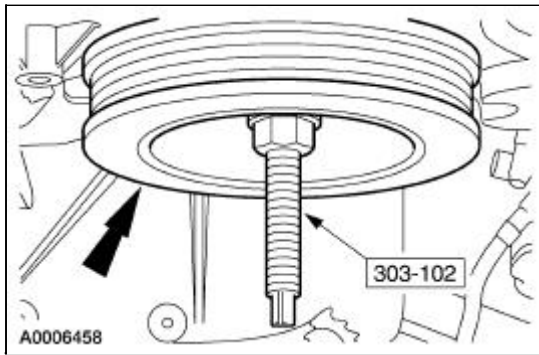
1. **NOTE:** Seal surface must be free of dirt and oil.

Apply Silicone Gasket and Sealant F7AZ-19554-EA or equivalent meeting Ford specification WSK-M2G343-A4, to the end of the keyway slot.



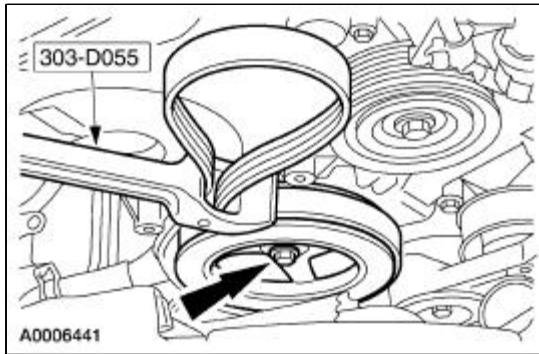
2. **NOTE:** Lubricate the outside diameter sealing surface of the crankshaft pulley with Super Premium SAE 5W-30 Motor Oil XO-5W30-QSP or equivalent meeting Ford specification WSS-M2C153-6.

Using the special tool, install the crankshaft pulley assembly.

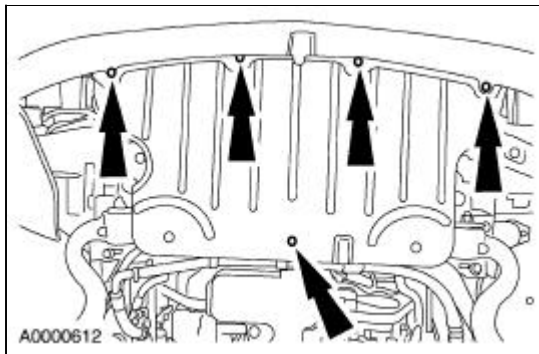


3. Using the special tool, install a new bolt and the washer.

- Tighten the bolt in four stages.
- Stage 1: Tighten to 120 Nm (89 lb-ft).
- Stage 2: Loosen one full turn (360 degrees).
- Stage 3: Tighten to 50 Nm (37 lb-ft).
- Stage 4: Tighten an additional 90 degrees.



4. Install the front center splash panel.



5. Lower the vehicle.

6. If equipped, install the secondary air valve, bracket and tube. For additional information, refer to [Section 303-08](#).

7. Install the accessory drive belt. For additional information, refer to [Section 303-05](#).

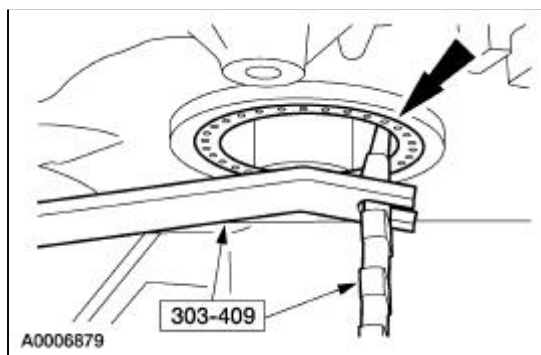
Crankshaft Front Oil Seal

Special Tool(s)

 ST1385-A	Seal Remover 303-409 (T92C-6700-CH)
 ST1328-A	Front Crankshaft Seal Installer 303-335

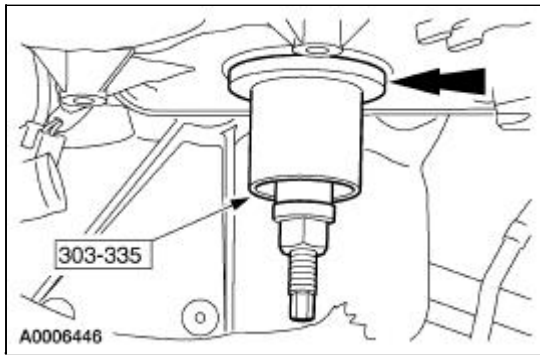
Removal

1. Remove the crankshaft pulley. For additional information, refer to [Crankshaft Pulley](#) in this section.
2. Using the special tool, remove the crankshaft front oil seal.



Installation

1. Lubricate the inside diameter of the seal with Super Premium SAE 5W-30 Motor Oil XO-5W30-QSP or equivalent meeting Ford specification WSS-M2C153-G.
2. Using the special tool, install the crankshaft front oil seal.

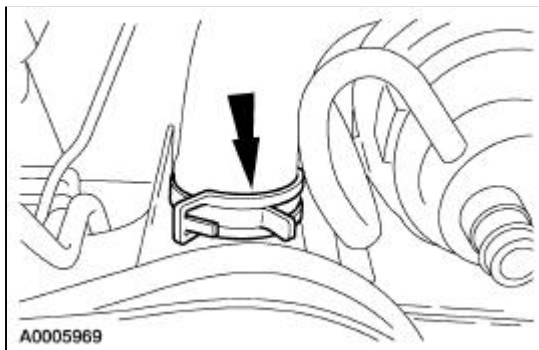


3. Install the crankshaft pulley. For additional information, refer to [Crankshaft Pulley](#) in this section.
-

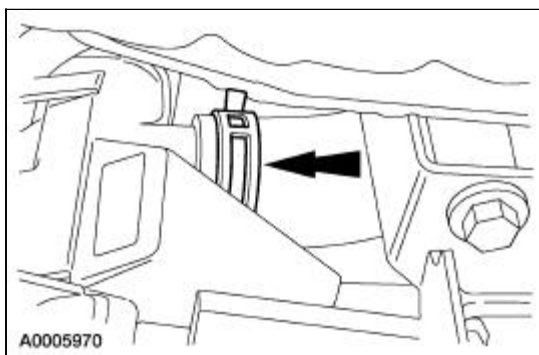
Engine Front Cover

Removal

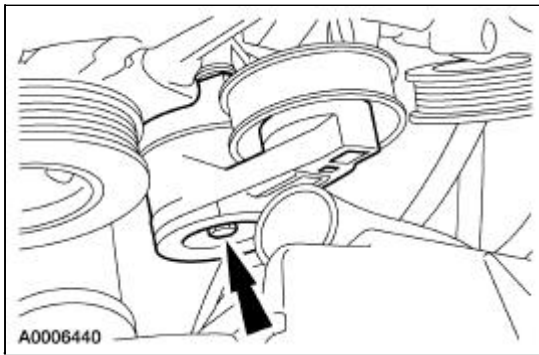
1. Remove the RH valve cover. For additional information, refer to [Valve Cover—RH](#) in this section.
2. Remove the LH valve cover. For additional information, refer to [Valve Cover—LH](#) in this section.
3. Remove the belt idler pulley. For additional information, refer to [Section 303-05](#).
4. Remove the water pump. For additional information, refer to [Section 303-03](#).
5. Disconnect the upper hose from the radiator.



6. Disconnect the lower hose from the radiator.

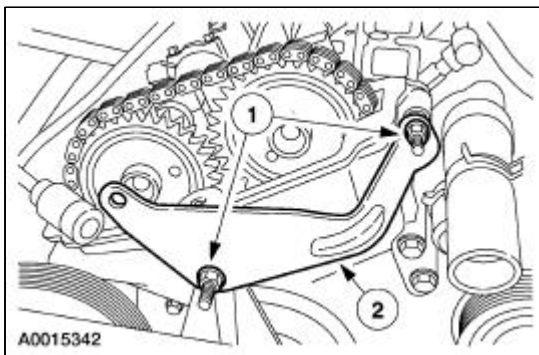


7. Remove the oil pan. For additional information, refer to [Oil Pan](#) in this section.
8. Remove the power steering pump. For additional information, refer to [Section 211-02](#).
9. Remove the hydraulic cooling fan pump. For additional information, refer to [Section 303-03](#).
10. Remove the bolt and the belt tensioner.

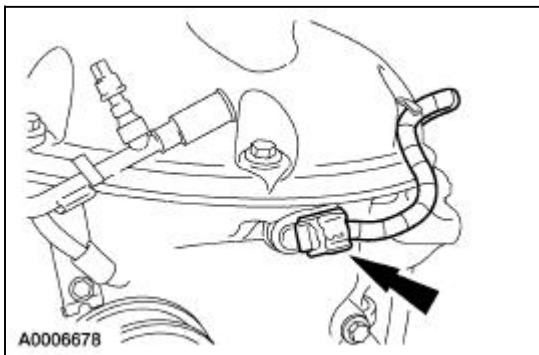


11. Remove the crankshaft front oil seal. For additional information, refer to [Crankshaft Front Oil Seal](#) in this section.

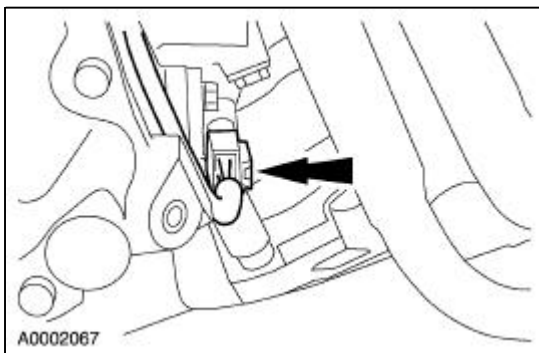
12. Remove the bracket.



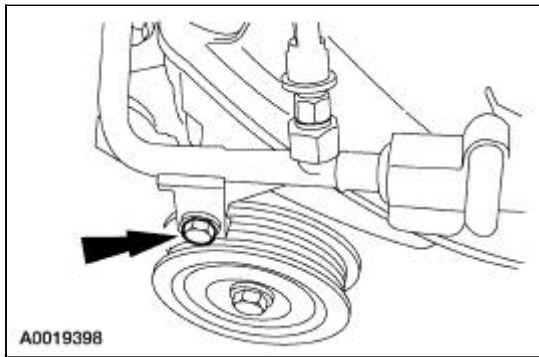
13. Disconnect the camshaft position (CMP) sensor electrical connector.



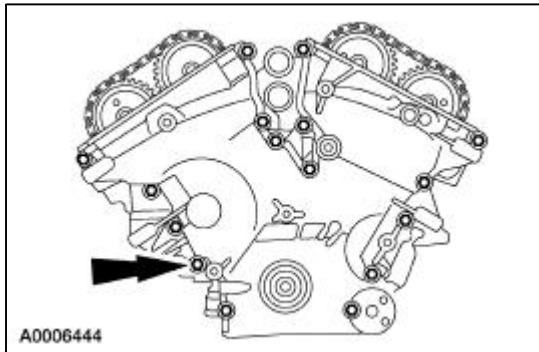
14. Disconnect the crankshaft position (CKP) sensor electrical connector.



15. Remove the fuel supply manifold bolt.



16. Remove the bolts and the engine front cover.
 - Discard the gasket.

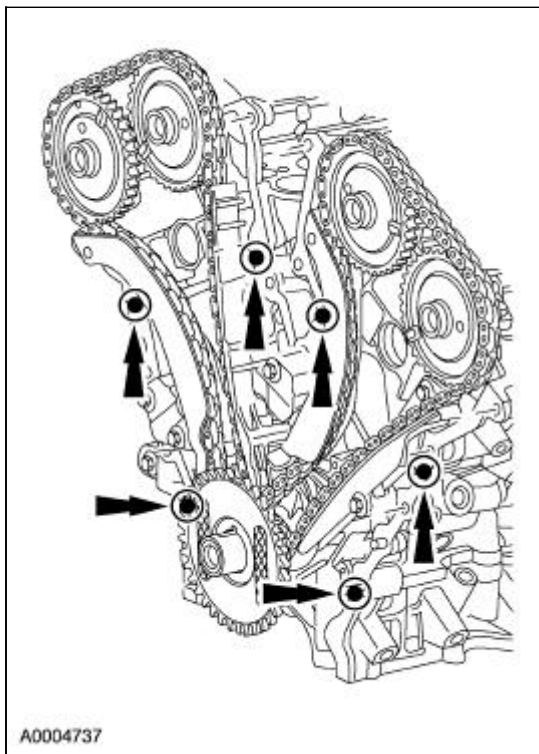


Installation

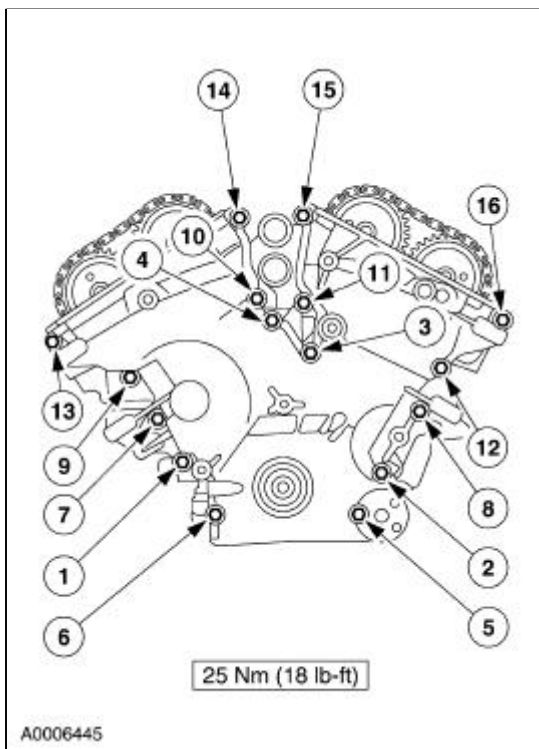
1. Clean the sealing surfaces on the engine and the front cover.
2. **NOTE:** Install the engine front cover within six minutes of sealer application.

Apply a 6 mm (0.24 in) diameter dot of Silicone Gasket and Sealant F7AZ-19554-EA or equivalent meeting Ford specification WSE-M4G323-A4 to the areas indicated.

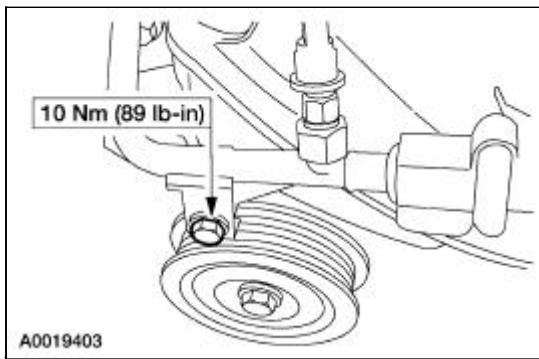
- Install a new gasket.



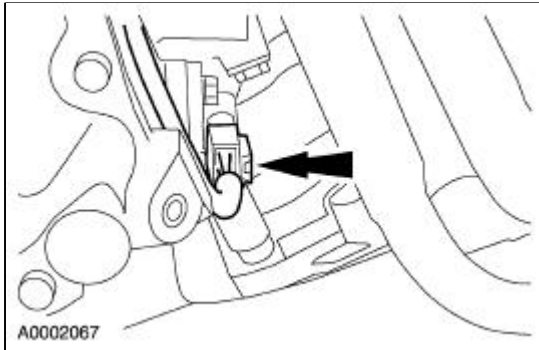
3. Position the front cover and tighten the bolts in the sequence shown.



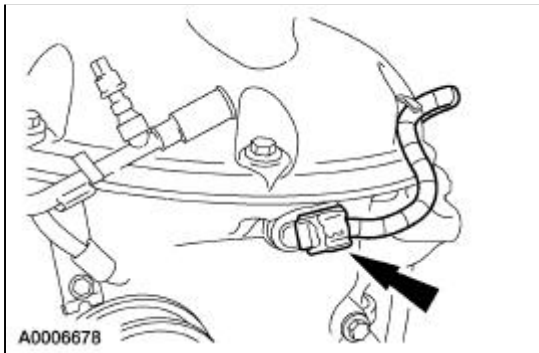
4. Install the fuel supply manifold bolt.



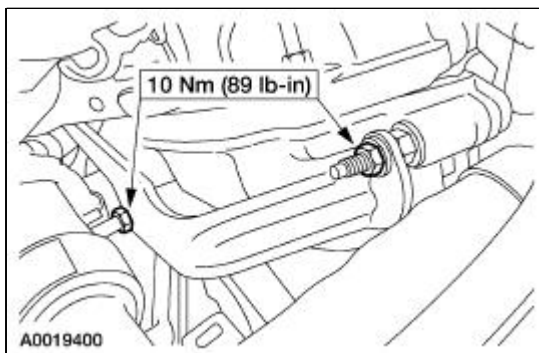
5. Connect the CKP sensor electrical connector.



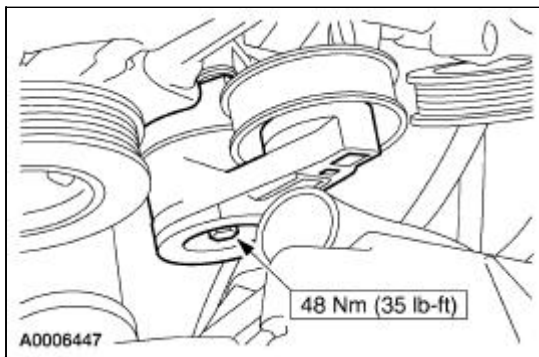
6. Connect the CMP sensor electrical connector.



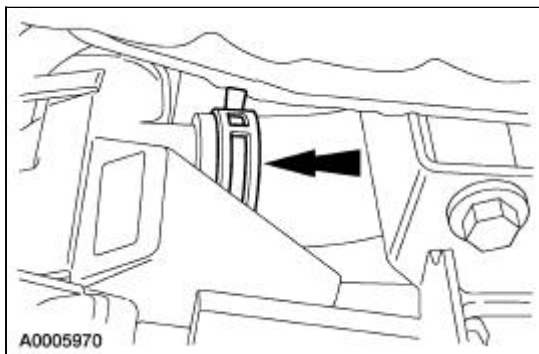
7. Install the bracket.



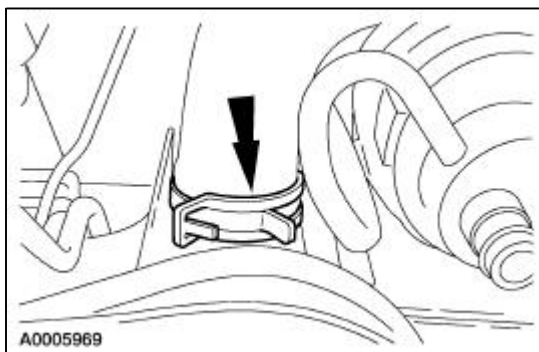
8. Install the crankshaft front oil seal. For additional information, refer to [Crankshaft Front Oil Seal](#) in this section.
9. Position the belt tensioner and install the bolt.



10. Install the hydraulic cooling fan pump. For additional information, refer to [Section 303-03](#).
11. Install the power steering pump. For additional information, refer to [Section 211-02](#).
12. Install the oil pan. For additional information, refer to [Oil Pan](#) in this section.
13. Connect the lower hose to the radiator.



14. Connect the upper hose to the radiator.

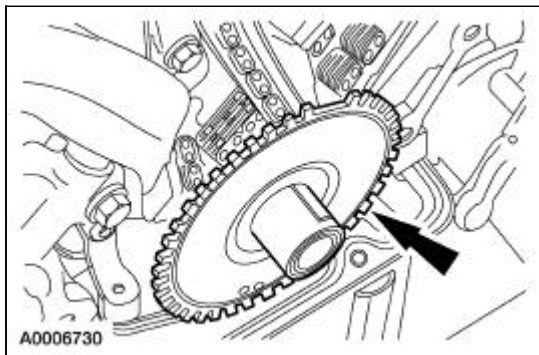


15. Install the water pump. For additional information, refer to [Section 303-03](#).
16. Install the belt idler pulley. For additional information, refer to [Section 303-05](#).
17. Install the LH valve cover. For additional information, refer to [Valve Cover—LH](#) in this section.
18. Install the RH valve cover. For additional information, refer to [Valve Cover—RH](#) in this section.
19. Fill the cooling system. For additional information, refer to [Section 303-03](#).

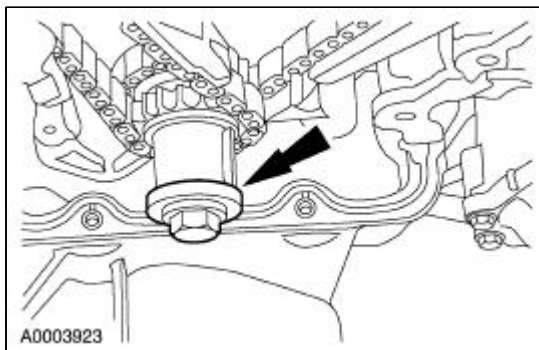
Timing Drive Components


Removal

1. Remove the engine front cover. For additional information, refer to [Engine Front Cover](#) in this section.
2. Remove the ignition pulse ring.

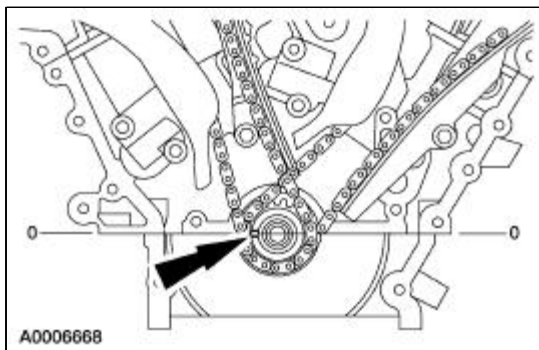



3. Reinstall the crankshaft damper bolt and washer.



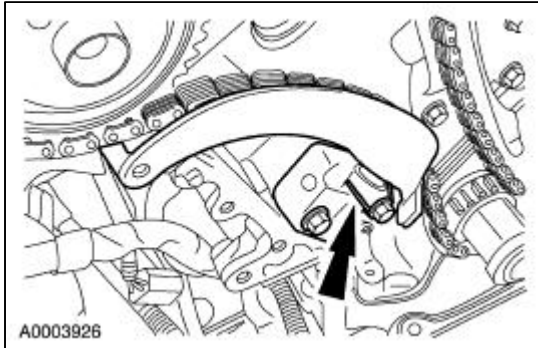
4.  **CAUTION:** Rotating the crankshaft in a counterclockwise direction may cause engine damage. Crankshaft journals are directionally machined. Rotating the crankshaft counterclockwise can raise burrs on bearing surfaces, reducing engine life.

Rotate the crankshaft clockwise to position the crankshaft keyway to the nine o'clock position.

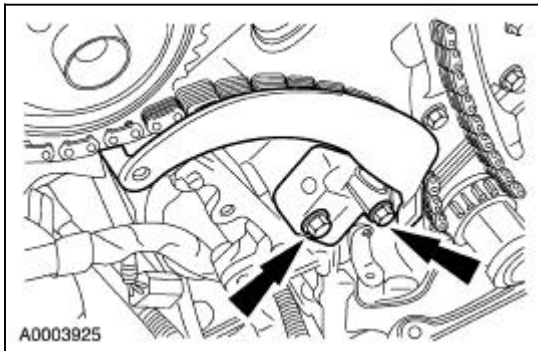


5.  **CAUTION:** If the RH timing chain tensioner arm and RH chain guide are to be reused, mark the position of each piece to make sure that they are installed on the correct side when reassembled.

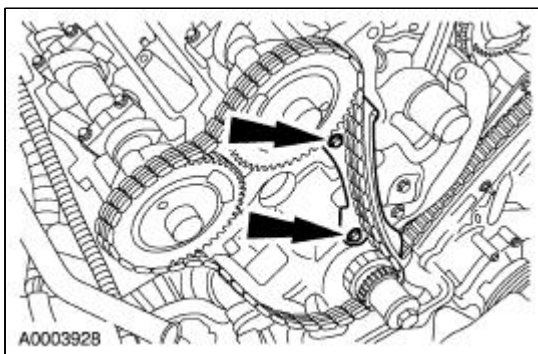
Install a stiff wire or paper clip into the RH timing chain tensioner before removing the bolts.



6. Remove the bolts, the timing chain tensioner and the tensioner arm.

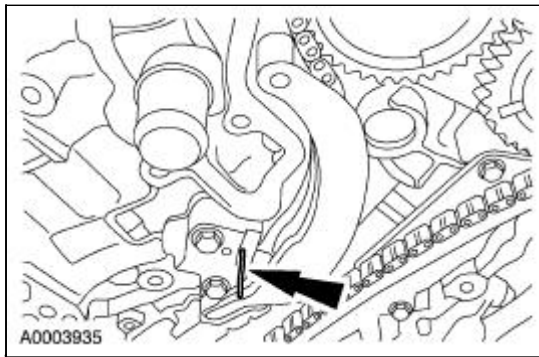


7. Remove the RH timing chain.
8. Remove the bolts and the RH timing chain guide.

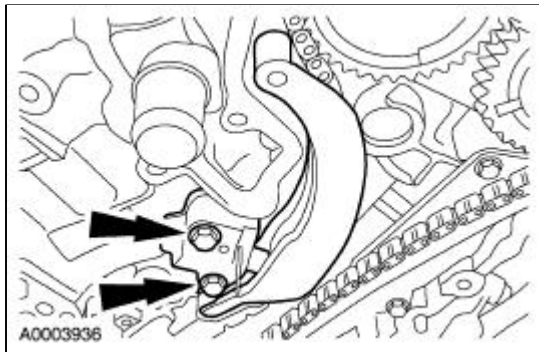


9.  **CAUTION:** If the LH timing chain tensioner arm and the LH chain guide are to be reused, mark the position of each piece to make sure that they are installed on the correct side when reassembled.

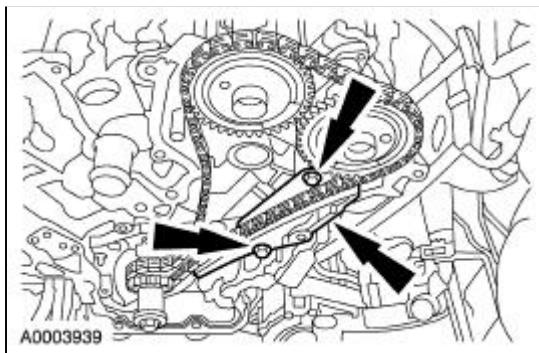
Install a stiff wire or paper clip into the LH timing chain tensioner.



10. Remove the bolts, the timing chain tensioner and the tensioner arm.




11. Remove the bolts and LH chain guide.

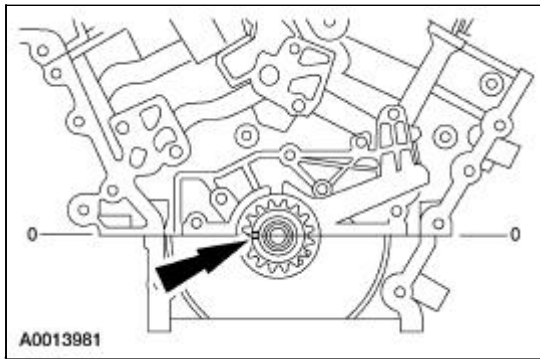



12. Remove the LH timing chain.

Installation

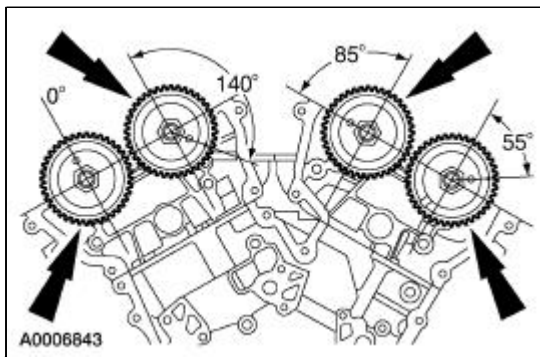
1.  **CAUTION:** Rotating the crankshaft in a counterclockwise direction may cause engine damage. Crankshaft journals are directionally machined. Rotating the crankshaft counterclockwise can raise burrs on bearing surfaces, reducing engine life.

Verify that the crankshaft keyway is in the nine o'clock position.

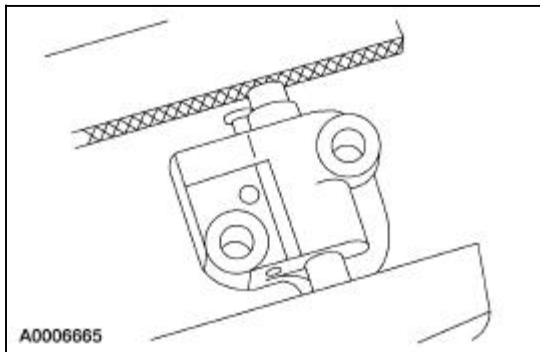


2.  **CAUTION:** The crankshaft keyway must remain in the nine o'clock position until the cams are located, or damage to the valves may occur.

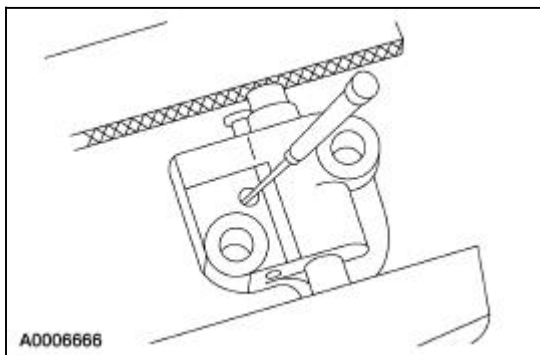
Rotate the LH and RH intake and exhaust camshafts to locate them in their neutral positions.



3. Position the LH chain tensioner in a soft-jawed vise.



4. Hold the chain LH tensioner ratchet lock mechanism away from the ratchet stem with a small pick.

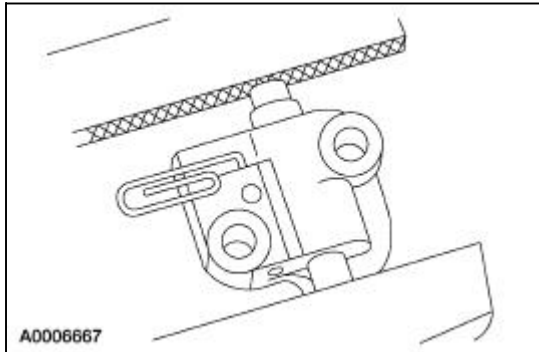


5.  **CAUTION:** During tensioner compression, do not release the ratchet stem until the tensioner piston is fully bottomed in its bore or damage to the ratchet stem will result.

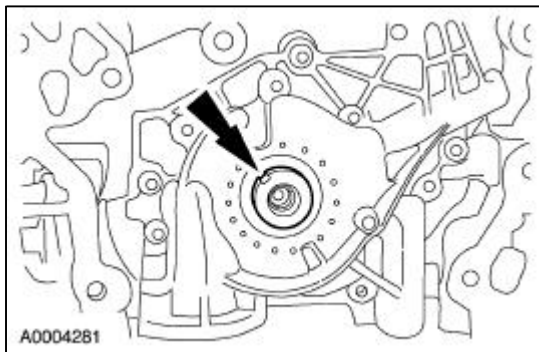
Slowly compress the LH timing chain tensioner.

6. **NOTE:** The wire must remain in the timing chain tensioner until the tensioner is installed.

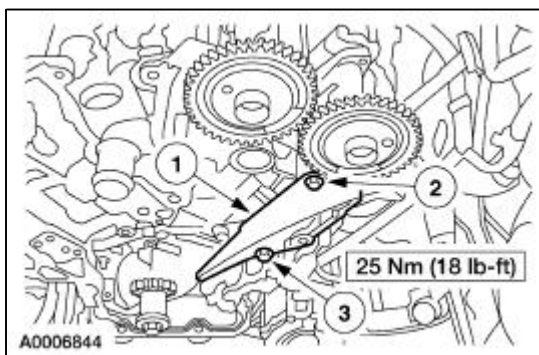
Retain the LH tensioner piston with a 1.5 mm (0.06 in) wire or paper clip.



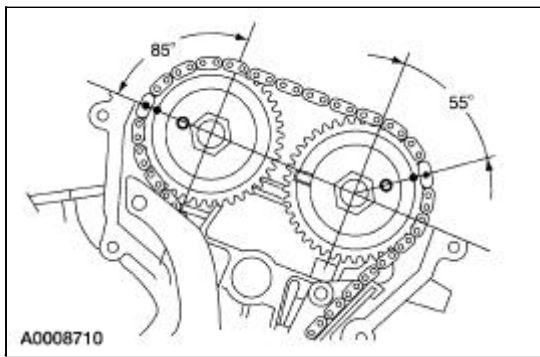
7. Rotate the crankshaft clockwise to position the keyway to the 11 o'clock position and remove the crankshaft damper bolt and washer.



8. Install the LH timing chain guide.
1. Position the guide to the engine.
 2. Install the shorter (gold color) bolt into the upper hole.
 3. Install the longer bolt (black color) into the lower hole.

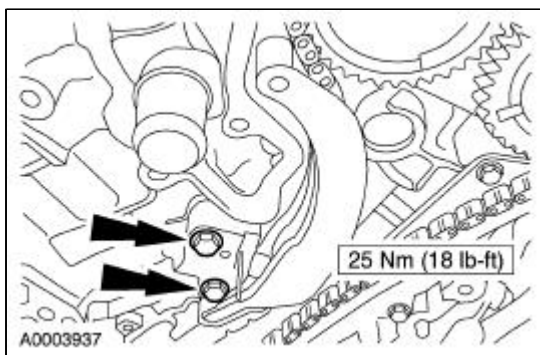


9. Install the LH timing chain, aligning the timing index link (gold color) with the marks on the camshaft and crankshaft sprockets.

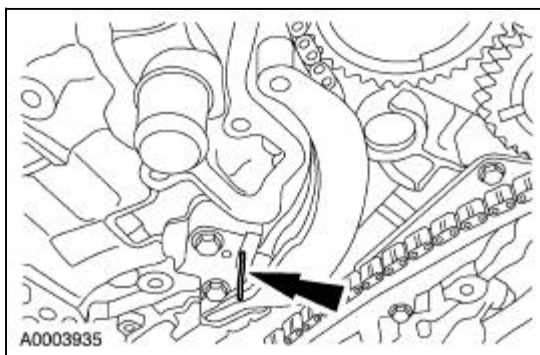


10. **NOTE:** Be sure to position the tensioner so that the tensioner piston is fully engaged in the tensioner arm.

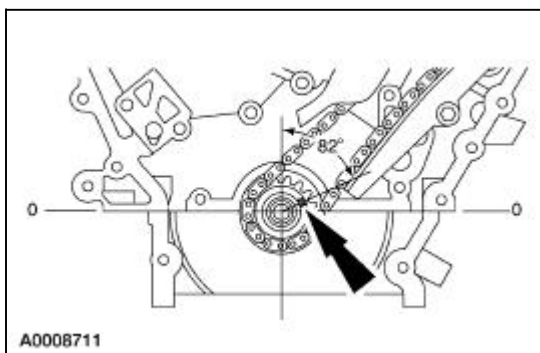
Install the LH tensioner arm, tensioner and bolts.



11. Remove the wire or paper clip from the tensioner.

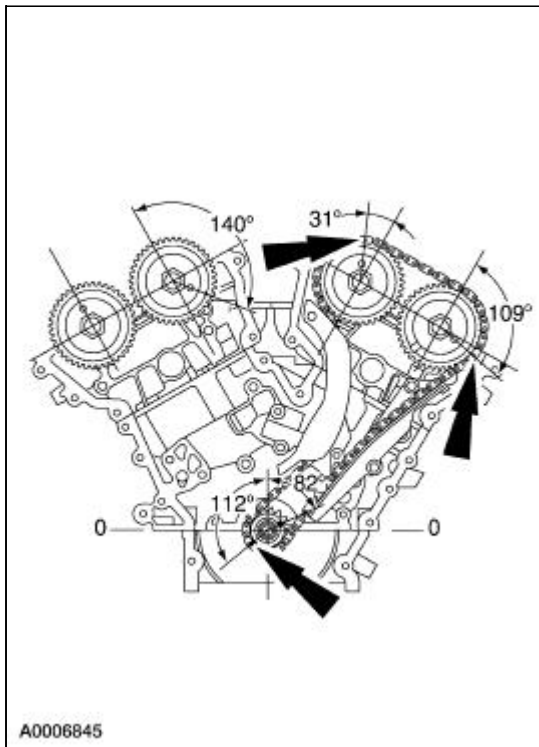


12. Rotate the crankshaft clockwise and position the keyway between the two o'clock and three o'clock positions for RH timing chain installation.

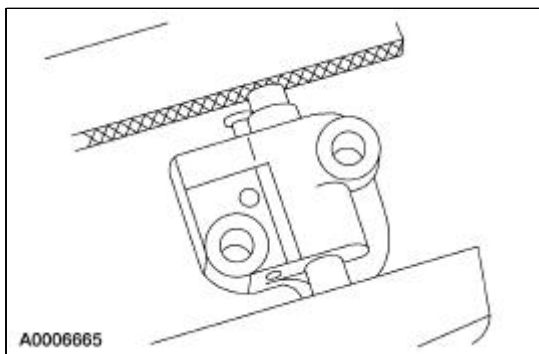


13. Verify that the timing index links (gold color) on the LH timing chain are in alignment with the

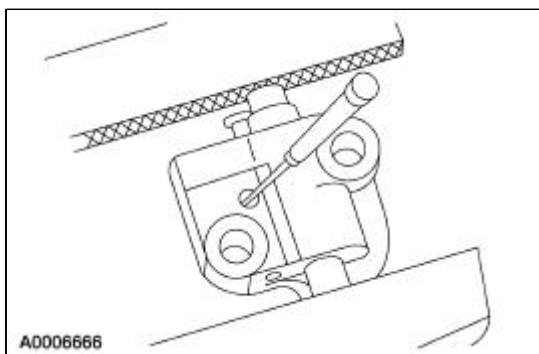
timing index marks on the camshaft and crankshaft sprockets.



14. Position the RH chain tensioner in a soft-jawed vise.



15. Hold the RH chain tensioner ratchet lock mechanism away from the ratchet stem with a small pick.

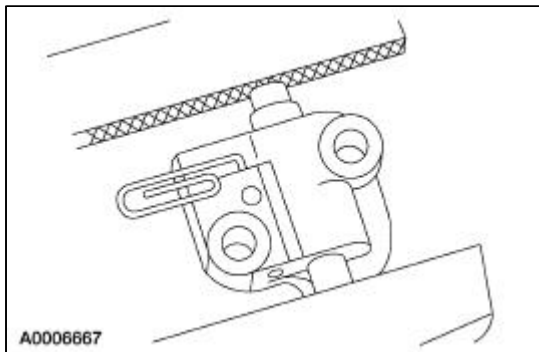


16.  **CAUTION:** During tensioner compression, do not release the ratchet stem until the tensioner piston is fully bottomed in its bore or damage to the ratchet stem will result.

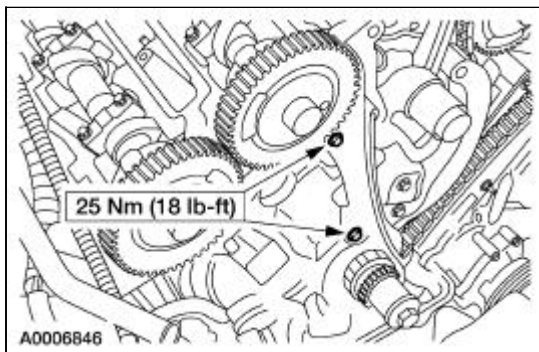
Slowly compress the RH timing chain tensioner.

17. **NOTE:** The wire must remain in the timing chain tensioner until the tensioner is installed.

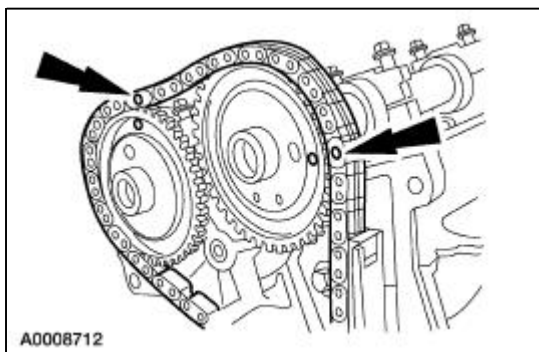
Retain the RH tensioner piston with a 1.5 mm (0.06 in) wire or paper clip.



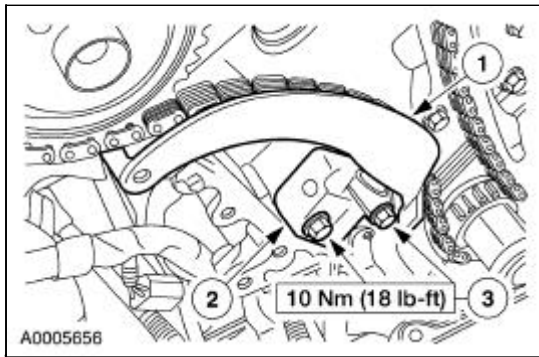
18. Install the RH chain guide and bolts.



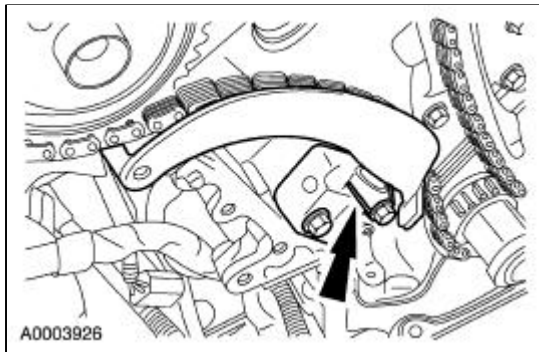
19. Install the RH timing chain, aligning the timing index links (gold color) with the marks on the camshaft and crankshaft sprockets.



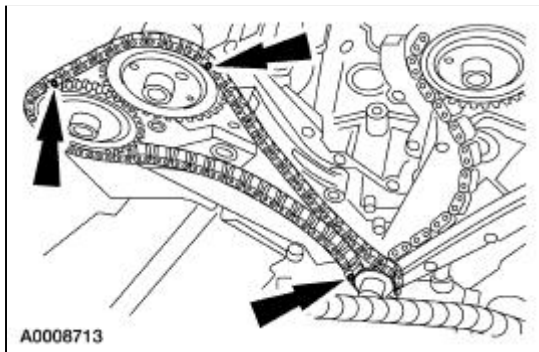
20. Install the RH tensioner.
1. Position the tensioner arm.
 2. Position the tensioner.
 3. Install the bolts.



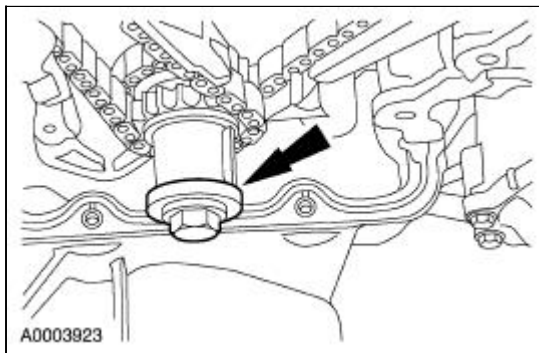
21. Remove the wire or paper clip from the RH tensioner.



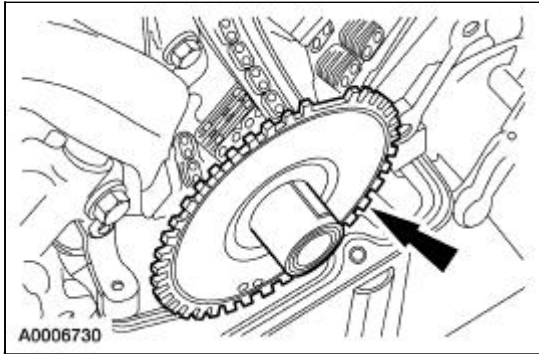
22. Verify that the timing index links (gold color) on the RH timing chain are in alignment with the timing index marks on the camshaft and crankshaft sprockets.



23. Remove the bolt and washer.



24. Install the ignition pulse ring.




25. Install the engine front cover. For additional information, refer to [Engine Front Cover](#) in this section.
-

Camshaft —LH

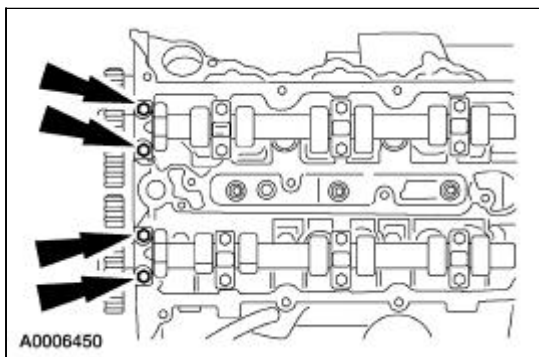
Removal

1. Remove the timing chains. For additional information, refer to [Timing Drive Components](#) in this section.

2.  **CAUTION:** Remove the camshaft journal thrust caps prior to loosening other camshaft journal cap bolts. Damage to the camshaft journal thrust cap may occur if not removed first.

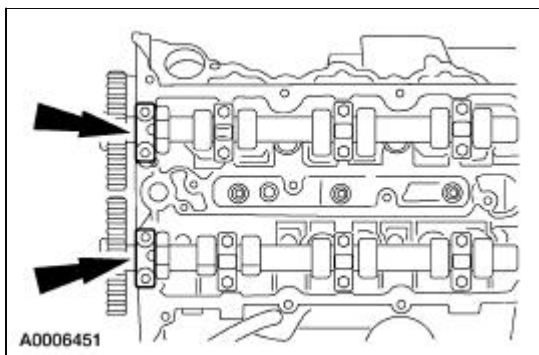
 **CAUTION:** Cylinder head camshaft journal caps and cylinder heads are numbered to be sure they are assembled in their original positions. Keep camshaft journal caps with the cylinder head from which they were removed. Do not mix with camshaft journal caps from another cylinder head.

Remove the bolts.

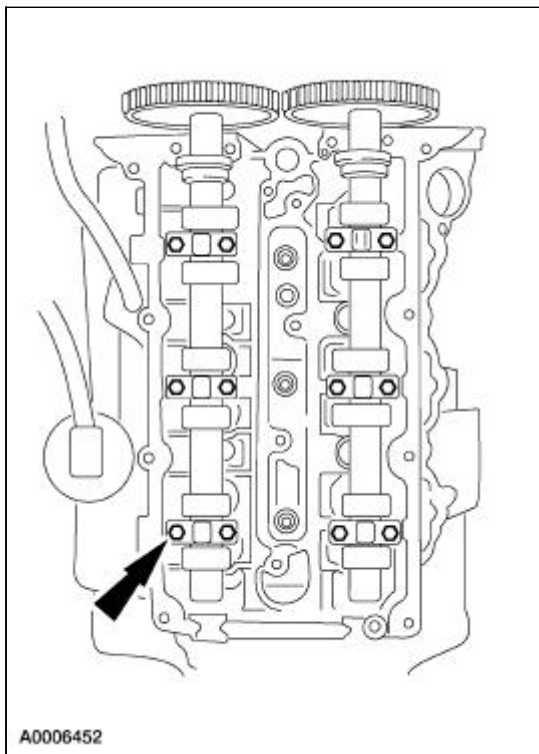


3. **NOTE:** The camshaft journal thrust caps have alignment dowels.

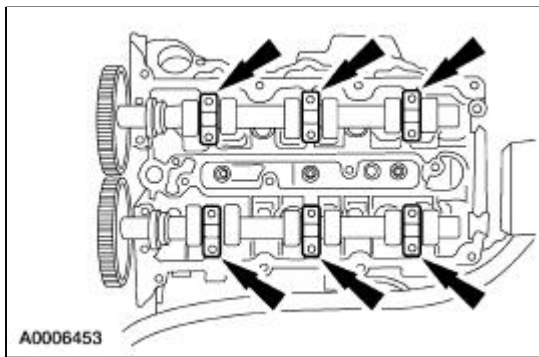
Using a soft-faced mallet, gently loosen and remove the camshaft journal thrust caps.



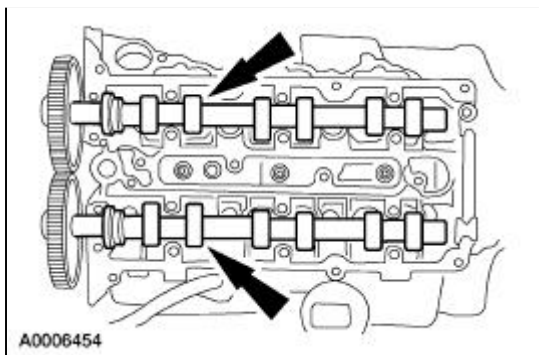
4. Remove the remaining camshaft journal bolts.



5. Using a soft-faced mallet, gently loosen and remove the remaining camshaft journal caps.



6. Carefully lift out the camshafts.

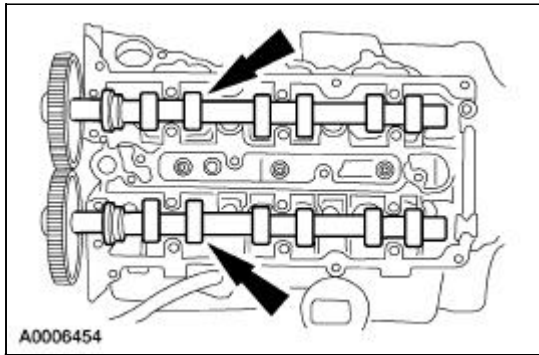


Installation

1. **NOTE:** Be sure camshaft bearing caps are installed in original positions.

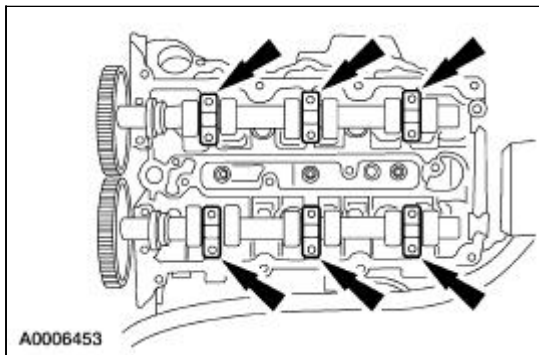
Lubricate camshafts with Super Premium SAE 5W-30 Motor Oil XO-5W30-QSP or equivalent meeting Ford specification WSS-M2C153-G and carefully position the camshafts into the

cylinder head.

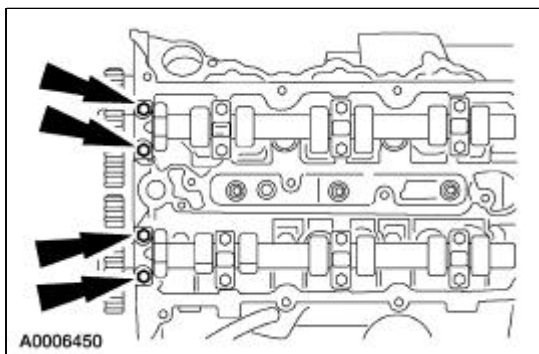


2.  **CAUTION:** Do not install the camshaft journal thrust caps until all of the camshaft bearing caps have been installed, or damage to the thrust caps may occur.

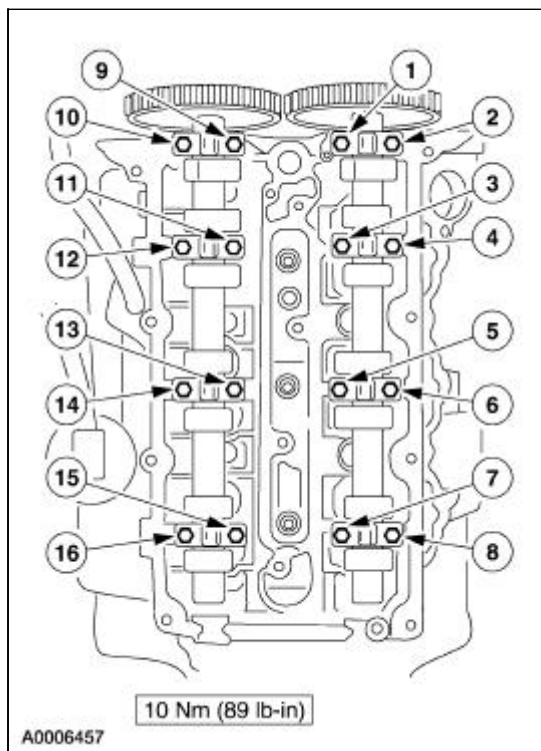
Lubricate the bearing surfaces of the camshaft bearing caps with Super Premium SAE 5W-30 Motor Oil XO-5W30-QSP or equivalent meeting Ford specification WSS-M2C153-G, and install the bearing caps and loosely install the bolts.



3. Lubricate the bearing surfaces of the camshaft caps with Super Premium SAE 5W-30 Motor Oil XO-5W30-QSP or equivalent meeting Ford specification WSS-M2C153-G, and loosely install the caps and bolts.




4. Tighten the bolts in sequence shown.



5. **NOTE:** If new camshafts were installed, refer to [Valve Spring—Lash Adjustment](#) in this section.

Lubricate the tappet shims and camshaft lobes with Super Premium SAE 5W-30 Motor Oil XO-5W30-QSP or equivalent meeting Ford specification WSS-M2C153-G.

6.  **CAUTION:** Verify that the crankshaft is in the nine o'clock position before rotating the camshafts, or damage to the valve train may result.


Rotate the camshafts to be sure they are not binding. If binding occurs, check to make sure that all bearing caps are in their original positions. Loosen all bearing cap bolts in reverse order and retighten.


7. Install the timing chains. For additional information, refer to [Timing Drive Components](#) in this section.
-

Camshaft —RH

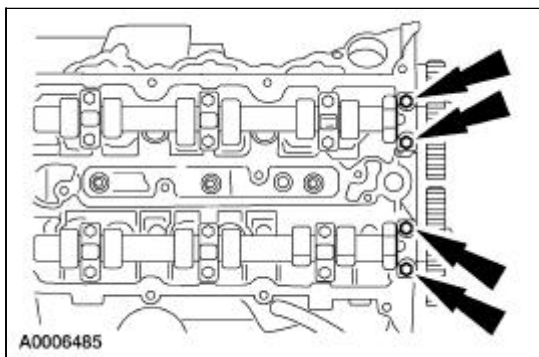
Removal

1. Remove the timing chains. For additional information, refer to [Timing Drive Components](#) in this section.

2.  **CAUTION:** Remove the camshaft journal thrust caps prior to loosening other camshaft journal cap bolts. Damage to the camshaft journal thrust cap may occur if not removed first.

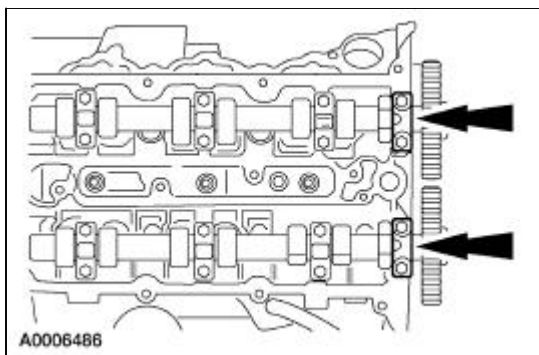
 **CAUTION:** Cylinder head camshaft journal caps and cylinder heads are numbered for assembly in their original positions. Keep camshaft journal caps with the cylinder head from which they were removed. Do not mix with camshaft journal caps from another cylinder head.

Remove the bolts.

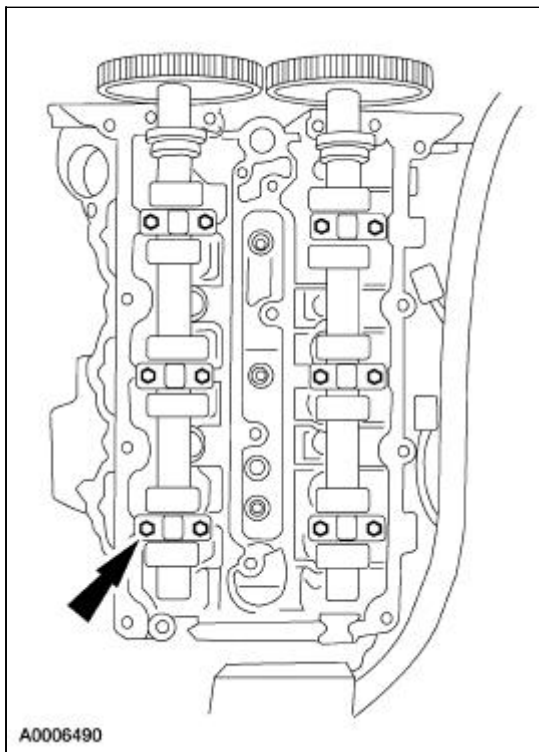


3. **NOTE:** The camshaft journal thrust caps have alignment dowels.

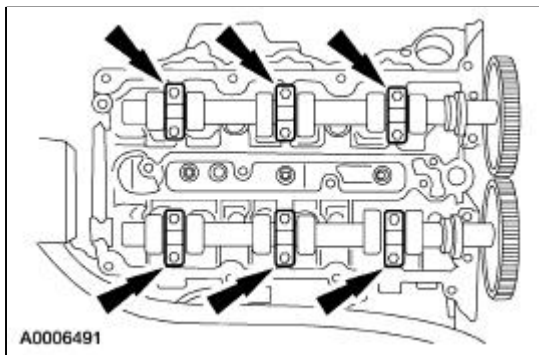
Using a soft-faced mallet, gently loosen and remove the camshaft journal thrust caps.



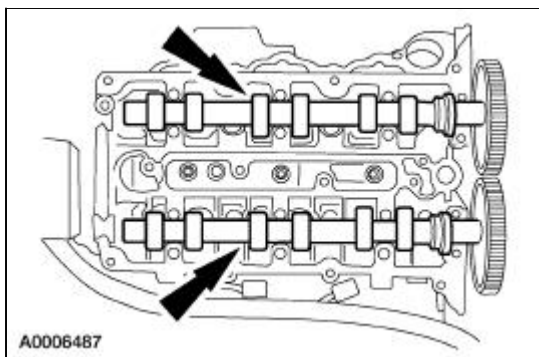
4. Remove the remaining camshaft journal cap bolts.



5. Using a soft-faced mallet, gently loosen and remove the remaining camshaft journal caps.



6. Carefully lift out the camshafts.

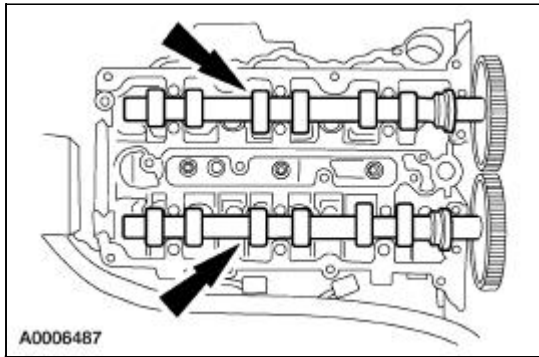


Installation

1. **NOTE:** Be sure camshaft bearing caps are installed in original positions.

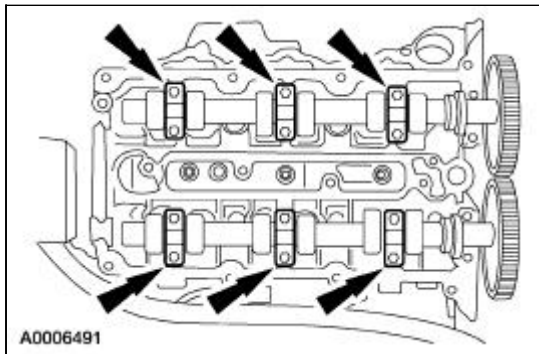
Lubricate camshafts with Super Premium SAE 5W-30 Motor Oil XO-5W30-QSP or equivalent meeting Ford specification WSS-M2C153-G and carefully position the camshafts into the

cylinder head.

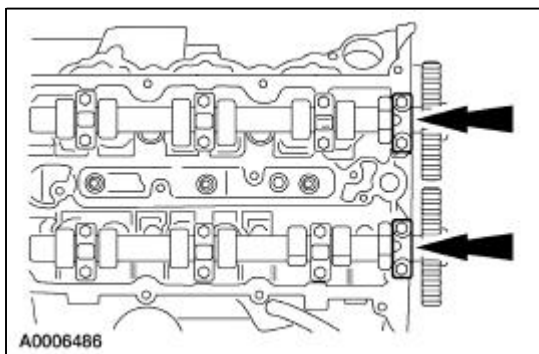


2.  **CAUTION: Do not install the camshaft journal thrust caps until all of the camshaft bearing caps have been installed, or damage to the thrust caps may occur.**

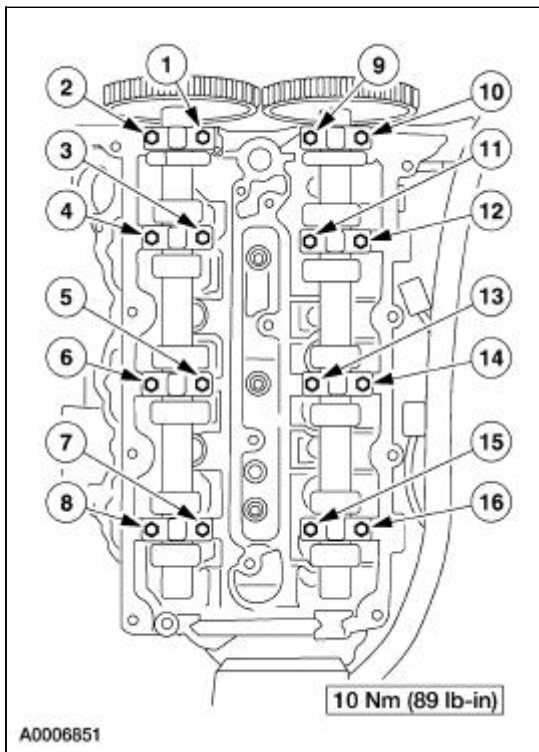
Lubricate the bearing surfaces of the camshaft bearing caps with Super Premium SAE 5W-30 Motor Oil XO-5W30-QSP or equivalent meeting Ford specification WSS-M2C153-G, and install the bearing caps and loosely install the bolts.



3. Lubricate the bearing surfaces of the camshaft bearing thrust caps with Super Premium SAE 5W-30 Motor Oil XO-5W30-QSP or equivalent meeting Ford specification WSS-M2C153-G, and install the caps and loosely install the bolts.




4. Tighten the bolts in sequence shown.



5. **NOTE:** If either of the camshafts were replaced, refer to [Valve Spring—Lash Adjustment](#) in this section.

Lubricate the tappet shims and camshaft lobes with Super Premium SAE 5W-30 Motor Oil XO-5W30-QSP or equivalent meeting Ford specification WSS-M2C153-G.

6.  **CAUTION:** Verify that the crankshaft is in the nine o'clock position before rotating the camshafts, or damage to the valve train may result.

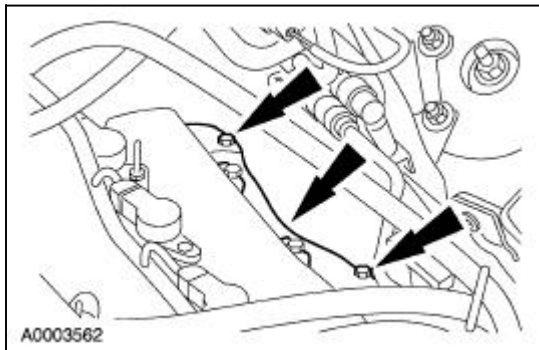
Rotate the camshafts to be make sure they are not binding. If binding occurs, check to sure that all bearing caps are in their original positions. Loosen all bearing cap bolts in reverse order and retighten.

7. Install the timing chains. For additional information, refer to [Timing Drive Components](#) in this section.
-

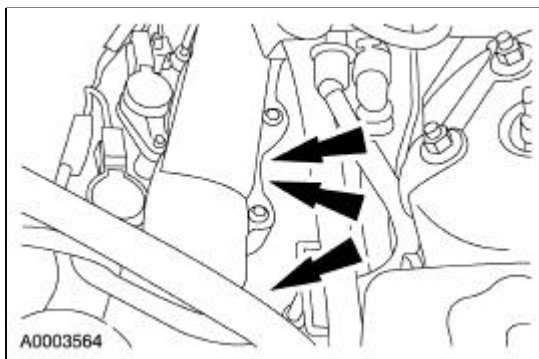
Exhaust Manifold — LH

Removal

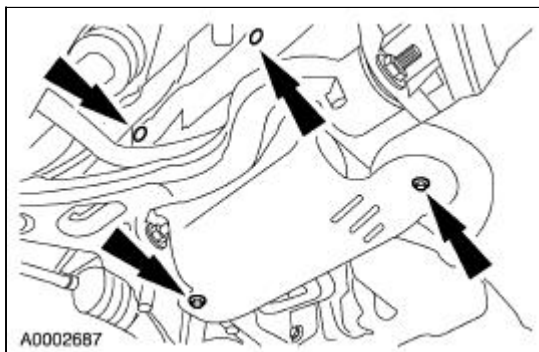
1. If equipped, remove the heat shield.



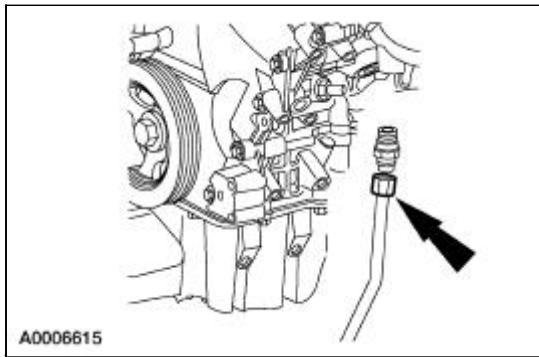
2. Remove the three upper nuts on the LH exhaust manifold.



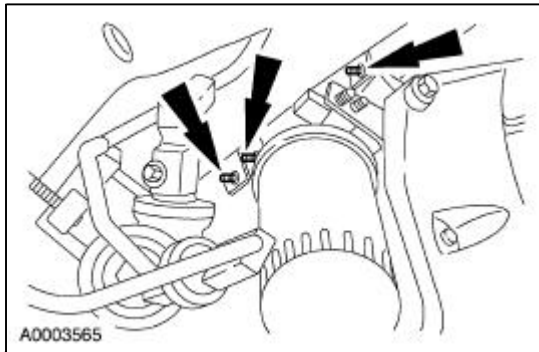
3. Remove the three-way catalytic converter (TWC). For additional information, refer to [Section 309-00](#).
4. Remove the lower splash shield.
 - Remove the bolts.
 - Remove the pin-type retainers and the shield.



5. If equipped, remove the secondary air tube from the exhaust manifold.



6. Remove the three lower nuts and the exhaust manifold.
 - Discard the gasket.

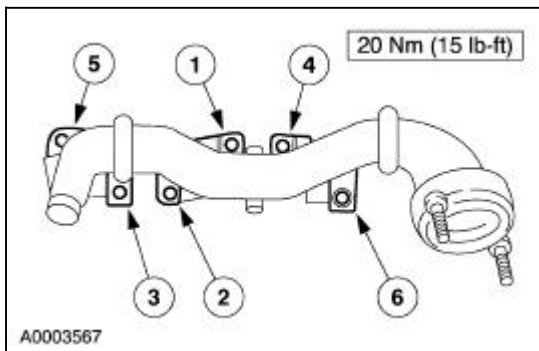


Installation

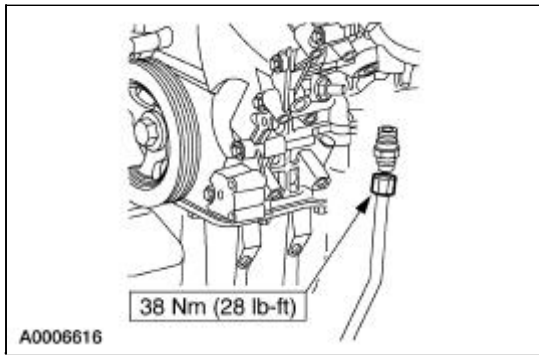
1. **NOTE:** To make sure of a seal, the manifold bolts must be tightened to the same specification two times.

Using a new gasket, install the exhaust manifold. Tighten the nuts in two stages.

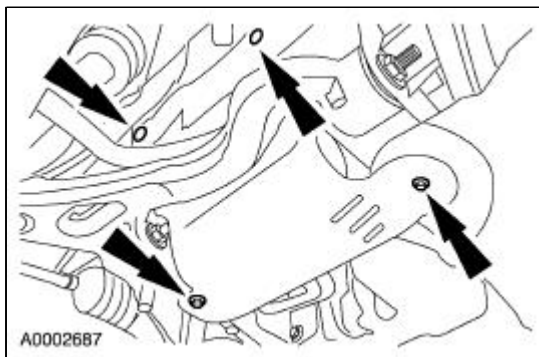
- Stage 1: Tighten to 20 Nm (15 lb-ft).
- Stage 2: Tighten to 20 Nm (15 lb-ft).



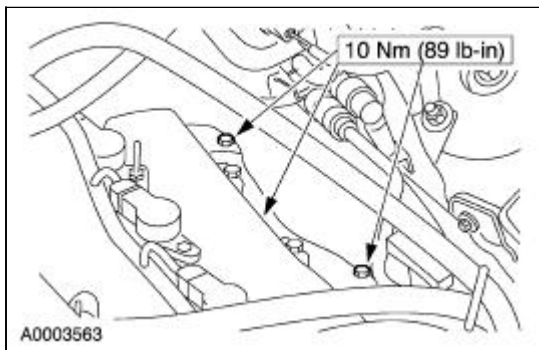
2. If equipped, install the secondary air tube to the exhaust manifold.



3. Install the lower splash shield.
 - Install the shield and the pin-type retainers.
 - Install the bolts.



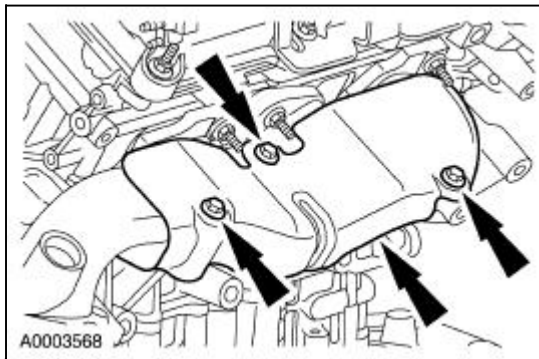
4. Install the TWC. For additional information, refer to [Section 309-00](#).
5. If equipped, install the heat shield.



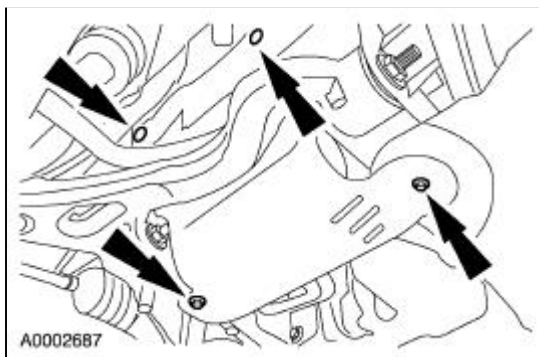
Exhaust Manifold —RH

Removal

1. If equipped, remove the heat shield.

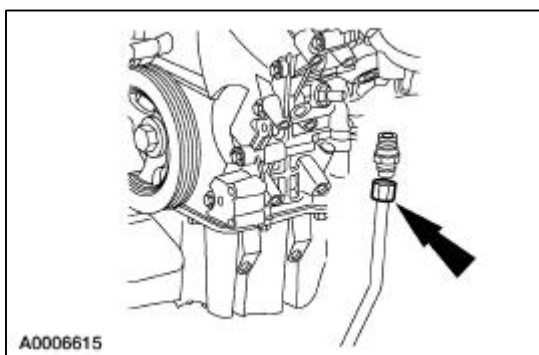


2. Remove the three-way catalytic converter (TWC). For additional information, refer to [Section 309-00](#).
3. Remove the lower splash shield.
 - Remove the bolts.
 - Remove the pin-type retainers and the shield.

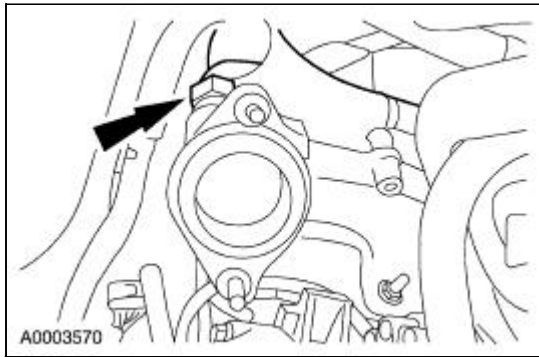


4. **NOTE:** Left side shown; right side similar.

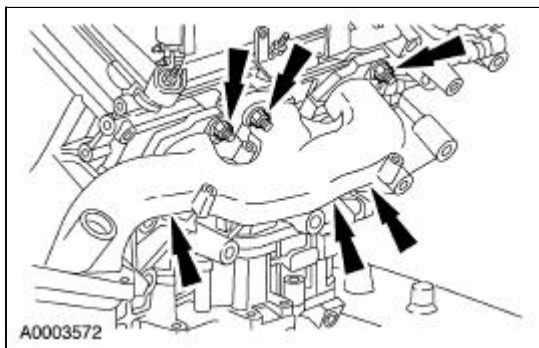
If equipped, remove the secondary air tube from the exhaust manifold.



5. Disconnect the EGR valve to exhaust manifold tube.



6. Remove the six nuts and the exhaust manifold.
 - Discard the gasket.

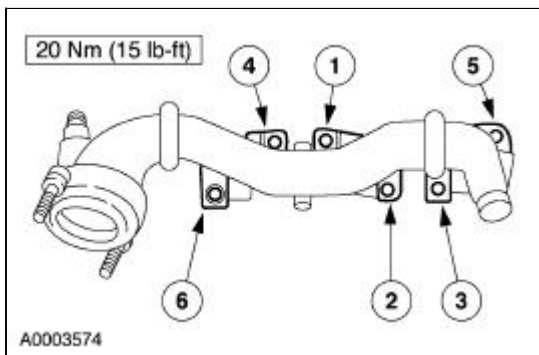


Installation

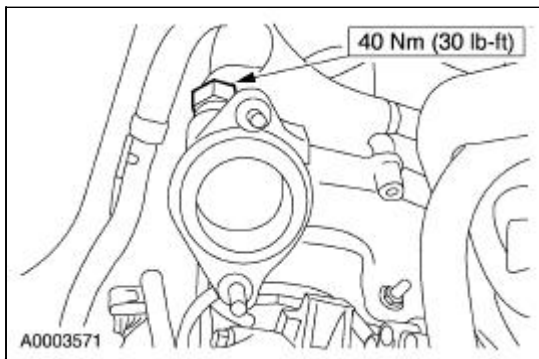
1. **NOTE:** To verify the seal, the manifold bolts must be tightened to the same specification two times.

Using a new gasket, install the exhaust manifold. Tighten the nuts in two stages:

- Stage 1: Tighten to 20 Nm (15 lb-ft).
- Stage 2: Tighten to 20 Nm (15 lb-ft).

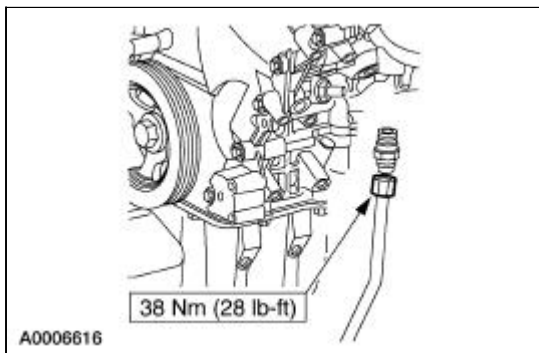


2. Install the EGR valve-to-exhaust manifold tube.

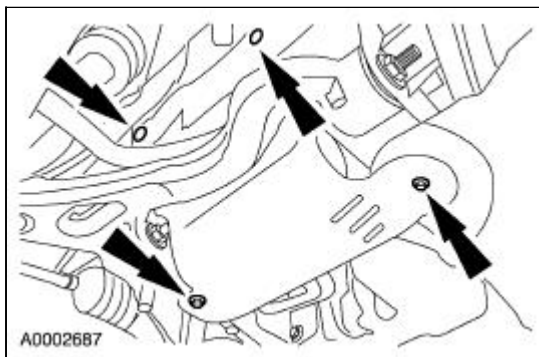


3. **NOTE:** Left side shown; right side similar.

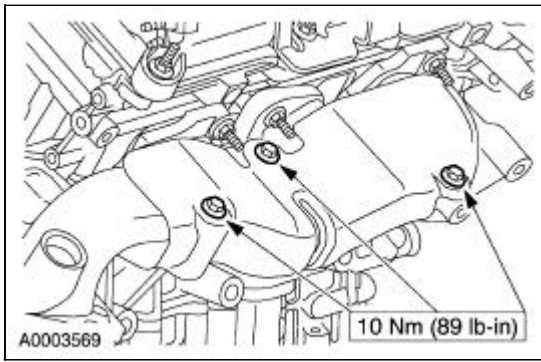
If equipped, install the secondary air tube to the exhaust manifold.



4. Install the lower splash shield.
- Install the shield and the pin-type retainers.
 - Install the bolts.



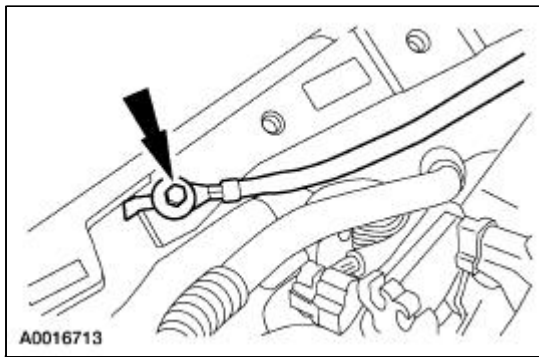
5. Install the TWC. For additional information, refer to [Section 309-00](#).
6. If equipped, install the heat shield.



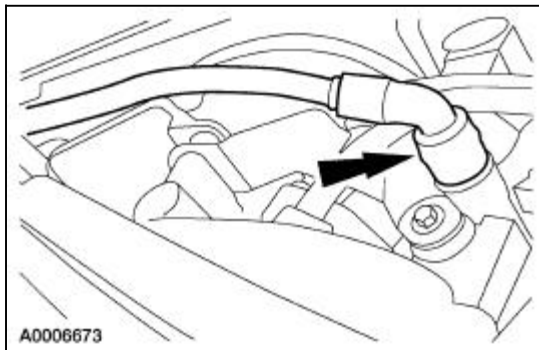
Cylinder Head —LH

Removal

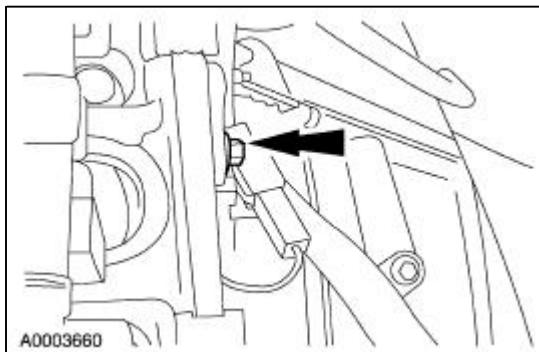
1. Remove the LH camshafts. For additional information, refer to [Camshaft—LH](#) in this section.
2. Remove the LH exhaust manifold. For additional information, refer to [Exhaust Manifold—LH](#) in this section.
3. Remove the lower intake manifold. Refer to [Intake Manifold—Lower](#).
4. Remove the ground strap.



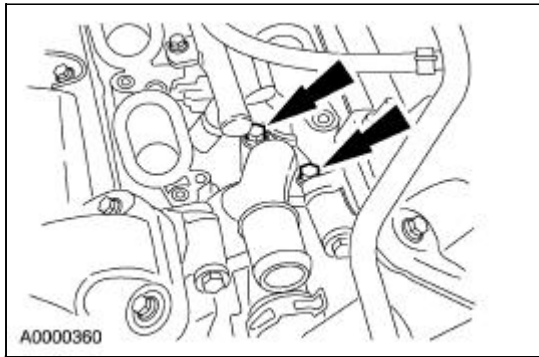
5. Disconnect the PCV tube.



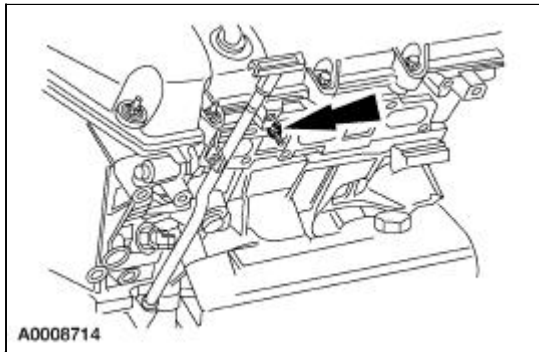
6. Remove the noise suppressor bolt.



7. Remove the bolts and the coolant outlet tube.

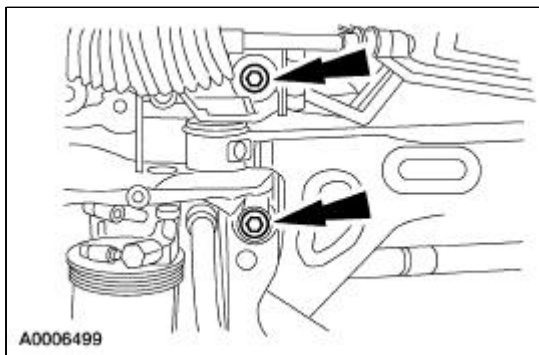


8. Remove the oil level indicator tube stud bolt.



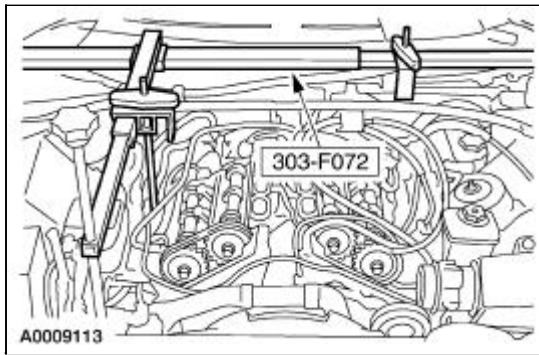
9. Raise the vehicle.

10. Install the four crossmember bolts.

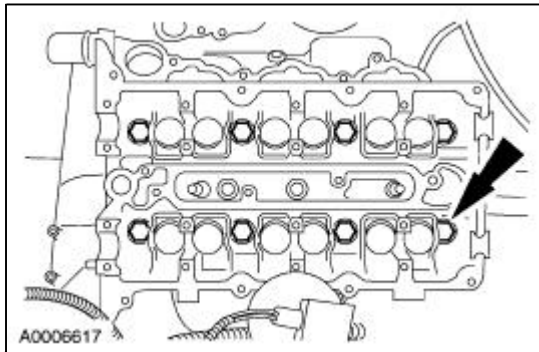


11. Lower the vehicle.


12. Remove the special tool.



13. Remove the bolts and the LH cylinder head.
 - Discard the gasket.



Installation

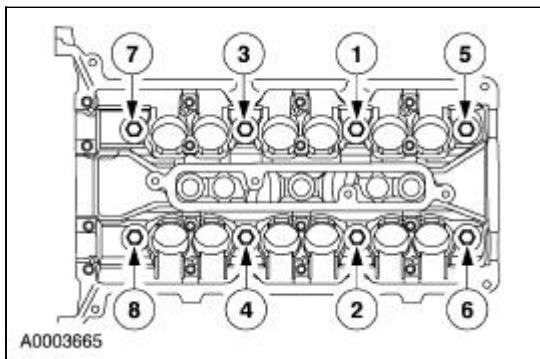
1.  **CAUTION:** Do not use metal scrapers, wire brushes, power abrasive discs or other abrasive means to clean the sealing surfaces. These tool cause scratches and gouges which make leak paths. Use a plastic scraping tool to remove all traces of the head gasket.

 **CAUTION:** The cylinder head bolts must be replaced with new bolts. They are tighten-to-yield designed and cannot be reused.

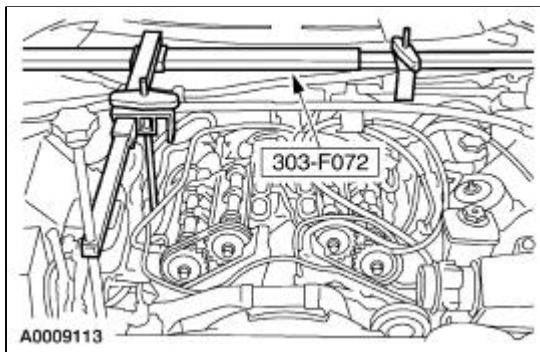
NOTE: LH and RH cylinder head gaskets are not interchangeable.

Using a new cylinder head gasket and bolts, install the LH cylinder head and loosely install the bolts.

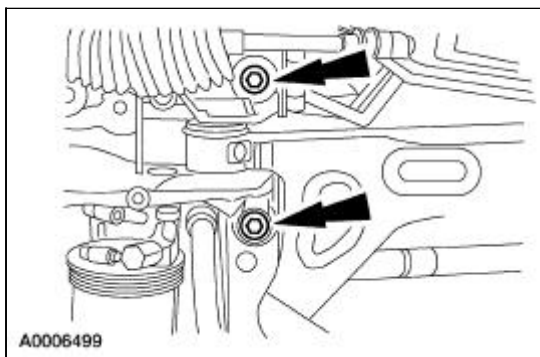
2. Tighten the bolts in six stages in the sequence shown.
 - Stage 1: Tighten to 30 Nm (22 lb-ft).
 - Stage 2: Rotate 90 degrees.
 - Stage 3: Back out a minimum of one full turn (360 degrees).
 - Stage 4: Tighten to 30 Nm (22 lb-ft).
 - Stage 5: Rotate 90 degrees.
 - Stage 6: Rotate all bolts an additional 90 degrees.



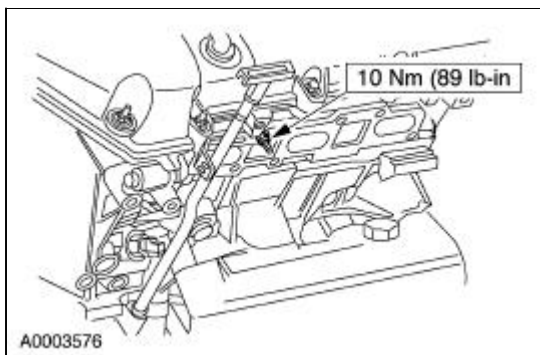
3. Install the special tool.



4. Raise the vehicle.
5. Remove the four crossmember bolts.

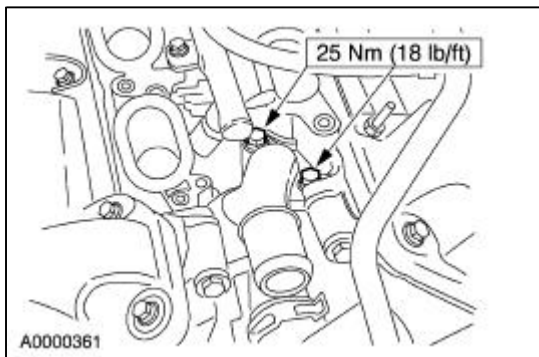


6. Lower the vehicle.
7. Install the oil level indicator tube stud bolt.

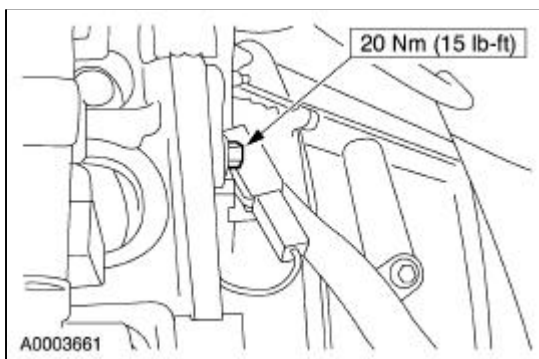


8. **NOTE:** Clean the sealing surfaces and inspect the O-ring seals thoroughly.

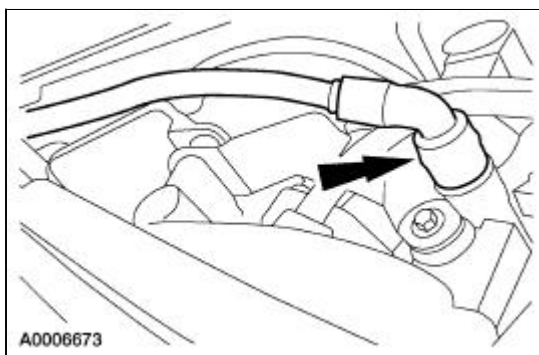
Install the coolant outlet tube and the retaining bolts.



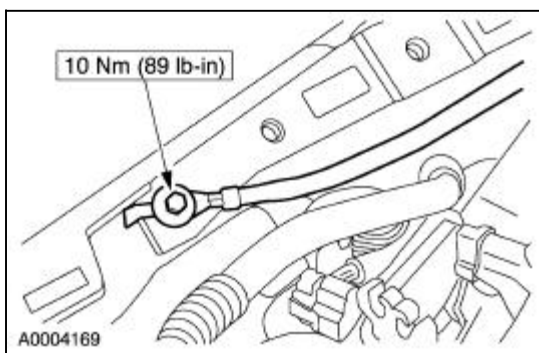
9. Position the noise suppressor and install the bolt.



10. Connect the PCV tube.



11. Install the ground strap.

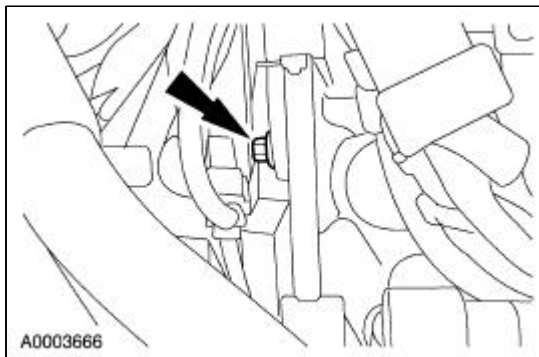


12. Install the lower intake manifold. For additional information, refer to [Intake Manifold—Lower](#) in this section.
 13. Install the LH exhaust manifold. For additional information, refer to [Exhaust Manifold—LH](#) in this section.
 14. Install the LH camshafts. For additional information, refer to [Camshaft—LH](#) in this section.
-

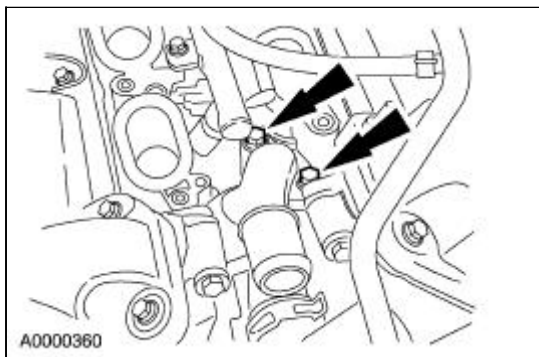
Cylinder Head —RH

Removal

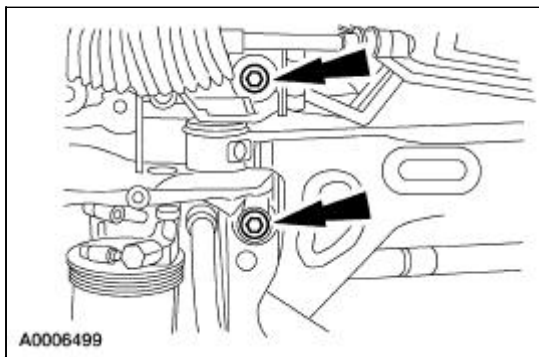
1. Remove the RH camshafts. For additional information, refer to [Camshaft—RH](#) in this section.
2. Remove the RH exhaust manifold. For additional information, refer to [Exhaust Manifold—RH](#) in this section.
3. Remove the lower intake manifold. For additional information, refer to [Intake Manifold—Lower](#) in this section.
4. Remove the noise suppressor bolt.



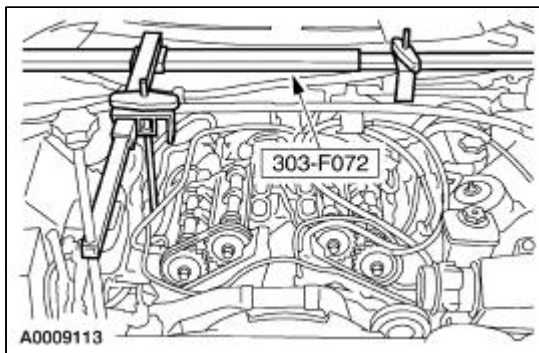
5. Remove the bolts and the coolant outlet tube.



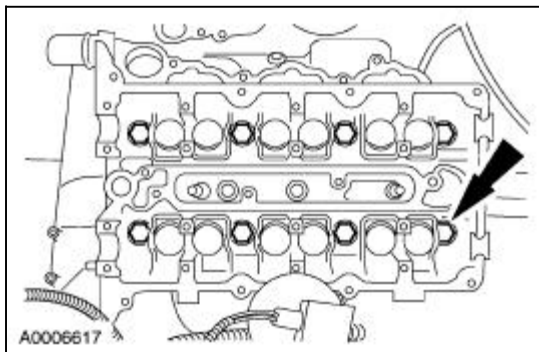
6. Raise the vehicle.
7. Install the four crossmember bolts.




8. Lower the vehicle.
9. Remove the special tool.



10. Remove the bolts and the RH cylinder head.
 - Discard the gasket.



Installation

1.  **CAUTION:** Do not use metal scrapers, wire brushes, power abrasive discs or other abrasive means to clean the sealing surfaces. These tool cause scratches and gouges which make leak paths. Use a plastic scraping tool to remove all traces of the head gasket.

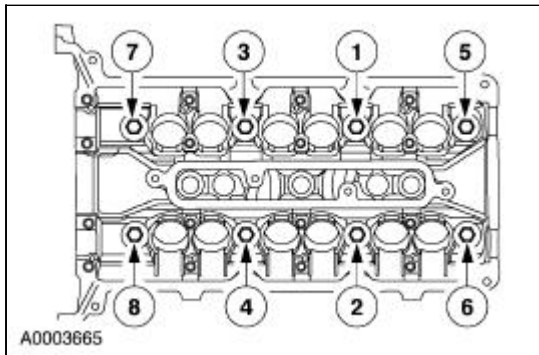
 **CAUTION:** The cylinder head bolts must be replaced with new bolts. They are tighten-to-yield designed and cannot be reused.

NOTE: LH and RH cylinder head gaskets are not interchangeable.

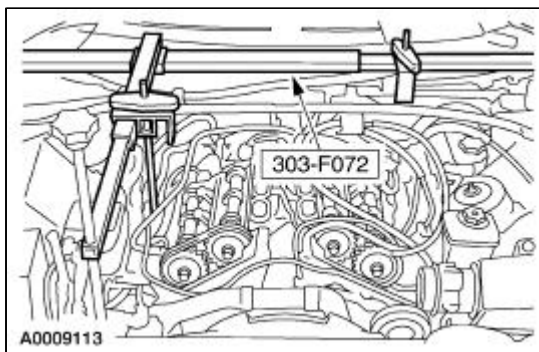
Using a new cylinder head gasket and bolts, install the RH cylinder head and loosely install the bolts.

2. Tighten the bolts in six stages in the sequence shown.

- Stage 1: Tighten to 30 Nm (22 lb-ft).
- Stage 2: Rotate 90 degrees.
- Stage 3: Back out a minimum of one full turn (360 degrees).
- Stage 4: Tighten to 30 Nm (22 lb-ft).
- Stage 5: Rotate 90 degrees.
- Stage 6: Rotate all bolts an additional 90 degrees.

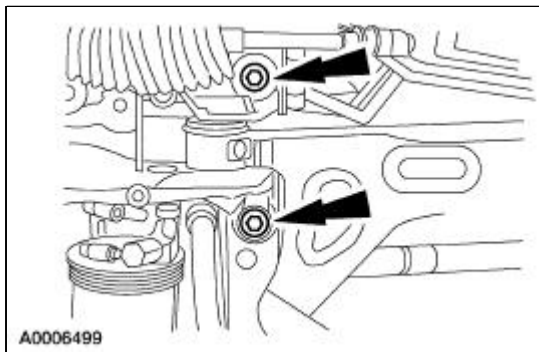


3. Install the special tool.



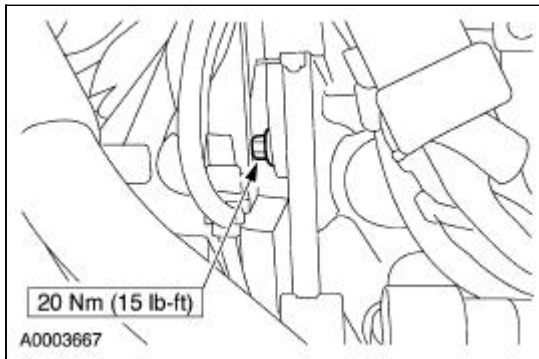
4. Raise the vehicle.

5. Remove the four crossmember bolts.



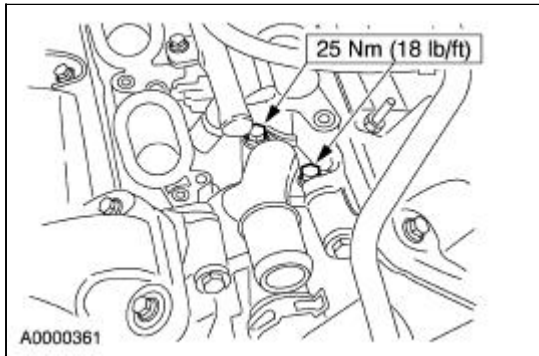
6. Lower the vehicle.

7. Position the noise suppressor and install the bolt.



8. **NOTE:** Clean the sealing surfaces and inspect the O-ring seals thoroughly.

Position the coolant outlet tube and install the bolts.



9. Install the lower intake manifold. For additional information, refer to [Intake Manifold—Lower](#) in this section.
 10. Install the RH exhaust manifold. For additional information, refer to [Exhaust Manifold—RH](#) in this section.
 11. Install the RH camshafts. For additional information, refer to [Camshaft—RH](#) in this section.
-

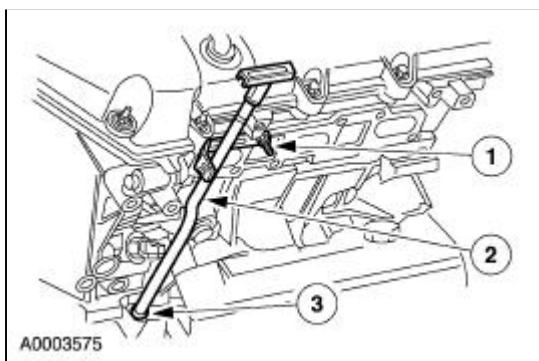
Oil Level Indicator and Tube

Removal

1. **NOTE:** The exhaust manifold is removed for clarity.

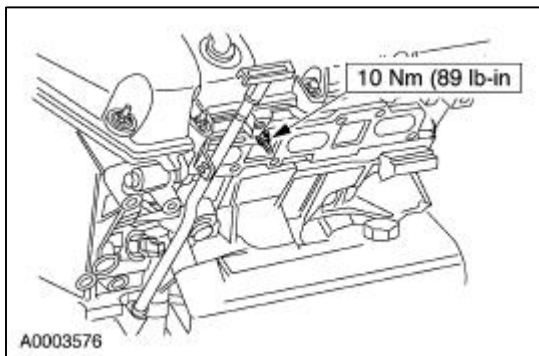
Remove the oil level indicator and tube.

1. Remove the stud bolt.
2. Remove the oil level indicator tube.
3. Inspect the O-ring seal at the end of the oil level indicator tube and install a new O-ring seal if necessary.



Installation

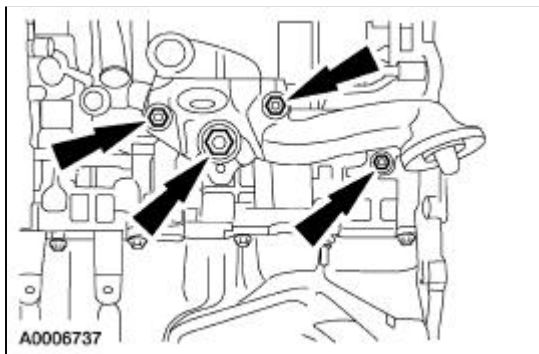
1. To install, reverse the removal procedure.



Oil Filter Adapter

Removal

1. Remove the LH engine mount. For additional information, refer to [Engine Mount—LH](#) in this section.
2. Drain the engine oil.
3. Remove the oil filter.
4. If equipped, remove the oil cooler. For additional information, refer to [Oil Cooler](#) in this section.
5. Remove the bolts and the oil filter adapter.



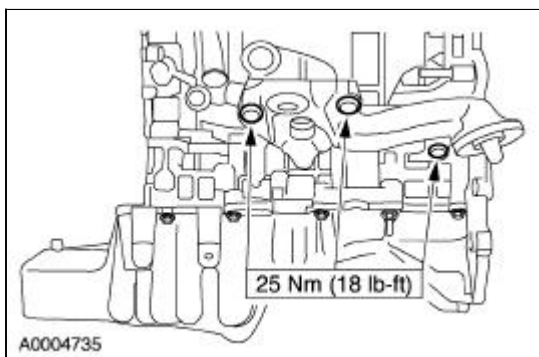
Installation

1. **NOTE:** The oil filter adapter bolts must be tightened in two steps.

NOTE: Inspect the O-ring seal and the surfaces for contamination prior to installation.

NOTE: Non-oil cooler equipped engine shown. Engines equipped with oil cooler are similar.

Position the oil filter adapter and a new O-ring seal and install the bolts.

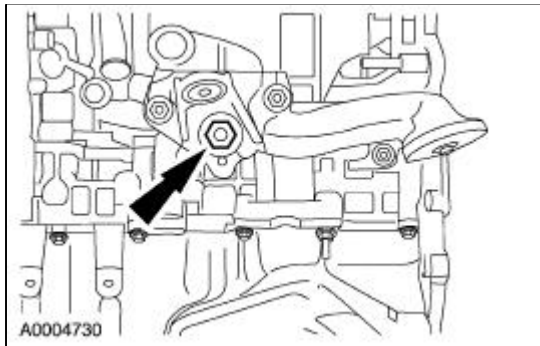


2. **NOTE:** Non-oil cooler equipped engine shown. Engines equipped with oil cooler are similar.

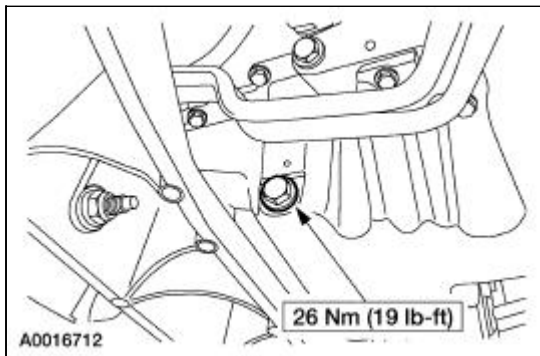
Using a new O-ring seal, lubricate with Super Premium SAE 5W-30 Motor Oil XO-5W30-QSP or equivalent meeting Ford specification WSS-M2C153-G and install the bolt.

Tighten the oil filter adapter bolts in two stages:

- Stage 1: Tighten to 30 Nm (22 lb-ft).
- Stage 2: Tighten to 155 Nm (114 lb-ft).



3. Tighten the oil pan drain plug.

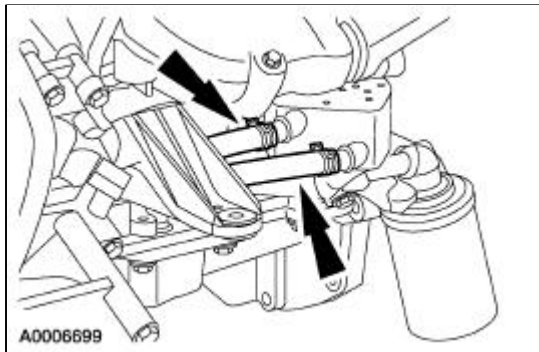


4. Install the oil filter.
 5. If equipped, install the oil cooler. For additional information, refer to [Oil Cooler](#) in this section.
 6. Fill the engine with Super Premium SAE 5W-30 Motor Oil XO-5W30-QSP meeting Ford specification WSS-M2C153-G or equivalent.
 7. Install the LH engine mount. For additional information, refer to [Engine Mount—LH](#) in this section.
 8. If drained, fill the engine cooling system. For additional information, refer to [Section 303-03](#).
-

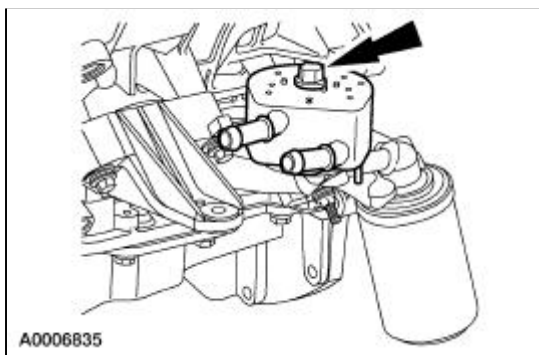
Oil Cooler

Removal

1. Drain the engine cooling system. For additional information refer to [Section 303-03](#).
2. Raise and support the vehicle. For additional information, refer to [Section 100-02](#).
3. Remove the oil cooler hoses.



4. Remove the bolt and the oil cooler.
 - Inspect the gasket. Discard if damaged.

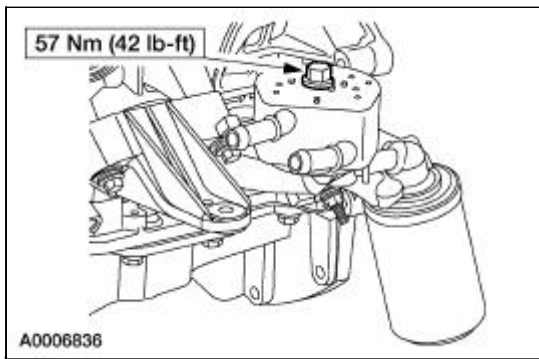


Installation

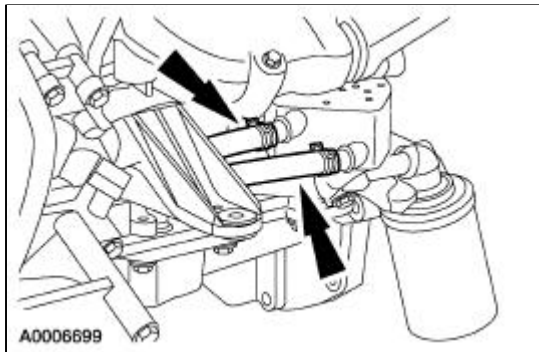
1. **NOTE:** Inspect gasket and surfaces for contamination prior to installation.

Position the oil cooler and gasket and install the bolt.

- Rotate the cooler clockwise until the locating pin hits the stop.



2. Install the oil cooler hoses.

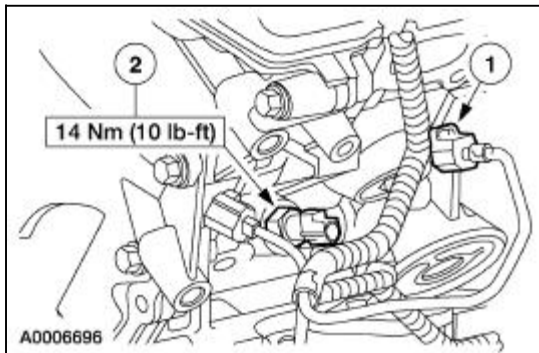


3. Lower the vehicle.
 4. Fill the engine cooling system. For additional information, refer to [Section 303-03](#).
-

Oil Pressure Switch —Oil Cooler

Removal and Installation

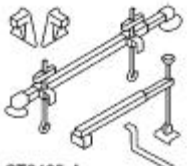

1. Remove the oil pressure switch.
 1. Disconnect the electrical connector.
 2. Remove the switch.



2. To install, reverse the removal procedure.
-

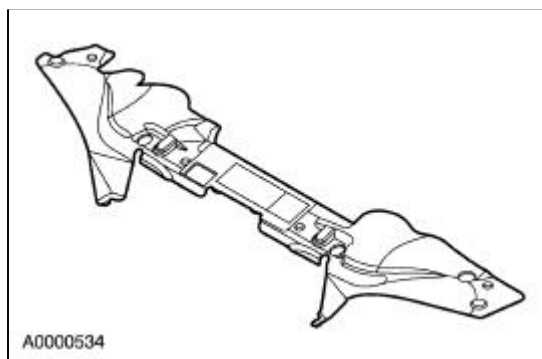
Oil Pan

Special Tool(s)

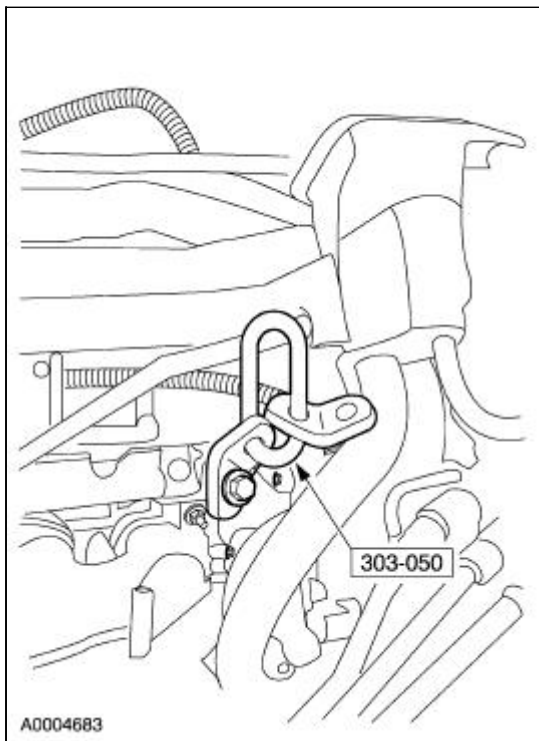
 <p>ST2425-A</p>	Three Bar Engine Support Kit 303-F072
 <p>ST1595-A</p>	Engine Lifting Brackets 303-050

Removal

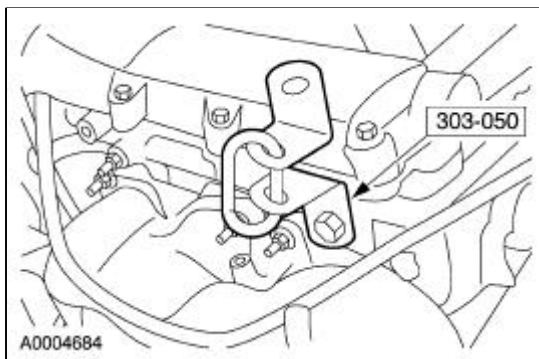
1. Remove the air cleaner outlet tube. For additional information, refer to [Section 303-12](#).
2. Remove the upper radiator sight shield.



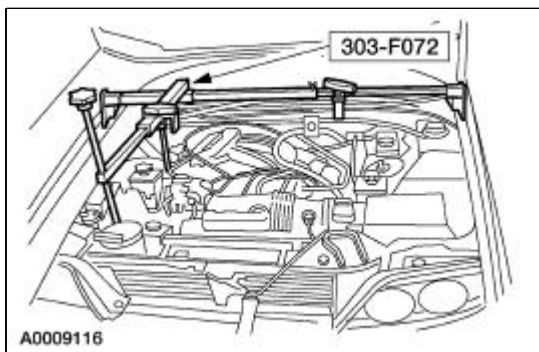
3. Install the special tool.



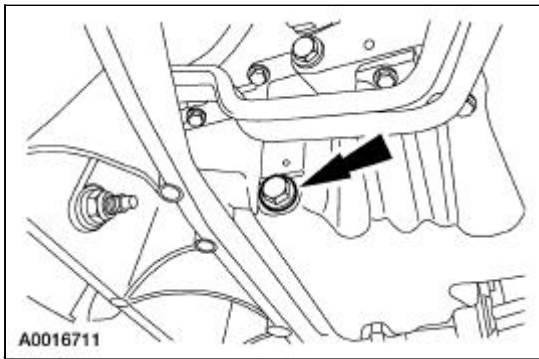
4. Install the special tool.



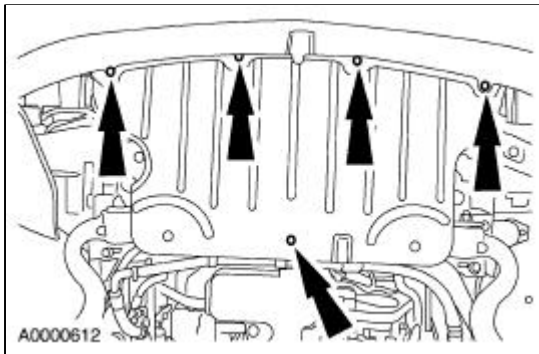
5. Using the special tool, support the engine.



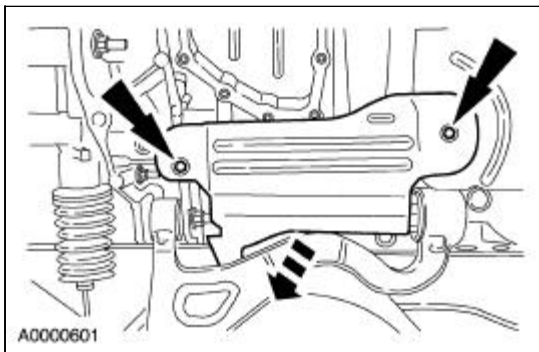
6. Remove the generator. For additional information, refer to [Section 414-02](#).
7. Drain the engine oil.



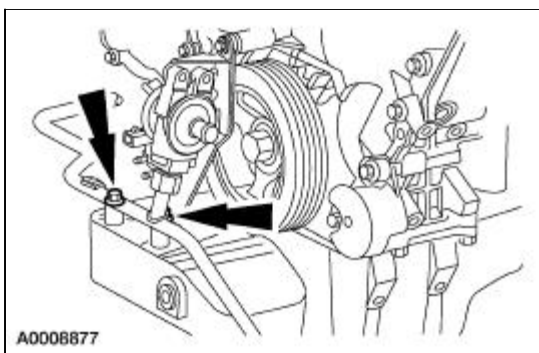
8. Remove the front center splash shield.



9. Remove the RH front splash shield.



10. Remove the A/C compressor. For additional information, refer to [Section 412-03](#).
11. If equipped, remove the electronic thermactor air (ETA) bracket bolts.

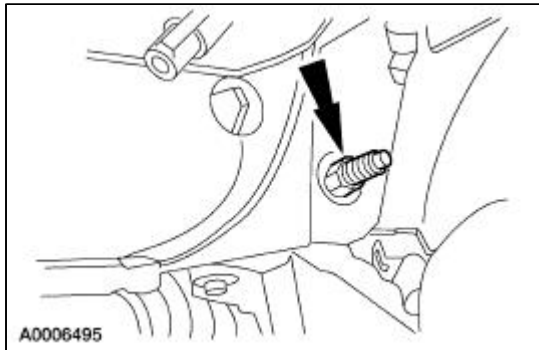


12. **NOTE:** On RH drive vehicles, the power steering line attaches to the oil pan stud.

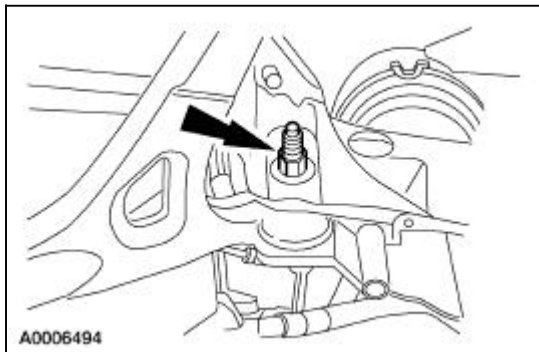
NOTE: On RH drive vehicles, the wiring harness attaches to the RH side of the oil pan.

Remove the steering gear. For additional information, refer to [Section 211-02](#).

13. Remove the LH lower control arm through bolt.

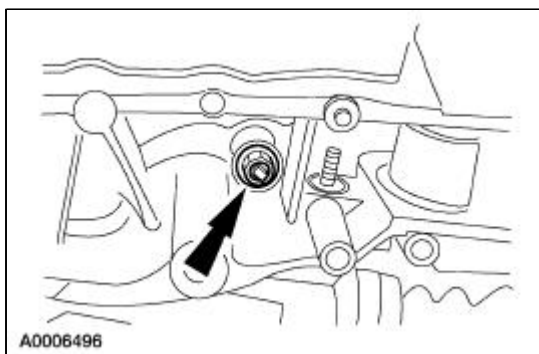


14. Remove the RH lower control arm through bolt.

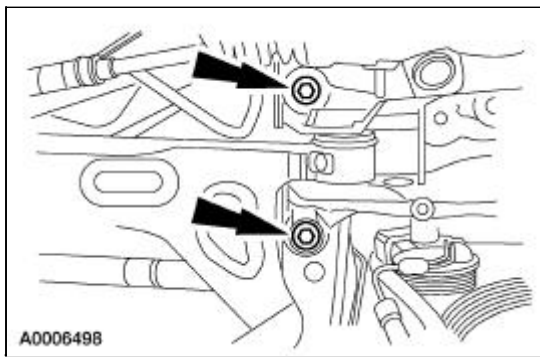


15. **NOTE:** LH shown; RH similar.

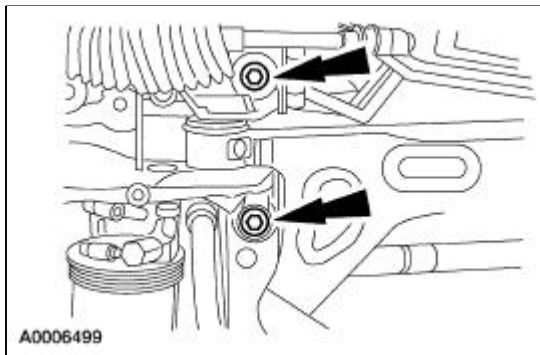
Remove the LH and the RH engine mount nuts.



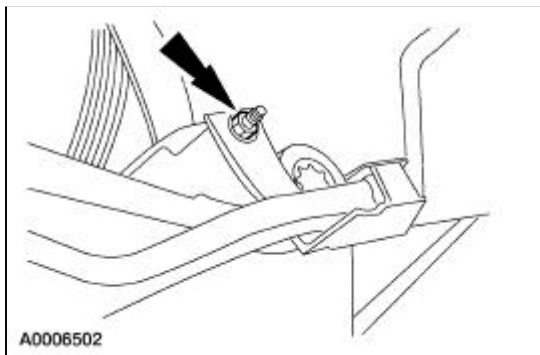
16. Remove the LH subframe bolts.



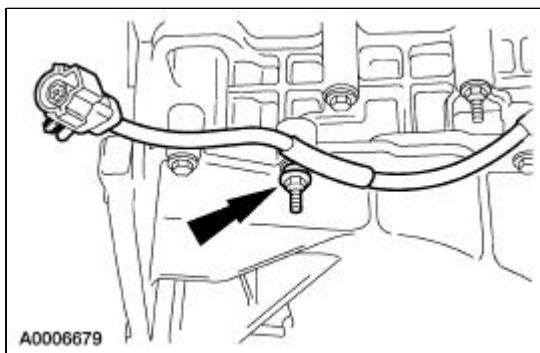
17. Remove the RH subframe bolts.



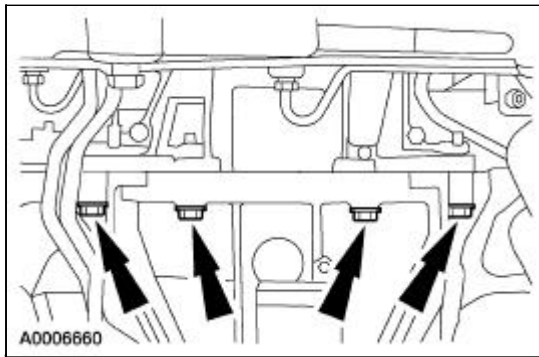
18. Remove the transmission cooler line bracket nut.



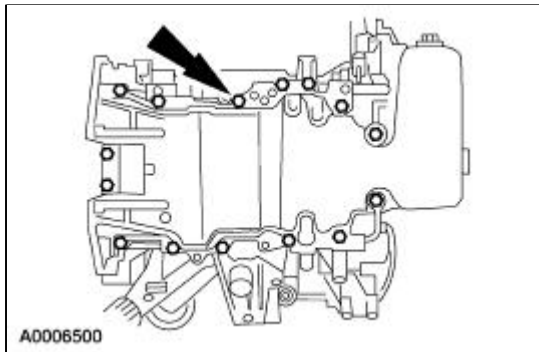
19. Remove the nut and the wiring harness from the stud.



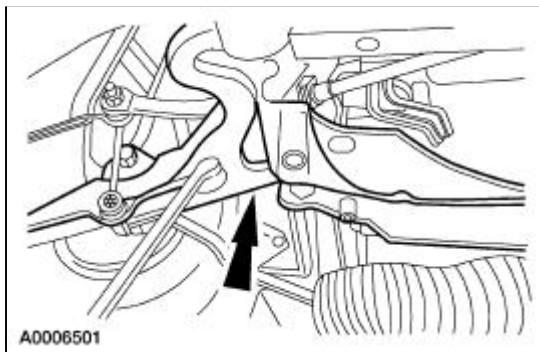
20. Remove the transmission to oil pan bolts.




21. Remove the oil pan bolts.



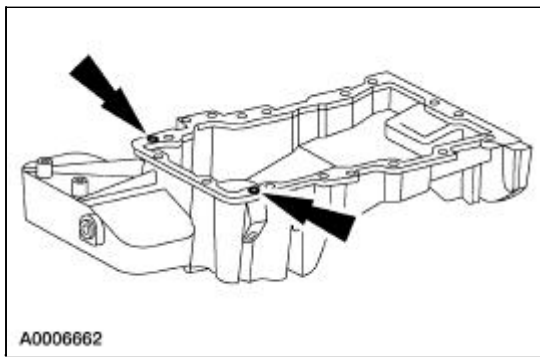
22. Gently pry the subframe down and remove the oil pan.
 - Discard the gasket.



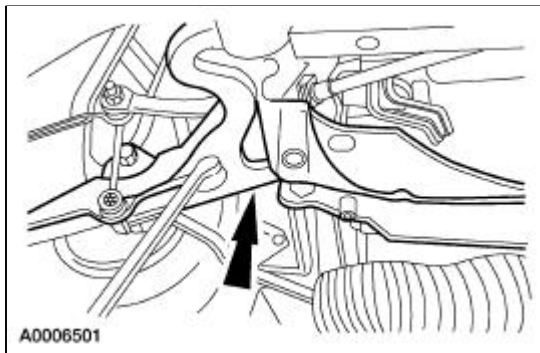
Installation

1. Clean all of the sealing surfaces.
2. Position a new gasket on the pan.
3.  **CAUTION: The oil pan must be installed and the bolts tightened within six minutes of the sealant application.**

Apply a 10 mm (0.40 in) dot of Silicone Gasket and Sealant F7AZ-19554-EA or equivalent meeting Ford specification WSE-M4G323-A4 to the oil pan gasket in the indicated position.



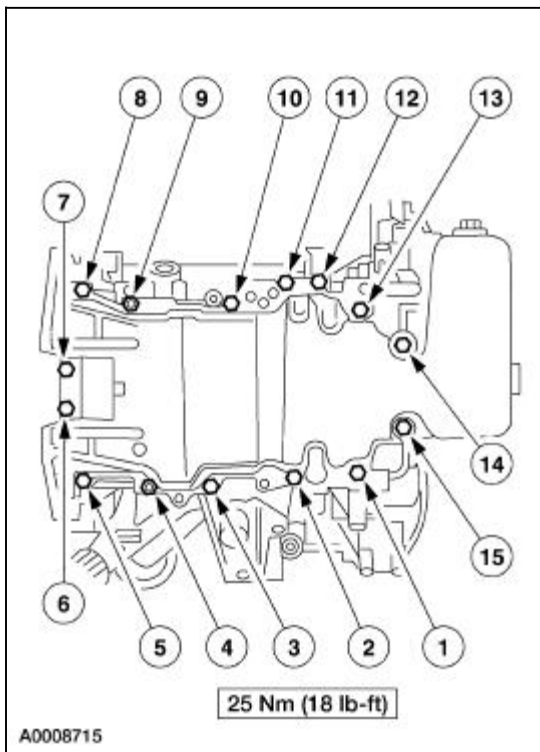
4. Gently pry the subframe down and install the oil pan.



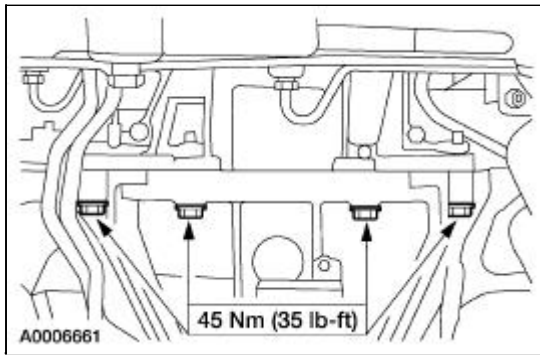
5. **NOTE:** Fasteners No. 4 and No. 9 are studs.

Position the oil pan and install the studs and bolts.

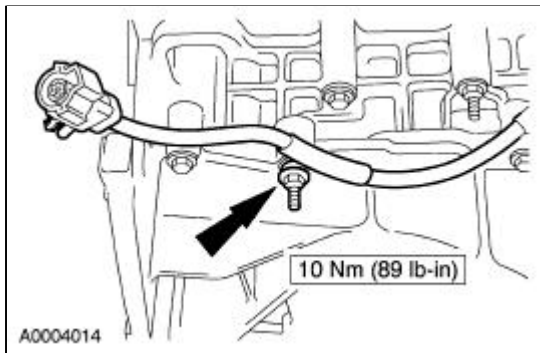
- Tighten the bolts in the sequence shown.



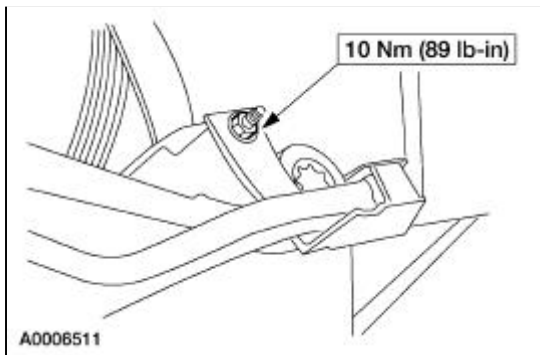
6. Install the transmission to oil pan bolts.



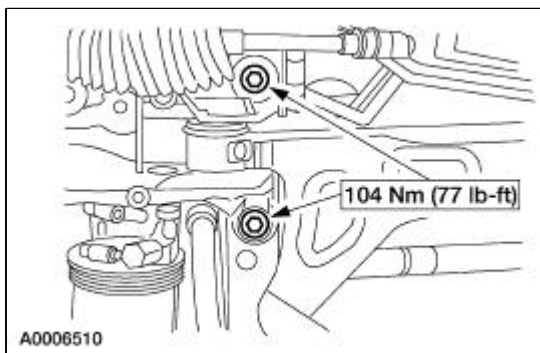
7. Position the wiring harness on the stud and install the nut.



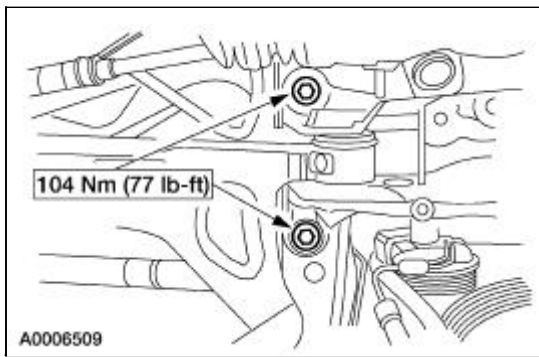
8. Install the transmission cooler line bracket nut.



9. Install the RH subframe bolts.

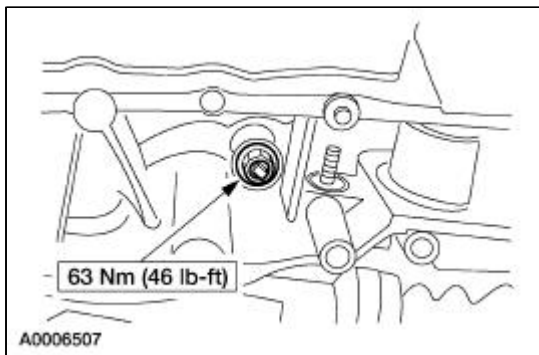


10. Install the LH subframe bolts.

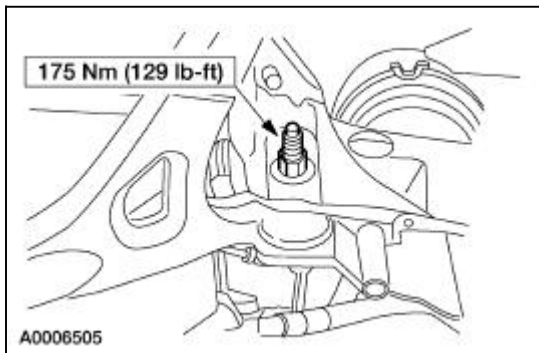


11. **NOTE:** LH shown; RH similar.

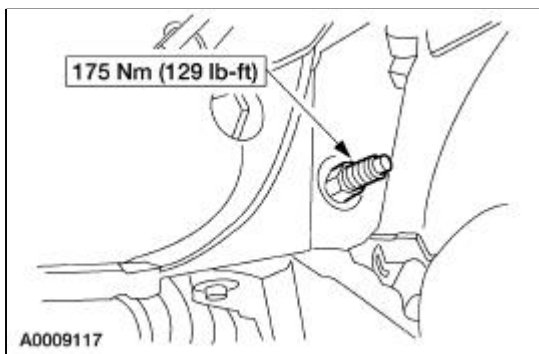
Install the LH and the RH engine mount nuts.



12. Install the RH lower control arm through bolt.

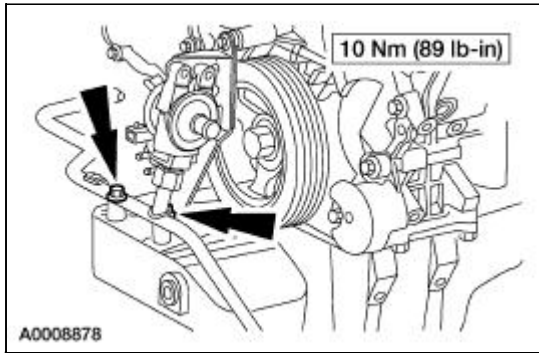


13. Install the LH lower control arm through bolt.



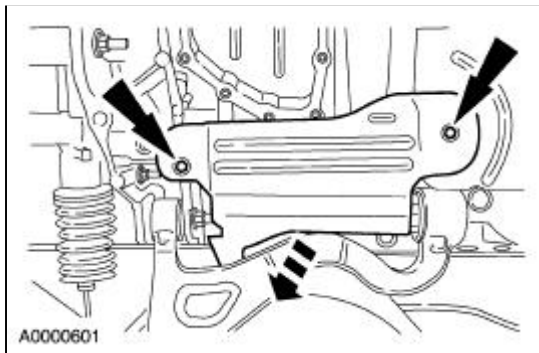
14. Install the steering gear. For additional information, refer to [Section 211-02](#).

15. If equipped, install the electronic thermactor air (ETA) bracket bolts.

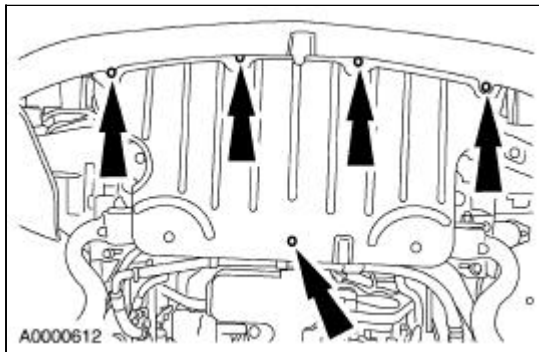


16. Install the A/C compressor. For additional information, refer to [Section 412-03](#).

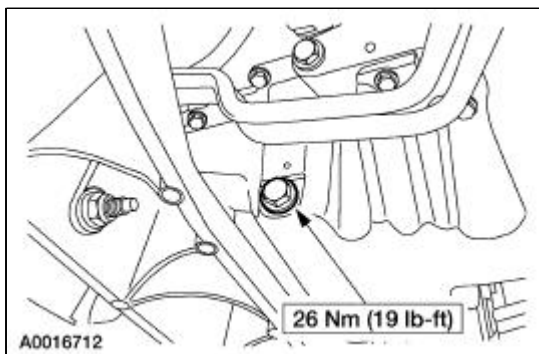
17. Install the RH front splash shield.



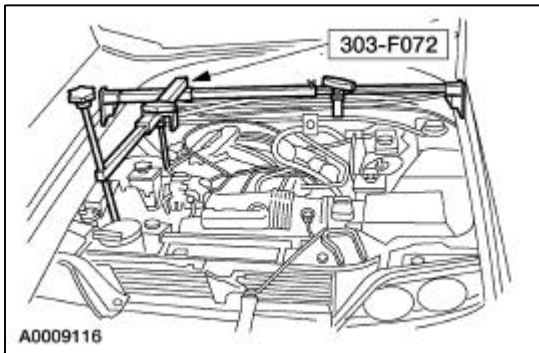
18. Install the front center splash shield.



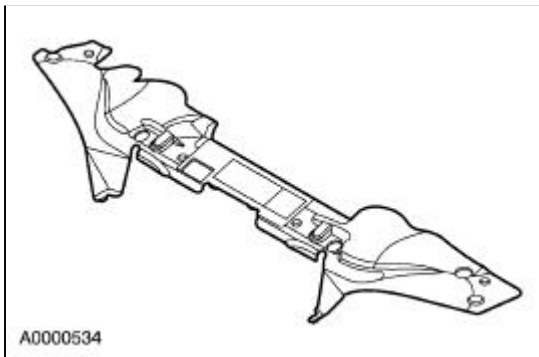
19. Tighten the oil pan drain plug.



20. Install the generator. For additional information, refer to [Section 414-02](#).
21. Remove all of the special tools.



22. Install the upper radiator sight shield.

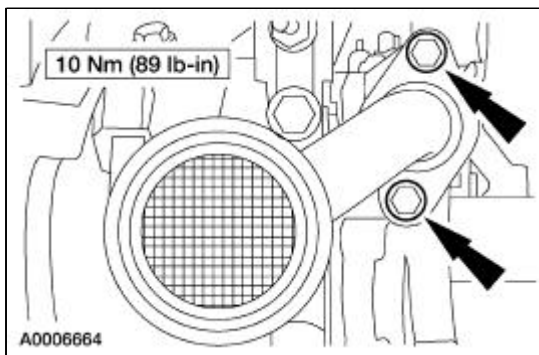


23. Install the air cleaner outlet tube. For additional information, refer to [Section 303-12](#).
 24. Fill the engine crankcase with Super Premium SAE 5W-30 Motor Oil XO-5W30-QSP or equivalent meeting Ford specification WSS-M2C153-G.
 25. Check the vehicle alignment. For additional information, refer to [Section 204-00](#).
-

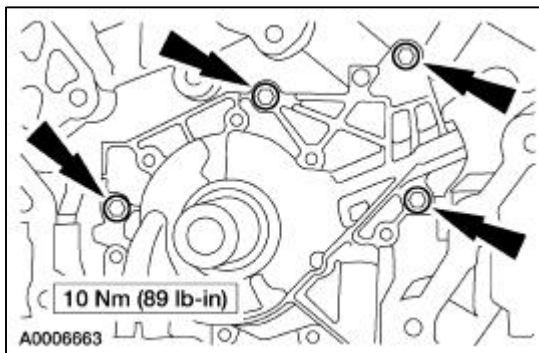
Oil Pump

Removal and Installation

1. Remove the timing chains. For additional information, refer to [Timing Drive Components](#) in this section.
2. Remove the crankshaft sprocket.
3. Remove the bolts and the oil pump screen tube.
 - Inspect the O-ring seal. Install a new seal if necessary.



4. Remove the bolts and the oil pump.

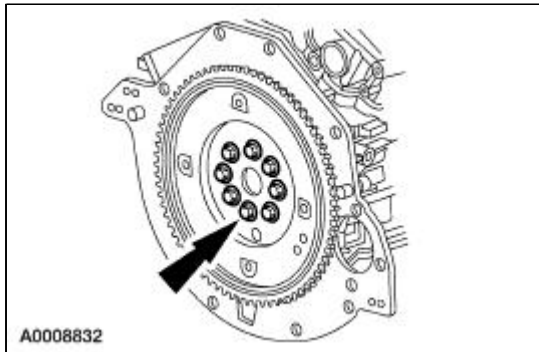


5. To install, reverse the removal procedure.

Flywheel

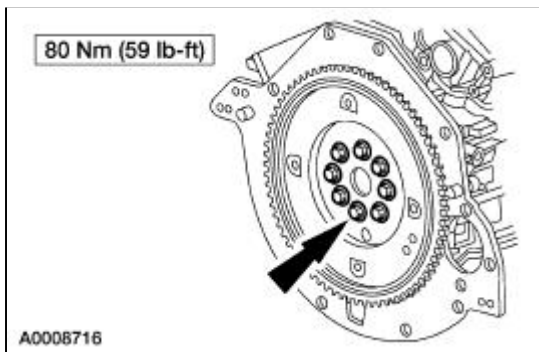
Removal

1. Remove the clutch. For additional information, refer to [Section 308-02](#).
2. Remove the bolts and the flywheel.



Installation

1. Position the flywheel and install the bolts.

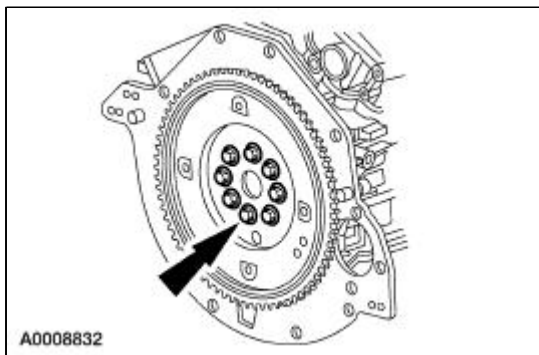


2. Install the clutch. For additional information, refer to [Section 308-02](#).
-

Flexplate

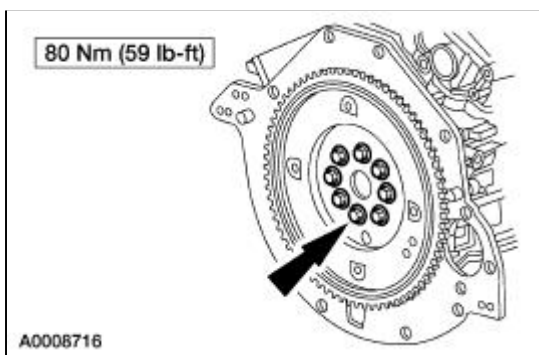
Removal

1. Remove the transmission. For additional information, refer to [Section 307-01](#).
2. Remove the bolts and the flexplate.
 - Inspect the flexplate for cracks or other damage. Install a new flexplate if necessary.



Installation



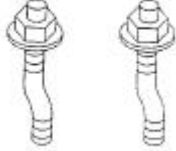

1. Position the flexplate and install the bolts.



2. Install the transmission. For additional information, refer to [Section 307-01](#).
-

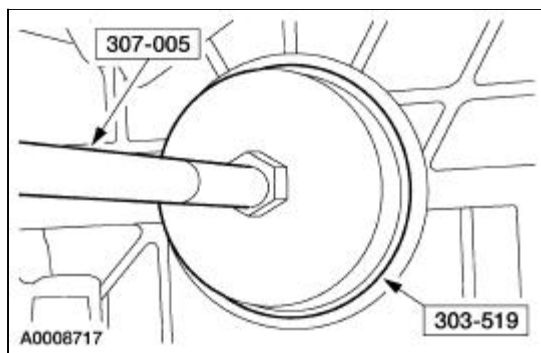
Crankshaft Rear Oil Seal

Special Tool(s)

 ST1187-A	Impact Slide Hammer 307-005
 ST1382-A	Rear Crankshaft Seal Remover 303-519 (T95P-6701-EH)
 ST1333-A	Rear Crankshaft Adapter Bolts 303-384 (T91P-6701-A)
 ST1327-A	Crankshaft Seal Replacer 303-178 (T82L-6701-A)

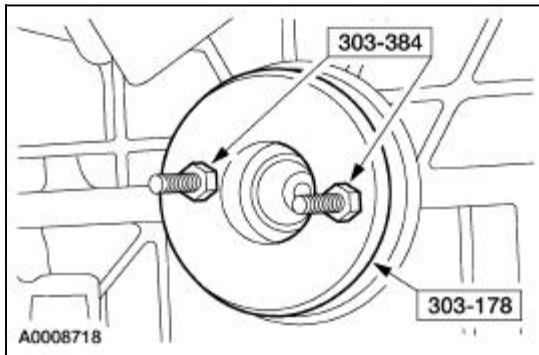
Removal

1. Remove the flywheel or flexplate. For additional information, refer to [Flywheel](#) or [Flexplate](#) in this section.
2. Using the special tools, remove the crankshaft rear oil seal.



Installation

1. Lubricate the outer lips and the inner seal on the crankshaft rear oil seal with Super Premium 5W-30 Motor Oil XO-5W30-QSP or equivalent meeting Ford specification WSS-M2C153-G.
2. Using the special tools, install the crankshaft rear oil seal.

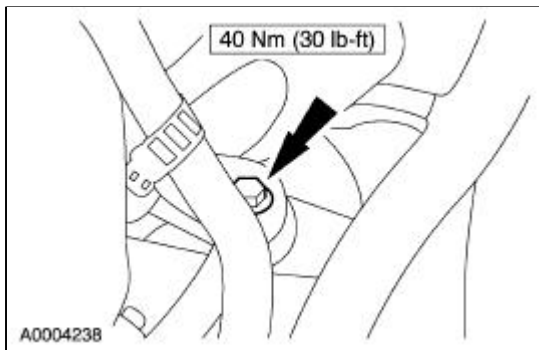


3. Install the flywheel or flexplate. For additional information, refer to [Flywheel](#) or [Flexplate](#) in this section.
-

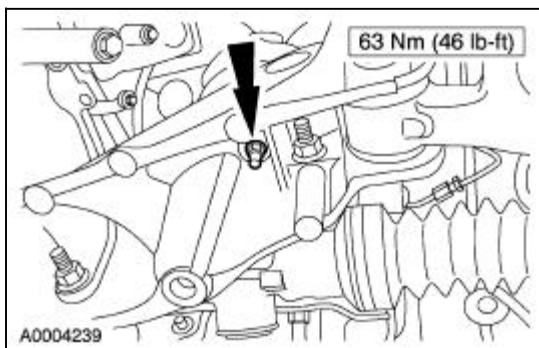
Engine Mount —LH


Removal and Installation

1. Remove the intake manifold tuning valve. For additional information, refer to [Section 303-14](#).
2. Remove the fresh air intake housing. For additional information, refer to [Section 412-01](#).
3. Remove the LH engine mount upper nut.

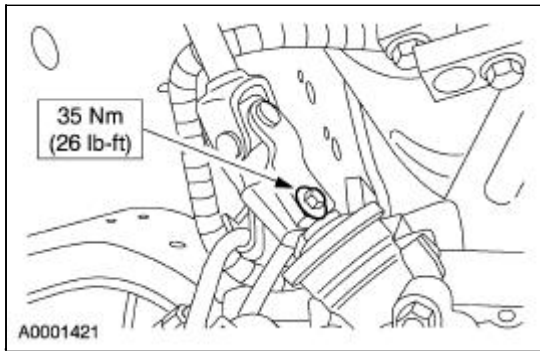


4. Raise and support the vehicle. For additional information, refer to [Section 100-02](#).
5. Remove the LH engine mount lower nut.

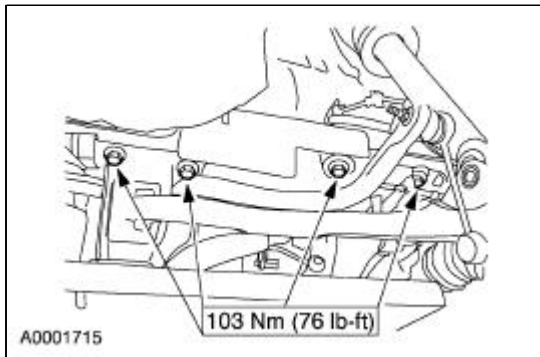


6.  **CAUTION:** The steering wheel must be in the locked position, or the lower end of the column wired in such a way that the steering column does not rotate, resulting in damage to air bag sliding contact.

Disconnect the steering coupling.



7. Raise the engine.
8. Loosen the four bolts and lower the sub-frame to remove the mount.

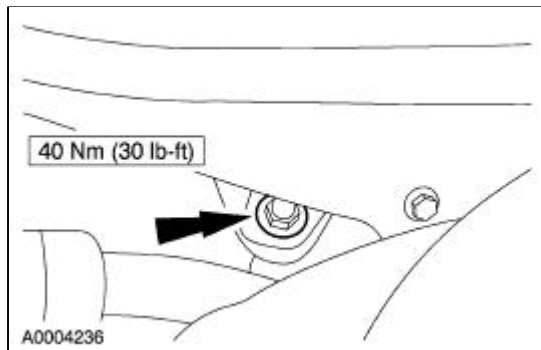


9. To install, reverse the removal procedure.
-

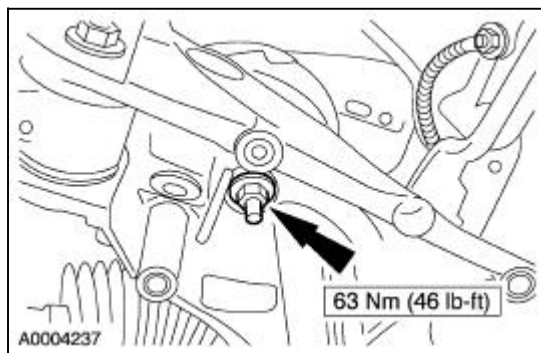
Engine Mount —RH

Removal and Installation

1. Remove the intake manifold tuning valve. For additional information, refer to [Section 303-14](#).
2. Remove the fresh air intake housing. For additional information, refer to [Section 412-01](#).
3. Remove the RH engine mount upper nut.





4. Raise and support the vehicle. For additional information, refer to [Section 100-02](#).
5. Remove the RH engine mount lower nut.




6. Raise the engine and remove the engine mount.
7. To install, reverse the removal procedure.


Valve Spring —Lash Adjustment

Special Tool(s)

 <p>ST2429-A</p>	Camshaft Lift Tools 303-659
 <p>ST1271-A</p>	Feeler Gauge Set 303-D027 (D81L-4201A)

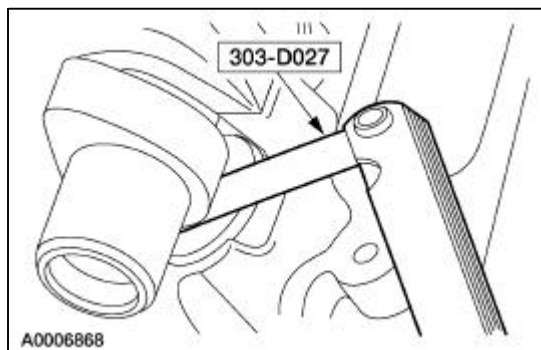
Removal

1. Remove the RH valve cover. For additional information, refer to [Valve Cover—RH](#) in this section.
2. Remove the LH valve cover. For additional information, refer to [Valve Cover—LH](#) in this section.
3.  **CAUTION: Rotating the crankshaft in a counterclockwise direction may cause engine damage. Crankshaft journals are directionally machined. Rotating the crankshaft counterclockwise can raise burrs on bearing surfaces, reducing engine life.**

 **CAUTION: Camshaft lobes must be 180 degrees away from each valve tappet or valve lash measurements will be incorrect.**

Rotate the engine clockwise to position the camshaft lobe away from the shim surface.

4. Using the special tool, measure the clearance between the camshaft and the shim surface. Record the information.

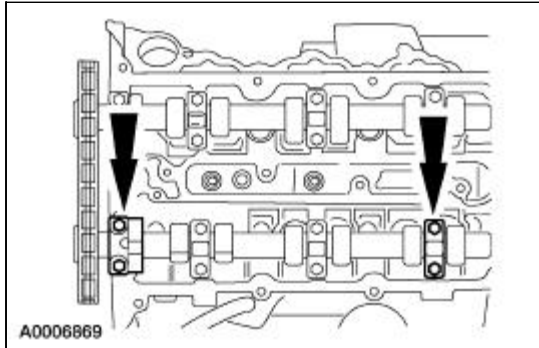


5. Use a bright colored marker to mark the position of the timing chain in relation to the camshaft sprockets to make sure that the timing remains correct.

6.  **CAUTION:** The camshaft caps must be installed in their original positions.

Mark the camshaft cap locations.

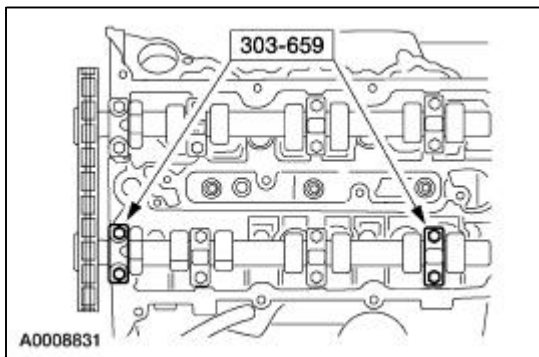
7. Remove the camshaft thrust cap and rear camshaft cap from the camshaft that requires shim adjustment.



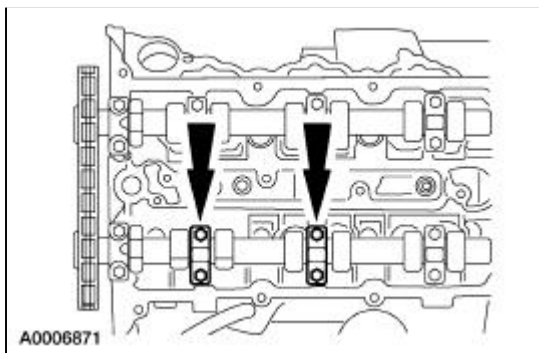
8. **NOTE:** The taller special tool is installed in place of the rear camshaft cap to allow the camshaft to be lifted to remove the shims.


Install the special tools.

- Hand-tighten the bolts.



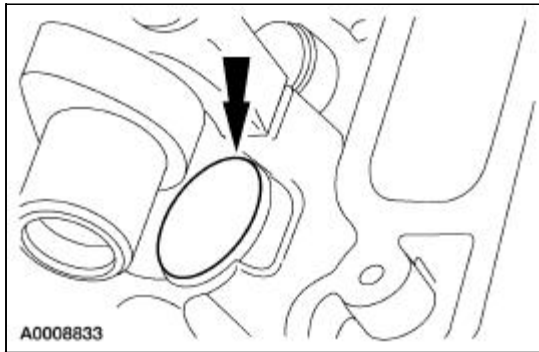
9. Remove the bolts and the center camshaft caps.



10.  **CAUTION:** Do not use any means of marking the shims other than a permanent type marker. Any scratches or paint on the shims may result in incorrect lash adjustments and severe engine damage.

Use a permanent marker to mark the location of each shim.

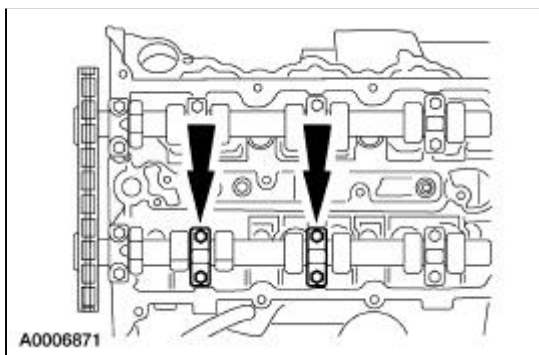
11. Use a rubber-tipped air gun and compressed air to remove the shims that require adjustment.
 - Blow compressed air between the shim edge and bucket rail to dislodge the shim.



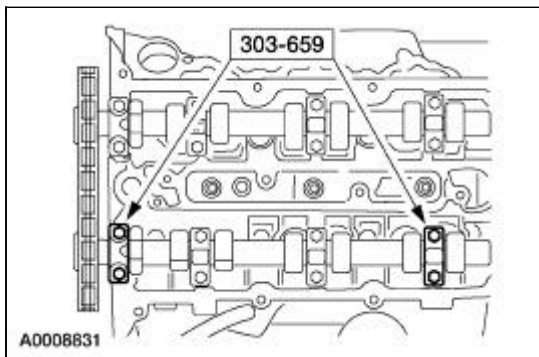
12. Measure and record the thickness of each shim to correspond with valve clearance.
13. Use the following formula to calculate the required shim thickness.
 - Valve clearance specification:
 - Intake: 0.175 mm — 0.225 mm (0.0069 in — 0.0089 in)
 - Exhaust: 0.325 mm — 0.375 mm (0.0128 in — 0.0148 in)
 - Original shim thickness + measured clearance - desired clearance = required shim thickness.

Installation

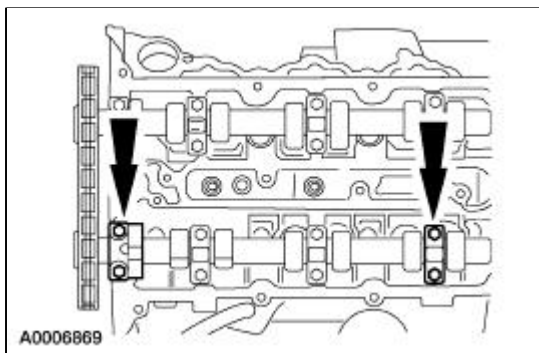
1. Apply a light coat of Super Premium SAE 5W-30 Motor Oil XO-5W30-QSP or equivalent meeting Ford specification WSS-M2C153-G to the replacement shim(s) and install the shim(s).
2. Apply Super Premium SAE 5W-30 Motor Oil XO-5W30-QSP or equivalent meeting Ford specification WSS-M2C153-G to the camshaft journals and bearing caps.
3. Position the center camshaft journal caps and loosely install the bolts.



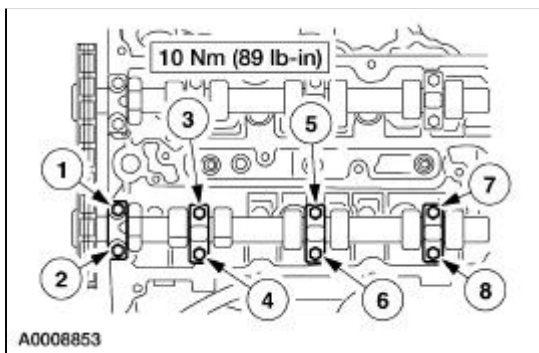
4. Remove the bolts and the special tools.



5. Position the camshaft journal rear and front thrust caps and loosely install the bolts.



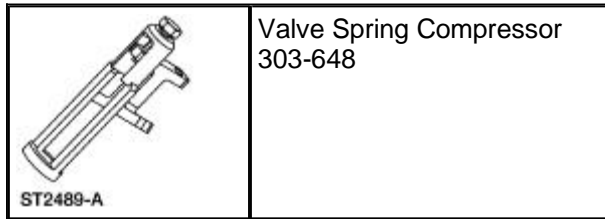
6. Tighten the bolts in the indicated sequence.



7. Rotate the crankshaft clockwise to rotate the camshafts two full revolutions and recheck the valve clearance.
 8. Install the LH valve cover. For additional information, refer to [Valve Cover—LH](#) in this section.
 9. Install the RH valve cover. For additional information, refer to [Valve Cover—RH](#) in this section.
-


Valve Spring —Springs, Retainers, and Stem Seals


Special Tool(s)



Removal

1. Remove the appropriate camshafts. For additional information, refer to [Camshaft—LH](#) or [Camshaft—RH](#) in this section.
2. Position the piston to the top of its stroke on the appropriate cylinder.
3. Remove the appropriate spark plug. For additional information, refer to [Section 303-07A](#).
4. Pressurize the cylinder with compressed air to hold both valves closed.

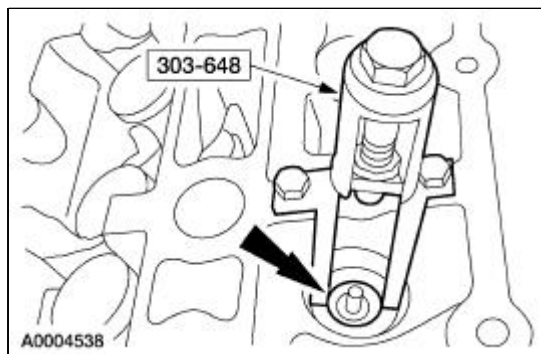
5.  **CAUTION: Do not use any means of marking the shims other than a permanent type marker. Any scratches or paint on the shims may result in incorrect lash adjustments and severe engine damage.**

 **CAUTION: The tappets and shims must be installed in their original positions to make sure of correct valve lash settings.**

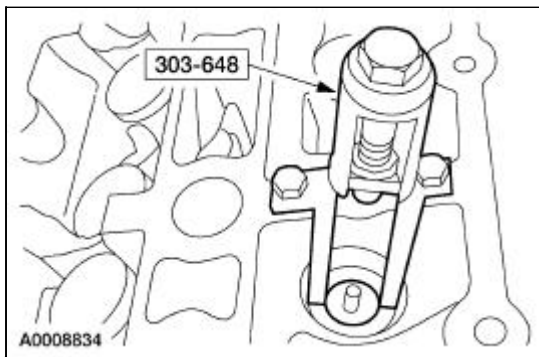
Remove the tappet and shim from the valve.

- If more than one tappet and shim are removed, mark them using a permanent type marker.

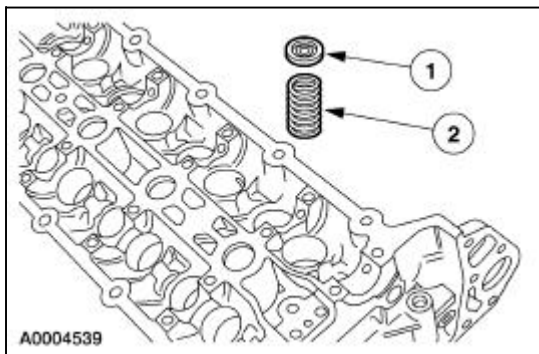
6. Using the special tool, compress the valve spring and remove the retainer locks.



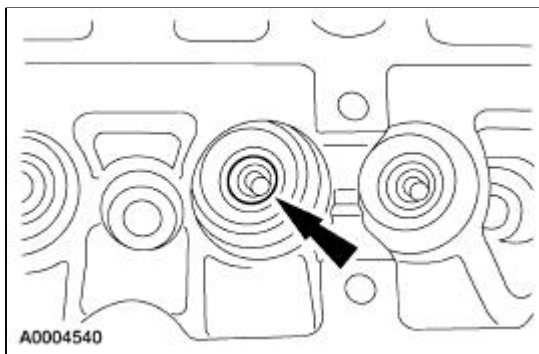
7. Remove the special tool.



8. Remove the valve spring.
 1. Remove the retainer.
 2. Remove the valve spring.



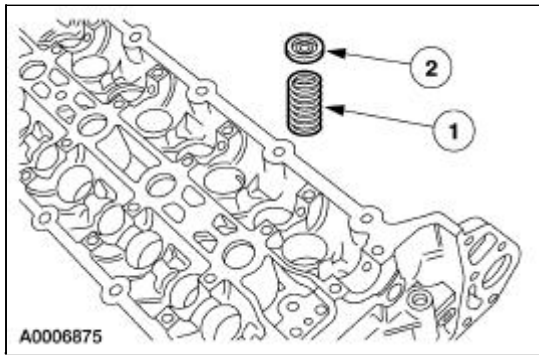
9. Remove the valve stem seal.



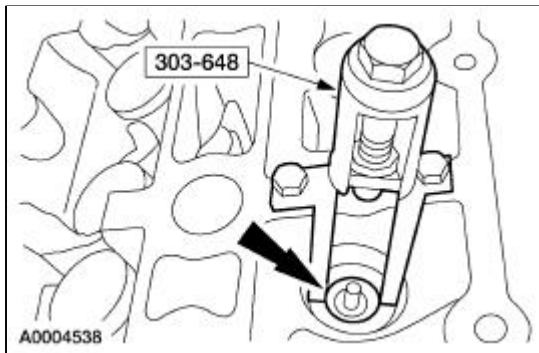
10. Repeat the procedure until all the valve stem seals have been removed.


Installation

1. Install the valve stem seal.
2. Install the valve spring.
 1. Install the spring.
 2. Install the retainer.



3. Using the special tool, compress the valve spring and install the retainer locks.




4. Release the compressed air used to hold the valves closed.
 5. Install the spark plug. For additional information, refer to [Section 303-07A](#).
 6. Repeat the procedure until all of the valve stem seals have been installed.
 7.  **CAUTION: The tappets and shims must be installed in their original positions to make sure of correct valve lash settings.**
Install the tappet and shim from the valve.
 8. Install the camshafts. For additional information, refer to [Camshaft—LH](#) or [Camshaft—RH](#) in this section.
-

Valve Tappet

Removal and Installation

1. Remove the appropriate camshafts. For additional information, refer to [Camshaft—LH](#) or [Camshaft—RH](#) in this section.

2.  **CAUTION:** Do not use any means of marking the shims other than a permanent type marker. Any scratches or paint on the shims may result in incorrect lash adjustments and severe engine damage.

 **CAUTION:** The tappets and shims must be installed in their original positions to make sure of correct valve lash settings.

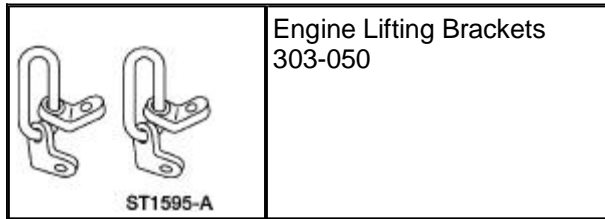
NOTE: The shim sits on top of the valve tappet.

Remove the tappet and shim.

3. To install, reverse the removal procedure.
-

Engine

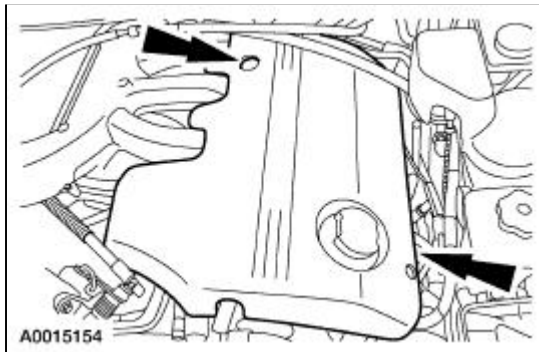
Special Tool(s)



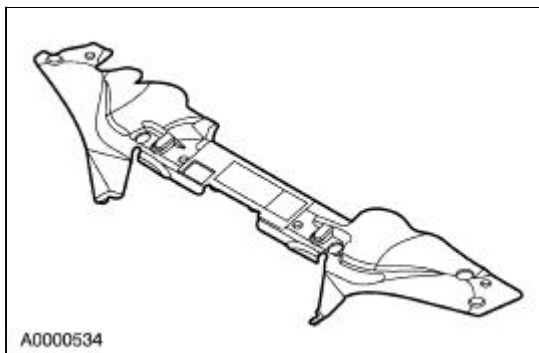
Removal

All vehicles

1. Disconnect the battery ground cable. For additional information, refer to [Section 414-01](#).
2. Remove the air cleaner outlet tube and the air cleaner. For additional information, refer to [Section 303-12](#).
3. Remove the engine appearance cover.

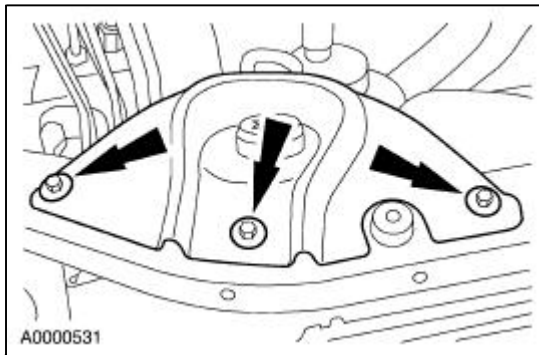


4. Drain the cooling system. For additional information, refer to [Section 303-03](#).
5. Evacuate the A/C system. For additional information, refer to [Section 412-00](#).
6. Remove the upper radiator sight shield.

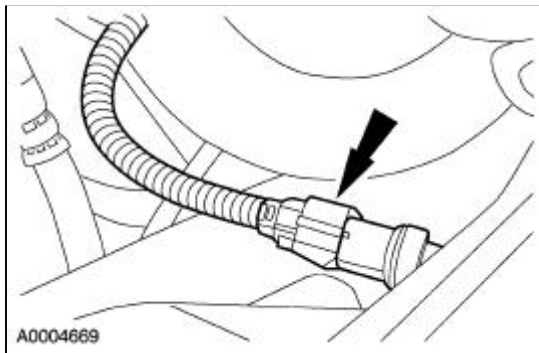


7. **NOTE:** RH shown; LH similar.

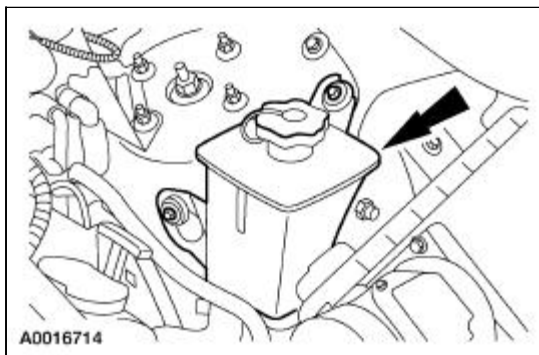
Remove the upper radiator support brackets.



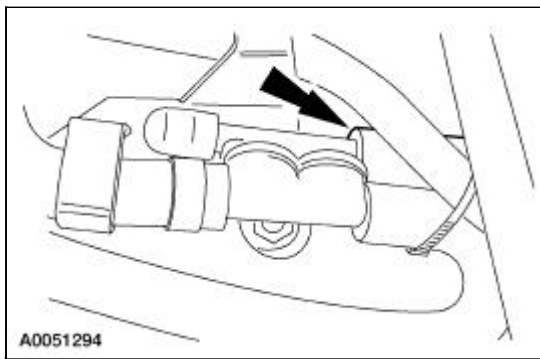
8. Disconnect the A/C pressure switch electrical connector.



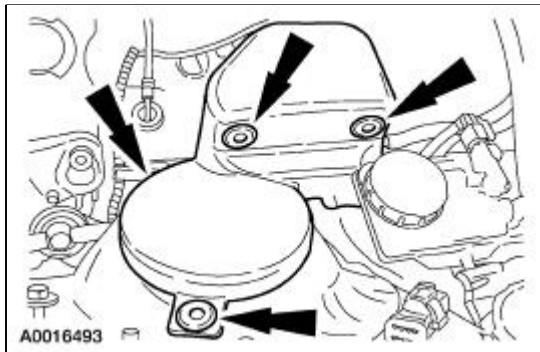
9. Remove the power steering reservoir bolts and secure the power steering reservoir to the engine.



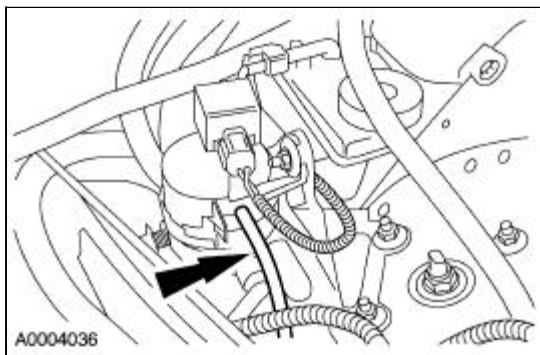
10. Disconnect the fuel tube. For additional information, refer to [Section 310-00](#).
11. Disconnect the brake booster vacuum hose.



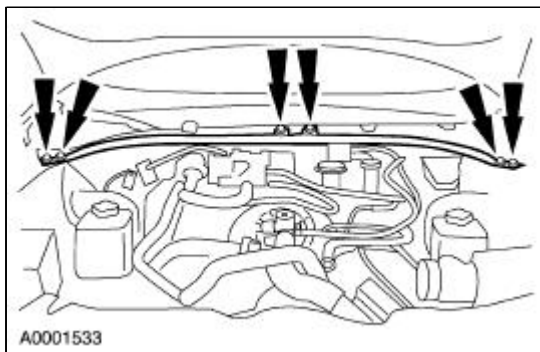
12. Remove the vapor management valve (VMV) cover.



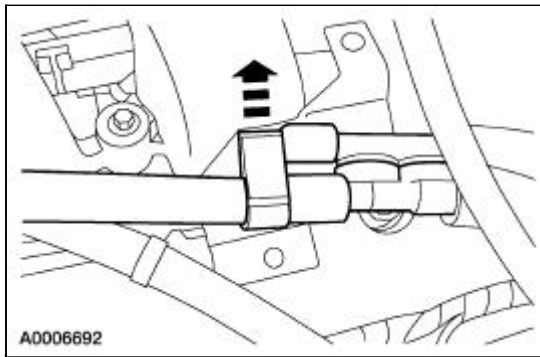
13. Disconnect the vacuum hose.



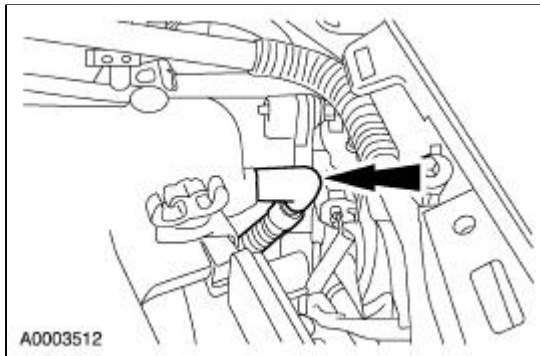
14. Remove the fresh air inlet duct. For additional information, refer to [Section 412-01](#).



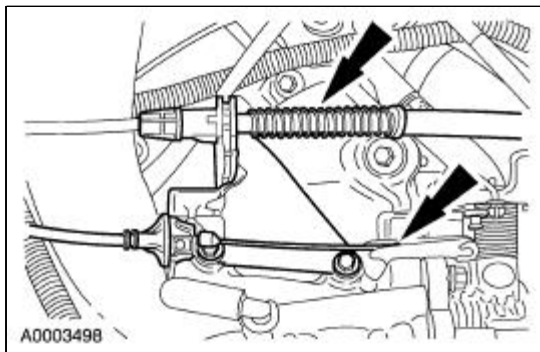
15. Unclip the chassis vacuum tubes from the support bracket and disconnect the tubes.



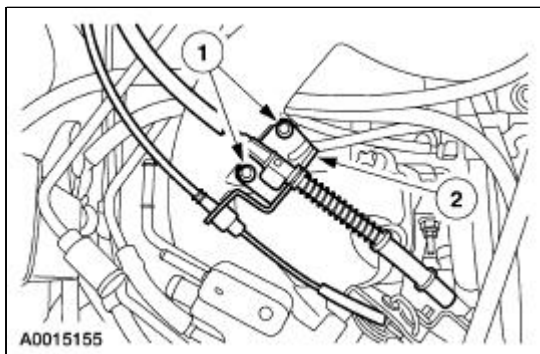
16. Disconnect the main vacuum hose from the rear of the intake manifold.



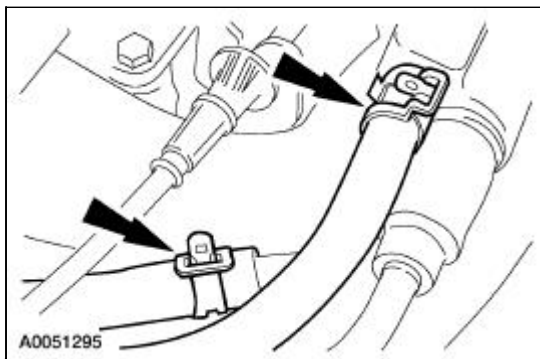
17. Disconnect the accelerator and speed control cables.



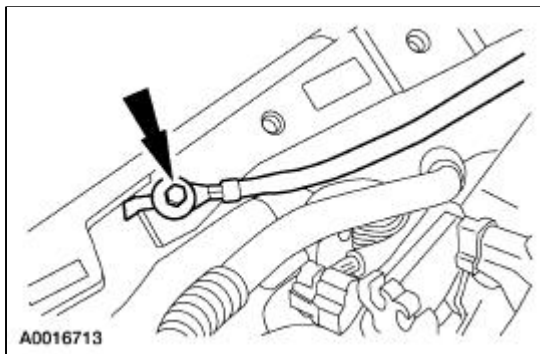
18. Remove the cable brackets.
1. Remove the bolts.
2. Remove the bracket.



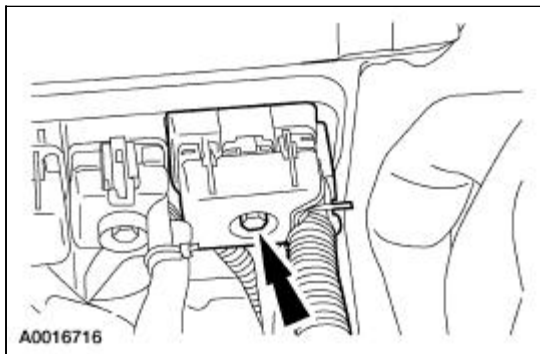
19. Disconnect the throttle body coolant hoses.



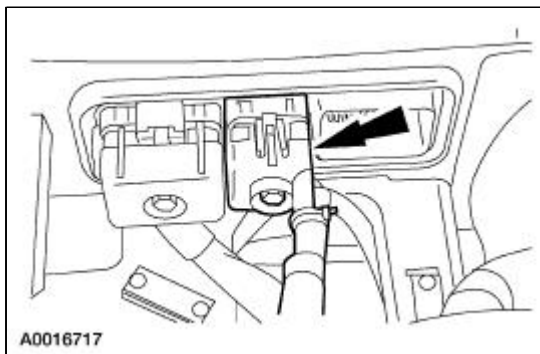
20. Remove the ground strap bolt.



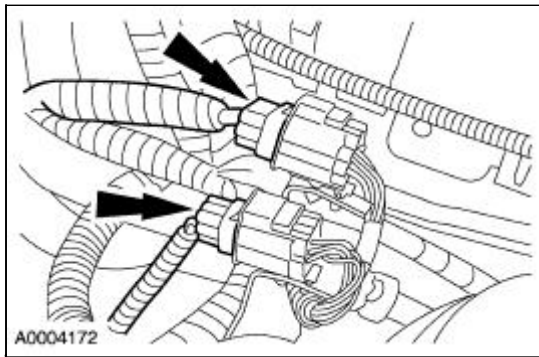
21. Loosen the bolt and disconnect the main engine wiring harness connector.



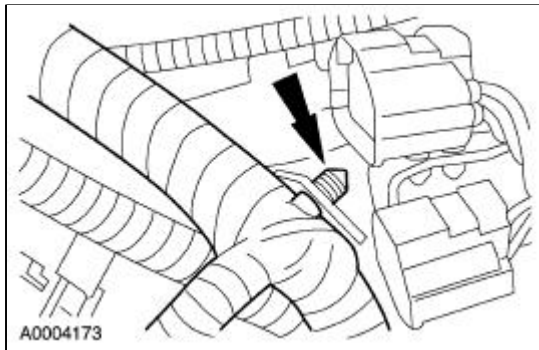
22. Loosen the bolt and disconnect the main transmission wiring harness connector.



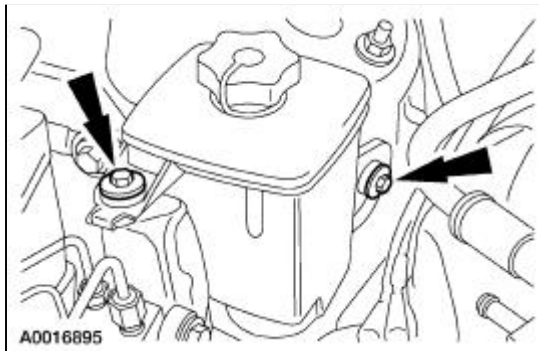
23. Disconnect the two fuel charging wiring harness connectors.



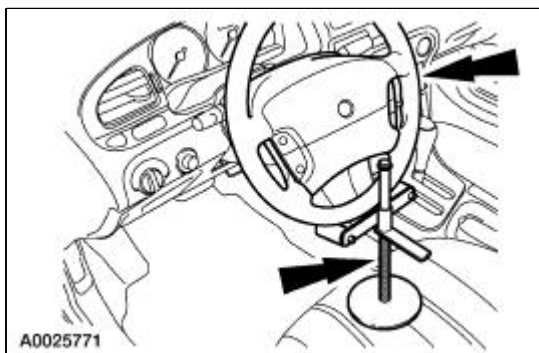
24. Disconnect the wiring harness retainer from the bracket.



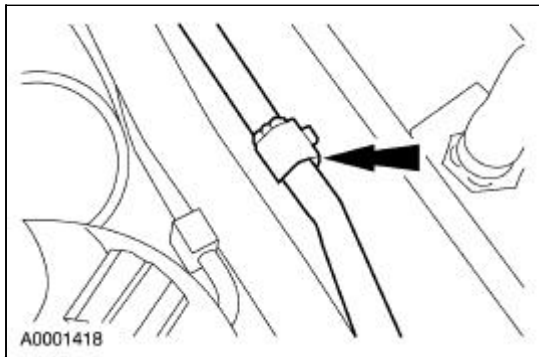
25. Remove the bolts and secure the hydraulic cooling fan reservoir to the engine.



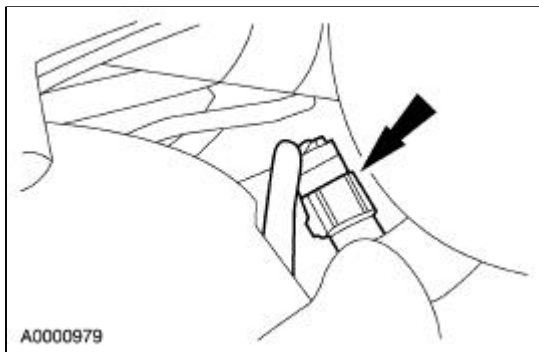
26. Hold the steering wheel in the straight forward position using a suitable holding device.



27. Unclip the tube from the frame.



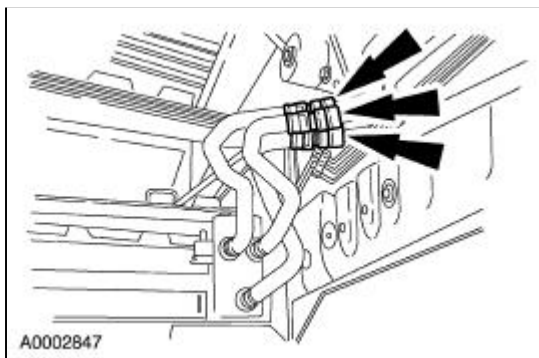
28. Disconnect the connector located at the end of the coolant valve harness pigtail.



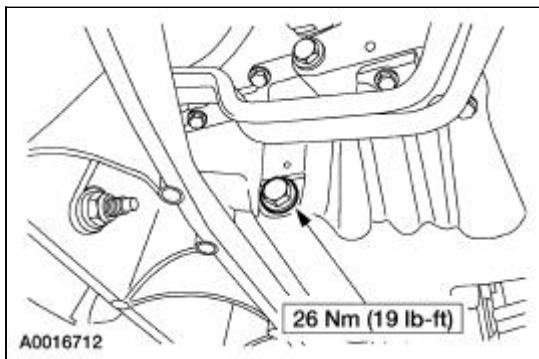
29. **NOTE:** The top heater hose has a green identifying mark to match the hose on the dual coolant flow valve. If the mark is not visible, identify the hoses for location. This will aid in the correct installation of the hose assemblies.

NOTE: Hose assemblies shown with components removed for clarity.

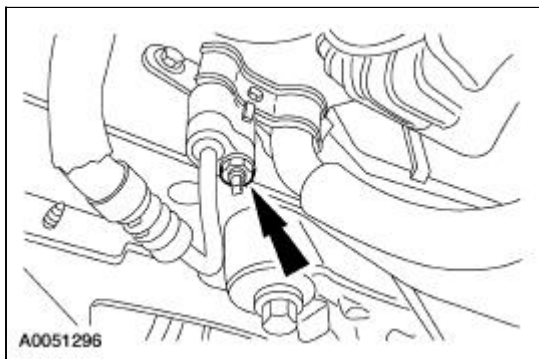
Disconnect the three quick-disconnect couplings from the coolant control valve hoses. For additional information, refer to [Section 412-00](#).



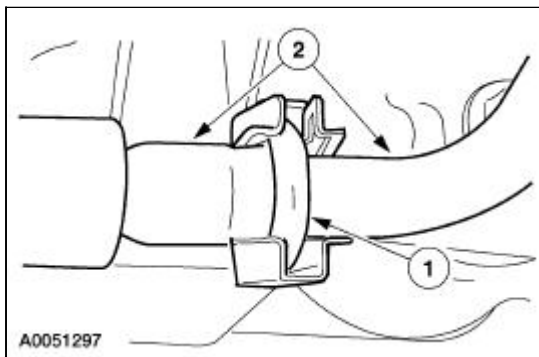
30. Raise and support the vehicle. For additional information, refer to [Section 100-02](#).
31. Drain the engine oil.



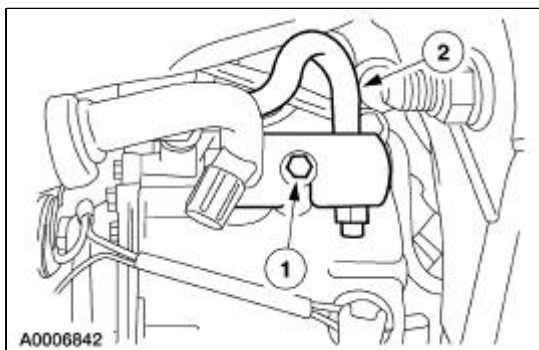
32. Remove the center, LH and RH splash shields.
33. Disconnect the A/C high pressure tube at the right frame rail.



34. Disconnect the A/C suction tube.
 1. Remove the safety clip.
 2. Disconnect the A/C tube.



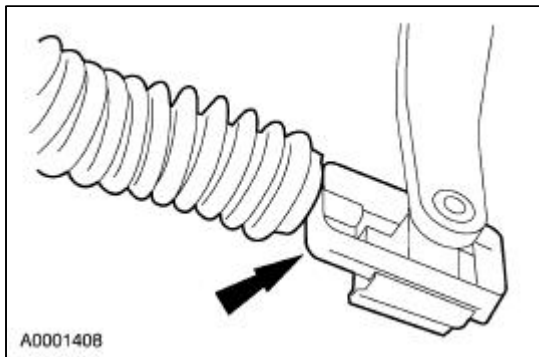
35. Reposition the A/C manifold and tube assembly.
 1. Remove the bolt.
 2. Reposition the A/C manifold and tube assembly.



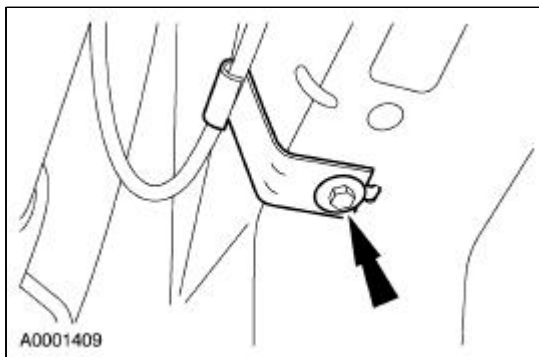
36. Remove the driveshaft. For additional information, refer to [Section 205-01](#).

Vehicles with automatic transmission

37. Disconnect the shift cable from the transmission.

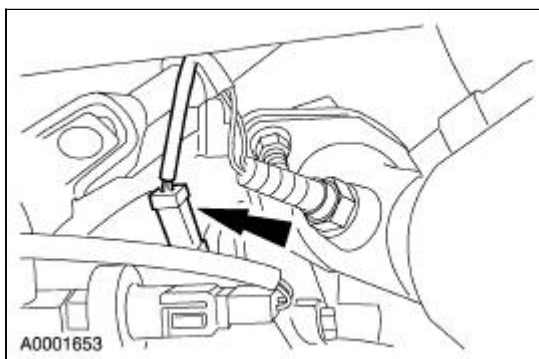


38. Remove the bolt securing the cable bracket to the floor.

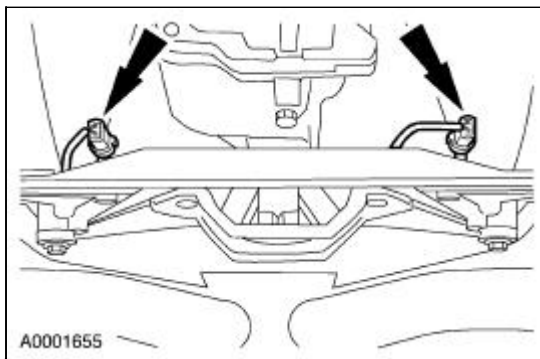


All vehicles

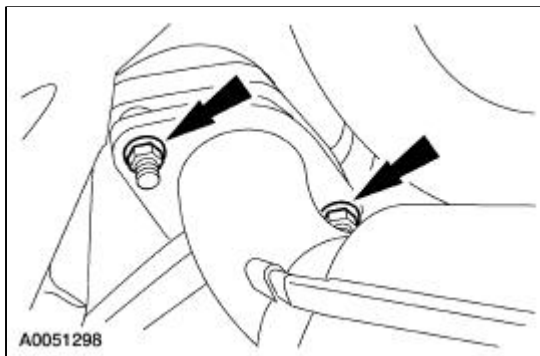
39. Disconnect the two heated oxygen sensors (HO2S) electrical connectors.



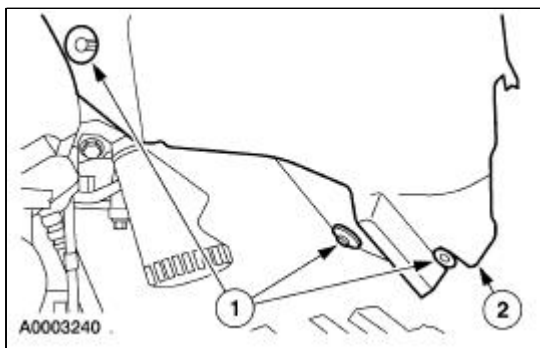
40. Disconnect the two catalyst monitor connectors.



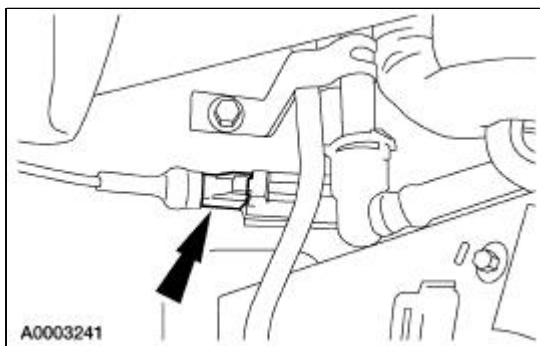
41. Remove the four nuts and the three-way catalytic converter.



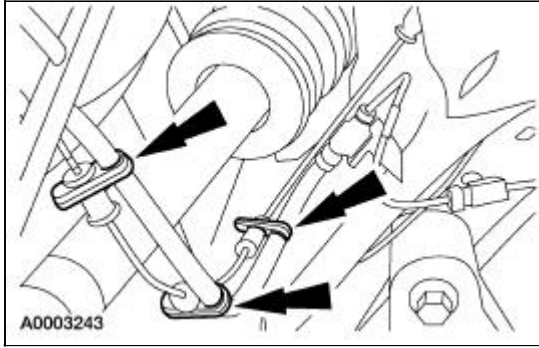
42. Lower the vehicle.
43. Remove the front wheels and tires. For additional information, refer to [Section 204-04](#).
44. Position the inner splash shield aside.
 1. Remove the pin-type retainers.
 2. Position the inner splash shield aside.



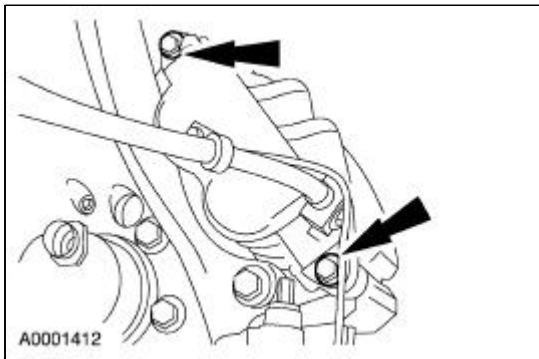
45. Disconnect the anti-lock brake sensor electrical connector.



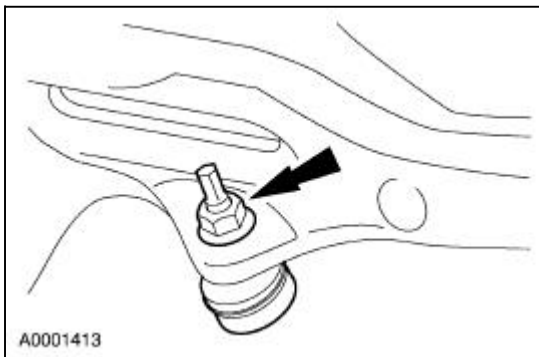
46. Remove the anti-lock brake sensor harness from the brake hose clips.



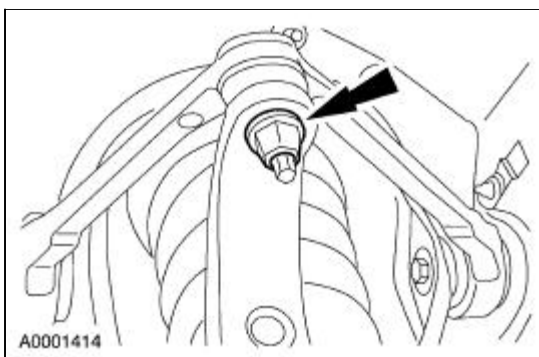
47. Remove the bolts and the front brake calipers. Support the calipers out of the way.



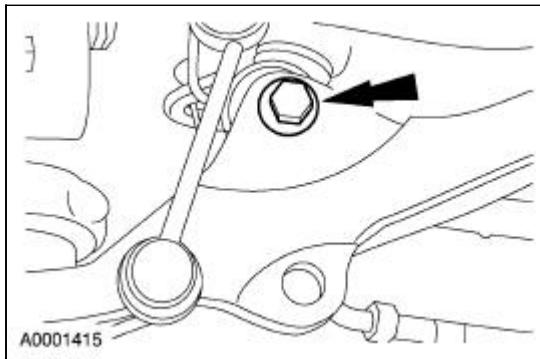
48. Remove the nuts and disconnect the stabilizer links lower mounts.



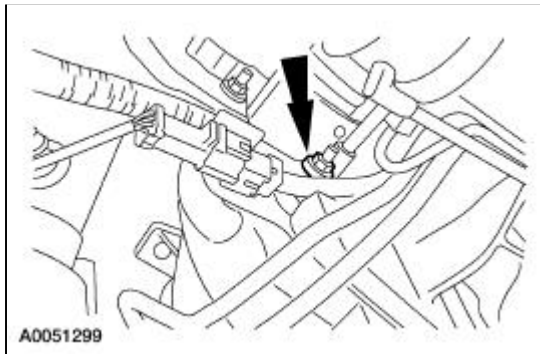
49. Remove the nuts and disconnect the upper ball joints.



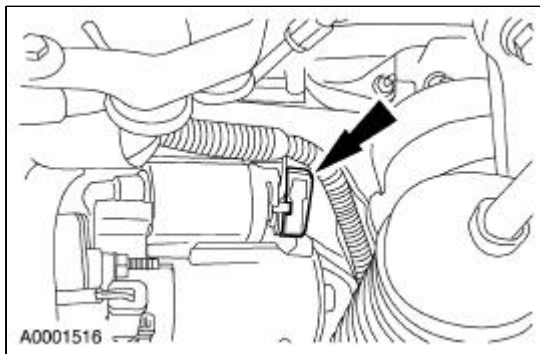
50. Remove the lower strut mount bolts.



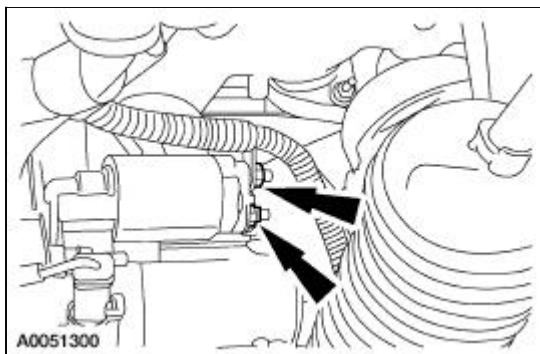
51. Disconnect the ground strap.



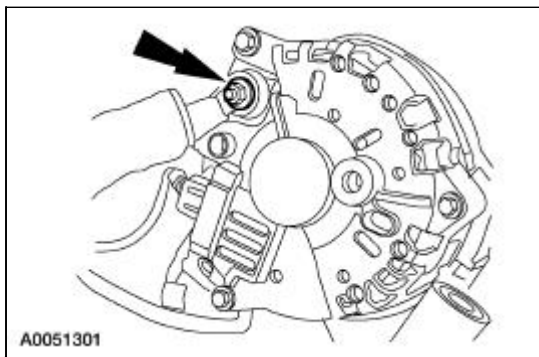
52. Remove the cover.



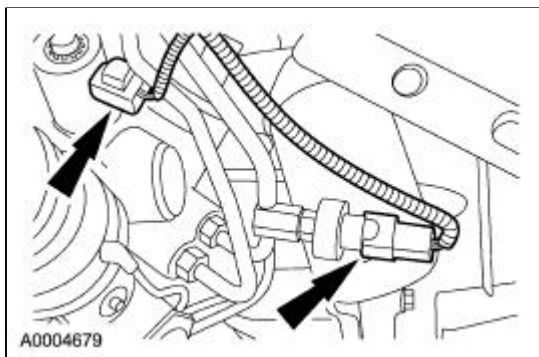
53. Remove the nuts and position the cables aside.



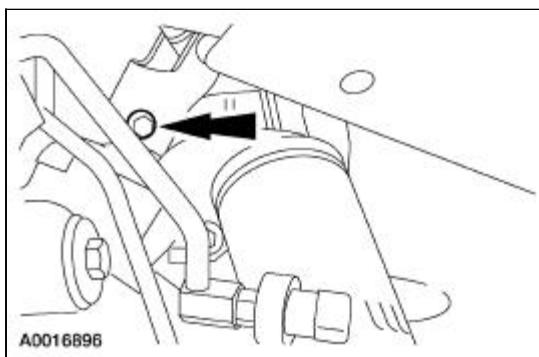
54. Disconnect the B+ terminal from the generator.



55. Disconnect the power steering pressure sensor electrical connectors.

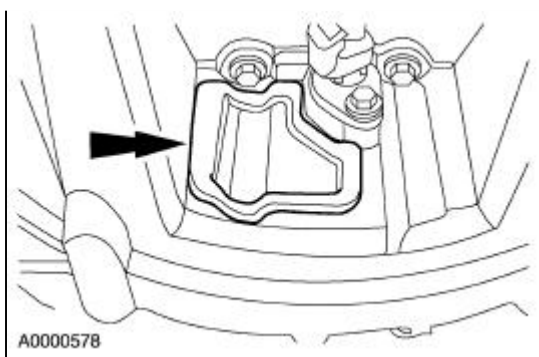


56. Remove the steering shaft clamp bolt.



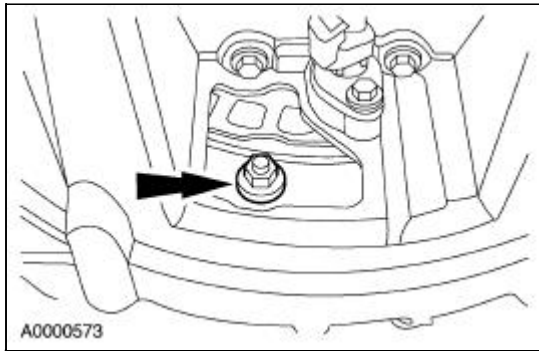
Vehicles with automatic transmission

57. Remove the access cover.



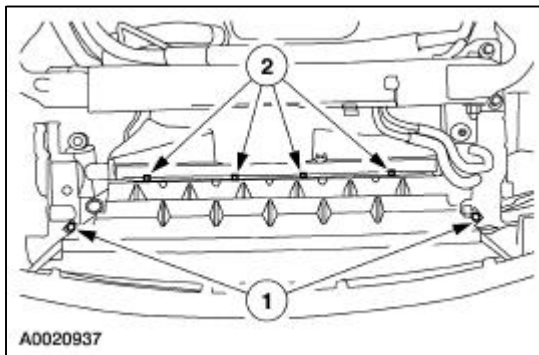
58. **NOTE:** Mark one stud and the flexplate for assembly reference.

Remove the nuts.

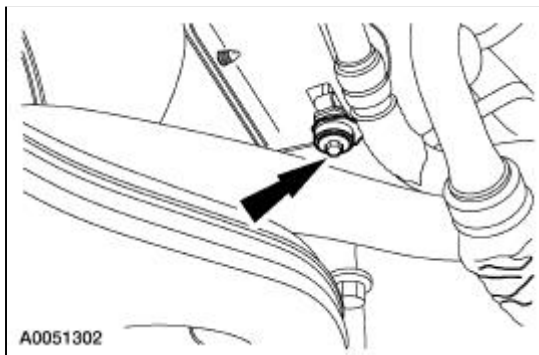


All vehicles

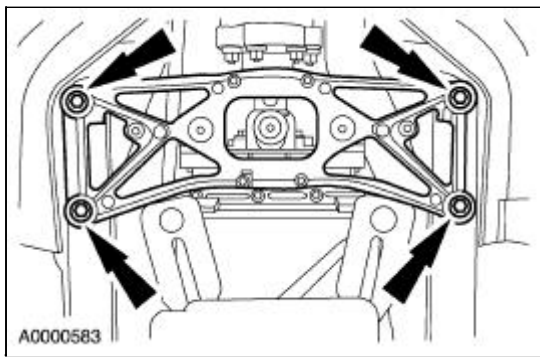
59. Remove the air deflector.
 1. Remove the pin-type retainers.
 2. Remove the side-clip retainers.



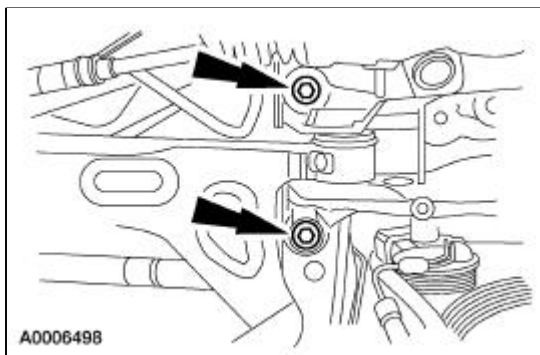
60. Remove the power steering hose bracket bolt.



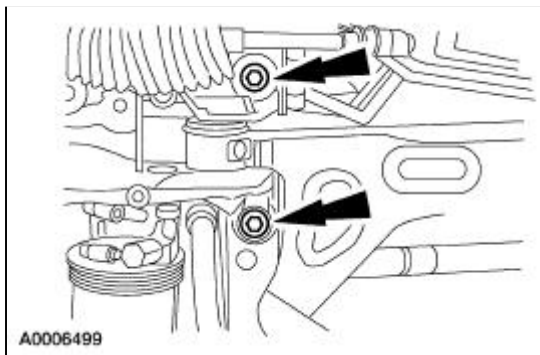
61. Support the rear of the vehicle with suitable safety stands.
62. Support the engine, transmission, front and center crossmembers and the cooling system with a powertrain lift and a transmission support bracket.
63. Remove the four transmission crossmember bolts.



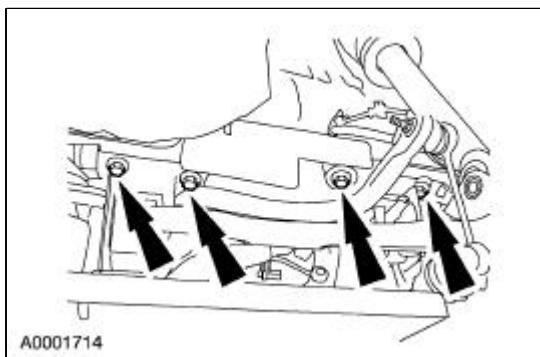
64. Remove the LH subframe bolts.



65. Remove the RH subframe bolts.



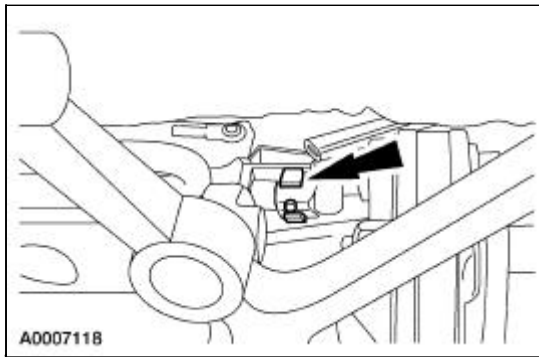
66. Remove the four crossmember bolts.



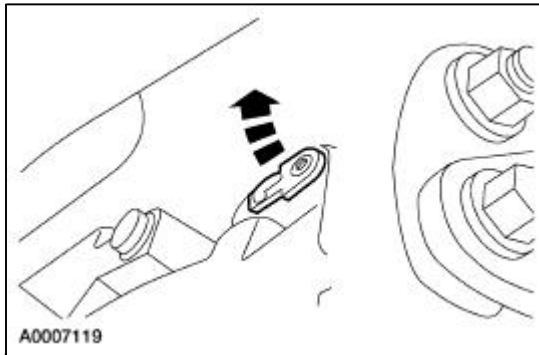
Vehicles with manual transmission

67. Disconnect the selector rod.

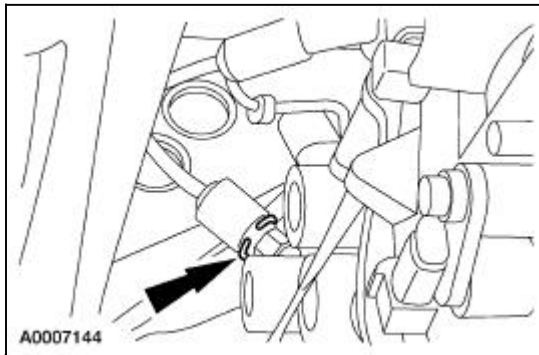
- Remove the selector rod locating pin.



68. Disconnect the stabilizer rod.
- Remove the stabilizer rod locating pin.

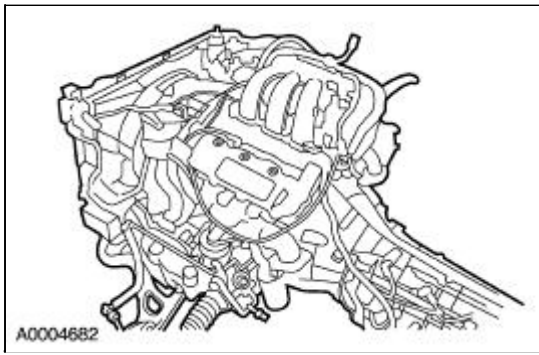


69. Disconnect the slave cylinder supply tube.
- Remove the slave cylinder supply tube retaining clip.
 - Plug the hose to prevent loss of fluid.

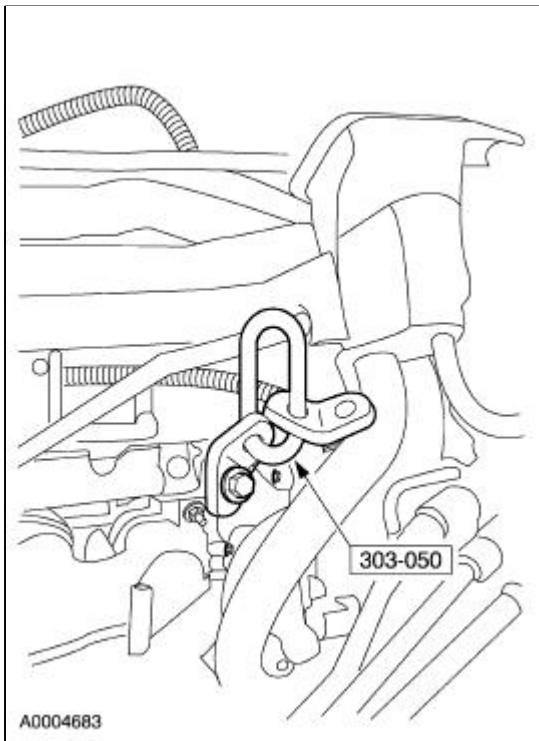


All vehicles

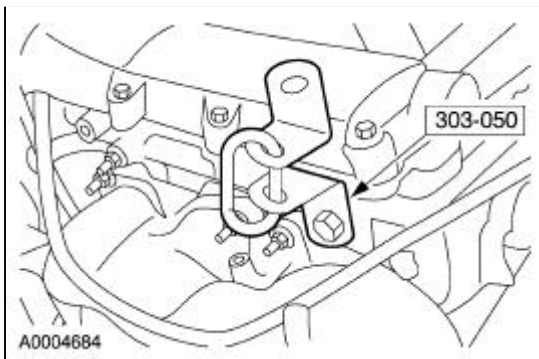
70. Carefully lower the entire assembly from the vehicle.



71. Install the special tool to the engine.

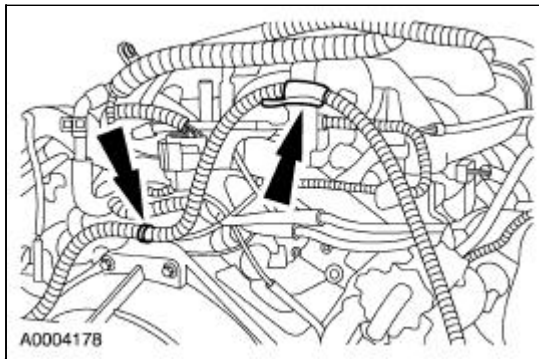


72. Install the special tool to the engine.

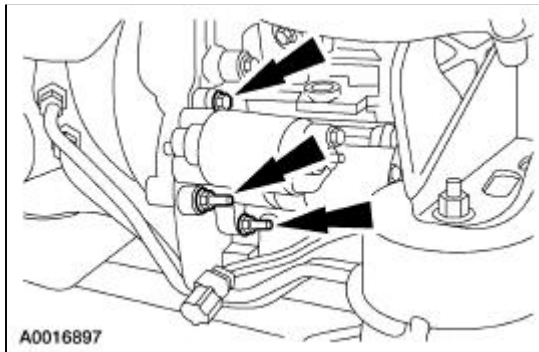


73. Using an engine crane and spreader bar, support the engine and transmission in the front subframe.

74. Disconnect the two wire harness retainers and position the harness out of the way.

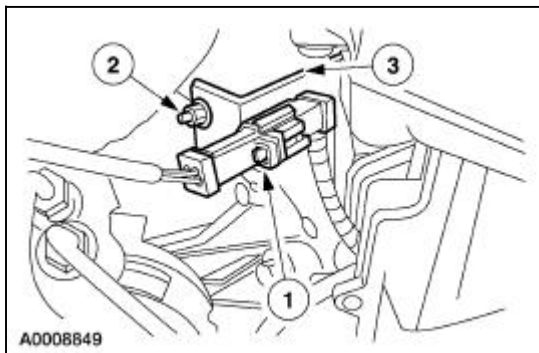


75. Remove the starter assembly.

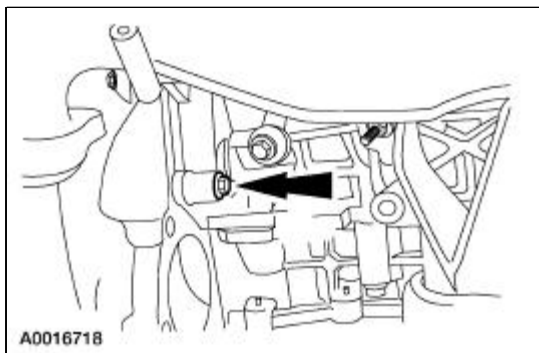


76. Remove the heated oxygen sensor (HO2S) bracket.

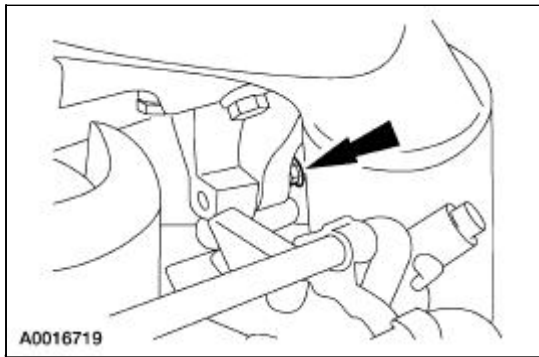
1. Unclip the connector.
2. Remove the nut.
3. Remove the bracket.



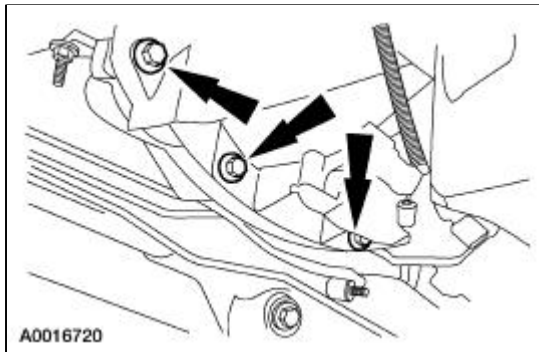
77. Remove the engine to transmission bolt.



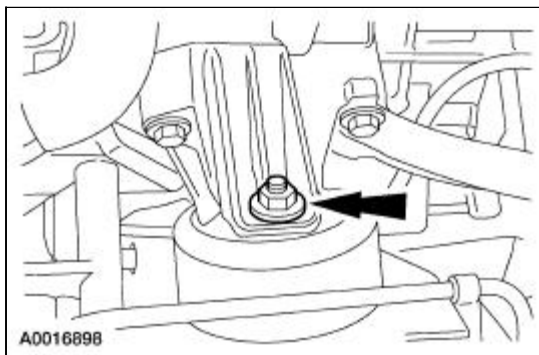
78. Remove the engine to transmission bolt.



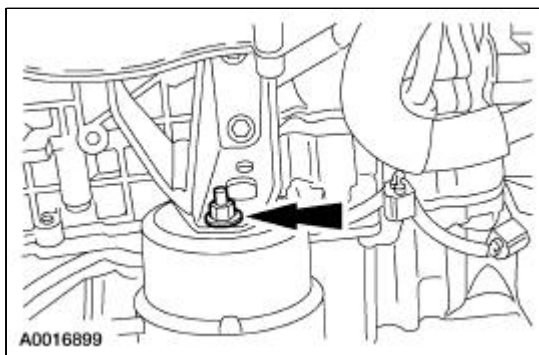
79. Remove the four lower engine to transmission bolts.



80. Remove the LH engine mount nut.

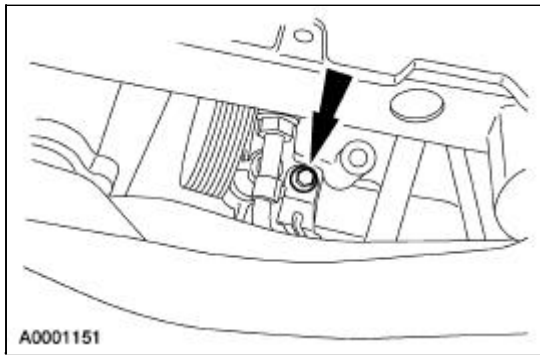


81. Remove the RH engine mount nut.

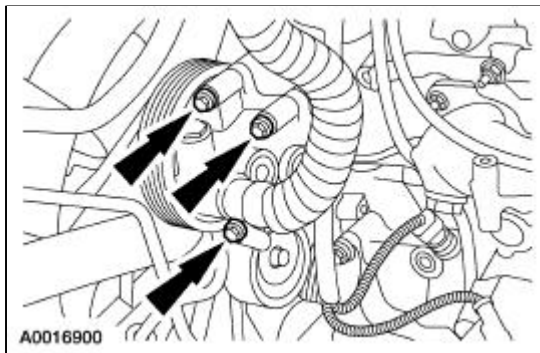


82. Remove the accessory drive belt. For additional information, refer to [Section 303-05](#).

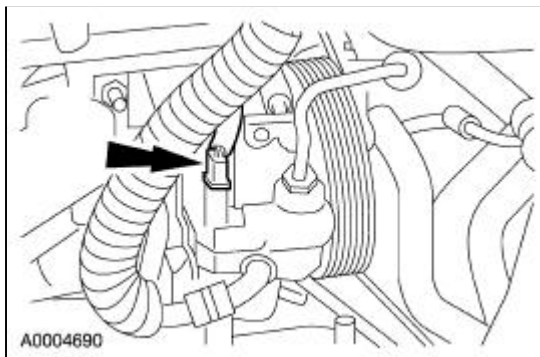
83. Remove the power steering bracket bolt and bracket.



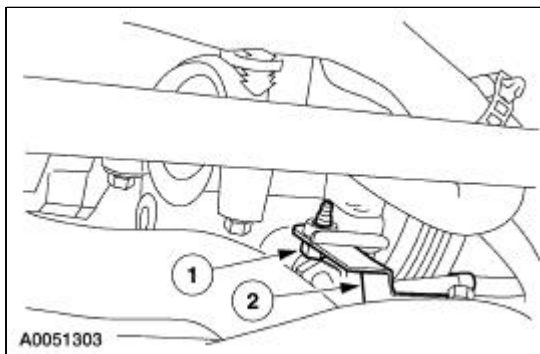
84. Remove the bolts and secure the power steering pump and reservoir aside.



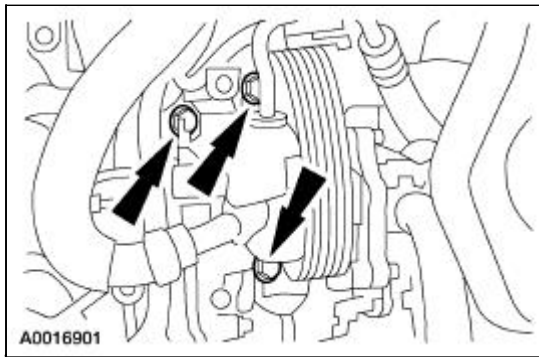
85. Disconnect the hydraulic cooling fan pump electrical connector.



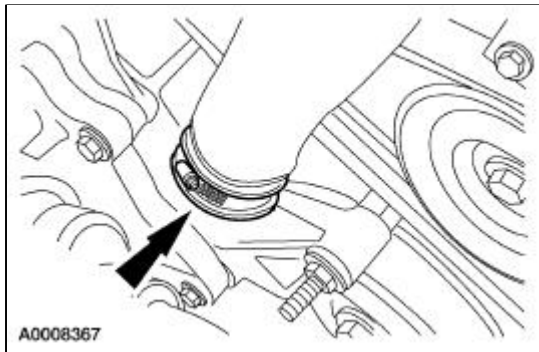
86. Remove the hydraulic cooling fan tube bracket.
1. Remove the bolt.
2. Remove the bracket.



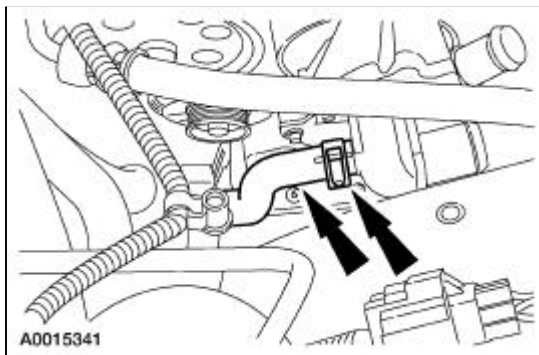
87. Remove the bolts and secure the hydraulic cooling fan pump aside.



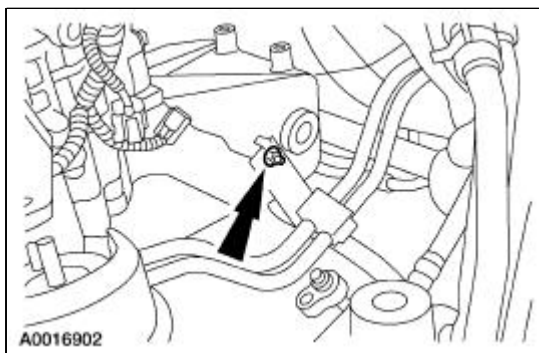
88. Disconnect the upper radiator hose.



89. Disconnect the heater water hose from the water pump.

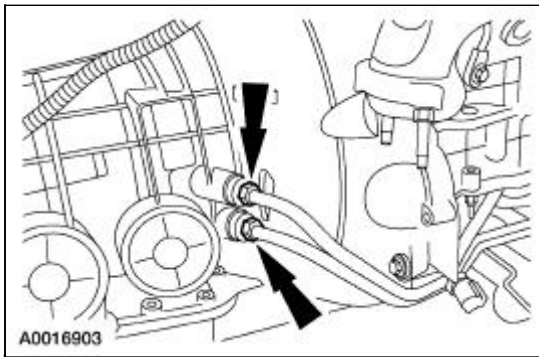


90. If equipped, remove the nut and transmission cooler tubes from the oil pan.

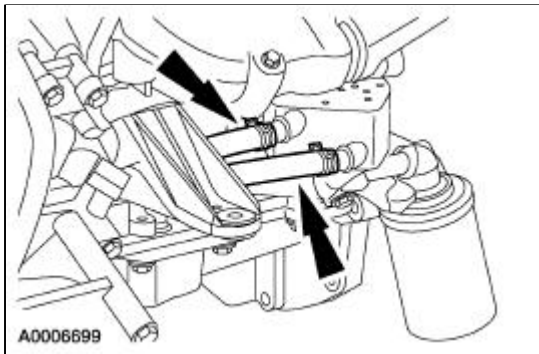


91. Remove the engine and transmission from the subframe. Rest on the floor or on a bench.

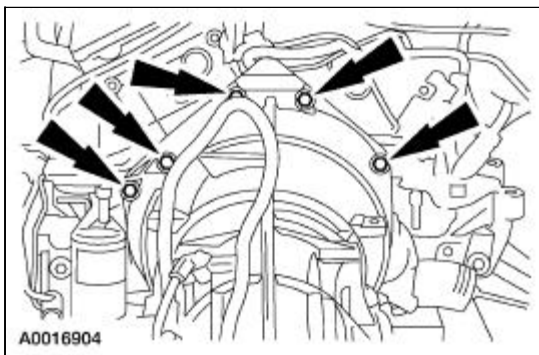
92. If equipped, remove the transmission oil cooler tubes and plug the openings.



93. If equipped, disconnect the oil cooler hoses.


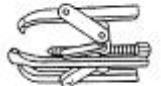



94. Remove the bolts and separate the transmission from the engine.



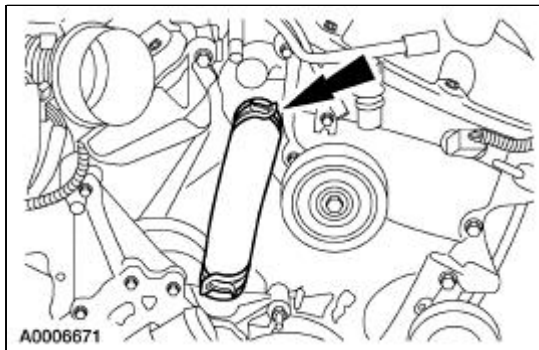
Engine

Special Tool(s)

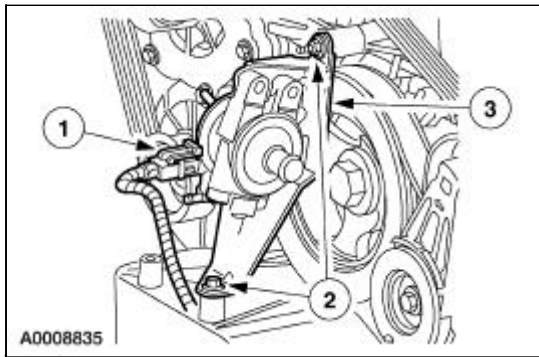
 ST2115-A	Connecting Rod Guide Set 303-462 (T94P-6136-AH)
 ST1184-A	Crankshaft Damper Remover 303-D121
 ST1276-A	Cylinder Ridge Reamer 303-016 (T64L-6011-EA)

Disassembly

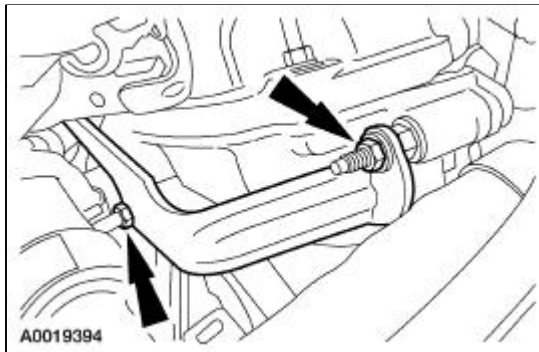
1. Disconnect the water pump hose from the inlet tube.



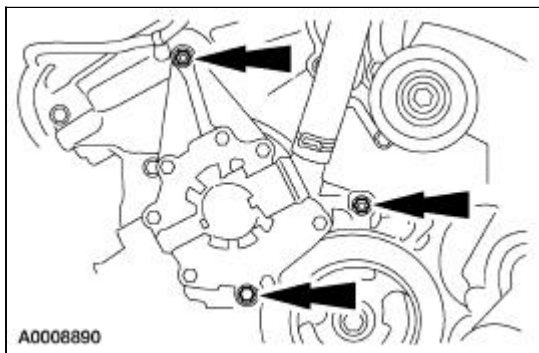
2. If equipped, remove the thermactor air control valve and bracket.
 1. Disconnect the electrical connector.
 2. Remove the bolt and nut.
 3. Remove the valve/bracket.



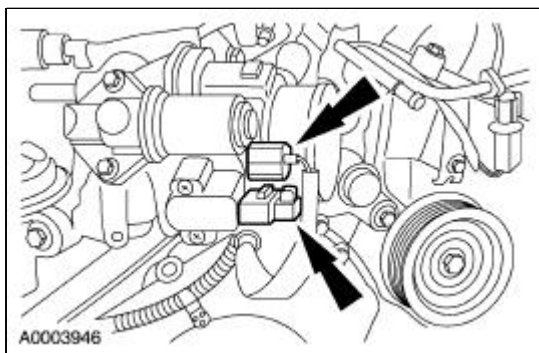
3. Remove the two nuts and the bracket.



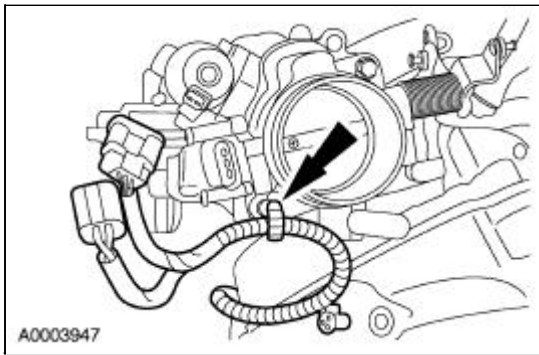
4. Remove the one bolt, two stud bolts, and the water pump.



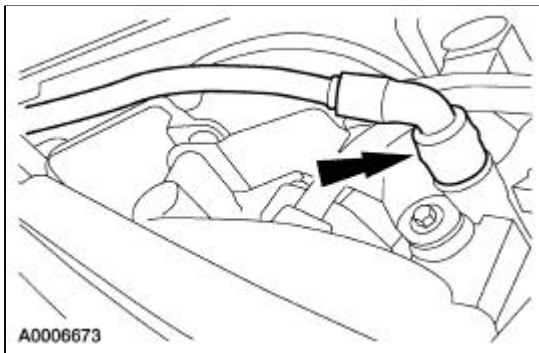
5. Disconnect the throttle position (TP) sensor and idle air control (IAC) electrical connectors.



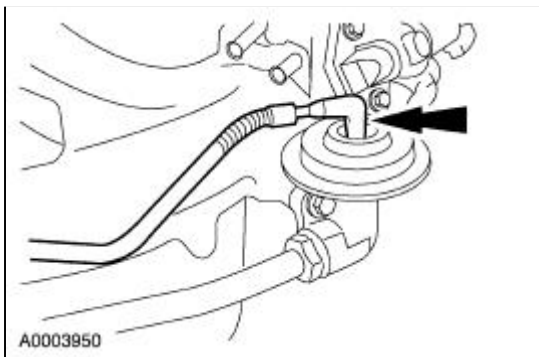
6. Unclip the wire harness retainer.



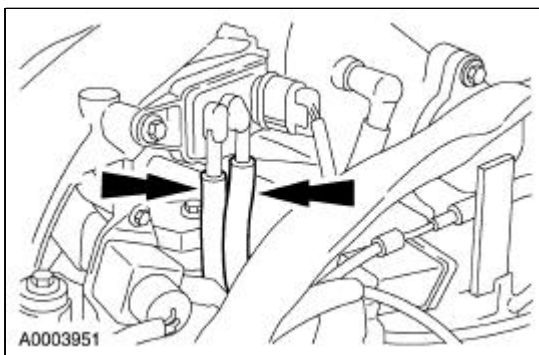
7. Disconnect the PCV tube at the rear of the upper intake manifold.



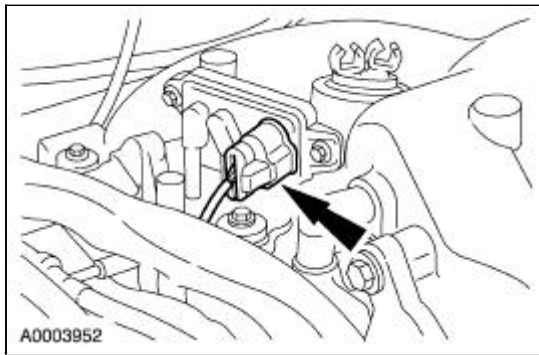
8. Disconnect the exhaust gas recirculation (EGR) vacuum line.



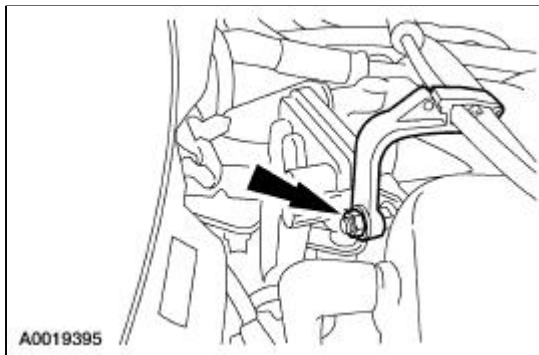
9. Disconnect the differential pressure feedback EGR hoses.



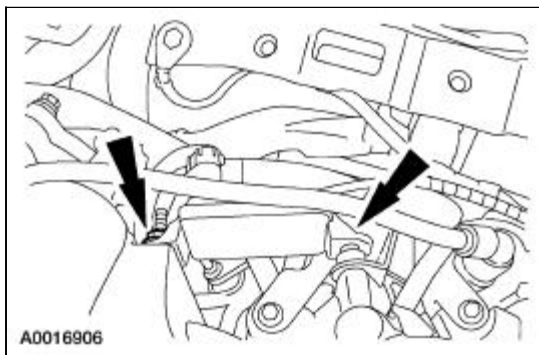
10. Disconnect the differential pressure feedback EGR electrical connector.



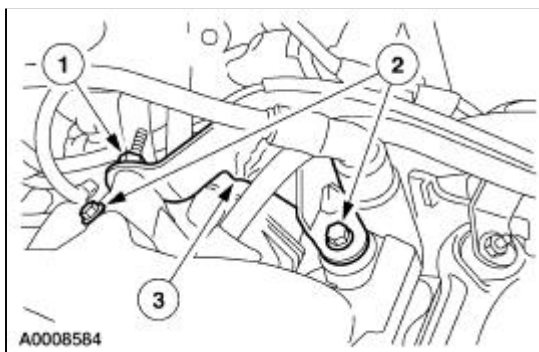
11. Remove the nut and the accelerator cable clip.



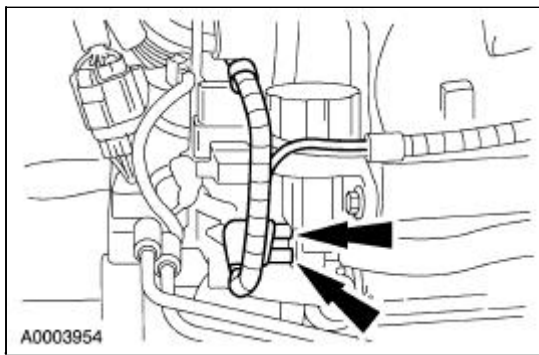
12. Remove the nut and stud and position the differential pressure feedback EGR transducer aside.



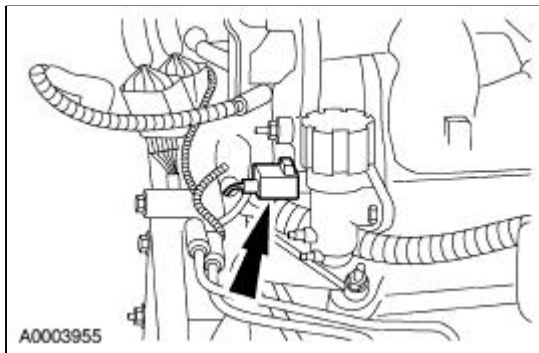
13. Remove the fuel pressure sensor shield.
 1. Remove the nut.
 2. Remove the bolts.
 3. Remove the shield.



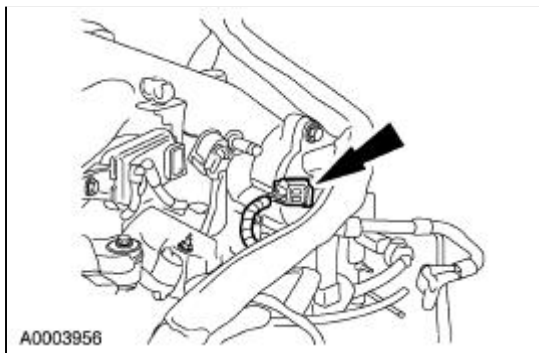
14. Disconnect the vacuum tubes from the EGR vacuum regulator control (EVR).



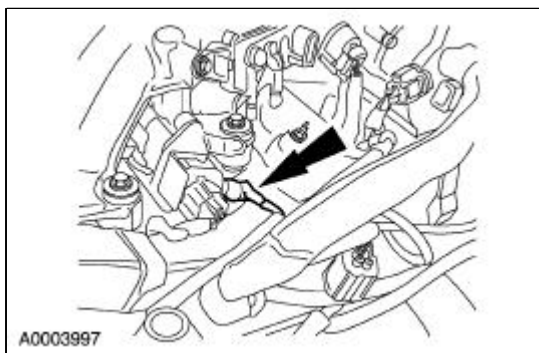
15. Disconnect the EVR electrical connector.



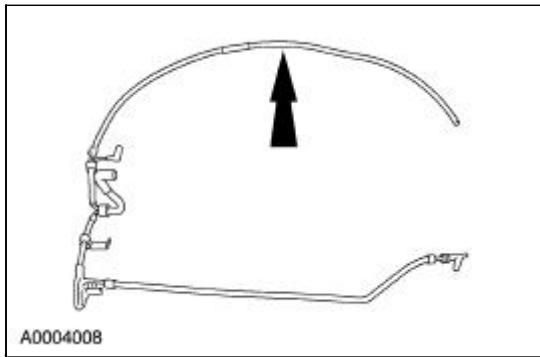
16. Disconnect the intake manifold tuning valve (IMTV) electrical connector.



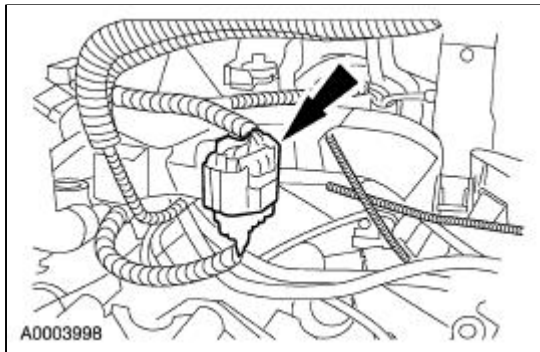
17. Disconnect the fuel pressure sensor jumper from the main vacuum harness.



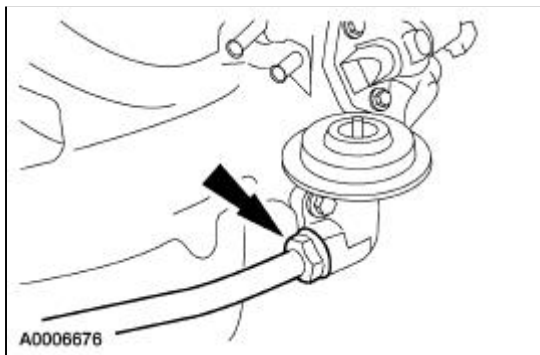
18. Remove the vacuum harness.



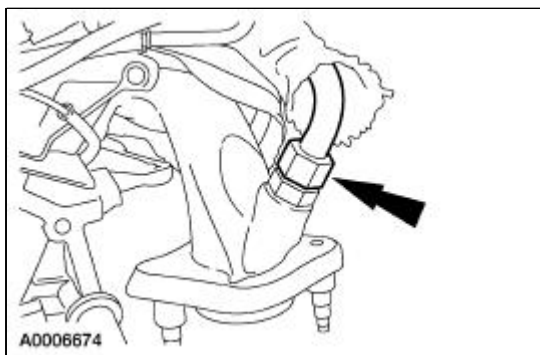
19. Disconnect the fuel injector wiring harness connector.



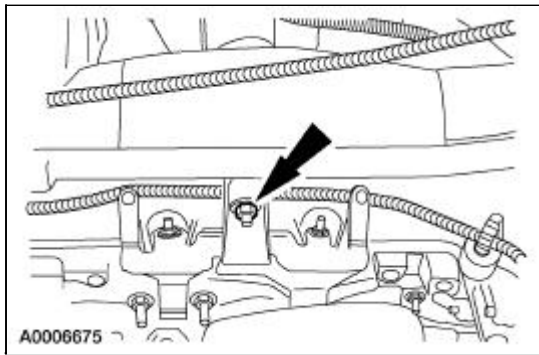
20. Disconnect the EGR tube at the EGR valve.



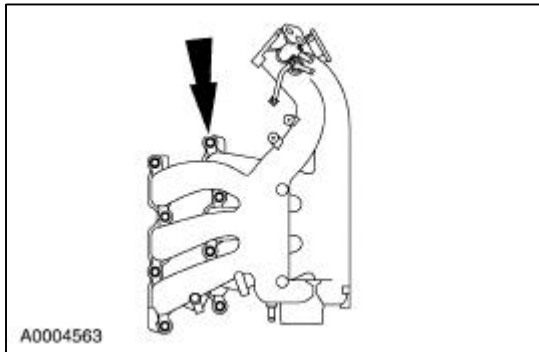
21. Disconnect the EGR tube at the exhaust manifold and remove the tube.



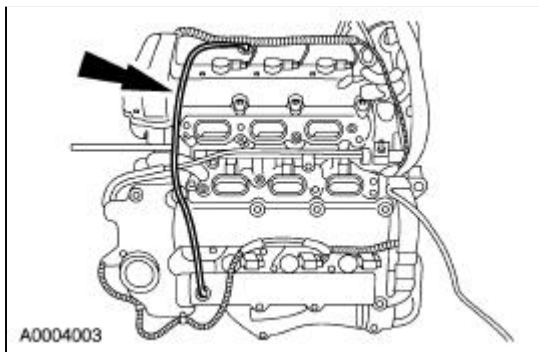
22. Remove the intake manifold bolt.



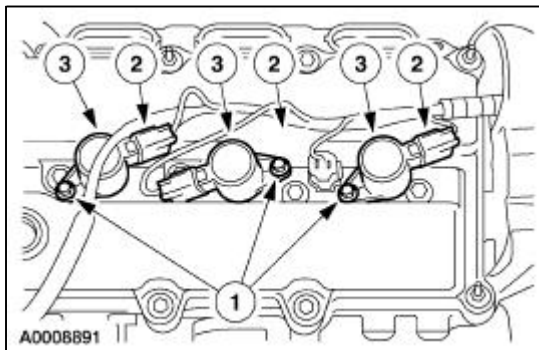
23. Remove the eight bolts and the upper intake manifold.
- Inspect the gaskets. Discard if damaged.



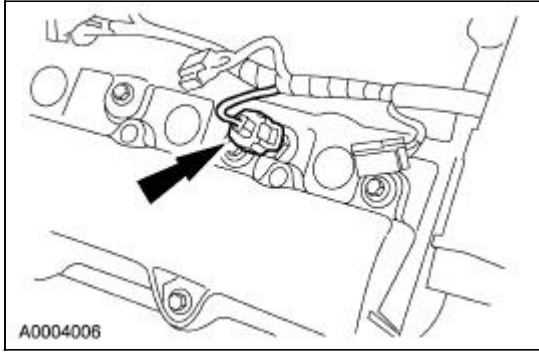
24. Remove the crankcase ventilation tube.



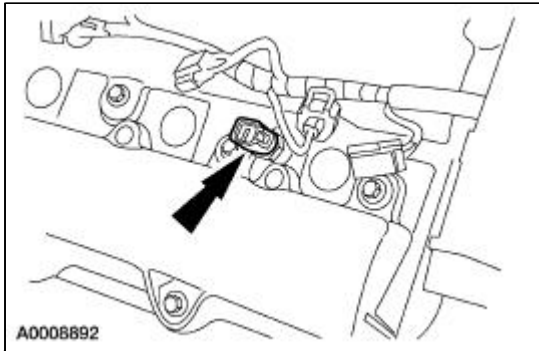
25. Remove the LH ignition coils.
1. Remove the bolts.
 2. Disconnect the electrical connectors.
 3. Remove the LH ignition coils.



26. Disconnect the cylinder head temperature (CHT) sensor connector.

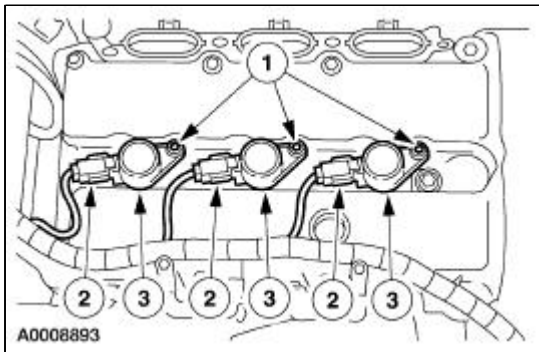


27. Remove the CHT sensor.

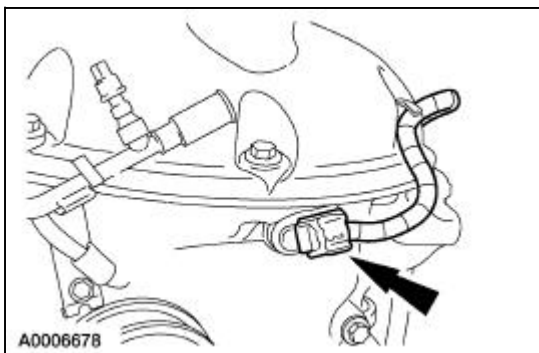


28. Remove the RH ignition coils.

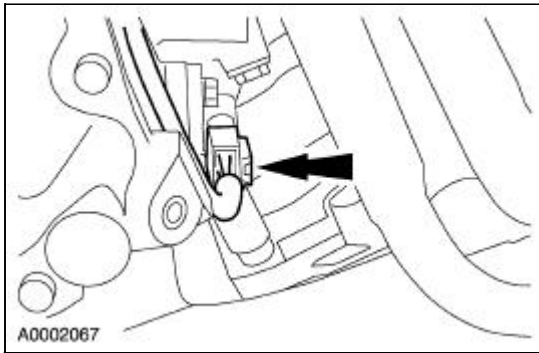
1. Remove the bolts.
2. Lift the coils and disconnect the electrical connectors.
3. Remove the RH ignition coils.



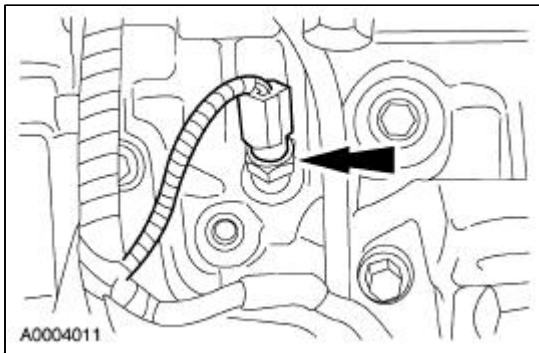
29. Disconnect the camshaft position (CMP) sensor electrical connector.



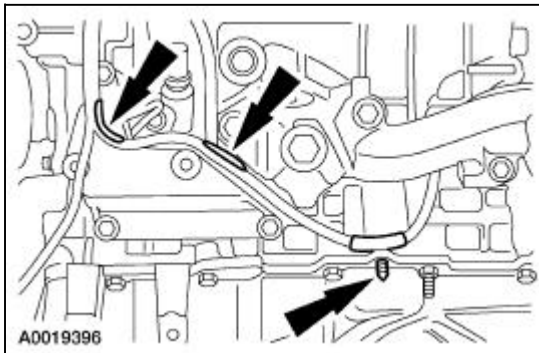
30. Disconnect the crankshaft position (CKP) sensor electrical connector.



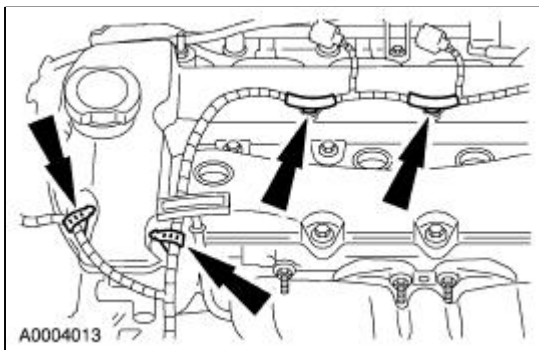
31. Disconnect the oil pressure sensor electrical connector.



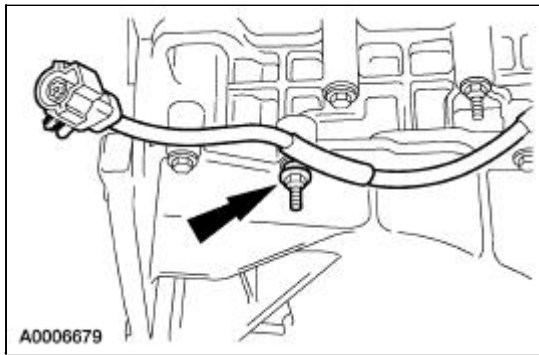
32. Detach the three wiring harness retainers from the block.



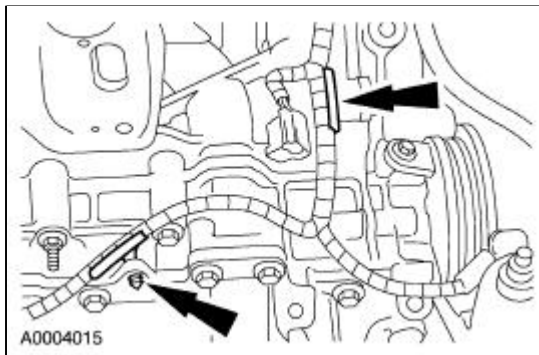
33. Detach the four wiring harness retainers.



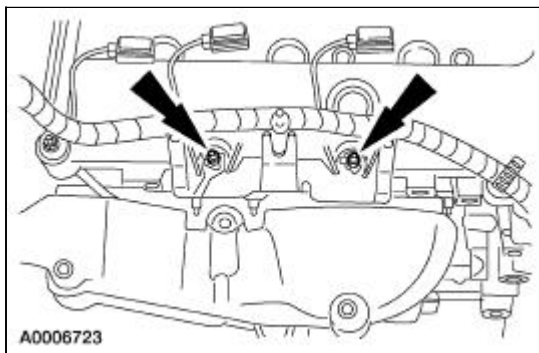
34. Remove the nut and wiring harness from the stud.



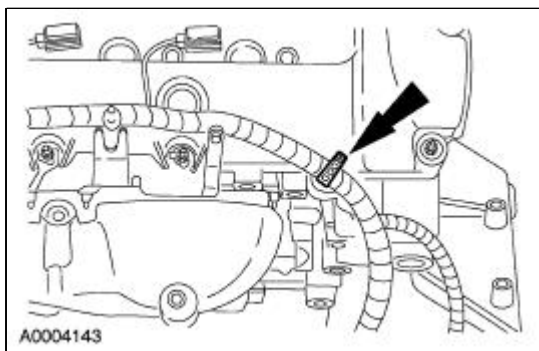
35. Detach the two wiring harness retainers from the block.



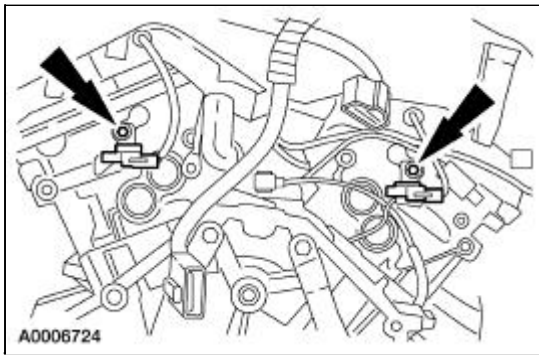
36. Remove the nuts.



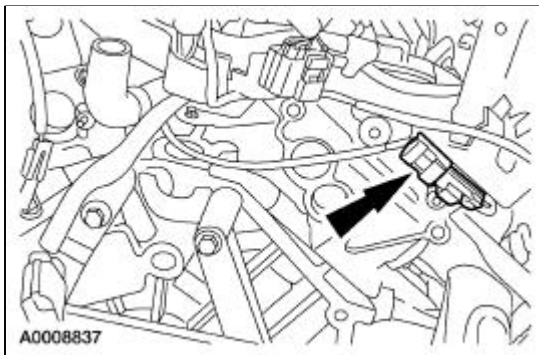
37. Unclip the wiring harness retainer.



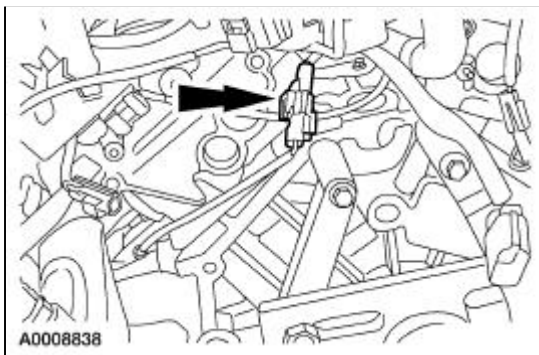
38. Remove the two bolts and the two radio ignition interference capacitors.



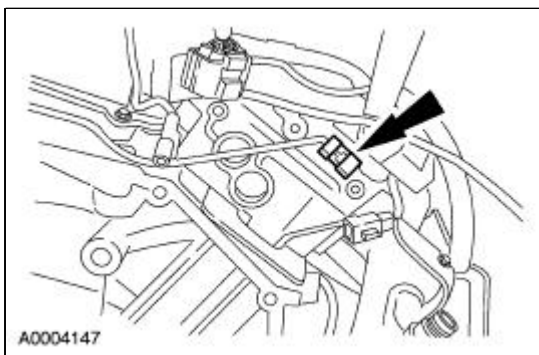
39. Disconnect the valley knock sensor electrical connector.



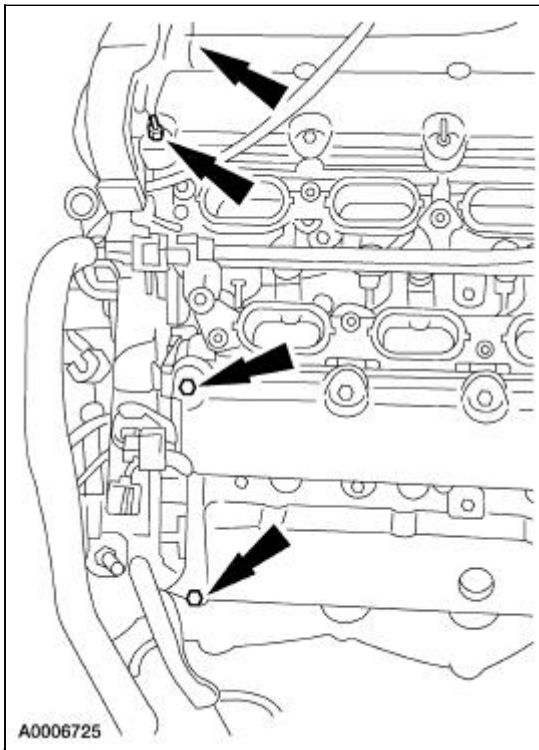
40. Disconnect the RH engine knock sensor (KS) electrical connector.



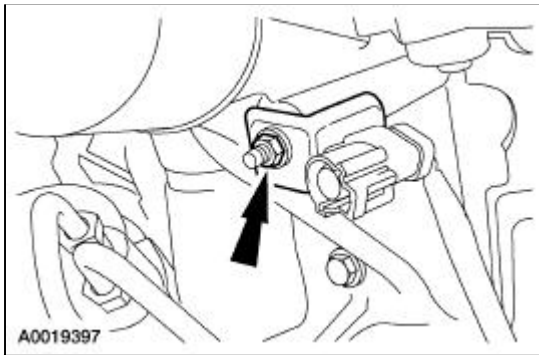
41. Unclip the KS connector from the wiring harness.



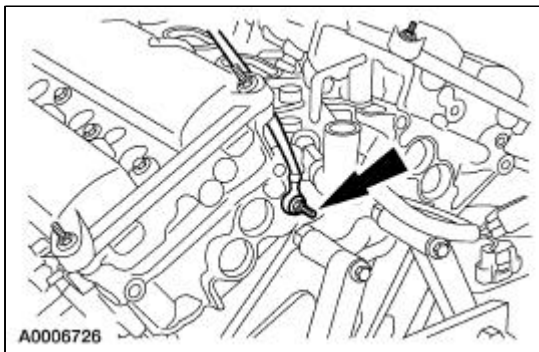
42. Remove the four nuts and the wiring harness.



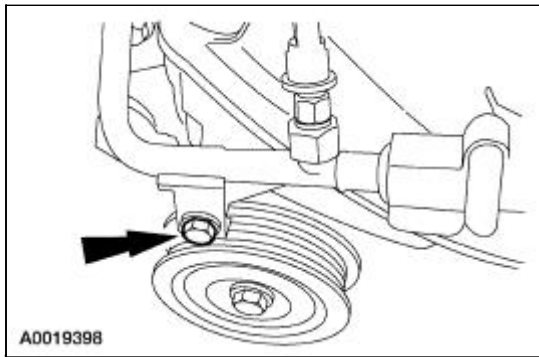
43. Remove the nut and the bracket.



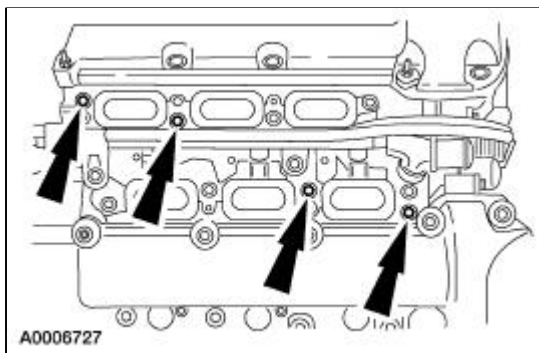
44. Remove the nut and the ground strap.



45. Remove the bolt.

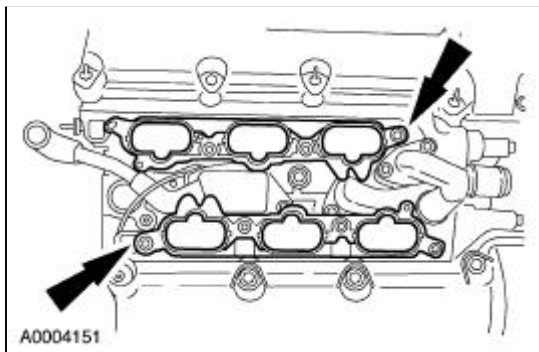


46. Remove the bolts and the lower intake manifold assembly.



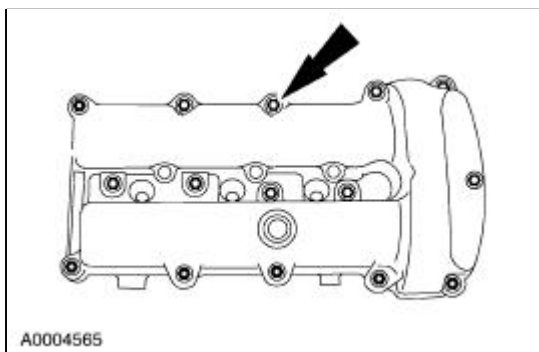
47. Remove the lower intake manifold gaskets.

- Inspect the gaskets for damage. Discard if damaged.

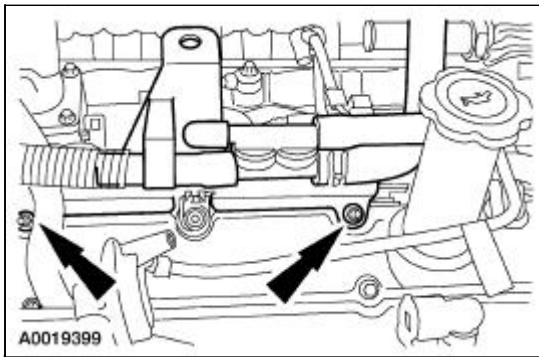


48. Remove the studs and bolts and remove the RH valve cover and gasket.

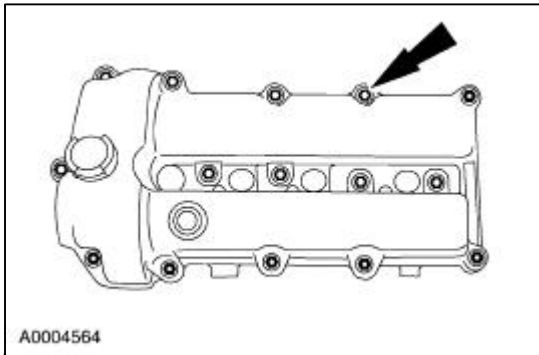
- Discard the gasket.



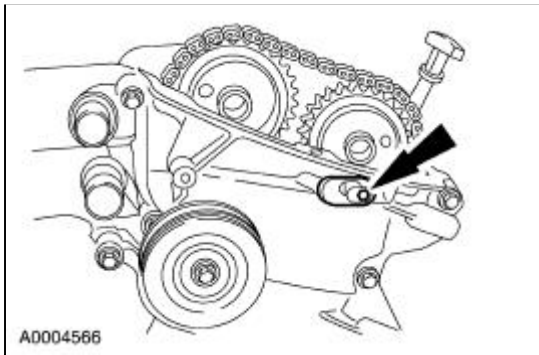
49. Remove the nuts and position the bracket aside.



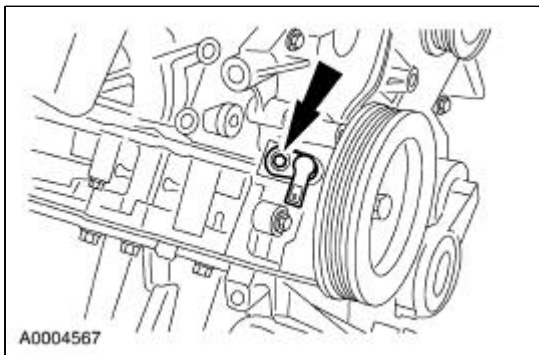
50. Remove the studs and bolts and remove the LH valve cover and gasket.
- Discard the gasket.



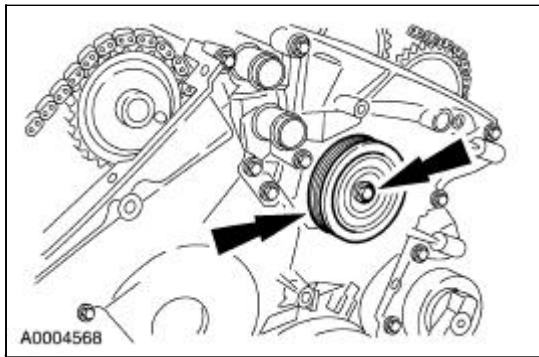
51. Remove the bolts and the CMP sensor.



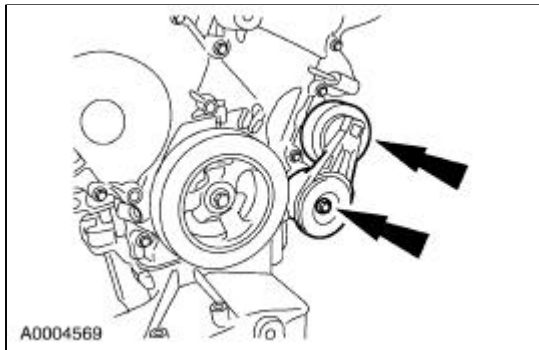
52. Remove the bolt and the CKP sensor.



53. Remove the bolt and the idler pulley.

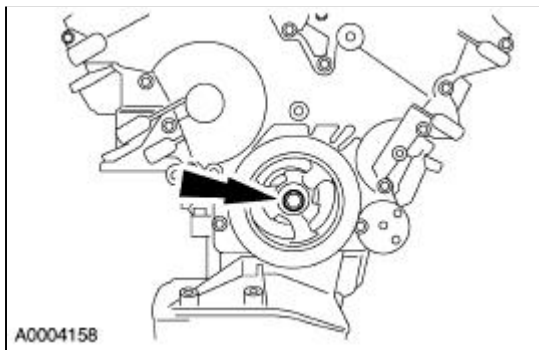


54. Remove the bolt and the drive belt tensioner.

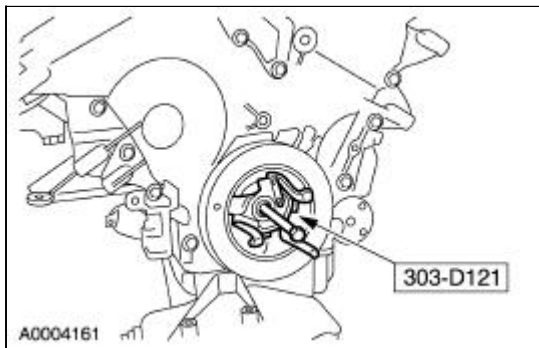


55. Remove the bolt.

- Discard the bolt.



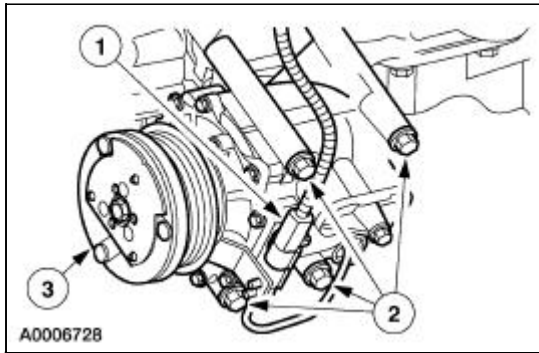
56. Using the special tool, remove the crankshaft pulley.



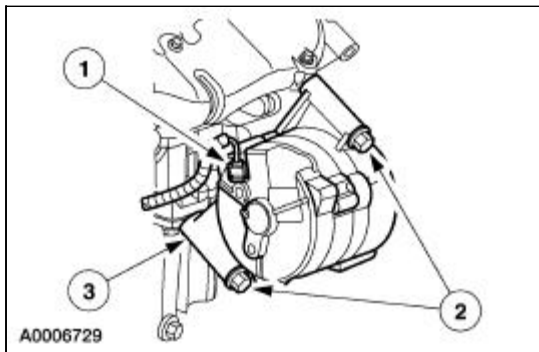
57. Remove the A/C compressor.

1. Disconnect the electrical connector.
2. Remove the bolts.

3. Remove the compressor.

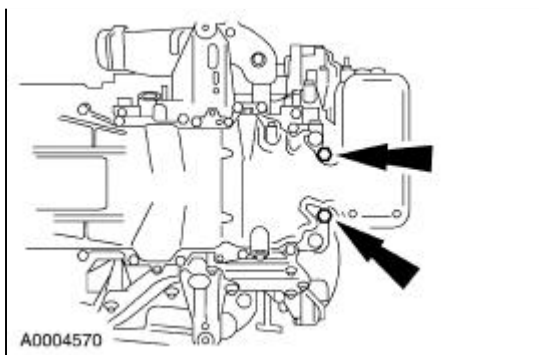


58. Remove the generator.
 1. Disconnect the electrical connector.
 2. Remove the bolts.
 3. Remove the generator.

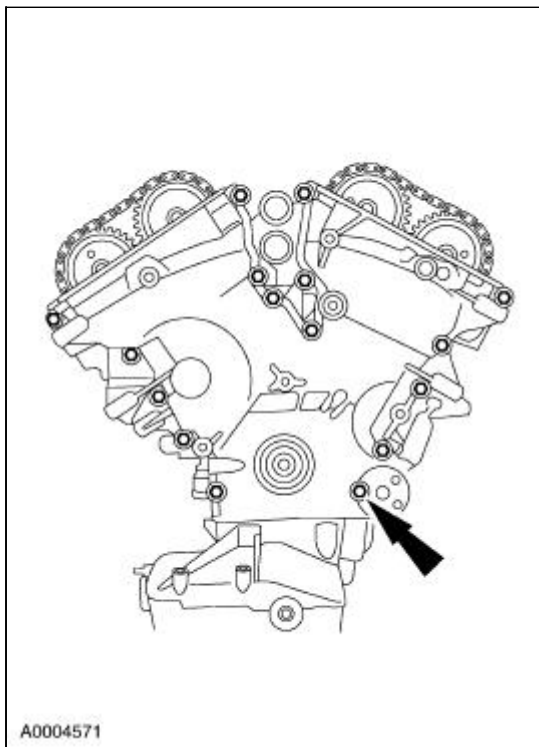


59. Remove the engine harness assembly.

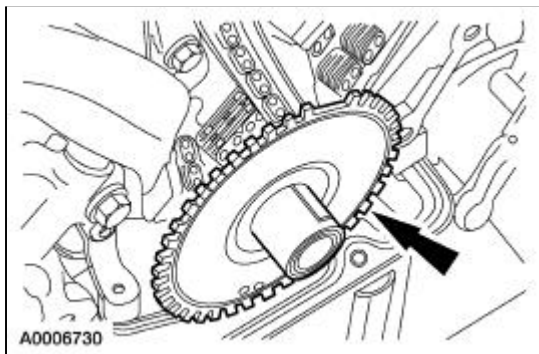
60. Remove the bolts.




61. Remove the bolts and the engine front cover and gasket.
 - Discard the gasket.



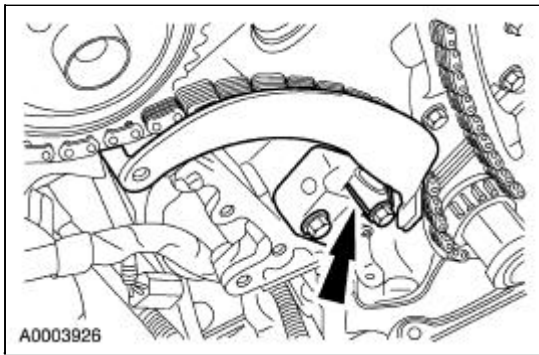
62. Remove the ignition pulse ring.



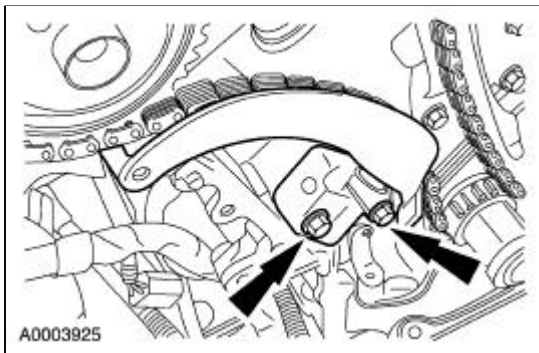
63.  **CAUTION:** Rotating the crankshaft in a counterclockwise direction may cause possible engine damage. Crankshaft journals are directionally machined. Rotating the crankshaft counterclockwise can raise burrs on bearing surfaces, reducing engine life.

 **CAUTION:** If the RH timing chain tensioner arm and RH timing chain guide are to be reused, mark position of each to make sure of original position when reassembled.

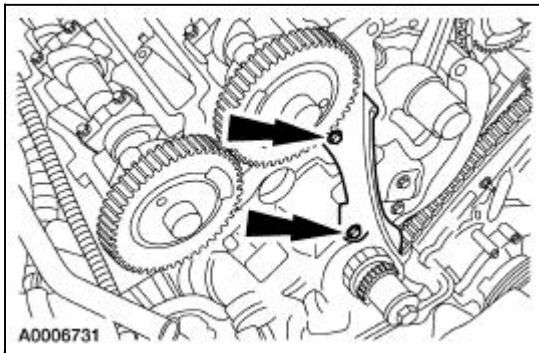
Install a stiff wire or paper clip into the timing chain tensioner before removing the bolts.




64. Remove the bolts, the timing chain tensioner and the tensioner arm.

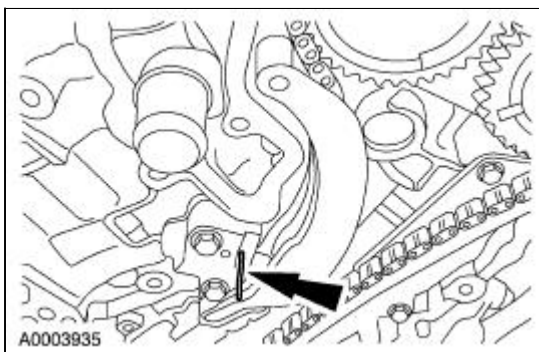


65. Remove the RH timing chain.
66. Remove the bolts and the RH timing chain guide.

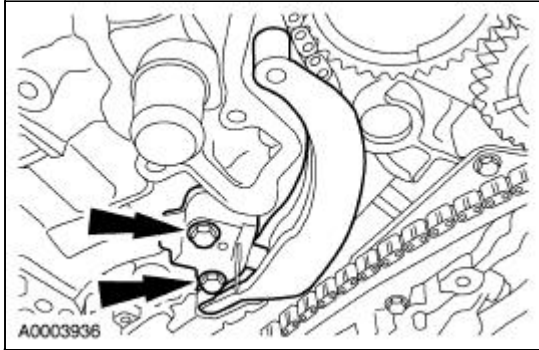


67.  **CAUTION:** If the LH timing chain tensioner arm and the LH timing chain guide are to be reused, mark position of each to make sure of original position when reassembled.

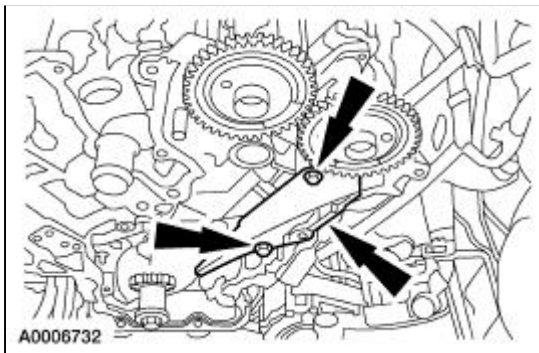
Install a stiff wire or paper clip into the timing chain tensioner before removing the bolts.



68. Remove the bolts, the timing chain tensioner and the tensioner arm.



69. Remove the LH timing chain.
70. Remove the bolts and the LH chain guide.



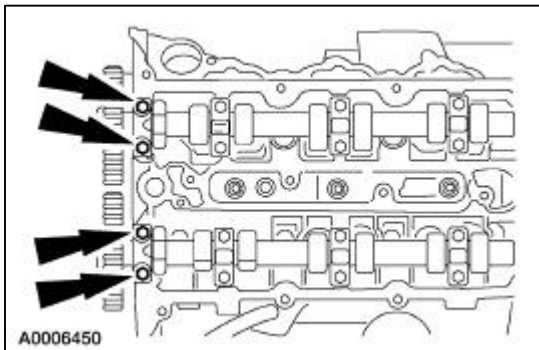
71. Remove the crankshaft sprocket.

72.  **CAUTION:** Remove the camshaft journal thrust caps prior to loosening other camshaft journal cap bolts. Damage to the camshaft journal thrust cap may occur if not removed first.

 **CAUTION:** Cylinder head camshaft journal caps and cylinder heads are numbered to be sure they are assembled in their original position. Keep camshaft journal caps with the cylinder head from which they were removed. Do not mix with camshaft journal caps from another cylinder head.

NOTE: LH side shown; RH side similar.

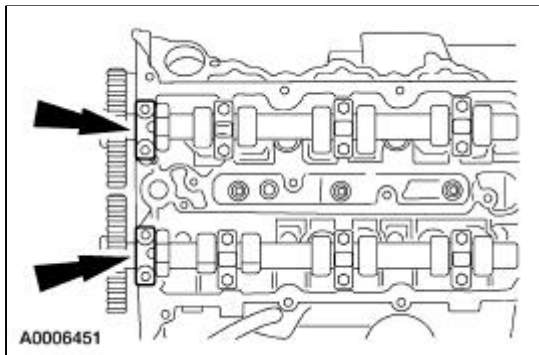
Remove the LH and RH camshaft thrust cap bolts.



73. **NOTE:** LH side shown; RH side similar.

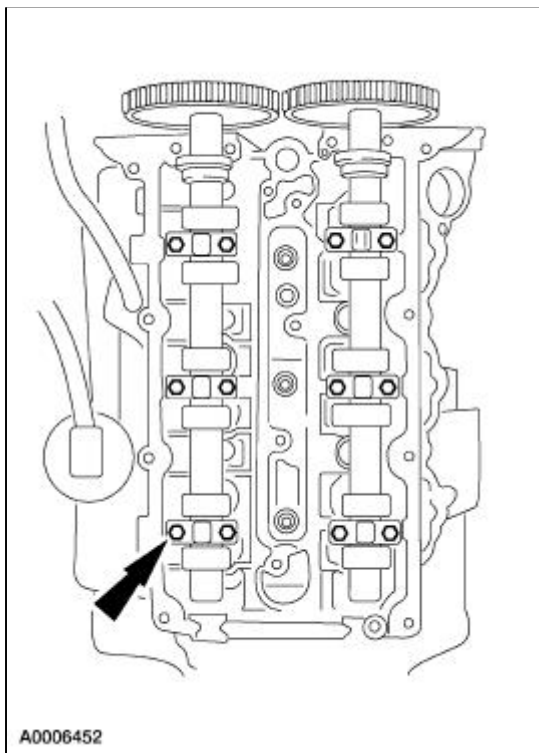
NOTE: The camshaft journal thrust caps have alignment dowels.

Using a soft-faced mallet, gently loosen and remove the LH and RH camshaft journal thrust caps.



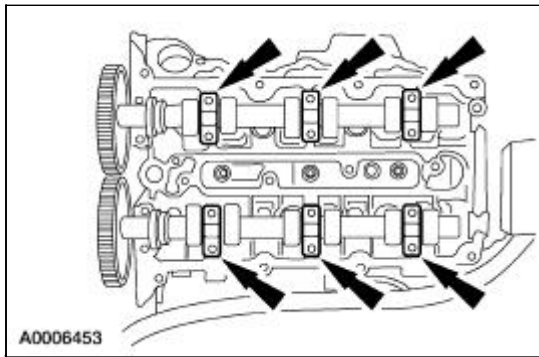
74. **NOTE:** LH side shown; RH side similar.


Remove the remaining bolts.



75. **NOTE:** LH side shown; RH side similar.

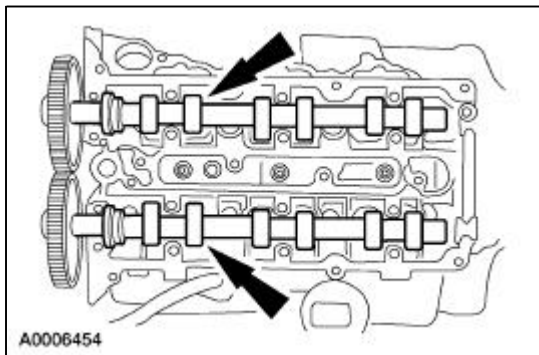
Using a soft-faced mallet, gently loosen and remove the remaining camshaft journal caps.



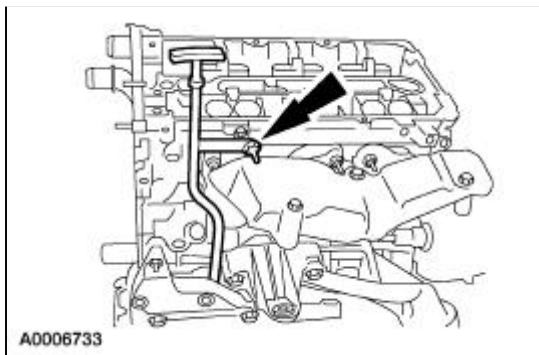
76.  **CAUTION:** If the bucket tappets are to be reused, mark the position of the bucket tappets to make sure they are assembled in their original positions.

NOTE: LH side shown; RH side similar.

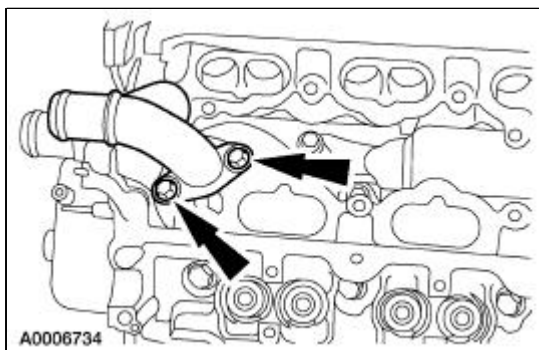
Carefully lift out the LH and RH intake and exhaust camshafts.



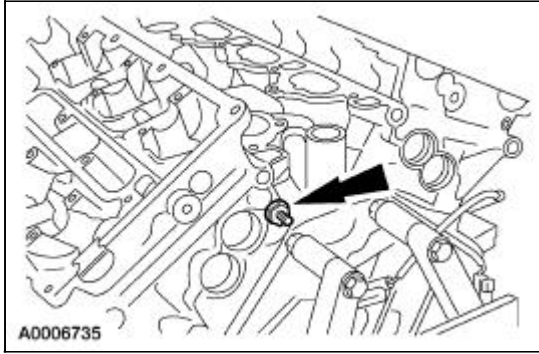
77. Remove the stud bolt and the oil level indicator tube.



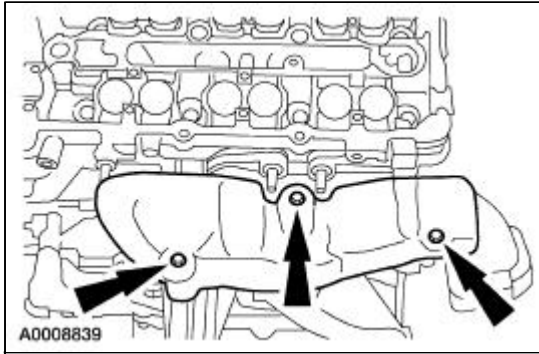
78. Remove the bolts and the coolant bypass tube.



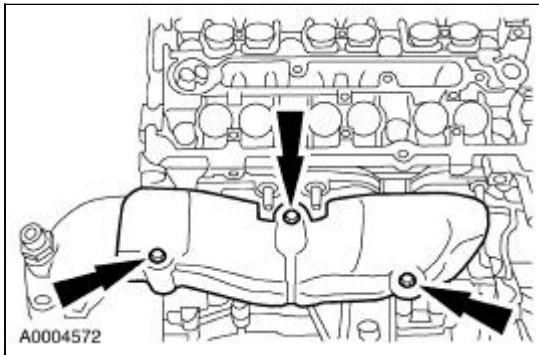
79. Remove the PCV tube stud.



80. If equipped, remove the bolts and the LH heat shield.



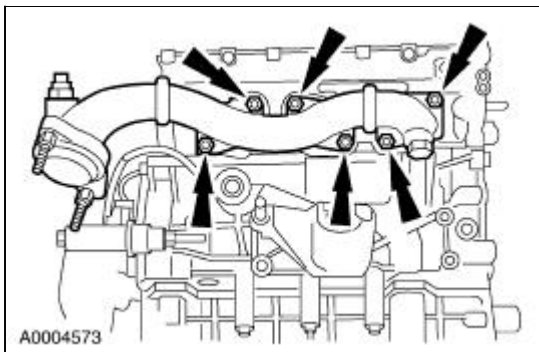
81. If equipped, remove the bolts and RH heat shield.



82. **NOTE:** RH side shown; LH side similar.

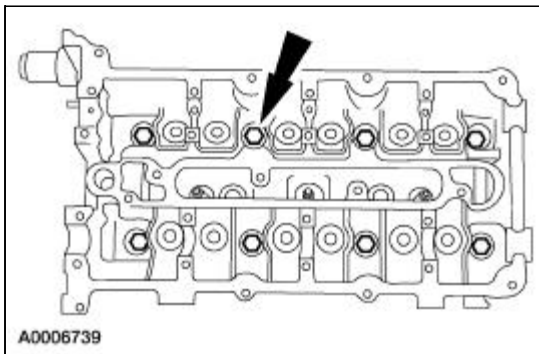
Remove the nuts and the RH and LH exhaust manifold and gasket.

- Discard the gasket.

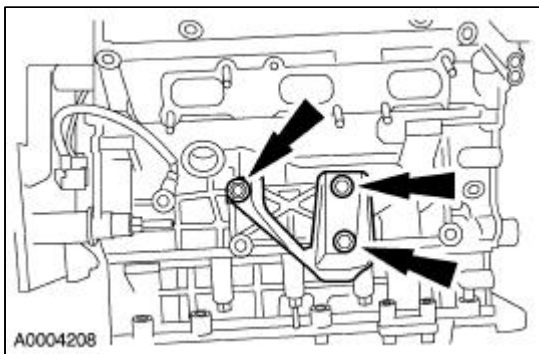


83. Remove the bolts and the RH and LH cylinder heads.

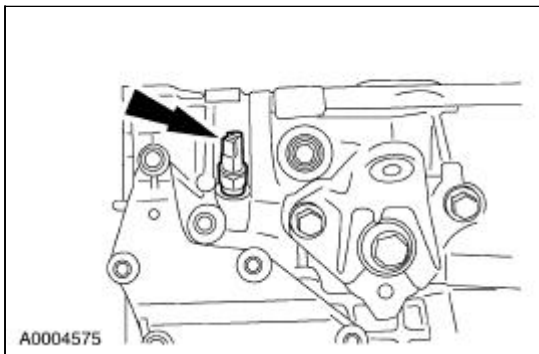
- Discard the gaskets.



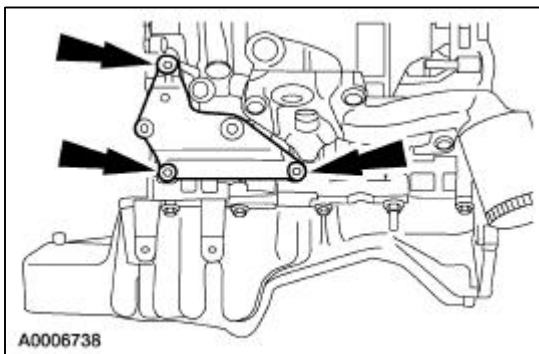
84. Remove the one stud, two bolts and the RH engine mount bracket.



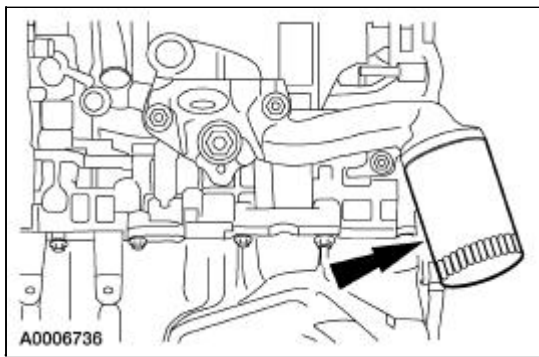
85. Remove the oil pressure switch.



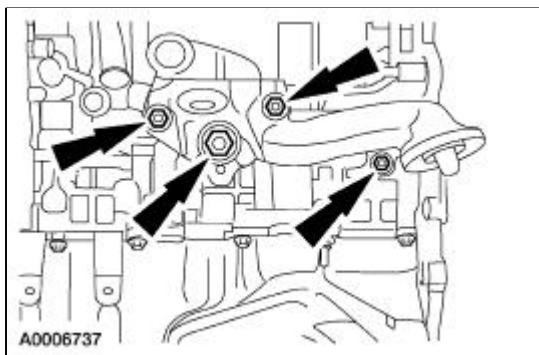
86. Remove the bolts and the A/C compressor mounting bracket.



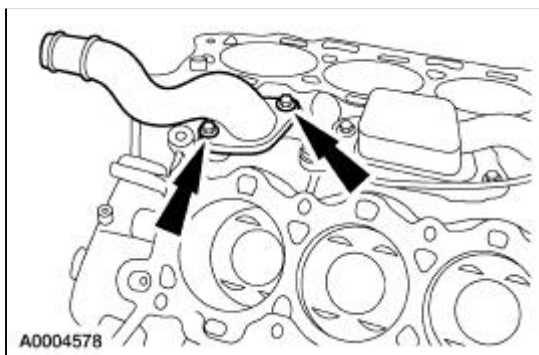
87. Remove the oil filter.



88. Remove the bolts and the oil filter adapter.

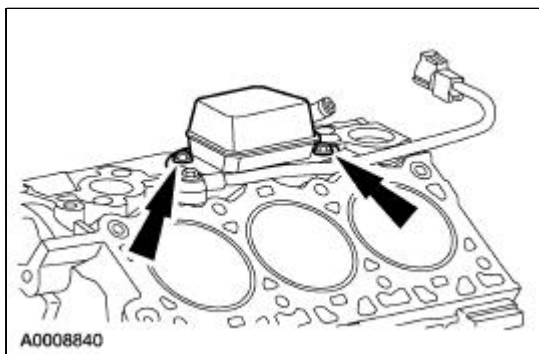


89. Remove the bolts and the inlet tube.

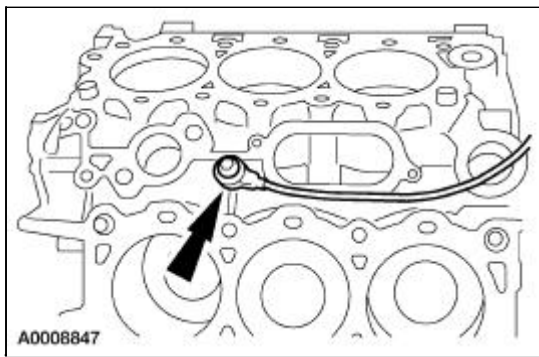


90. Remove the bolts and the oil separator.

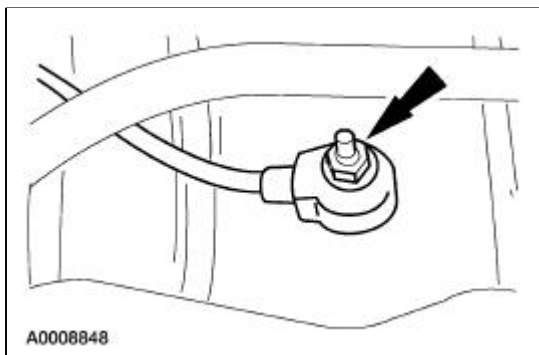
- Discard the gasket.



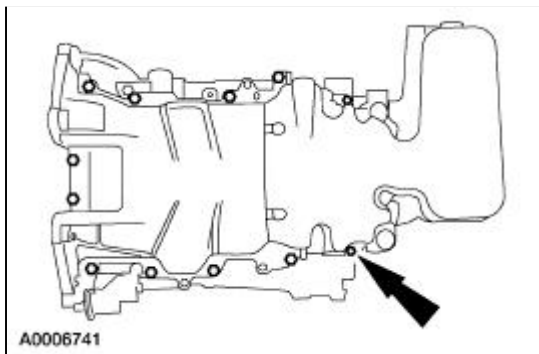
91. Remove the bolt and the top-mounted KS.



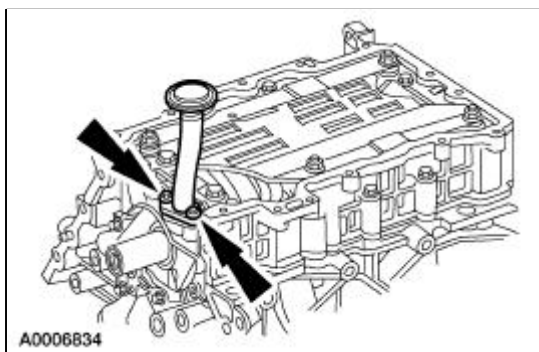
92. Remove the nut and the side-mounted KS.



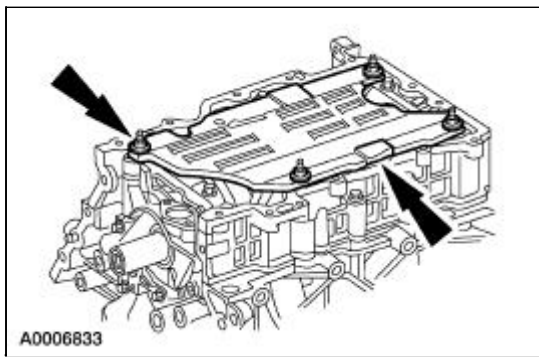
93. Remove the bolts and studs and the oil pan.
● Discard the gasket.



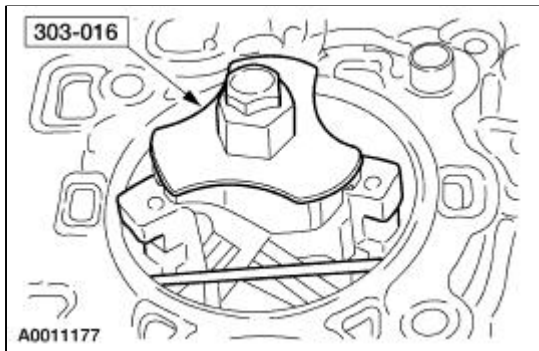
94. Remove the bolts and the oil pick up tube.
● Inspect the O-ring seal for damage.



95. Remove the nuts and the oil pan baffle.



96. Using the special tool, remove the cylinder ridge.



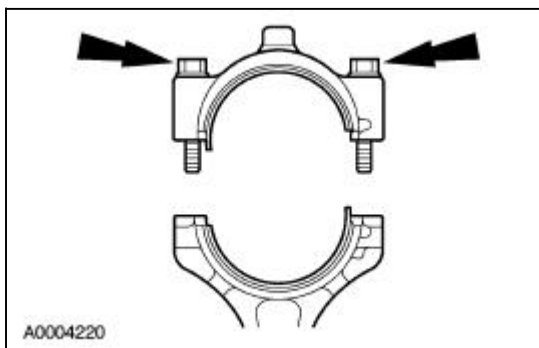
97.  **CAUTION: Pistons, connecting rods, connecting rod bearings and caps should be marked to be sure they are assembled in their original locations.**

NOTE: Before removing piston or connecting rod assemblies, inspect the top of the cylinder bores. If necessary, remove any ridge or carbon deposits from each cylinder using a suitable cylinder ridge reamer. For additional information, refer to [Section 303-00](#).

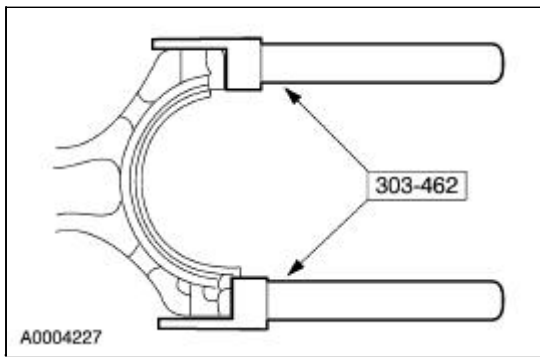
Turn crankshaft until the piston to be removed is at the high point of its travel near the cylinder head deck.

98. **NOTE:** Connecting rod bearing caps are cracked and split from the connecting rods during manufacture, thereby providing an exact fit to the connecting rod when assembled. Care should be taken to prevent dirt or grease from contaminating the cap and rod mating surfaces. Identification marks on the cap and rod must remain aligned as a matched set during assembly.

Remove the connecting rod cap retaining bolts, connecting rod cap, and lower connecting rod bearing. Keep the cap and bearing together.



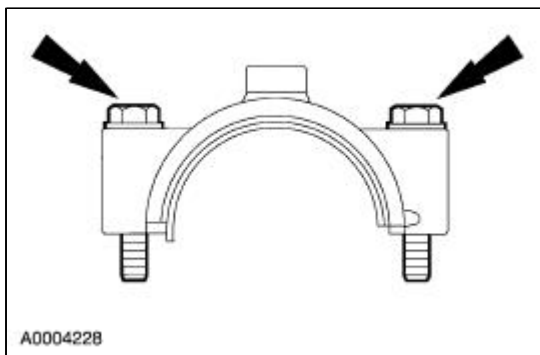
99. Using the special tool to protect the cylinder, push the piston, connecting rod and upper bearing assembly through the top of the cylinder bore.



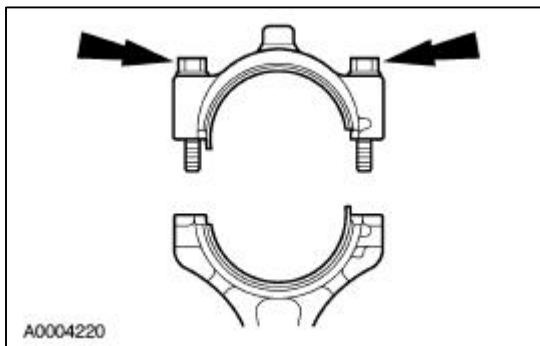
100.  **CAUTION:** Care should be taken not to damage the connecting rod and cap joint face surfaces or possible engine damage may occur.

 **CAUTION:** Connecting rod bolts must be replaced with new bolts. They are torque-to-yield and cannot be reused.

Connecting rod bolts are retained in the connecting rod caps with a slight press fit. Using a hammer and punch, drive the bolts from the caps.

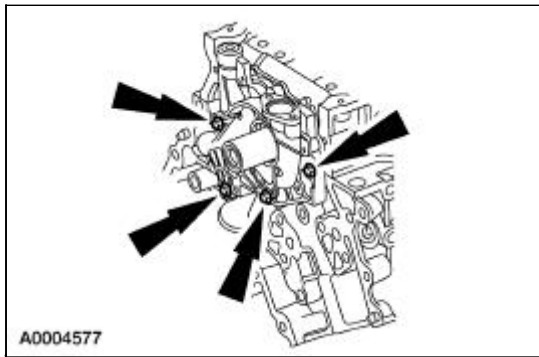


101. Using new connecting rod bolts, attach the connecting rod cap and lower bearing to the connecting rod and upper bearing to prevent mixing parts and damaging the connecting rod joint face surfaces.



102. If piston ring replacement, or piston and connecting rod disassembly is required, refer to Disassembly and Assembly of Subassemblies in this section.

103. Remove the bolts and the oil pump.

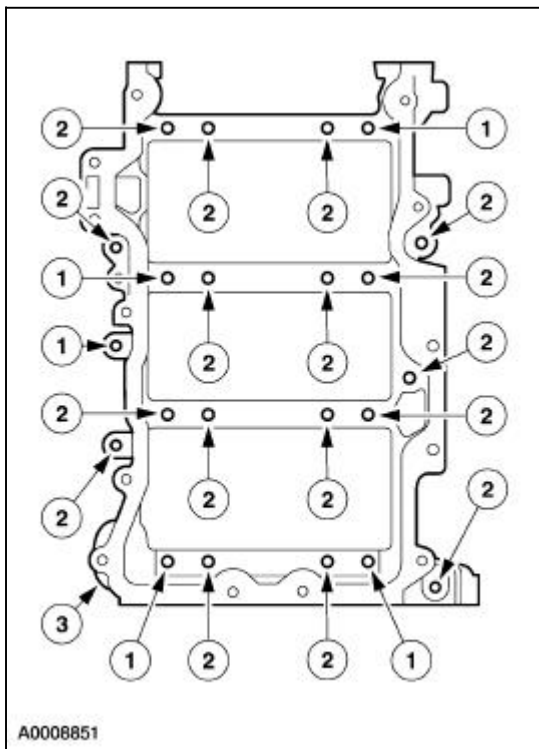


104.  **CAUTION: The bolts are torque-to-yield and cannot be reused. The bolts must be replaced.**

NOTE: Note the location of the stud bolts for assembly.

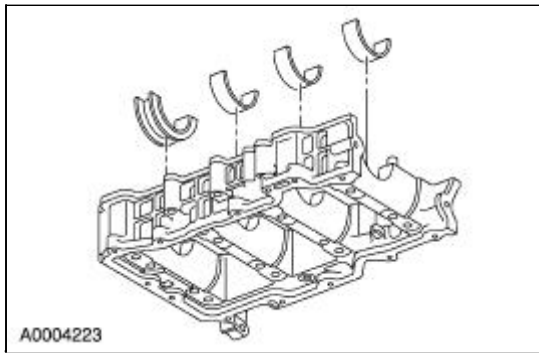
Remove the lower cylinder block.

1. Remove and discard the stud bolts.
2. Remove and discard the 17 bolts.
3. Remove the lower cylinder block.

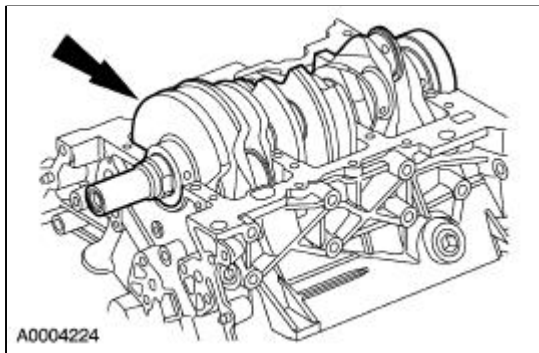


105. **NOTE:** If bearings are to be reused, mark the position of the upper and lower crankshaft main bearings and crankshaft thrust bearing.

Remove the lower crankshaft main bearings and crankshaft thrust bearing from the lower cylinder block.

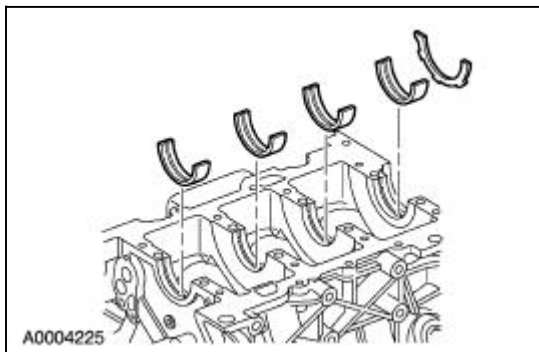


106. Carefully remove the crankshaft from the upper cylinder block.

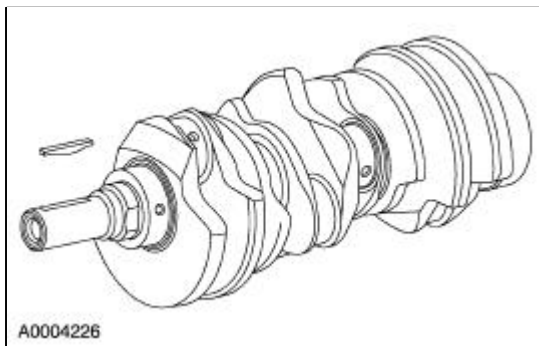


107. Remove and discard the crankshaft rear oil seal.

108. Remove the upper crankshaft bearings and thrust bearing from the upper cylinder block.



109. If necessary, remove the crankshaft key from the crankshaft keyway.

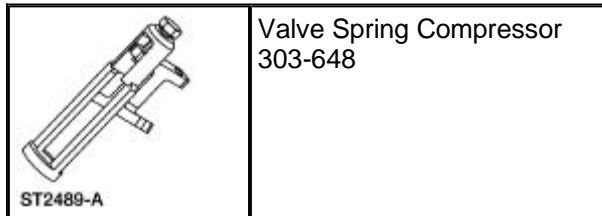


110. Remove the pipe plugs, engine block heater, and dowels from the cylinder block as necessary to clean foreign material from the oil and coolant passages.

111. Inspect the crankshaft, cylinder block and cylinder heads. For additional information, refer to [Section 303-00](#).

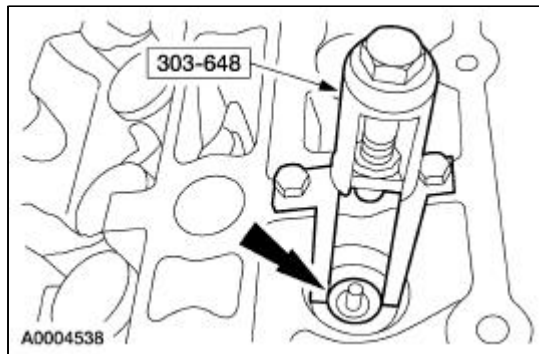
Cylinder Head

Special Tool(s)

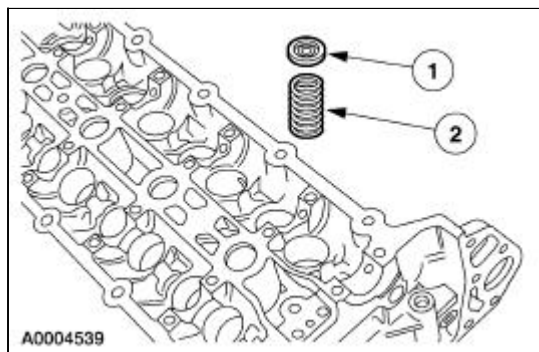


Disassembly

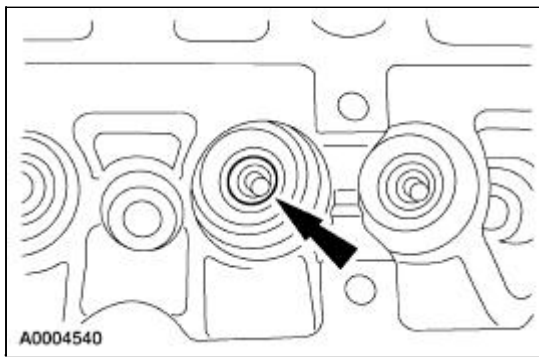
1. Using the special tool, remove the valve spring retainer key.



2. Remove the valve spring.
 - Remove the retainer.
 - Remove the spring.

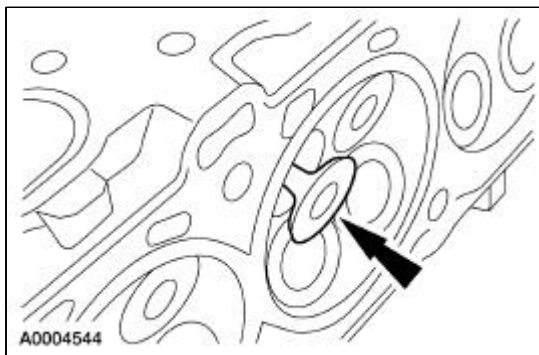


3. For component tests of the valve spring retainer, refer to [Section 303-00](#).
4. Remove the valve stem seal.



5. Remove the valve.

- For component tests of the valve, refer to [Section 303-00](#).
- For component tests of the cylinder head, refer to [Section 303-00](#).



6. Repeat the procedure until all of the valves are removed.

Assembly

1. To install, reverse the removal procedure.

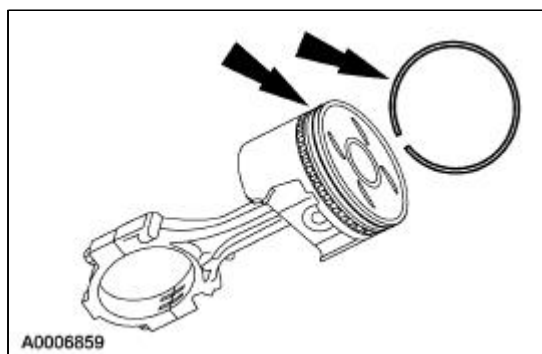
- Lubricate the valve stem and the valve stem seal with Super Premium SAE 5W-30 Motor Oil XO-5W30-QSP or equivalent meeting Ford specification WSS-M2C153-G.
-

Piston

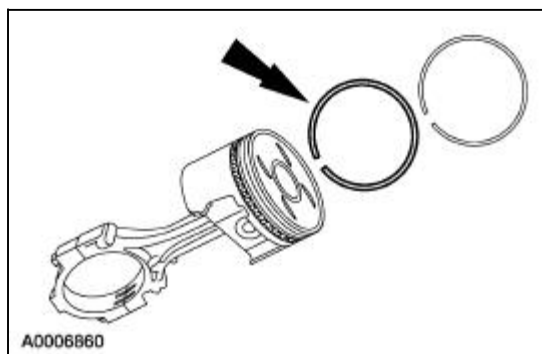
Disassembly

1. **NOTE:** Use a suitable ring expander to remove piston rings to prevent damage.

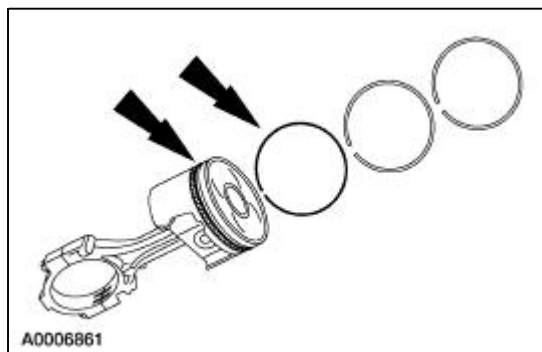
Remove the top compression ring.



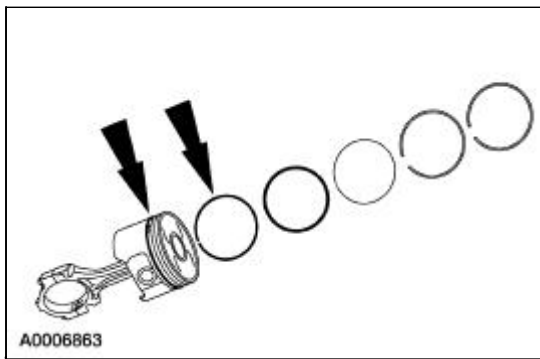
2. Remove the second compression ring.



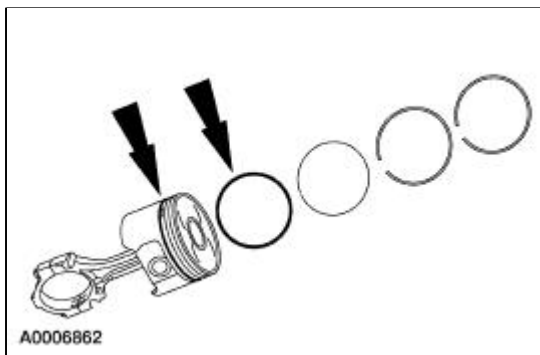
3. Remove the first oil control ring.



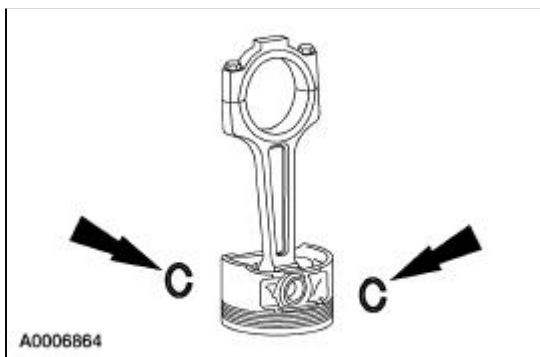
4. Remove the second oil control ring.



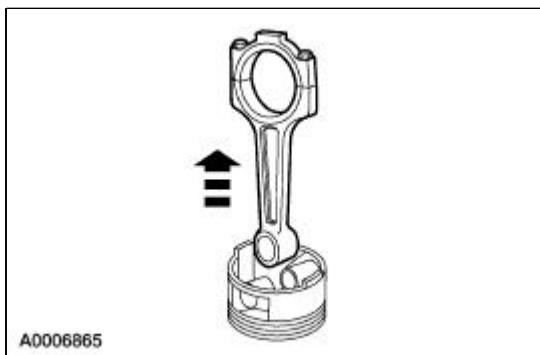
5. Remove the oil control spacer ring.



6. Remove the clips.



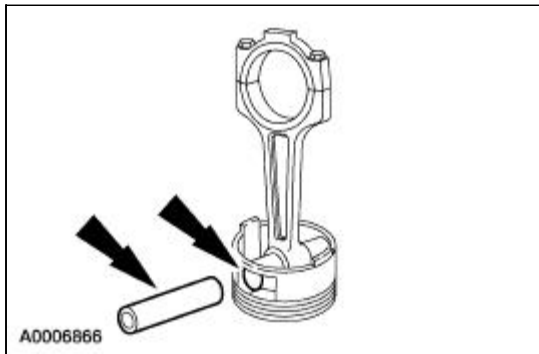
7. Remove the piston pin and the connecting rod from the piston.



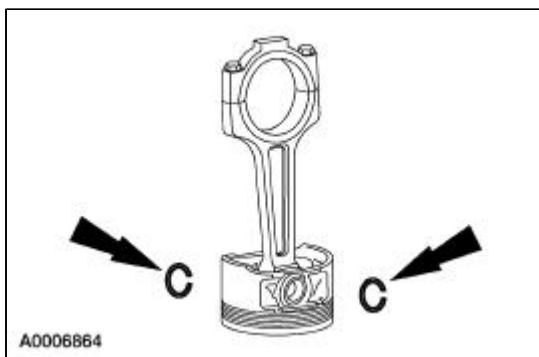
8. Clean and inspect the connecting rod and the piston; refer to [Section 303-00](#).

Assembly

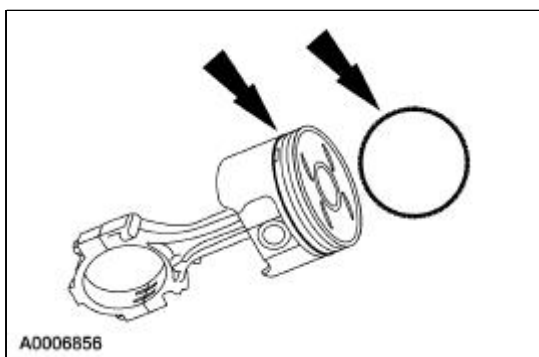
1. Lubricate the piston pin and piston pin bore with Super Premium SAE 5W-30 Motor Oil XO-5W30-QSP or equivalent meeting Ford specification WSS-M2C153-G and install the piston pin.



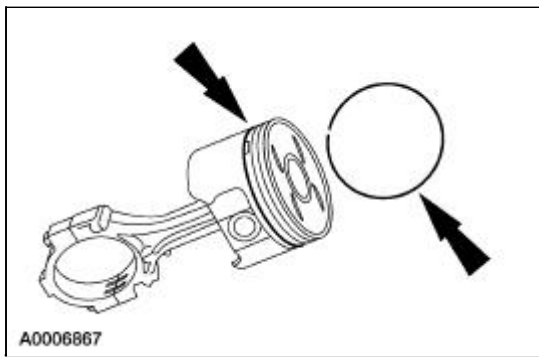
2. Install the clips.



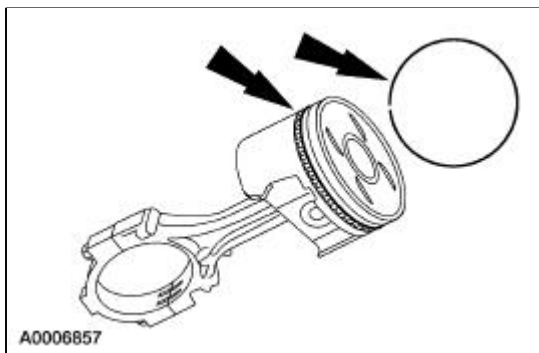
3. Check piston ring end gap. For additional information, refer to [Section 303-00](#).
4. Lubricate the piston and the piston rings with Super Premium SAE 5W-30 Motor Oil XO-5W30-QSP or equivalent meeting Ford specification WSS-M2C153-G.
5. Install the oil control spacer ring.



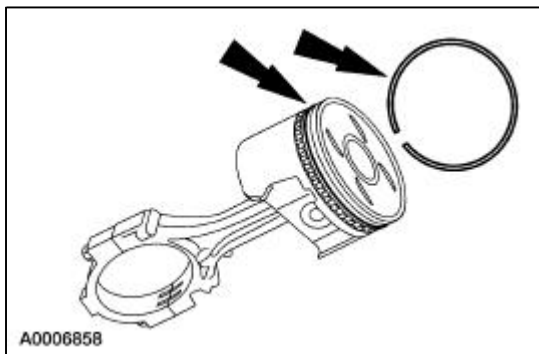
6. Install the second oil control ring.



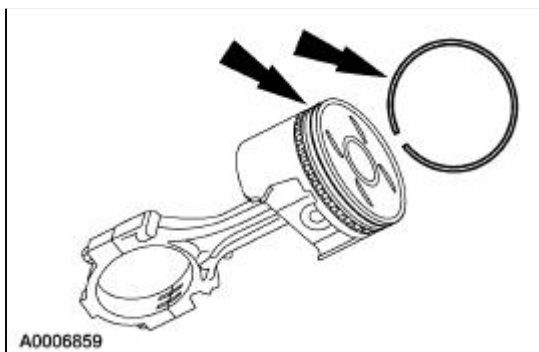
7. Install the first oil control ring.



8. Install the second compression ring.
 - The top of the second compression ring has a "0" on it. Position this side of the ring towards the top of the piston.

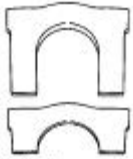




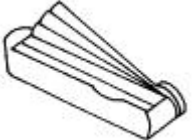
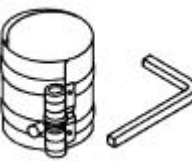


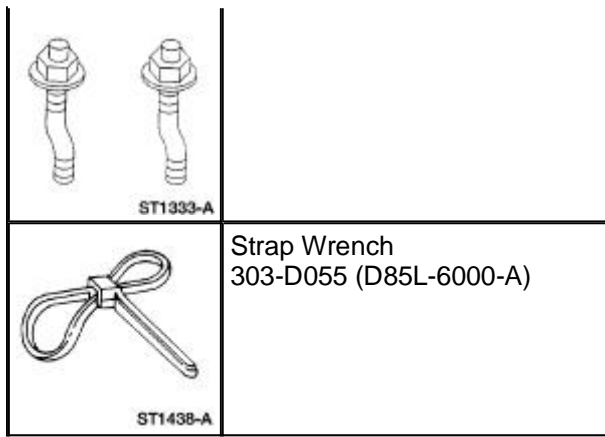
9. Install the top compression ring.
 - The top compression ring can be installed with either side up.




Engine

Special Tool(s)

 <p>ST2429-A</p>	<p>Camshaft Lift Tools 303-659</p>
 <p>ST2115-A</p>	<p>Connecting Rod Guide Set 303-462 (T94P-6136-AH)</p>
 <p>ST1327-A</p>	<p>Crankshaft Seal Replacer 303-178 (T82L-6701-A)</p>
 <p>ST1287-A</p>	<p>Crankshaft Damper Replacer 303-102 (T74P-6316-B)</p>
 <p>ST1328-A</p>	<p>Crankshaft Seal Installer/Aligner 303-335 (T88T-6701-A)</p>
 <p>ST1271-A</p>	<p>Feeler Gauge Set 303-D027 (D81L-4201-A)</p>
	<p>Piston Ring Compressor 303-D032 (D81L-6002-C)</p>
	<p>Rear Crankshaft Adapter Bolts 303-384 (T91P-6701-A)</p>

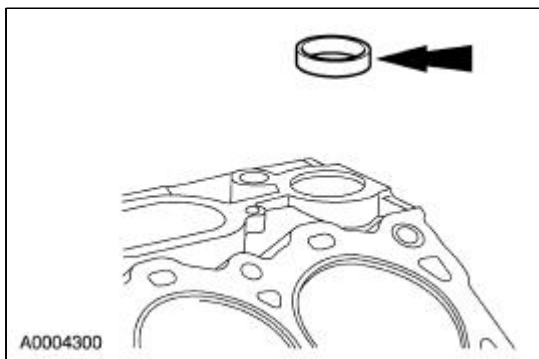


1.  **WARNING: Eye protection is required to be worn during the use of compressed air. Failure to follow these instructions may result in possible personal injury.**

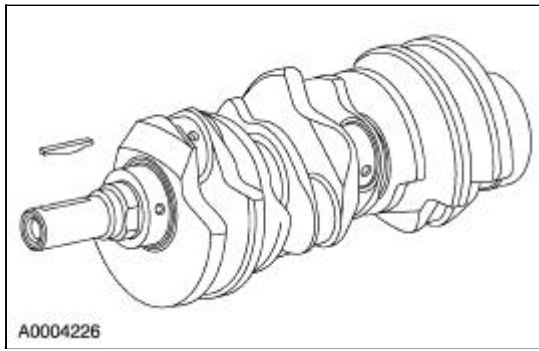
NOTE: If required, deglaze the cylinder walls using a suitable spring-type tool. Clean the cylinder walls with a detergent and water solution upside-down to prevent contamination of the lower portion of the cylinder block.

Clean gasket material, dirt and foreign material from the cylinder block. Wash the cylinder block with a suitable soap and water solution, and dry with compressed air.

2. Install the cup plugs, block dowels or pipe plugs that may have been removed during disassembly. Tighten the pipe plugs as follows:
 - 3/8-18 inch to 20 Nm (15 lb-ft) + 180 degrees
 - 1/2-14 inch to 40 Nm (30 lb-ft) + 180 degrees
 - 3/4-14 inch to 10 Nm (89 lb-in) + 720 degrees or 40 Nm (30 lb-ft), whichever comes first. Do not exceed 720 degrees or 40 Nm (30 lb-ft).
3. Measure the cylinder bore diameter and compare to specification. Cylinder bore measurements should be taken within 50 mm (2 in) from the top of the bore. Mark the outside of the block with the appropriate bore grade number for the replacement piston. Replacement pistons and domes are marked with grade numbers. For additional information, refer to [Section 303-00](#).
4. If removed, install cup plugs. Apply a 2 mm (0.08 in) bead of sealant meeting Ford specification WSK-M2G349-A7 to the cup plug prior to installation.



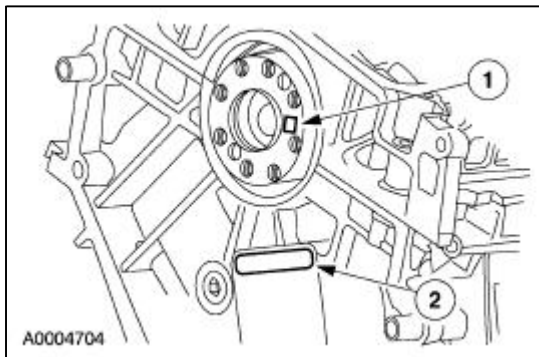
5. If removed, install the engine block heater. For additional information, refer to [Section 303-03](#).
6. If removed, install the crankshaft key into the keyway on the crankshaft.



7. **NOTE:** This procedure is for selecting bearings using a new crankshaft.

Select the crankshaft main bearings for each crankshaft journal.

1. Read the code on the crankshaft flange.
2. Read the code on the cylinder block rear face.
 - The first two numbers after the asterisk make up the code for main No. 1 and the next two numbers for main No. 2.
 - The first two numbers after the second asterisk make up the code for main No. 3 and the last two numbers for main No. 4.

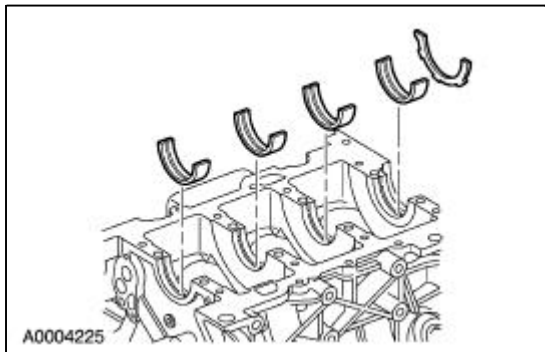


8. Look at the Select-Fit Chart and for each main, match the block and crankshaft code with its corresponding column or row, by reading across the crankshaft row and down the block column. Select the proper grade bearing for each main.
- For example: If the block code is *0609*0711* and the crankshaft code is *8480*8082*, main No. 1 should use grade 1 bearings, as determined by the intersection of the 06 block column and the 84 crankshaft row. Main Nos. 2, 3 and 4 should all be grade 2.

		BLOCK CODE																							
		98	99	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21
CRANKSHAFT CODE	91	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2
	90	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2
	89	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2
	88	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2
	87	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2
	86	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2
	85	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2
	84	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	3
	83	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	3
	82	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	3	3
	81	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	3	3
	80	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	3	3
	79	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	3	3	3
	78	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	3	3	3
	77	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	3	3	3
	76	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	3	3	3
	75	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	3	3
	74	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	3	3
	73	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	3	3
	72	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	3	3
71	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	3	3	
70	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	3	3	
69	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	3	3	
68	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	3	3	

A0004705

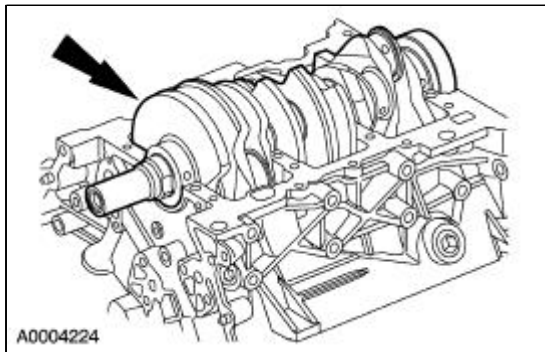
- Install the upper main bearing and upper thrust bearing into the cylinder block in the correct locations.



A0004225

- NOTE:** Lubricate the crankshaft main bearings and the crankshaft journals with Super Premium SAE 5W-30 Motor Oil XO-5W30-QSP or equivalent meeting Ford specification WSS-M2C153-G.

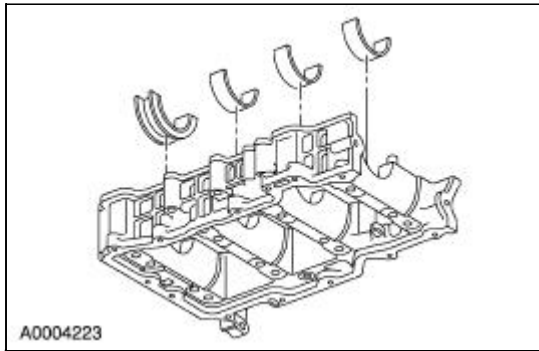
Carefully install the crankshaft into the cylinder block.




A0004224

- Install the lower main bearings and lower thrust bearing into the lower cylinder block in the

correct locations.

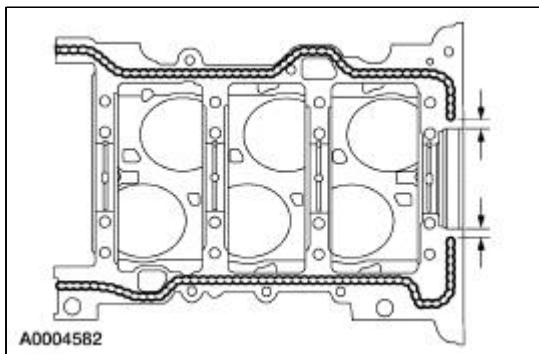


12.  **CAUTION: Do not use metal scrapers, wire brushes, power abrasive discs, or other abrasive means to clean the sealing surfaces. These tools cause scratches and gouges which may make leak paths. Use a plastic scraper to remove all traces of old sealant.**

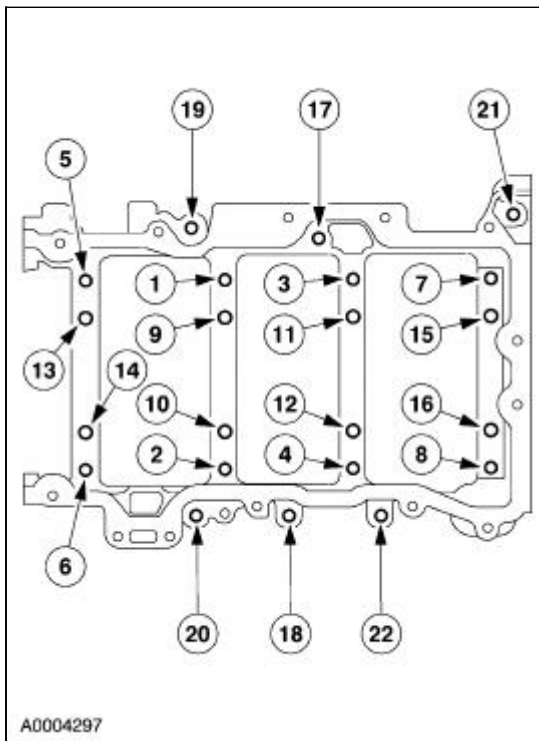
NOTE: Both sealing surfaces must be clean, dry and free of any dirt or other contamination prior to application of the sealant. Use Metal Surface Cleaner F4AZ-19A536-RA or equivalent meeting Ford specification WSE-M5B392-A. Allow to dry until there is no sign of wetness, or four minutes, whichever is longer. Failure to follow this procedure can cause future oil leakage.


NOTE: The lower cylinder block and bolts, with all bolts tightened, must be assembled within four minutes of applying sealer.

Apply a 3 mm (0.12 in) bead of Silicone Gasket and Sealant F7AZ-19554-EA or equivalent meeting Ford specification WSE-M4G323-A4 to the lower cylinder block ending 6 mm (0.24 in) from the rear crankshaft seal bore on both sides.



13. Install the lower cylinder block and bolts.
- Tighten the bolts in the sequence shown in four stages.
 - Stage 1: Tighten numbers 1 through 8 to 25 Nm (18 lb-ft).
 - Stage 2: Tighten numbers 9 through 16 to 40 Nm (30 lb-ft).
 - Stage 3: Rotate numbers 1 through 16 an additional 90 degrees.
 - Stage 4: Tighten numbers 17 through 22 to 25 Nm (18 lb-ft).

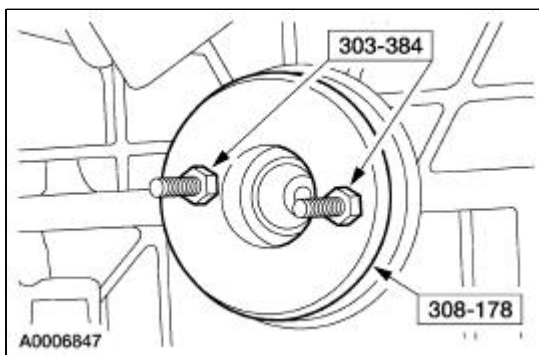


14. Remove the squeezed out sealer at the engine front cover surface and the rear seal bore inner diameter.
15. Check crankshaft end play. For additional information, refer to [Section 303-00](#).
16.  **CAUTION: Rotating the crankshaft in a counterclockwise direction may cause engine damage. Crankshaft journals are directionally machined. Rotating the crankshaft counterclockwise can raise burrs on bearing surfaces, reducing engine life.**

Rotate the crankshaft clockwise to verify free rotation.

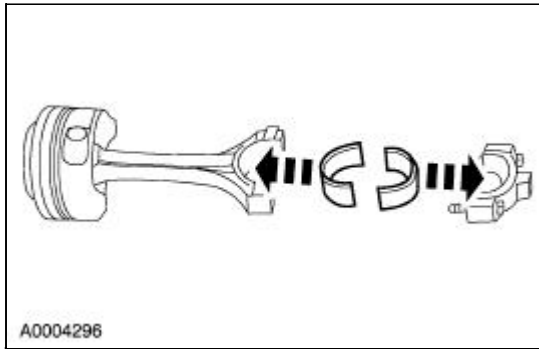
17. **NOTE:** Apply Super Premium SAE 5W-30 Motor Oil XO-5W30-QSP or equivalent meeting Ford specification WSS-M2C153-G to the crankshaft flange outer diameter and to the crankshaft seal bore inner diameter prior to seal installation.


Using the special tool, install the crankshaft rear oil seal.



18. Select the correct size connecting rod bearings. For additional information, refer to [Section 303-00](#).
19. **NOTE:** The connecting rod bearing tangs should align with the notch in the connecting rod and cap.

Install the connecting rod bearings into the connecting rods and connecting rod caps.



20.  **CAUTION:** Be sure not to scratch the cylinder wall or crankshaft journal with the connecting rod. Push the piston down until the connecting rod bearing seats on the crankshaft journal.

NOTE: Lubricate the pistons, piston rings, connecting rod bearings and entire cylinder bores with Super Premium SAE 5W-30 Motor Oil XO-5W30-QSP or equivalent meeting Ford specification WSS-M2C153-G prior to installation.

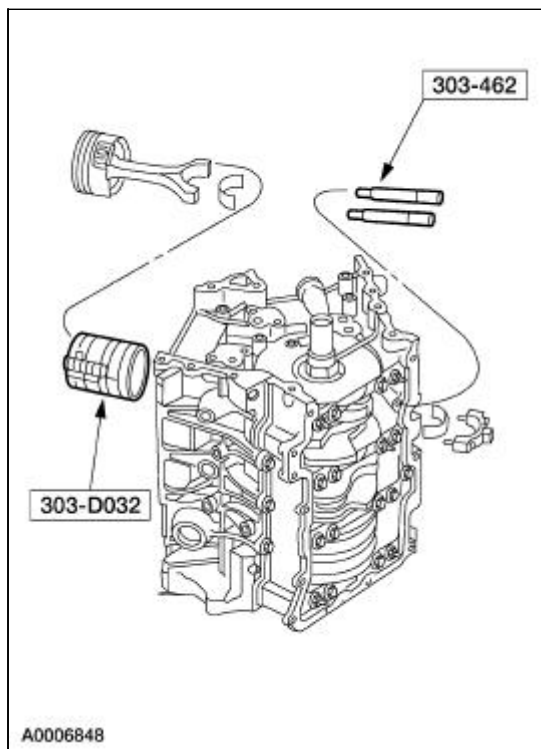
NOTE: Check piston rings for correct orientation prior to installing piston into cylinder bore. For additional information, refer to [Section 303-00](#).

NOTE: Install pistons with arrows on pistons to front of engine.

NOTE: After installation of each piston and connecting rod, rotate the crankshaft to verify smooth operation.

Turn the crankshaft until the crankshaft throw is at the bottom of the stroke. Using the special tools, install the piston, connecting rod, and connecting rod bearing assemblies Nos. 1 and 4. Tighten the bolts in three stages:

- Stage 1: Tighten to 23 Nm (17 lb-ft).
- Stage 2: Tighten to 43 Nm (32 lb-ft)
- Stage 3: Tighten an additional 90 degrees.

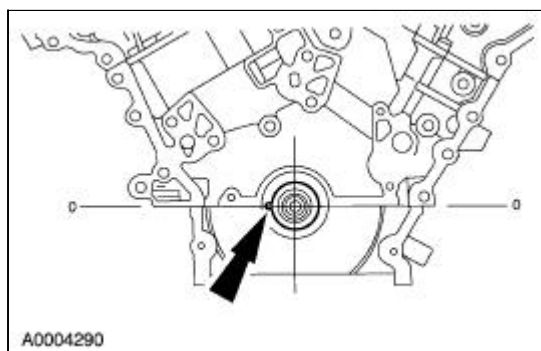


21. Install the piston, connecting rod and connecting rod bearing assemblies Nos. 2 and 5. Tighten the bolts in three stages:
 - Stage 1: Tighten to 23 Nm (17 lb-ft).
 - Stage 2: Tighten to 43 Nm (32 lb-ft).
 - Stage 3: Tighten an additional 90 degrees.

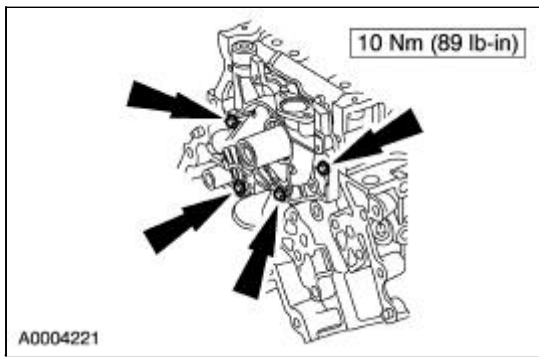
22. Install the piston, connecting rod and connecting rod bearing assemblies Nos. 3 and 6. Tighten the bolts in three stages:
 - Stage 1: Tighten to 23 Nm (17 lb-ft).
 - Stage 2: Tighten to 43 Nm (32 lb-ft).
 - Stage 3: Tighten an additional 90 degrees.

23. Check the connecting rod side clearance for all of the connecting rods. For additional information, refer to [Section 303-00](#).

24. Rotate the crankshaft to position the keyway at the nine o'clock position.

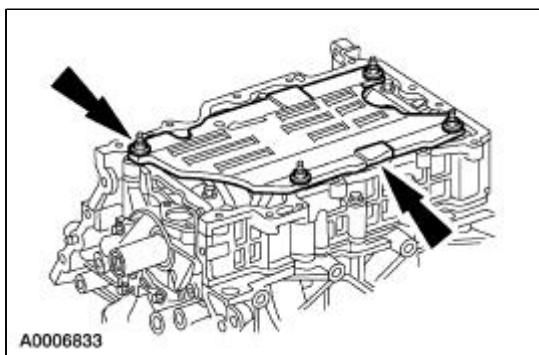


25. Position the oil pump and install the bolts.



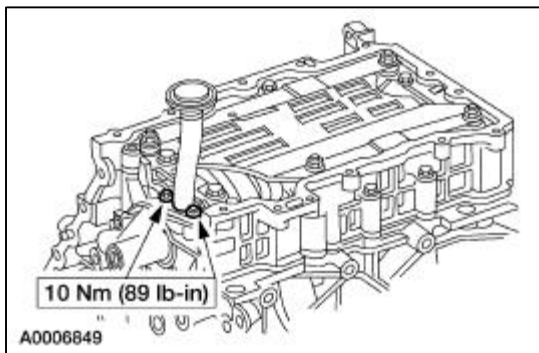
26. Position the oil pan baffle and install the nuts. Tighten in two stages:

- Stage 1: Tighten to 5 Nm (44 lb-in).
- Stage 2: Tighten an additional 45 degrees.

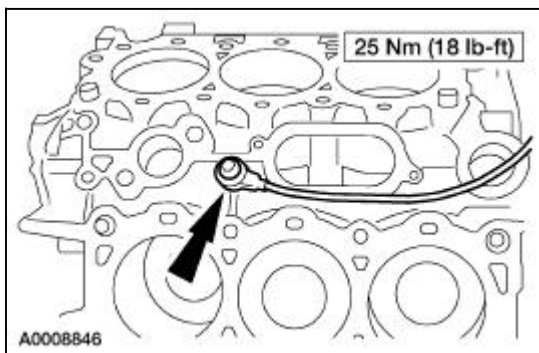


27. Position the oil pump screen cover and tube and install the bolts.

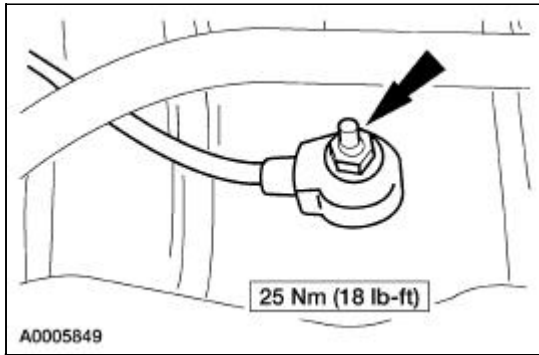
- Use a new O-ring seal if necessary.



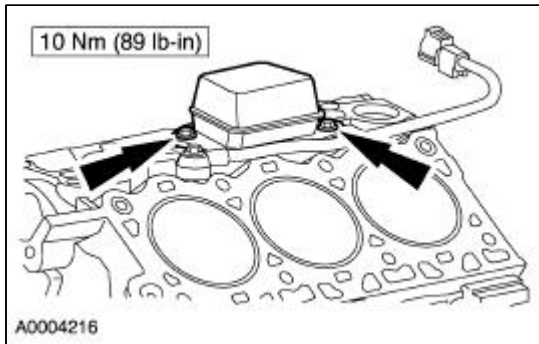
28. Position the top-mounted KS and install the bolt.



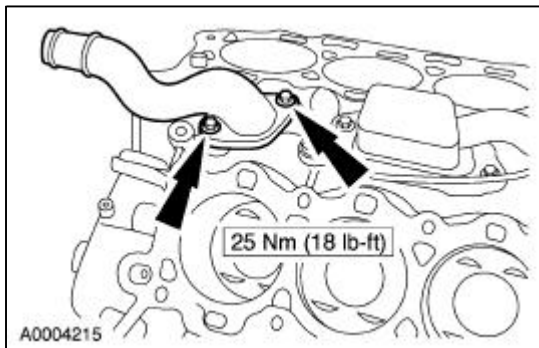
29. Position the side-mounted KS and install the nut.



30. Using a new gasket, position the oil separator and install the bolts.



31. Using a new O-ring seal, position the coolant inlet tube and install the bolts.



32. **⚠ CAUTION:** The cylinder head gasket surfaces are ground to a precision finish. Do not rest cylinder heads on gasket surfaces. Do not use any abrasive during cleaning of the surfaces. Hairline scratches, small burrs, or dirt can provide a leak path for a cylinder head gasket to leak. If gasket material remains on the sealing surface, use only a plastic-tipped scraper to remove the material. Do not attempt to reuse the head gaskets.

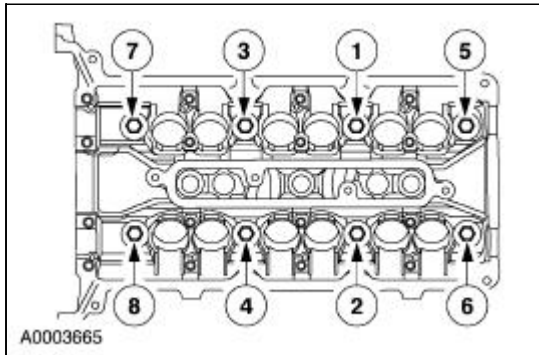
⚠ CAUTION: Cylinder head bolts are torque-to-yield and cannot be reused.

NOTE: The LH and RH cylinder head gaskets are not interchangeable.

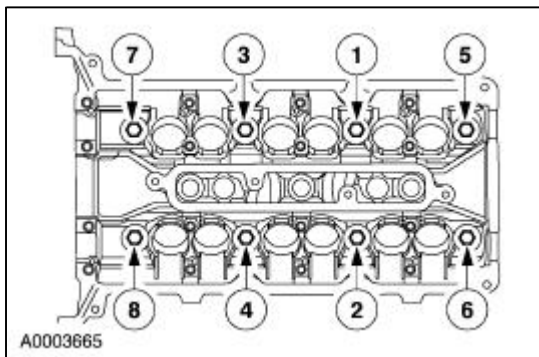
Using a new cylinder head gasket, position the RH cylinder head, and install the bolts.

- Tighten the bolts in six stages:
- Stage 1: Tighten to 30 Nm (22 lb-ft).
- Stage 2: Tighten an additional 90 degrees.


- Stage 3: Back out a minimum of one full turn (360 degrees).
- Stage 4: Tighten to 30 Nm (22 lb-ft).
- Stage 5: Tighten an additional 90 degrees.
- Stage 6: Tighten an additional 90 degrees.



33. Using a new cylinder head gasket, position the LH cylinder head, and install the bolts.
- Tighten the bolts in six stages:
 - Stage 1: Tighten to 30 Nm (22 lb-ft).
 - Stage 2: Tighten an additional 90 degrees.
 - Stage 3: Back out a minimum of one full turn (360 degrees).
 - Stage 4: Tighten to 30 Nm (22 lb-ft).
 - Stage 5: Tighten an additional 90 degrees.
 - Stage 6: Tighten an additional 90 degrees.



34.  **CAUTION: The tappets and shims must be installed in their original positions.**

 **CAUTION: The bucket tappets and bores must be absolutely clean prior to bucket tappet installation. Failure to correctly clean these components may result in a sticking valve leading to severe engine damage or failure.**

NOTE: Only lightly lubricate the tappet shim prior to installation. Excess oil on the tappet shim may cause inaccurate valve clearance measurements.

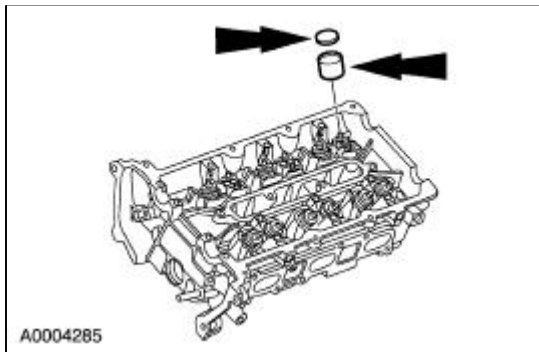
NOTE: LH side shown; RH side similar.

Lubricate all of the valve tappets, shims and bores and install them in their original positions.

- Lubricate the valve tappets and bores with Super Premium SAE 5W-30 Motor Oil XO-

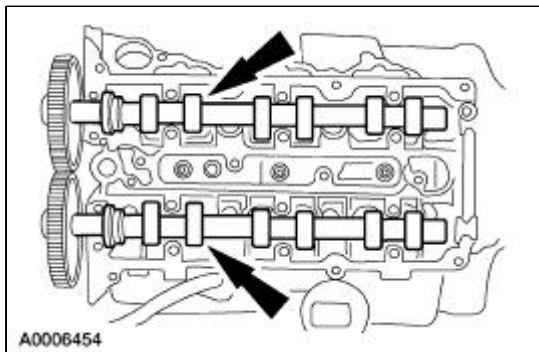
5W30-QSP or equivalent meeting Ford specification WSS-M2C153-G.

- Lubricate the shims with Super Premium SAE 5W-30 Motor Oil XO-5W30-QSP or equivalent meeting Ford specification WSS-M2C153-G.



35. **NOTE:** Be sure camshaft bearing caps are installed in their original positions.

Lubricate the LH camshafts with Super Premium SAE 5W-30 Motor Oil XO-5W30-QSP or equivalent meeting Ford specification WSS-M2C153-G and carefully position the camshaft into the LH cylinder head.

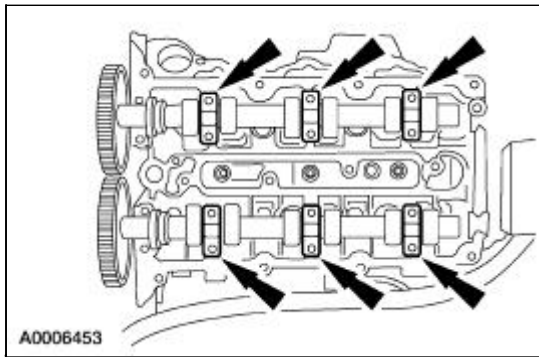


36. **⚠ CAUTION:** This is not a free-spinning engine. The crankshaft keyway must be at the nine o'clock position prior to tightening the camshaft caps or rotating the camshafts. Failure to follow these directions may result in serious engine damage.

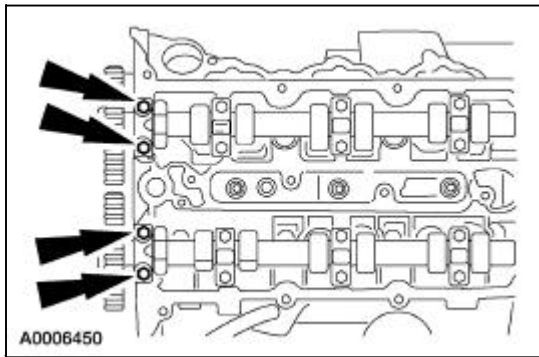
⚠ CAUTION: Cylinder head camshaft journal caps are numbered. Keep camshaft journal caps with the cylinder head from which they were removed. Do not mix with camshaft journal caps from another cylinder head.

⚠ CAUTION: Do not install the camshaft journal thrust caps until all of the camshaft bearing journal caps have been tightened, or damage to the thrust caps may occur.

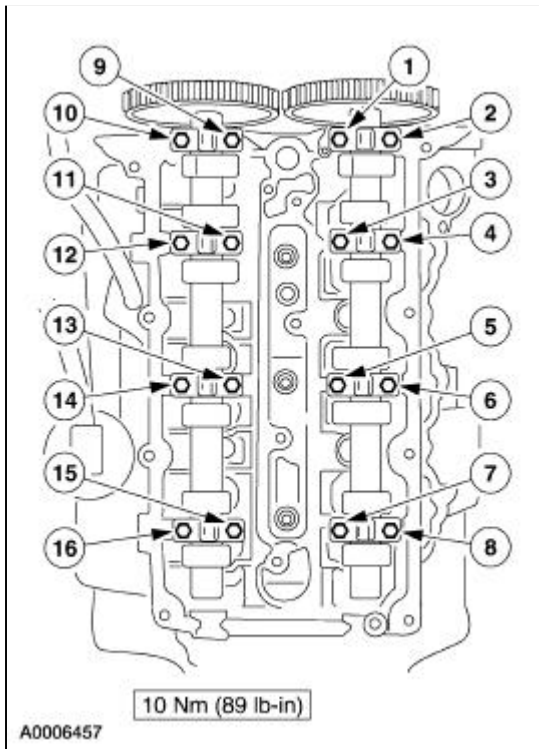
Lubricate the LH camshaft bearing journal caps with Super Premium SAE 5W-30 Motor Oil XO-5W30-QSP or equivalent meeting Ford specification WSS-M2C153-G. Position the caps in their correct locations and loosely install the bolts.



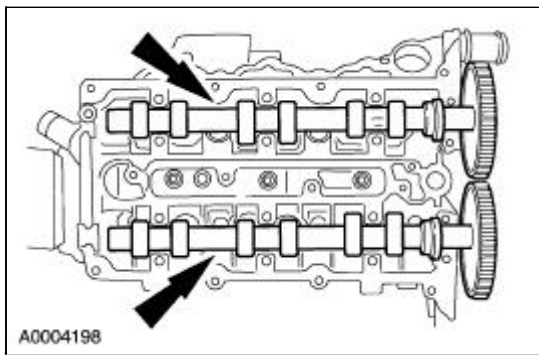
37. Lubricate the LH camshaft thrust caps with Super Premium SAE 5W-30 Motor Oil XO-5W30-QSP or equivalent meeting Ford specification WSS-M2C153-G and position the caps and loosely install the bolts.




38. Tighten the bolts in sequence shown.



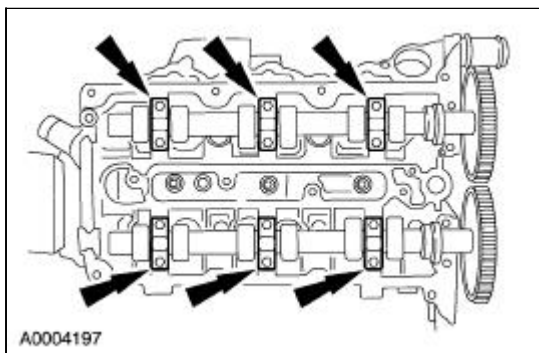
39. Lubricate the RH camshafts with Super Premium SAE 5W-30 Motor Oil XO-5W30-QSP or equivalent meeting Ford specification WSS-M2C153-G and carefully position the camshaft into the RH cylinder head.



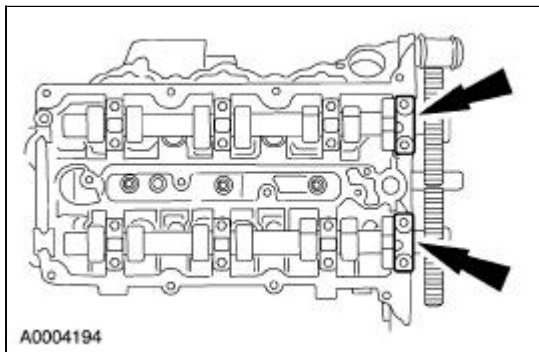
40.  **CAUTION:** Cylinder head camshaft journal caps and cylinder heads are numbered to make sure they are installed in their original position. Keep camshaft journal caps with the cylinder head from which they were removed. Do not mix with camshaft journal caps from another cylinder head.

 **CAUTION:** Do not install the camshaft journal thrust caps until all of the camshaft bearing journal caps have been tightened or damage to the thrust caps may occur.

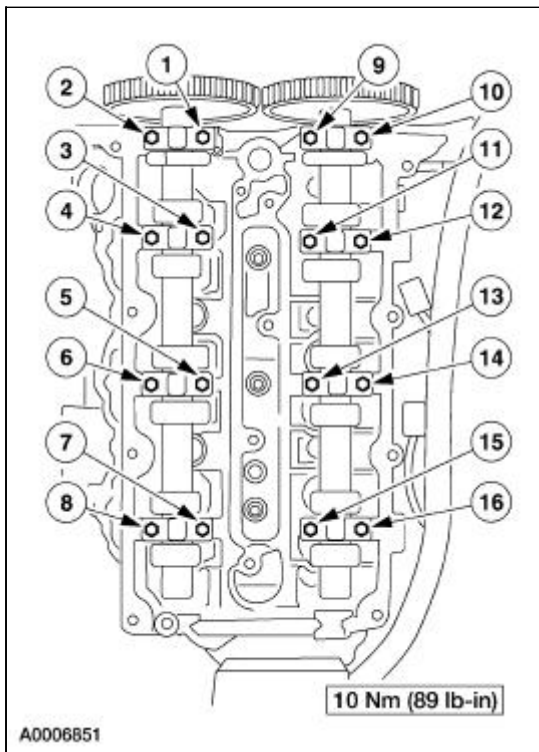
Lubricate the camshaft bearing journal caps with Super Premium SAE 5W-30 Motor Oil XO-5W30-QSP or equivalent meeting Ford specification WSS-M2C153-G. Position the caps in their correct locations and loosely install the bolts.




41. Lubricate the RH camshaft thrust caps with Super Premium SAE 5W-30 Motor Oil XO-5W30-QSP or equivalent meeting Ford specification WSS-M2C153-G and loosely install the caps and bolts.

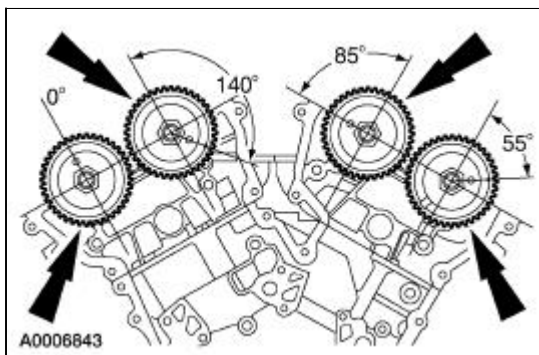


42. Tighten the camshaft journal cap bolts in the sequence shown.

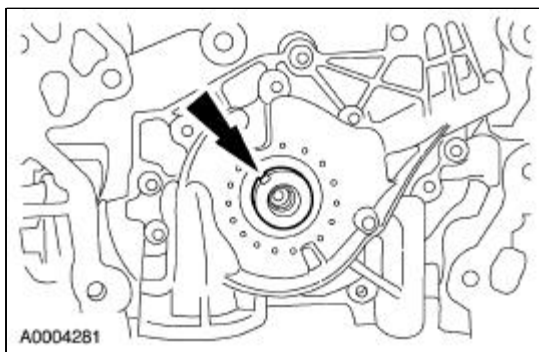


43.  **CAUTION:** The crankshaft keyway must remain in the nine o'clock position until the cams are located, or damage to the valves may occur.

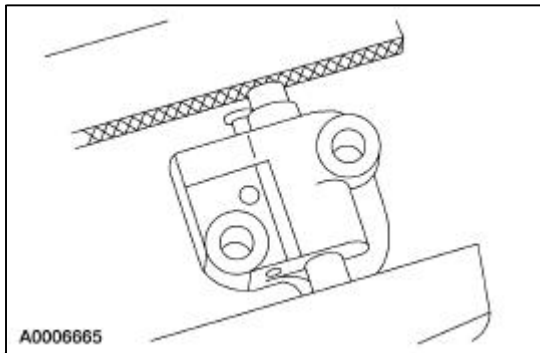
Rotate each camshaft to make sure there is smooth rotation and to position the cams in their neutral position.



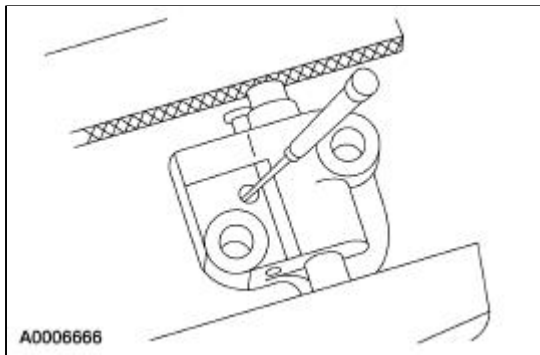
44. Install the crankshaft pulley and tighten the bolt.
45. Rotate the crankshaft clockwise to position the keyway to the 11 o'clock position.



46. Remove the bolt and the crankshaft pulley.
47. Position the LH chain tensioner in a soft-jawed vise.



48. Hold the chain LH tensioner ratchet lock mechanism away from the ratchet stem with a small pick.

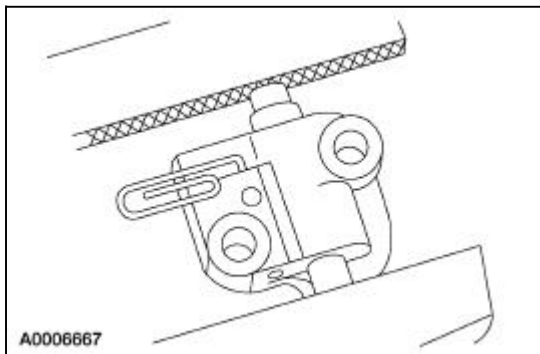


49.  **CAUTION:** During tensioner compression, do not release the ratchet stem until the tensioner piston is fully bottomed in its bore or damage to the ratchet stem will result.

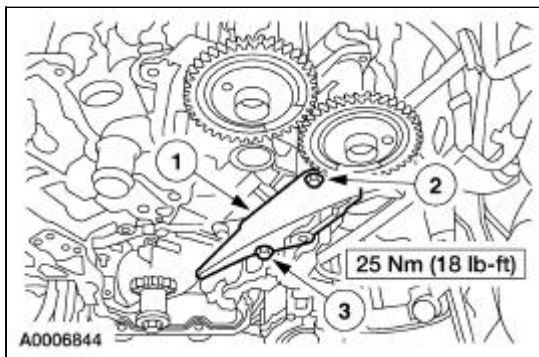
Slowly compress the LH timing chain tensioner.

50. **NOTE:** The wire must remain in the timing chain tensioner until the tensioner is installed.

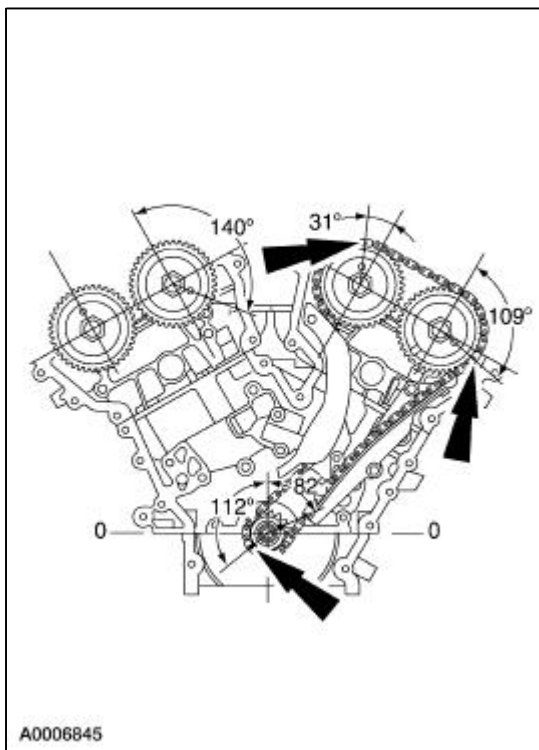
Retain the LH tensioner piston with a 1.5 mm (0.06 in) wire or paper clip.



51. Install the LH timing chain guide.
 1. Position the guide to the engine.
 2. Install the shorter (gold color) bolt into the upper hole.
 3. Install the longer bolt (black color) into the lower hole.

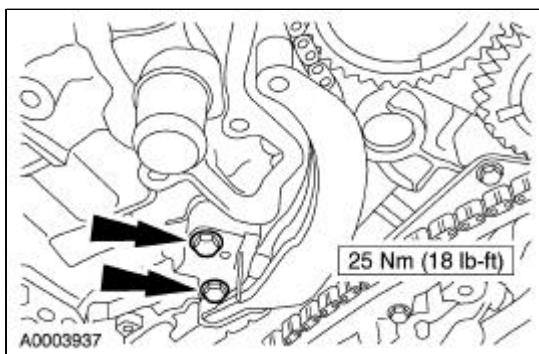


52. Install the LH timing chain, aligning the timing index link (gold color) with the marks on the camshaft and crankshaft sprockets.

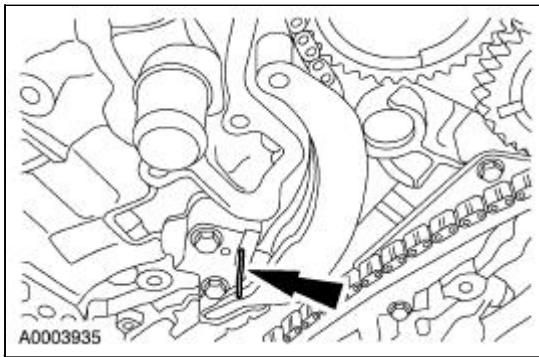


53. **NOTE:** Be sure to position the tensioner so that the tensioner piston is fully engaged in the tensioner arm.

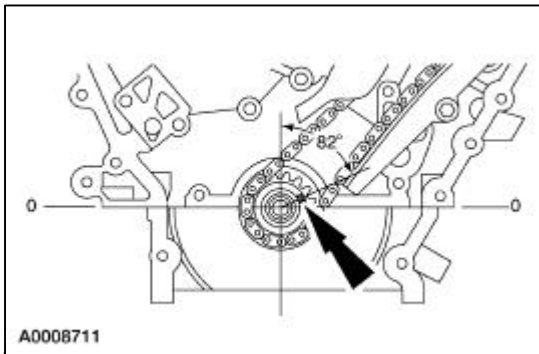
Install the LH tensioner arm, tensioner and tensioner bolts.



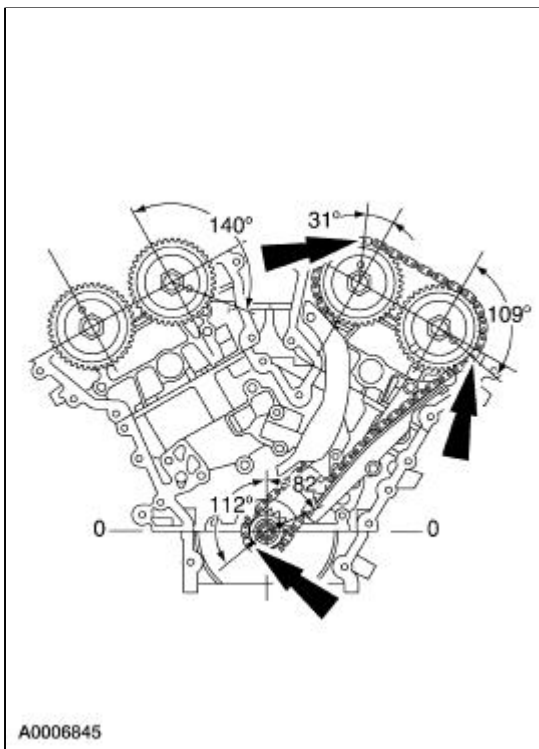
54. Remove the wire or paper clip from the tensioner.



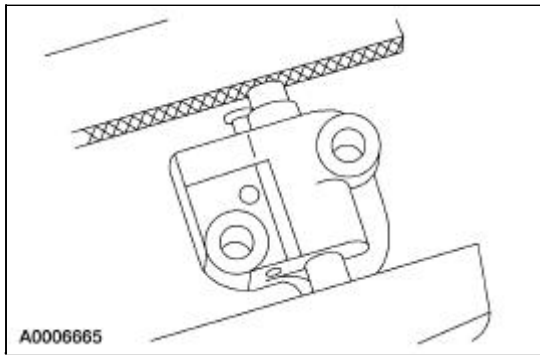
55. Rotate the crankshaft clockwise and position the keyway between the 2 o'clock and 3 o'clock positions for RH timing chain installation.



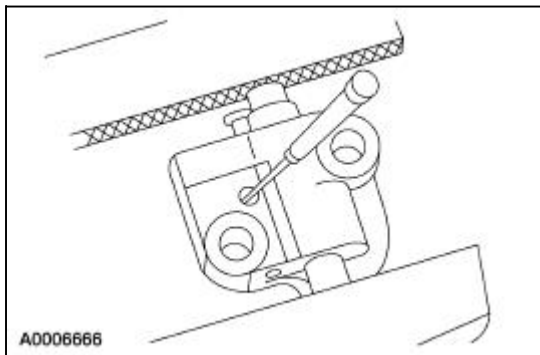
56. Verify that the timing index links (gold color) on the LH timing chain are in alignment with the timing index marks on the camshaft and crankshaft sprockets.



57. Position the RH chain tensioner in a soft-jawed vise.



58. Hold the RH chain tensioner ratchet lock mechanism away from the ratchet stem with a small pick.

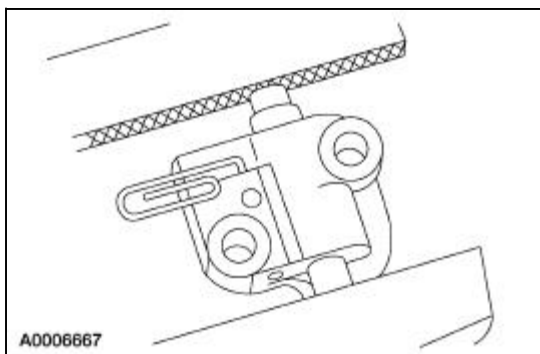


59.  **CAUTION:** During tensioner compression, do not release the ratchet stem until the tensioner piston is fully bottomed in its bore or damage to the ratchet stem will result.

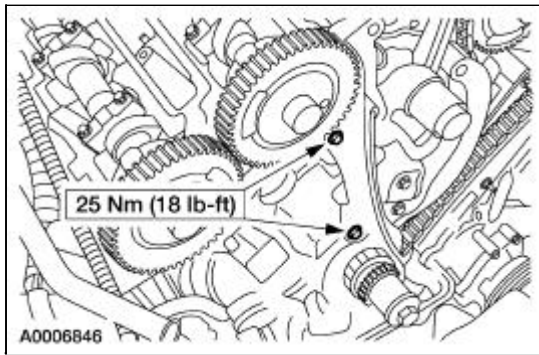
Slowly compress the RH timing chain tensioner.

60. **NOTE:** The wire must remain in the timing chain tensioner until the tensioner is installed.

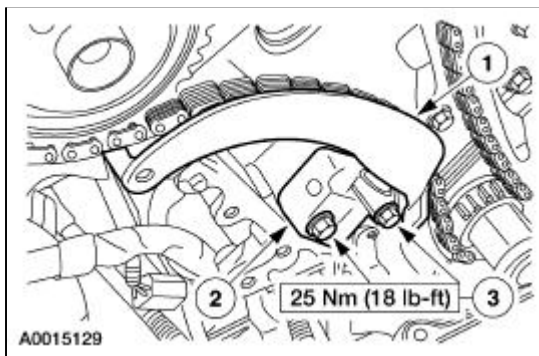
Retain the RH tensioner piston with a 1.5 mm (0.06 in) wire or paper clip.



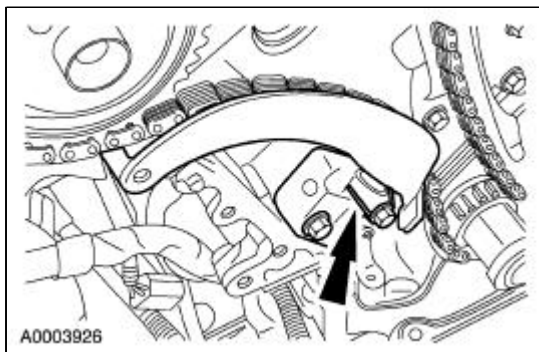
61. Install the RH chain guide and bolts.



62. Install the RH timing chain, aligning the timing index links (gold color) with the marks on the camshaft and crankshaft sprockets.
63. Install the RH tensioner.
 1. Position the tensioner arm.
 2. Position the tensioner.
 3. Install the bolts.



64. Remove the wire or paper clip from the RH tensioner.

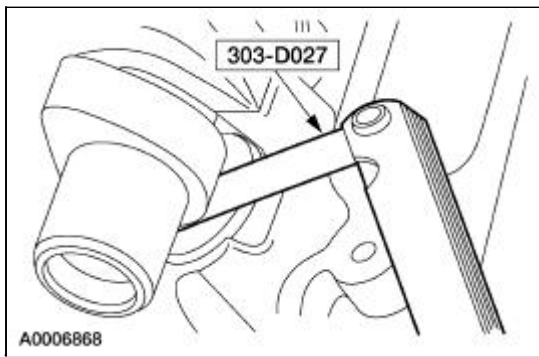


65. **⚠ CAUTION: Rotating the crankshaft in a counterclockwise direction may cause engine damage. Crankshaft journals are directionally machined. Rotating the crankshaft counterclockwise can raise burrs on bearing surfaces, reducing engine life.**


⚠ CAUTION: Camshaft lobes must be 180 degrees away from each valve tappet or valve lash measurements will be incorrect.

Rotate the engine clockwise to position the camshaft lobe away from the shim surface.

66. Using the special tool, measure the clearance between the camshaft lobe and the shim surface. Record the information.

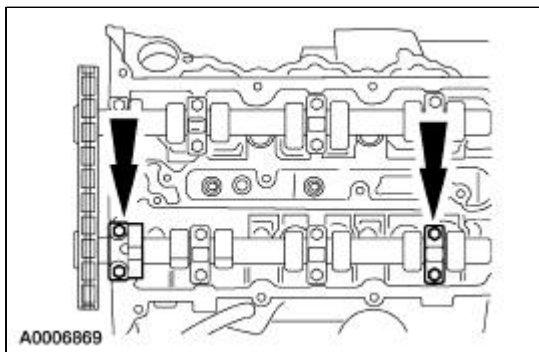


67. Use a bright colored marker to mark the position of the timing chain in relation to the camshaft sprockets to make sure that the timing remains correct.

68.  **CAUTION: The camshaft caps must be installed in their original positions.**

Mark the camshaft caps location.

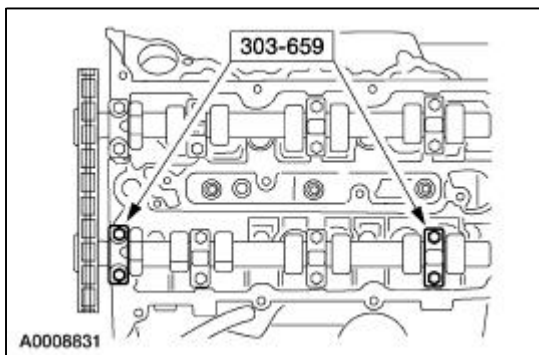
69. Remove the camshaft thrust cap and rear camshaft cap from the camshaft that requires shim adjustment.



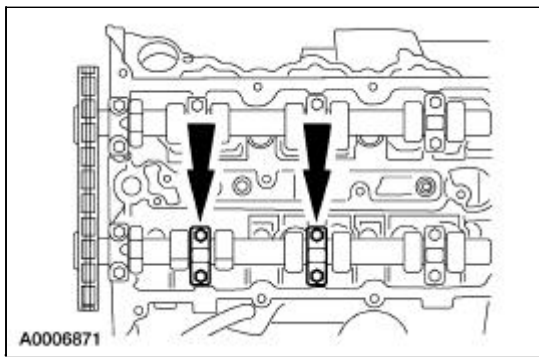
70. **NOTE:** The taller special tool is installed in place of the rear camshaft cap to allow the camshaft to be lifted to remove the shims.


Install the special tool.

- Hand-tighten the bolts.



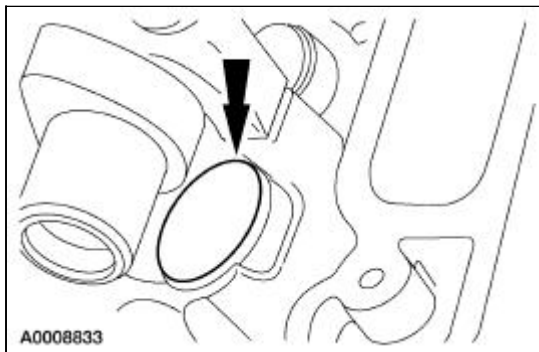
71. Remove the bolts and the center camshaft caps.



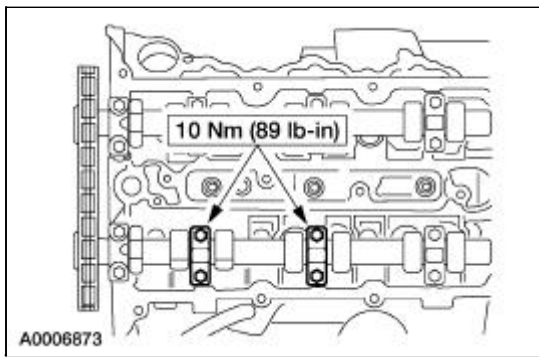
72.  **CAUTION: Do not use any means of marking the shims other than a permanent type marker. Any scratches or paint on the shims may result in incorrect lash adjustments and severe engine damage.**

Use a permanent marker to mark the location of each shim.

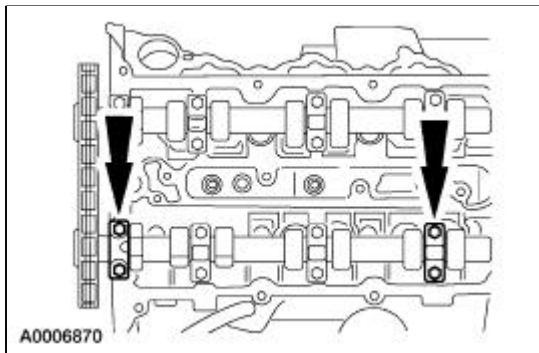
73. Use a rubber-tipped air gun and compressed air to remove the shims that require adjustment.
- Blow compressed air between the shim edge and bucket rail to dislodge the shim.



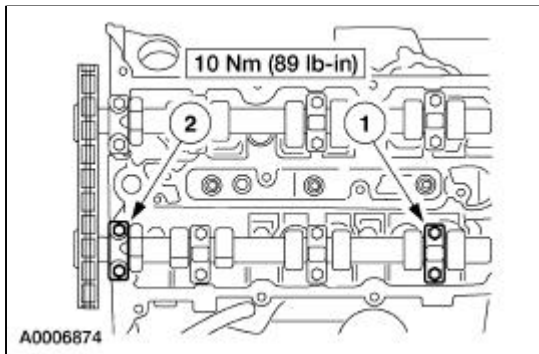
74. Measure and record the thickness of each shim to correspond with the valve clearance.
75. Use the following formula to calculate the required shim thickness.
- Valve clearance specification:
 - Intake: 0.175 mm — 0.225 mm (0.0069 in — 0.0089 in)
 - Exhaust: 0.325 mm — 0.375 mm (0.0128 in — 0.0148 in)
 - Original shim thickness + measured clearance - desired clearance = required shim thickness.
76. Apply a light coat of Super Premium SAE 5W-30 Motor Oil XO-5W30-QSP or equivalent meeting Ford specification WSS-M2C153-G to the replacement shim(s) and install the shim(s).
77. Apply Super Premium SAE 5W-30 Motor Oil XO-5W30-QSP or equivalent meeting Ford specification WSS-M2C153-G to the camshaft journals and bearing caps.
78. Position the center camshaft journal caps and install the bolts.



79. Remove the bolts and the special tools.

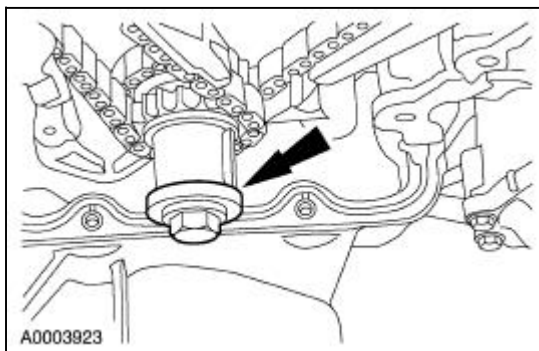


80. Install the camshaft caps.
1. Position the rear camshaft journal cap and install the bolts.
2. Position the camshaft journal thrust cap and install the bolts.

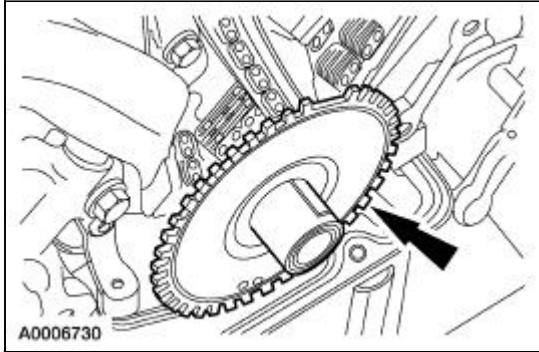


81. Rotate the engine clockwise to rotate the camshafts two full revolutions and recheck the valve clearance.

82. Remove the bolt and washer.

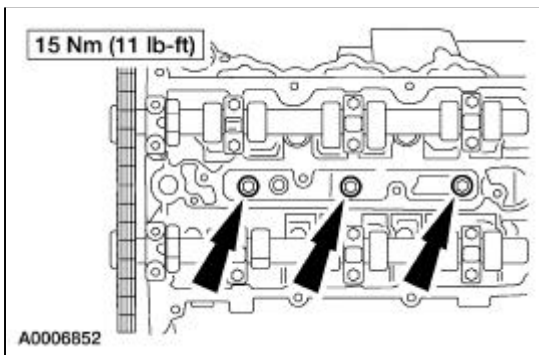


83. Install the ignition pulse ring.

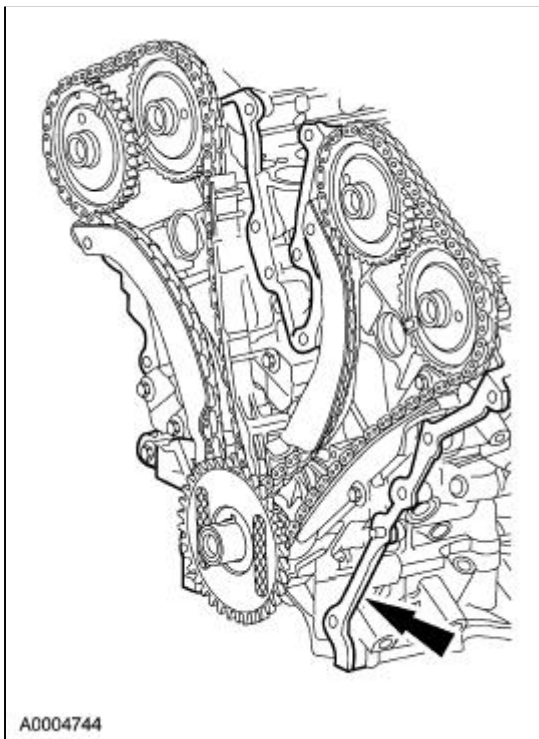


84. **NOTE:** LH shown; RH similar.

Install the LH and RH spark plugs.



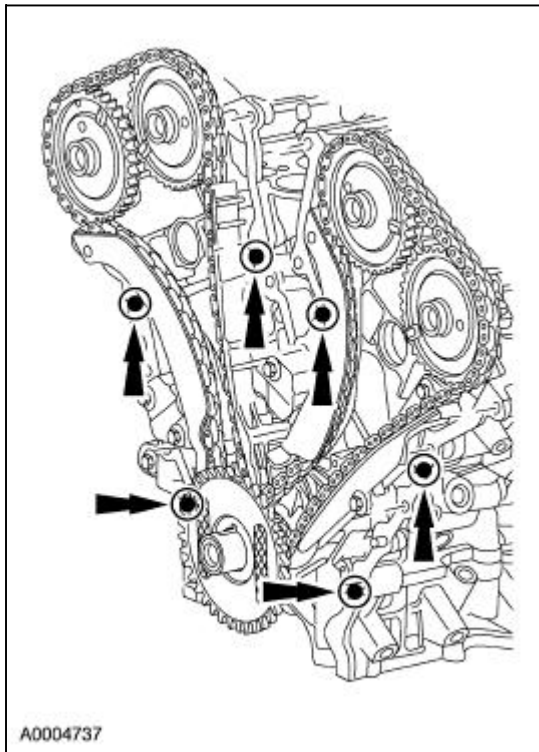
85. Clean the engine front cover to cylinder block and cylinder head sealing surfaces using a clean shop towel and Metal Surface Cleaner F4AZ-19A536-RA or equivalent meeting Ford specification WSE-M5B392-A to remove all residue.



86. Install new front cover seals into the front cover.

87. **NOTE:** Install the engine front cover and bolts no more than six minutes after applying sealer.

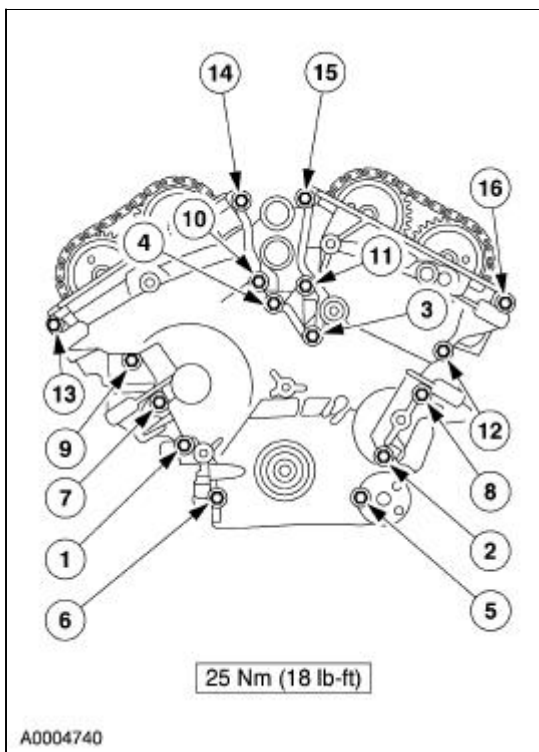
Apply a 6 mm (0.24 in) diameter dot of Silicone Gasket and Sealant F7AZ-19554-EA or equivalent meeting Ford specification WSE-M4G323-A4.



88. **NOTE:** Fastener No. 14 is a stud bolt.

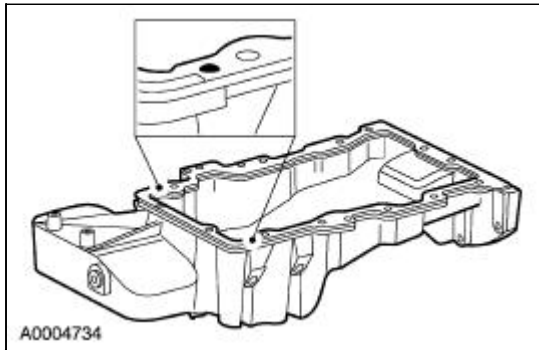
Install the engine front cover and the bolts.

- Tighten the bolts in the sequence shown.



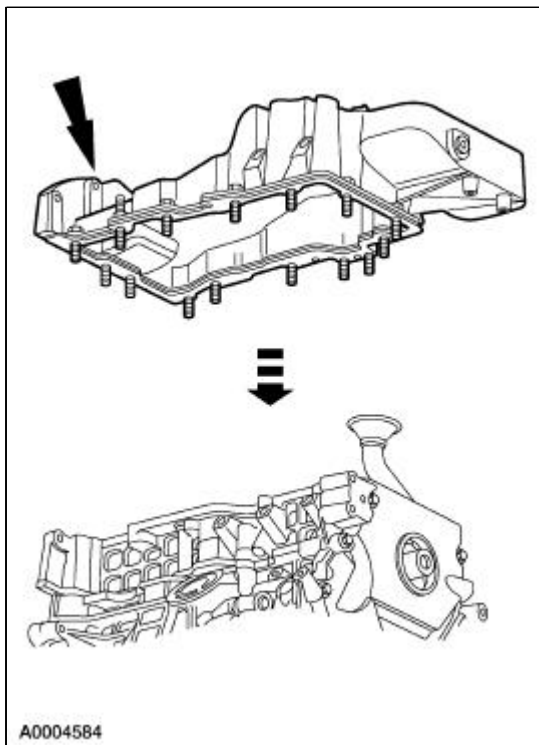
89. Rotate the engine upside down on the engine stand.
90. Clean the oil pan to cylinder block sealing surfaces on the oil pan and cylinder block with a clean shop towel and Metal Surface Cleaner F4AZ-19A536-RA or equivalent meeting Ford specification WSE-M5B392-A to remove all residues.
91. **NOTE:** Install the oil pan and bolts no more than six minutes after applying sealer.

Apply a 10 mm (0.4 in) dot of Silicone Gasket and Sealant F7AZ-19554-EA or equivalent meeting Ford specification WSE-M4G323-A4 onto the top of the new oil pan gasket at the two locations shown.

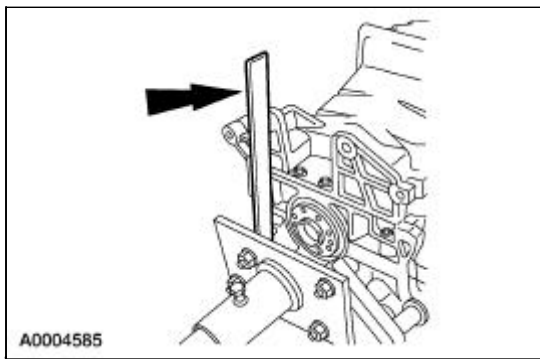


92. **NOTE:** The oil pan rear face must be installed flush to the cylinder block rear face to within +/- 0.10mm (0.0039 in). Failure to maintain this specification will require the oil pan to be removed and installed again.

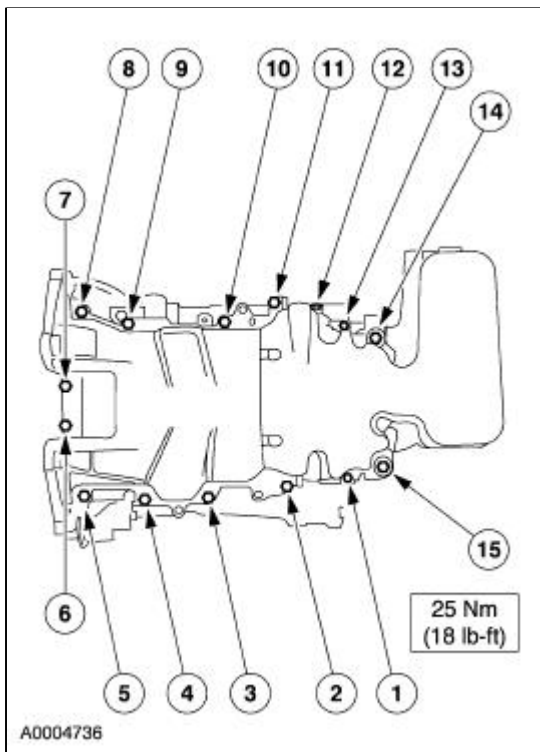
Position the oil pan and a new gasket and install the bolts finger-tight.



93. Using a straightedge, align the rear face of the oil pan flush with the rear face of the cylinder block.

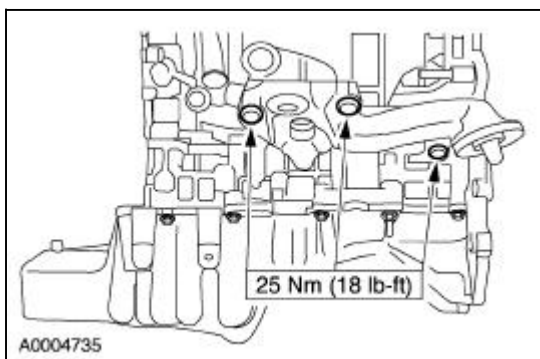


94. Tighten the oil pan bolts in the sequence shown.



95. **NOTE:** Non-oil cooler equipped engine shown. Engines equipped with oil cooler are similar.

Position the oil filter adapter and a new O-ring seal, and install the bolts.

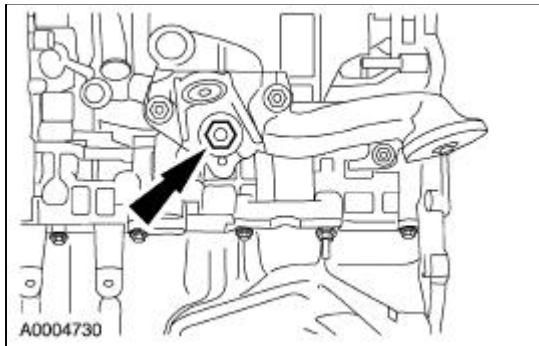


96. **NOTE:** Non-oil cooler equipped engine shown. Engines equipped with oil cooler are similar.

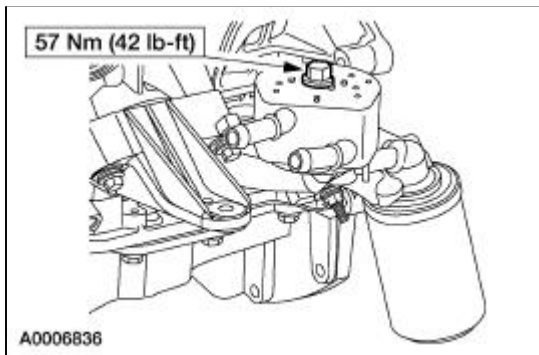
Using a new O-ring seal, lubricate with Super Premium SAE 5W-30 Motor Oil XO-5W30-QSP or equivalent meeting Ford specification WSS-M2C153-G and install the bolt.

Tighten the bolt in two stages:

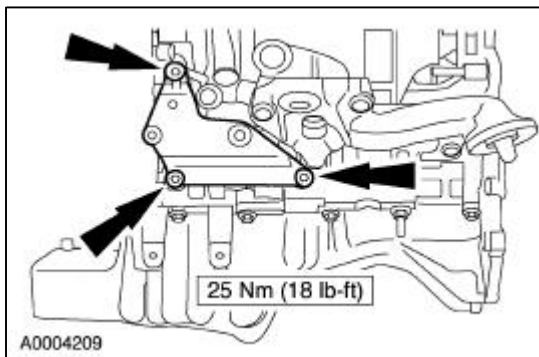
- Stage 1: Tighten to 30 Nm (22 lb-ft).
- Stage 2: Tighten to 155 Nm (114 lb-ft).



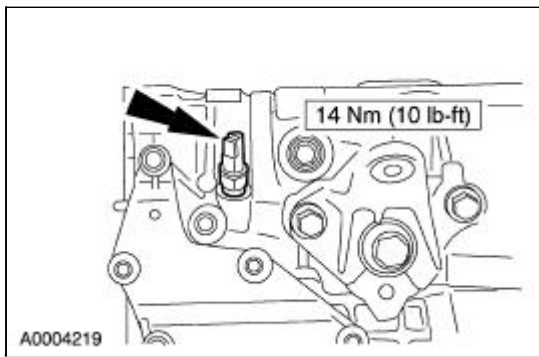
97. On vehicles equipped with an oil cooler, position the oil cooler and gasket and install the bolt.
- Rotate the cooler clockwise until the location pin hits the stop.



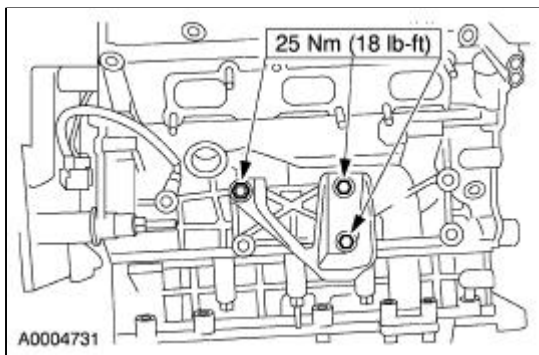
98. Lubricate the oil filter sealing ring with Super Premium SAE 5W-30 Motor Oil XO-5W30-QSP or equivalent meeting Ford specification WSS-M2C153-G and install the oil filter.
99. Position the A/C compressor mounting bracket and install the bolts.



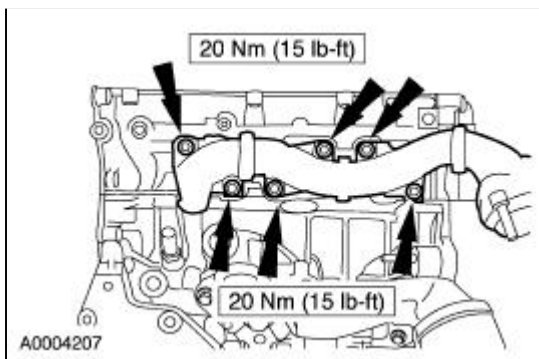
100. Install the oil pressure switch.



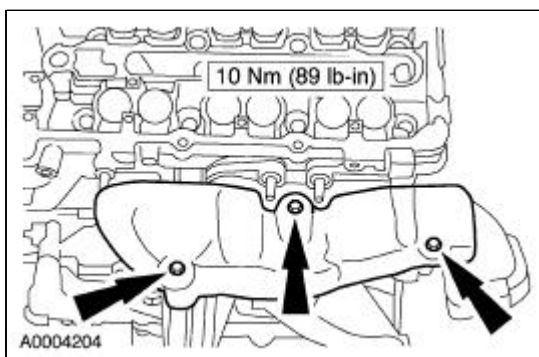
101. Position the RH engine mount bracket and install the bolts.



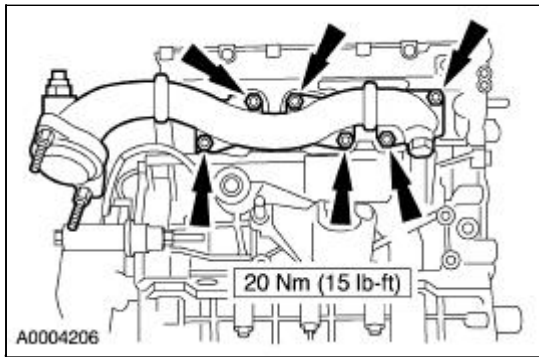
102. Using a new gasket, position the LH exhaust manifold and install the nuts.



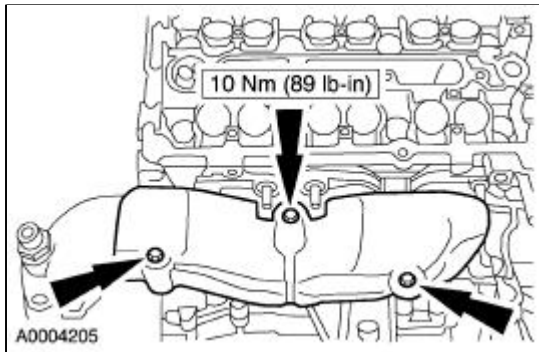
103. If equipped, position the LH heat shield and install the bolts.



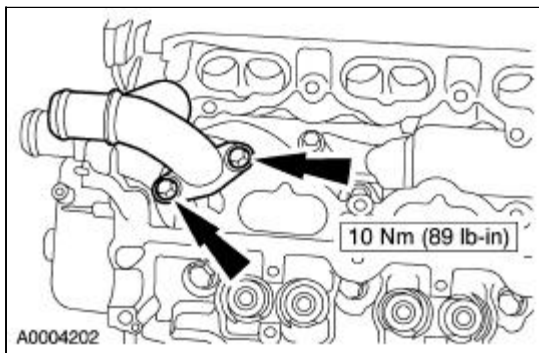
104. Using a new gasket, position the RH exhaust manifold and install the nuts.



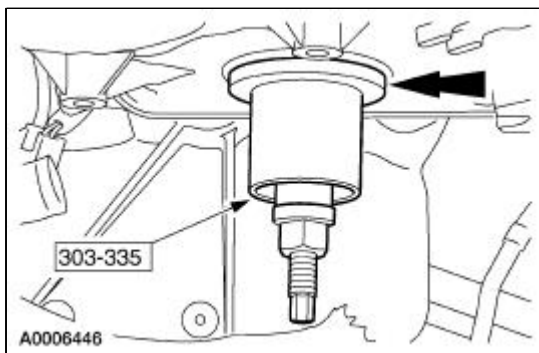
105. If equipped, position the RH heat shield and install the bolts.



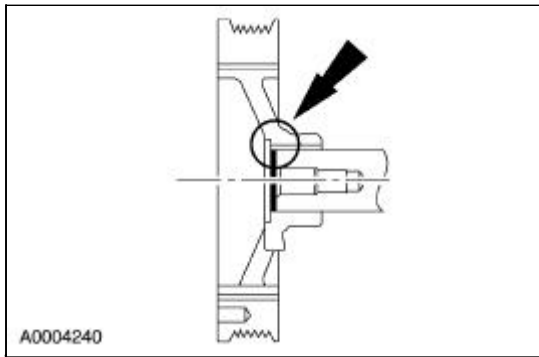
106. Using new O-ring seals, install the coolant bypass tube.



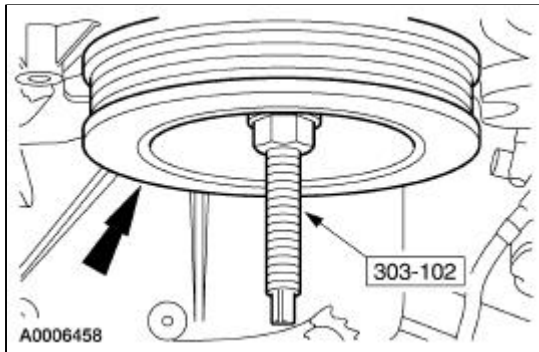
107. Using the special tool, install the crankshaft front oil seal.



108. Apply a dot of Silicone Gasket and Sealant F7AZ-19954-EA or equivalent meeting Ford specification WSE-M4G323-A4 to the crankshaft damper keyway slot.

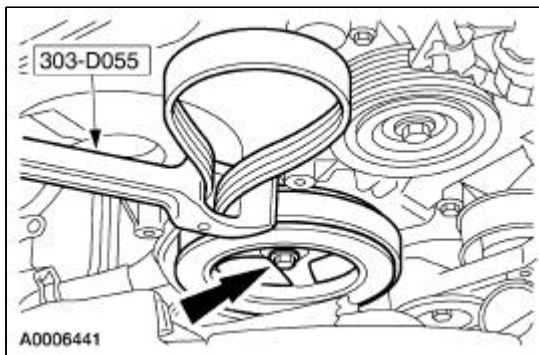


109. Using the special tool, install the crankshaft damper.

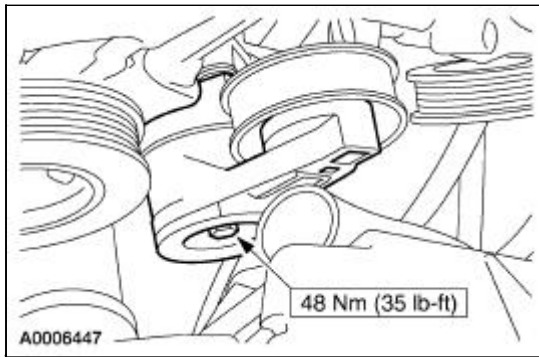


110. Using the special tool, install the washer and a new bolt. Tighten the bolt in four stages:

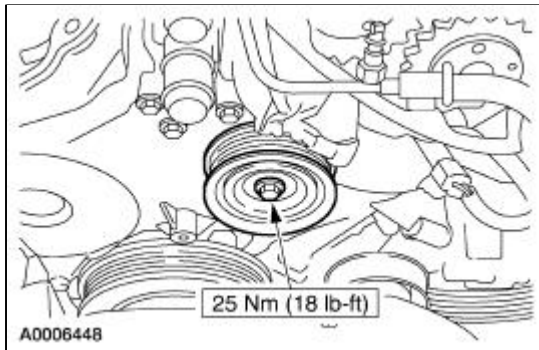
- Stage 1: Tighten to 120 Nm (89 lb-ft).
- Stage 2: Back out a minimum of one full turn (360 degrees).
- Stage 3: Tighten to 50 Nm (37 lb-ft).
- Stage 4: Tighten an additional 90 degrees.



111. Position the belt tensioner and install the bolt.

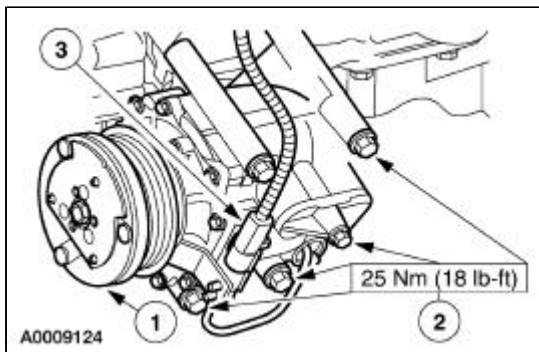


112. Position the idler pulley and install the bolt.

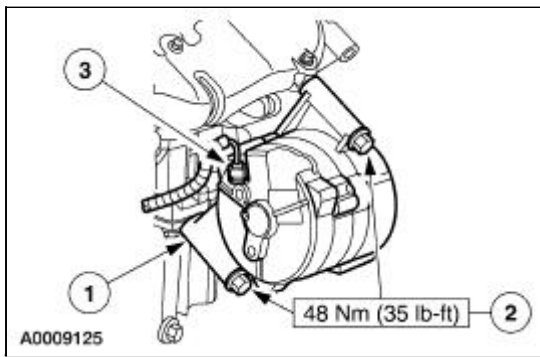


113. Install the engine harness assembly.

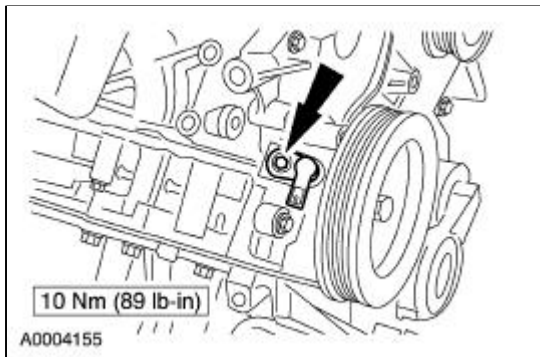
114. Install the A/C compressor.
1. Position the compressor.
 2. Install the bolts.
 3. Connect the electrical connector.



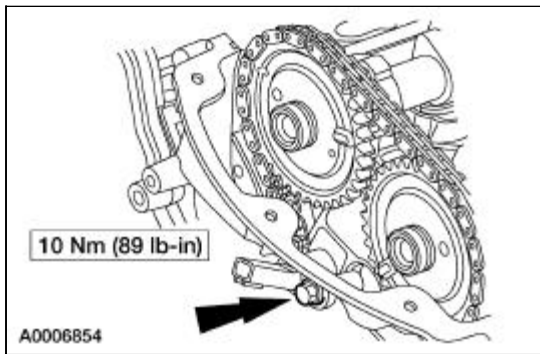
115. Install the generator.
1. Position the generator.
 2. Install the bolts.
 3. Connect the electrical connector.



116. Position the crankshaft position (CKP) sensor and install the bolt.

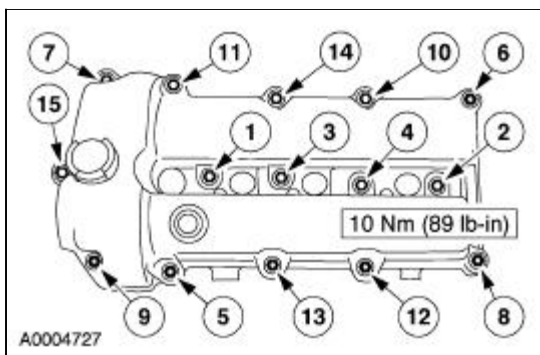


117. Position the camshaft position (CMP) sensor and install the bolt.

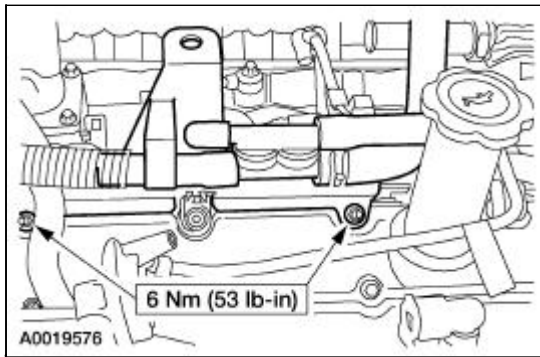


118. Install a new gasket in the LH valve cover.

119. Position the LH valve cover and install the bolts in the sequence shown.

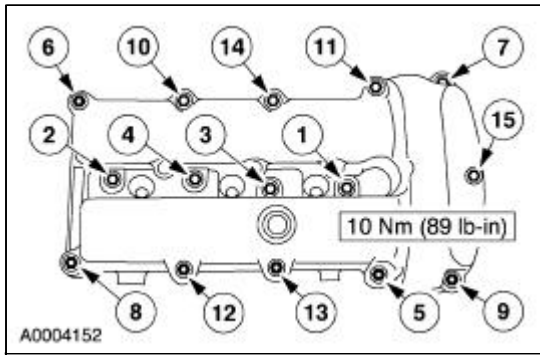


120. Install the bracket.

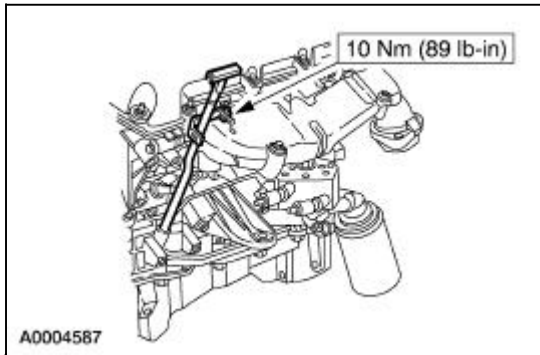


121. Install a new gasket in the RH valve cover.

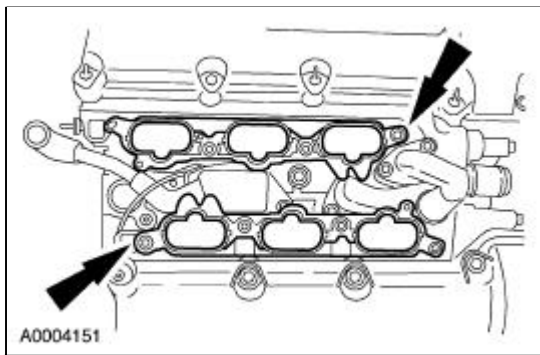
122. Position the RH valve cover and install the bolts in the sequence shown.



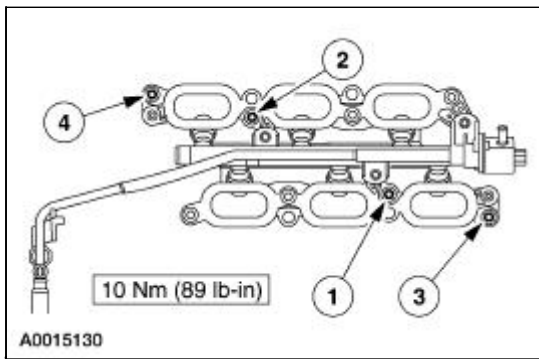
123. Install the oil level indicator and tube and install the stud bolt.



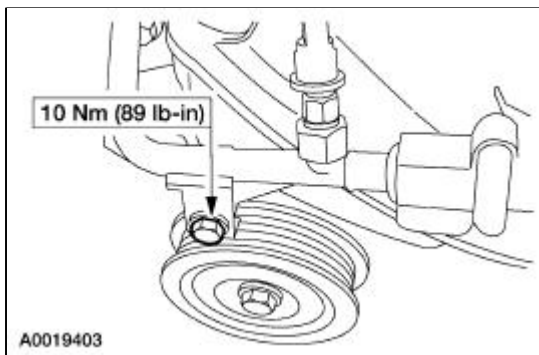
124. Position new lower intake manifold gaskets.



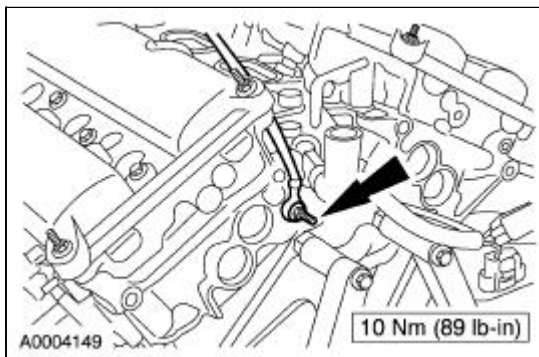
125. Position the lower intake manifold assembly and install the bolts in the sequence shown.



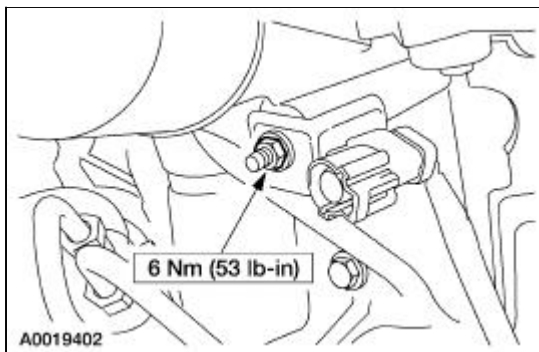
126. Install the bolt.



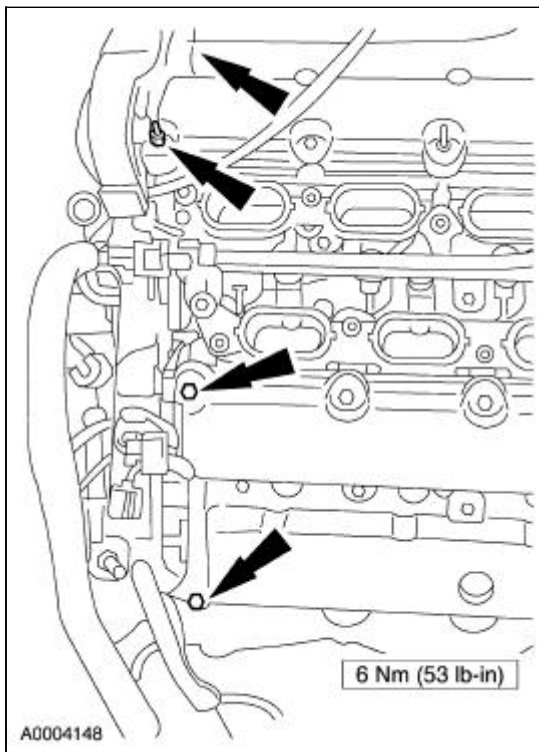
127. Position the ground strap and install the nut.



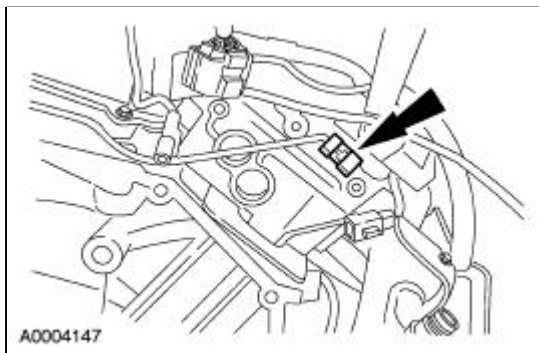
128. Install the bracket and the nut.



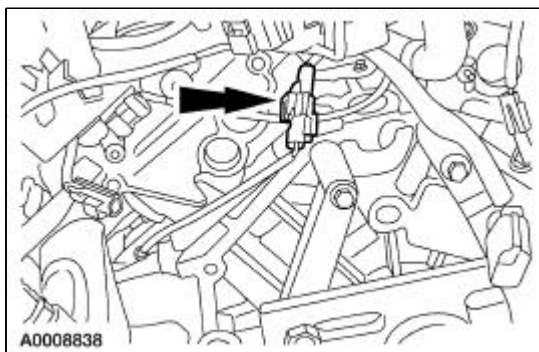
129. Position the wiring harness and install the four nuts.



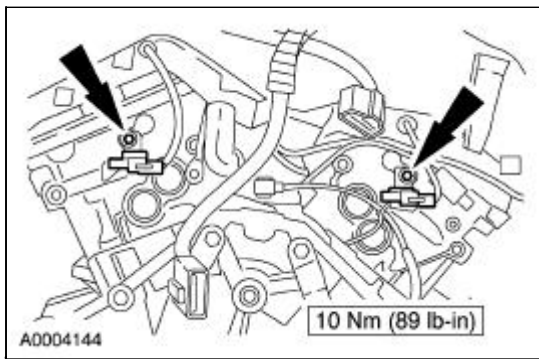
130. Clip the KS connector to the wiring harness.



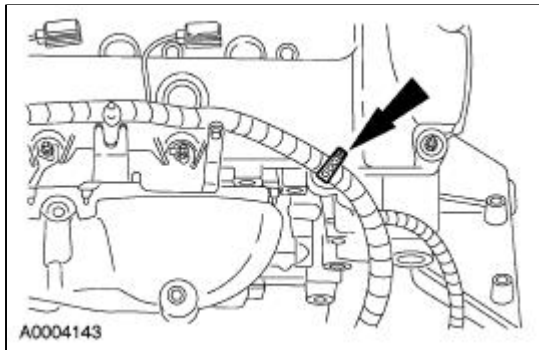
131. Connect the RH KS electrical connector.



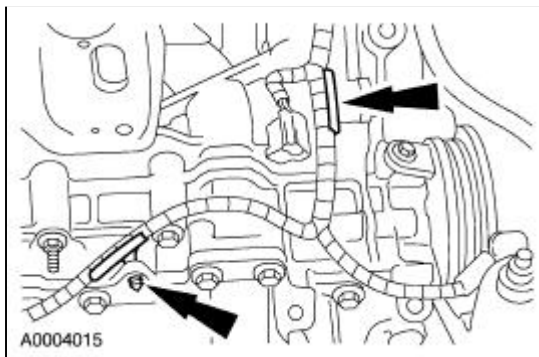
132. Position the two radio ignition interference capacitors and install the bolts.



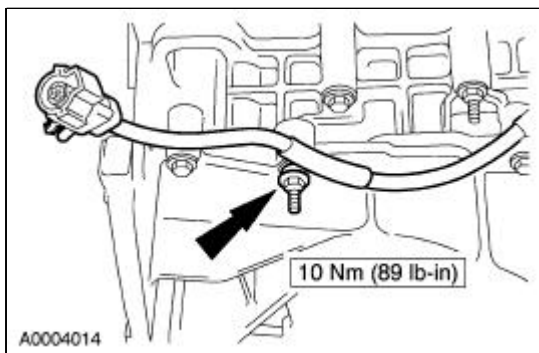
133. Attach the wiring harness retainer.



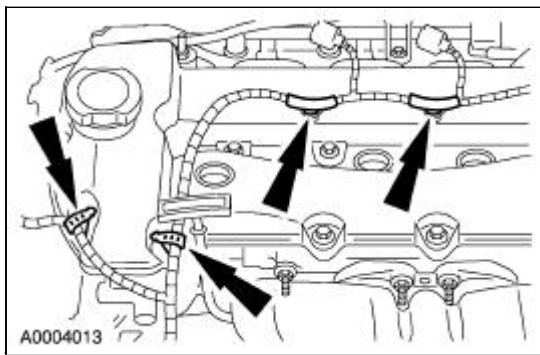
134. Clip the two wiring harness retainers into the brackets.



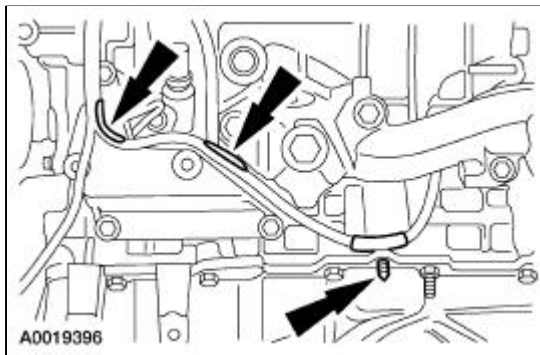
135. Position the wiring harness and install the nut.



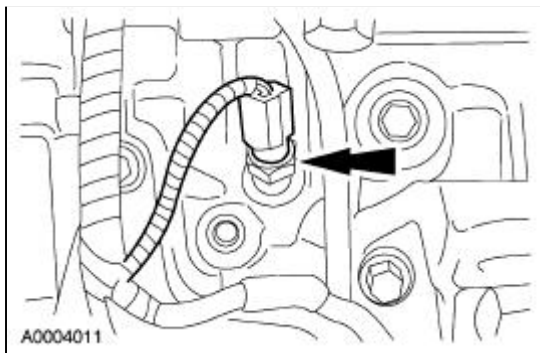
136. Attach the four wiring harness retainers.



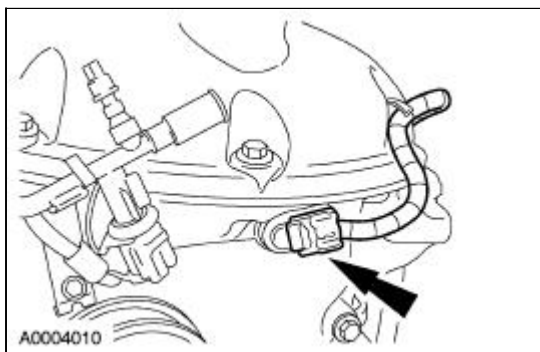
137. Attach the three wiring harness retainers.



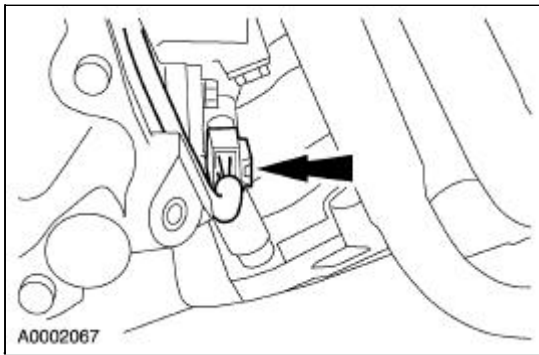
138. Connect the oil pressure sensor electrical connector.



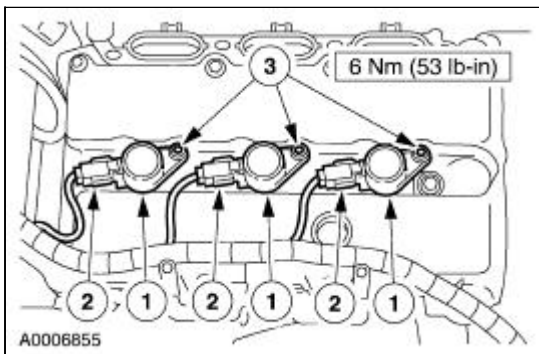
139. Connect the CMP sensor electrical connector.



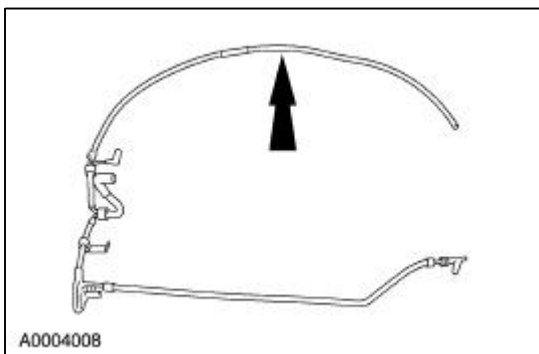
140. Connect the CKP sensor electrical connector.



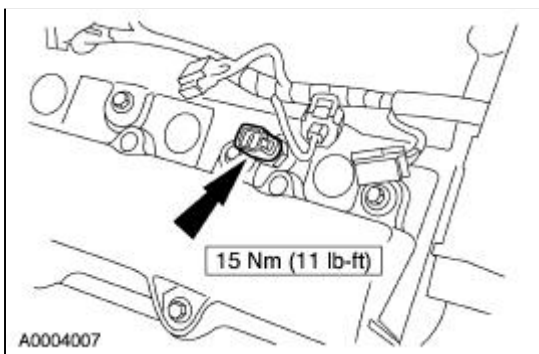
141. Install the RH ignition coils.
1. Install the RH ignition coils.
 2. Connect the electrical connectors.
 3. Install the bolts.



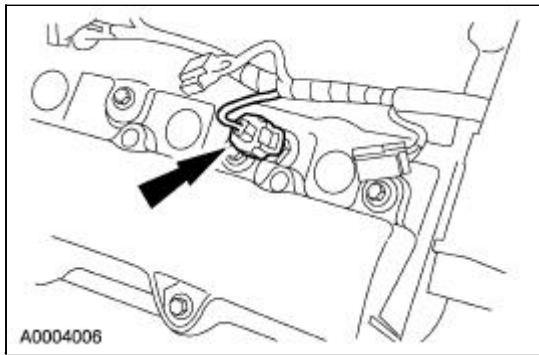
142. Install the vacuum harness.



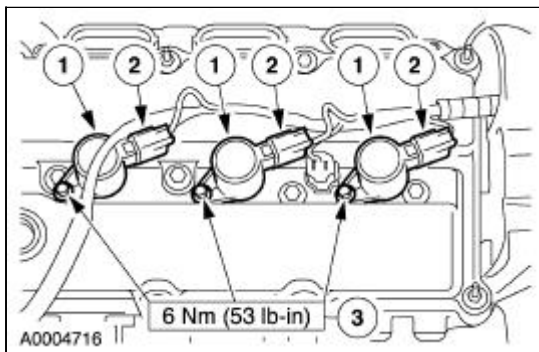
143. Install the cylinder head temperature (CHT) sensor.



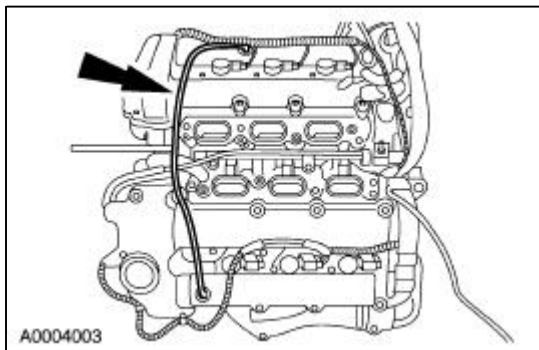
144. Connect the CHT sensor electrical connector.



145. Install the LH ignition coils.
1. Install the LH ignition coils.
 2. Connect the electrical connectors.
 3. Install the two studs and one bolt.

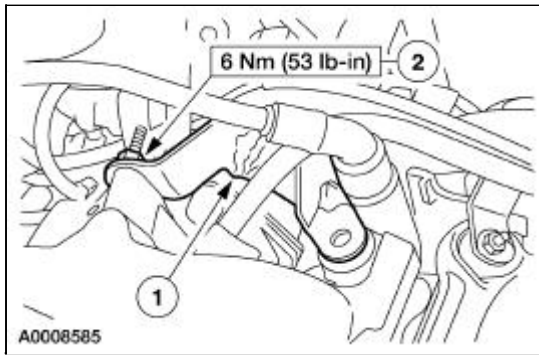


146. Install the crankcase ventilation tube.

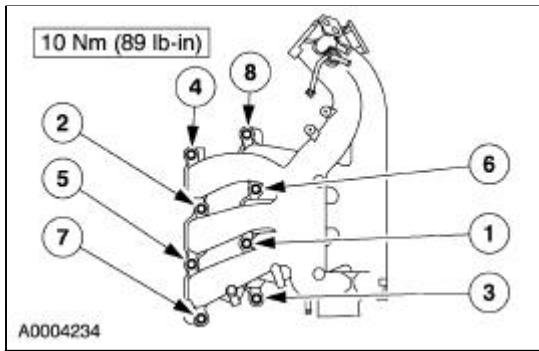


147. Position the upper intake manifold and gaskets.

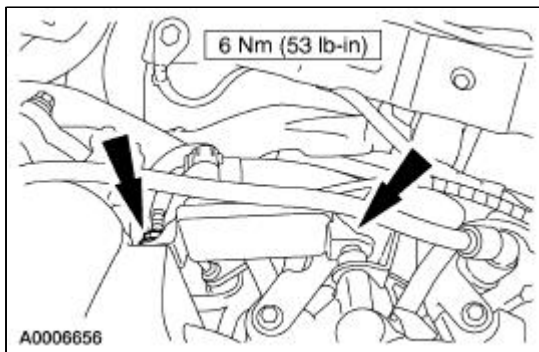
148. Install the fuel pressure sensor shield.
1. Position the shield.
 2. Install the nut.



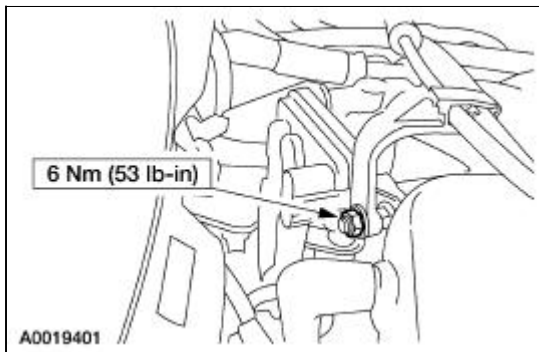
149. Install the upper intake bolts in the sequence shown.



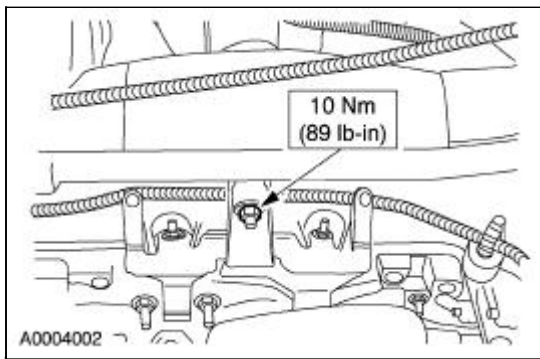
150. Position the differential pressure sensor EGR transducer and install the nut and stud.



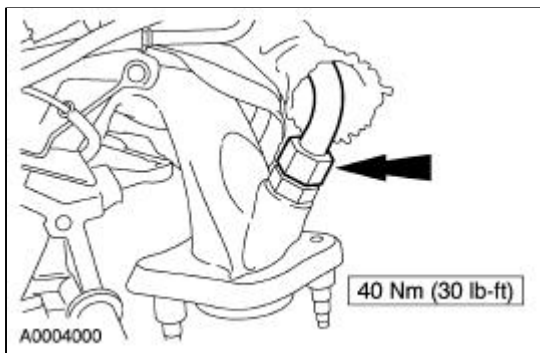
151. Install the accelerator cable clip and the nut.



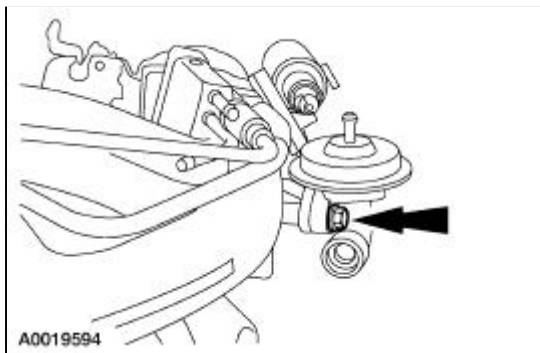
152. Install the upper intake support bracket bolt.



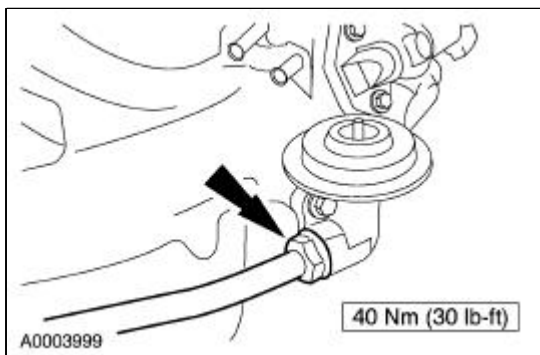
153. Connect the EGR tube at the exhaust manifold.



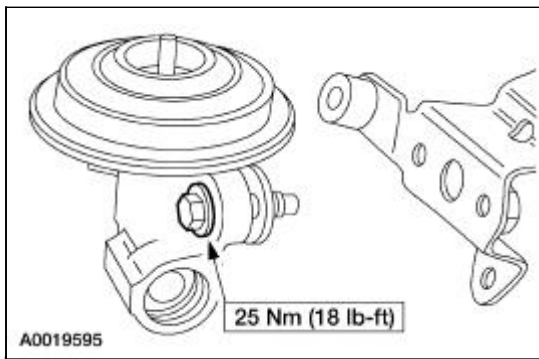
154. Loosen the EGR valve.



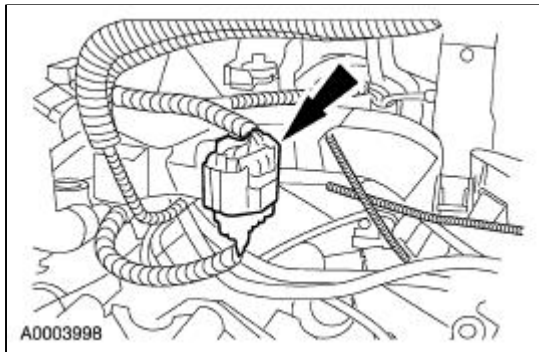
155. Connect the EGR tube to the EGR valve.



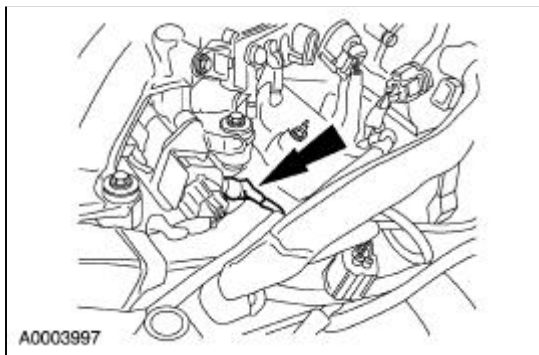
156. Tighten the EGR valve.



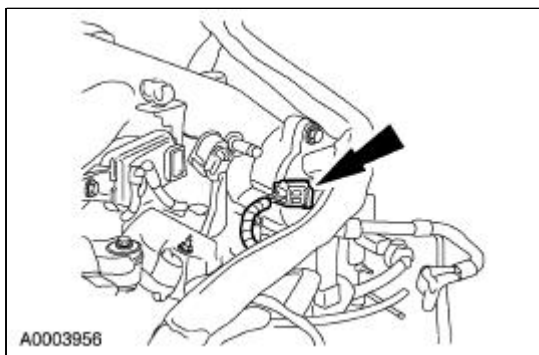
157. Connect the fuel injector wiring harness connector.



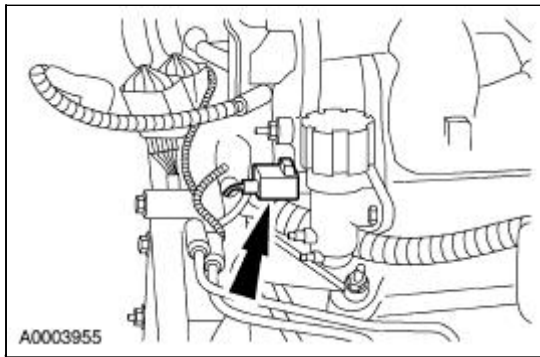
158. Connect the vacuum hose to the fuel pressure sensor.



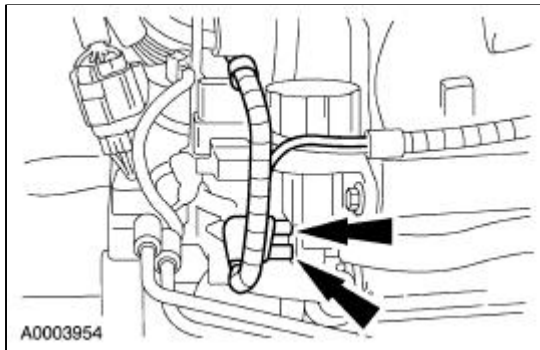
159. Connect the intake manifold tuning valve electrical connector.



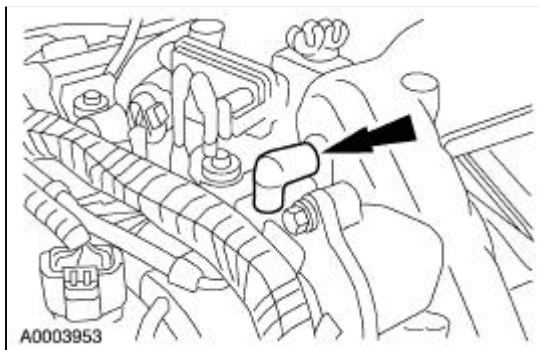
160. Connect the EGR vacuum regulator control electrical connector.



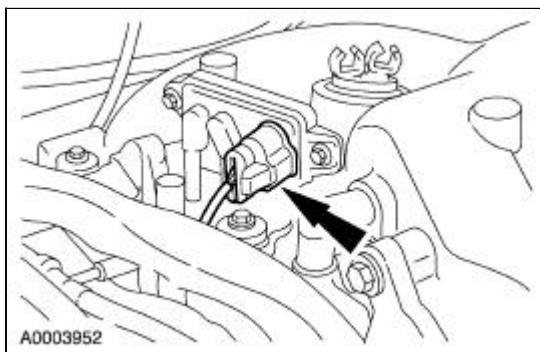
161. Connect the vacuum tubes at the EGR vacuum regulator control.



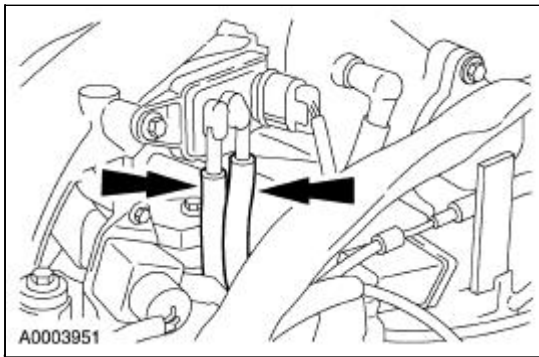
162. Connect the vacuum hose to the rear of the upper intake.



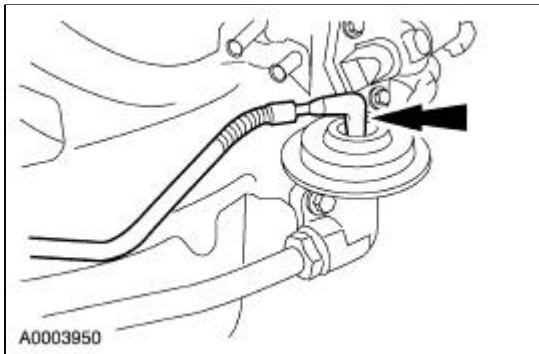
163. Connect the differential pressure feedback EGR electrical connector.



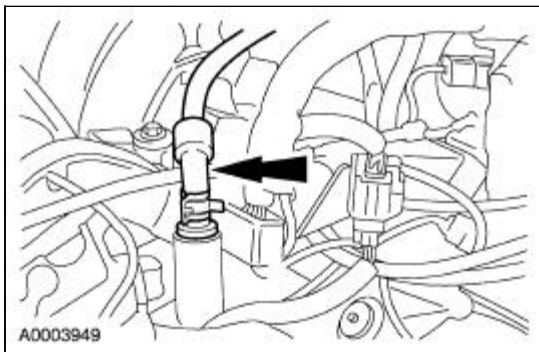
164. Connect the differential pressure feedback EGR vacuum hoses.



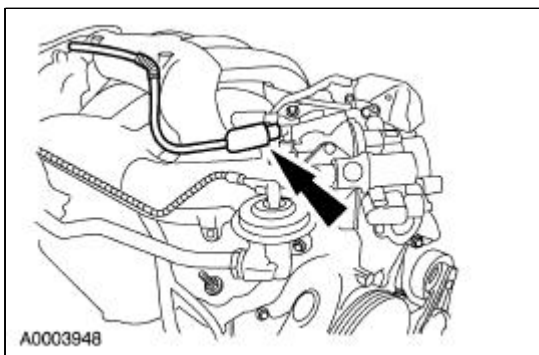
165. Connect the vacuum hose to the EGR valve.



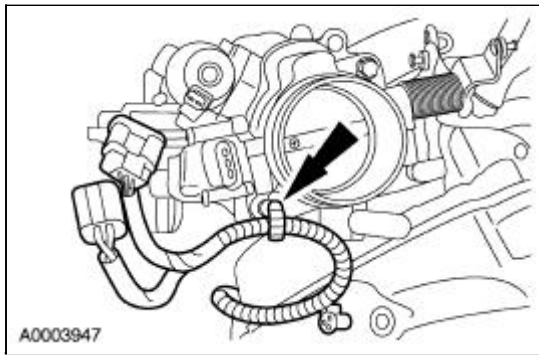
166. Install the PCV valve and tube.



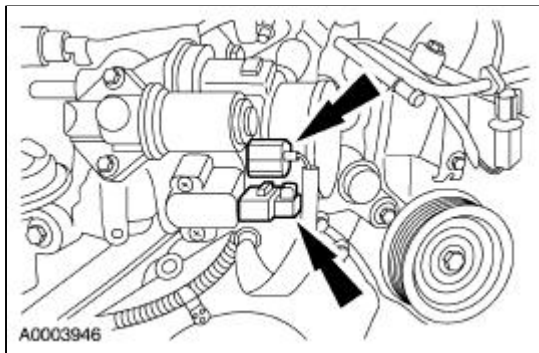
167. Connect the PCV tube to the throttle body.



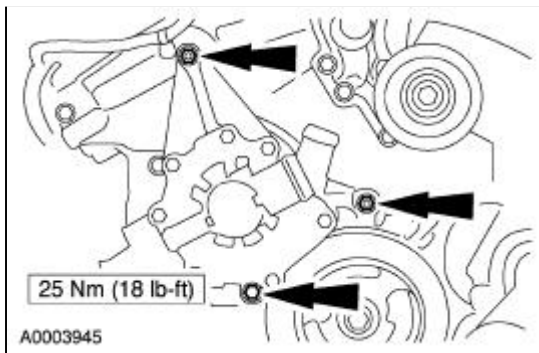
168. Attach the wiring harness retainer to the throttle body.



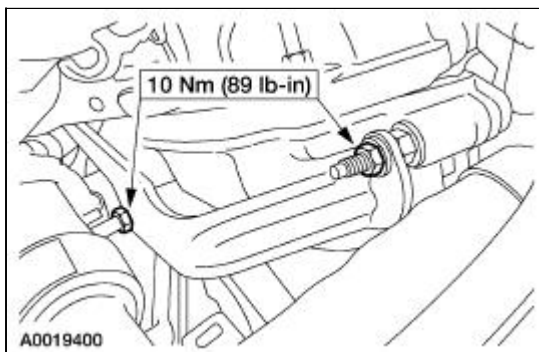
169. Connect the idle air control (IAC) valve and throttle position (TP) sensor electrical connectors.



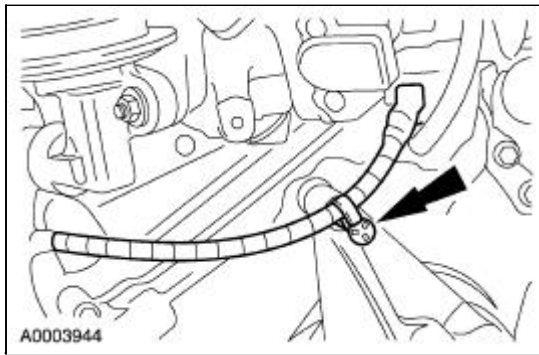
170. Position the water pump and install the one bolt and two studs.



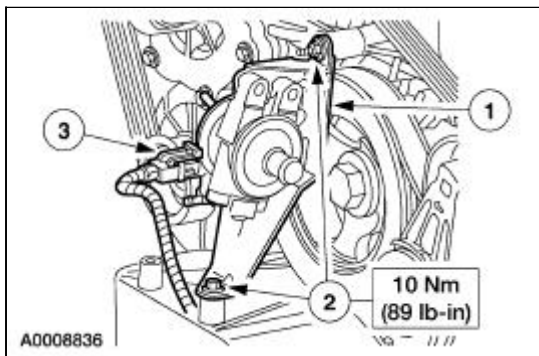
171. Install the bracket.



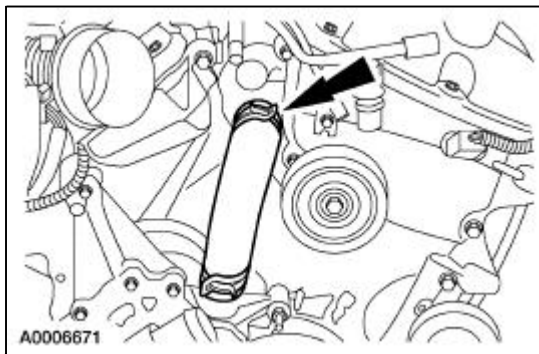
172. Attach the wiring harness retainer to the stud on the water pump.



173. If equipped, install the thermactor air control valve and bracket.
1. Install the valve and bracket.
 2. Install the nut and bolt.
 3. Connect the electrical connector.




174. Connect the water pump hose.



Engine

Special Tool(s)

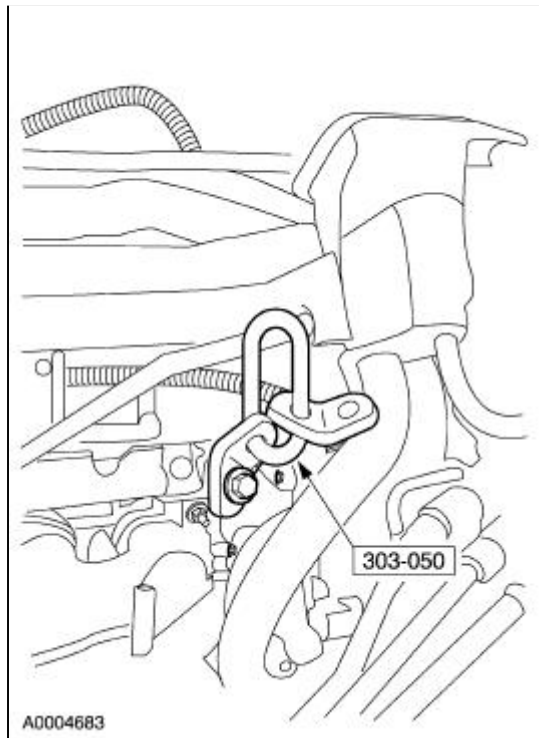
 <p>ST1595-A</p>	Engine Lifting Brackets 303-050
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Material

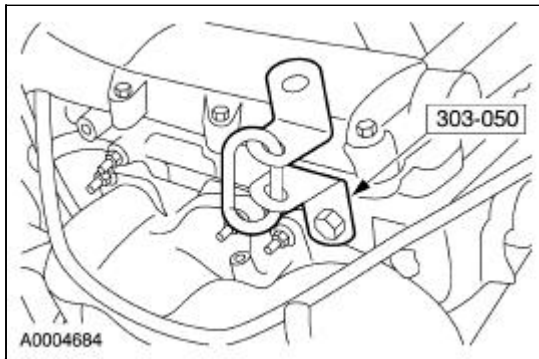
Item	Specification
Super Premium SAE 5W-20 Motor Oil XO-5W20-QSP or equivalent	WSS-M2C153- H

All vehicles

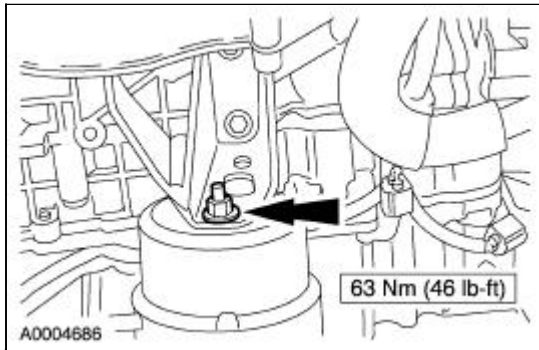
1. Install the special tool to the engine as shown.



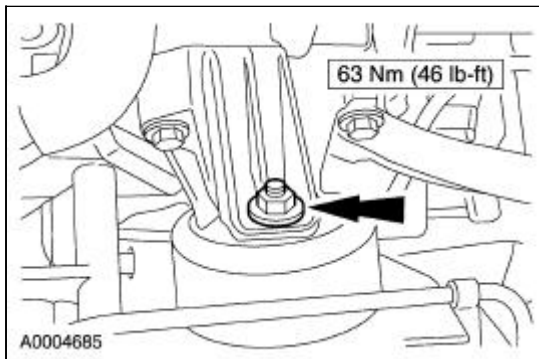
2. Install the special tool to the engine as shown.



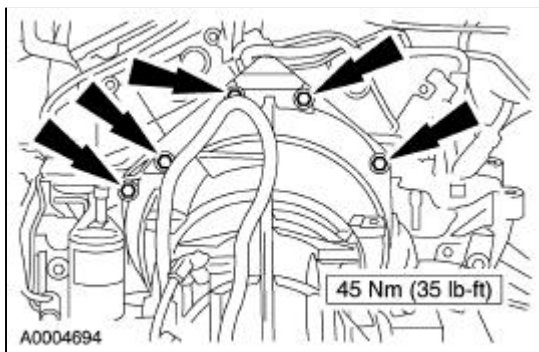
3. Using an engine crane, transfer the engine to the subframe.
4. Install the RH engine mount nut.



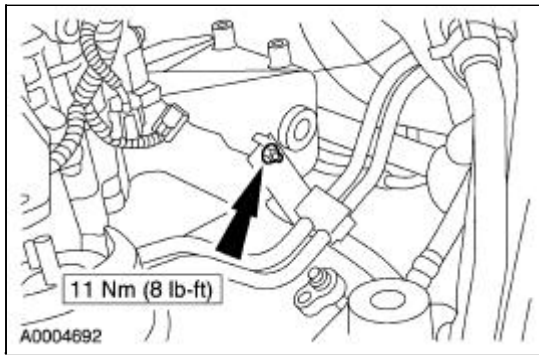
5. Install the LH engine mount nut.



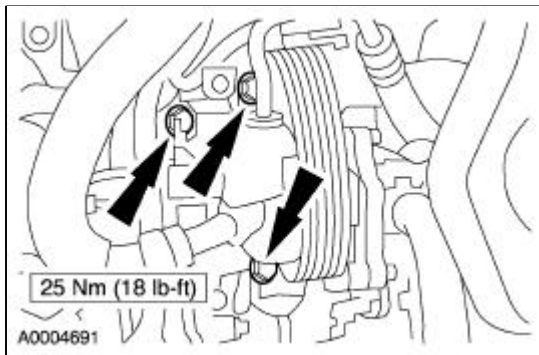
6. Install the transmission to the engine and install the bolts.



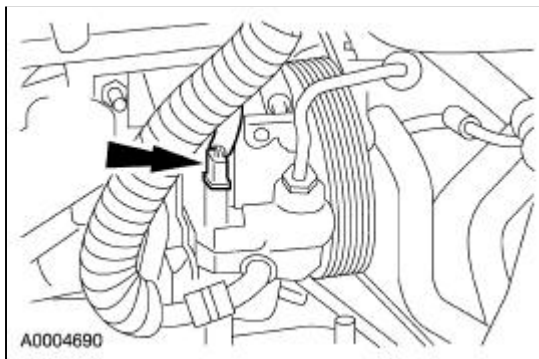
7. If equipped, position the transmission oil cooler lines to the oil pan and install the nut.



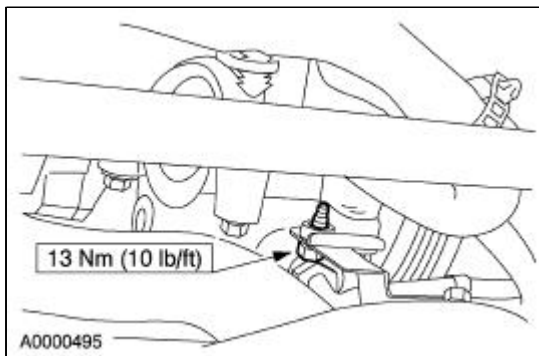
8. Position the hydraulic cooling fan pump and install the bolts.



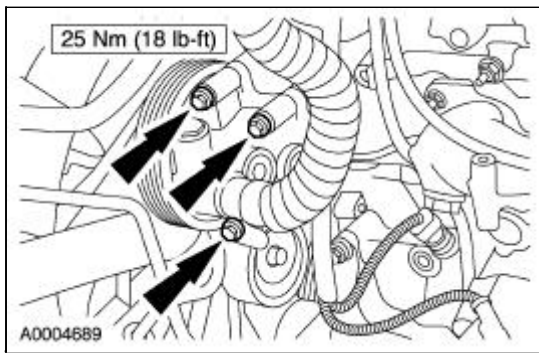
9. Connect the hydraulic cooling fan pump electrical connector.



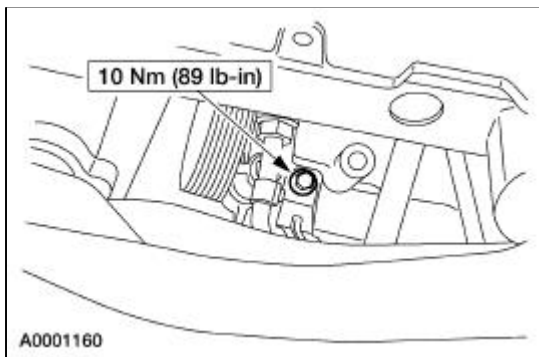
10. Install the hydraulic cooling fan high pressure tube bracket and retaining bolt.



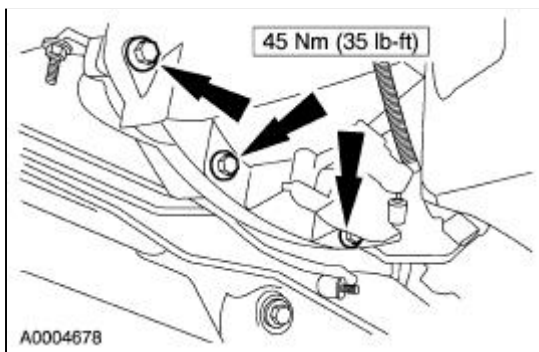
11. Position the power steering pump and install the bolts.



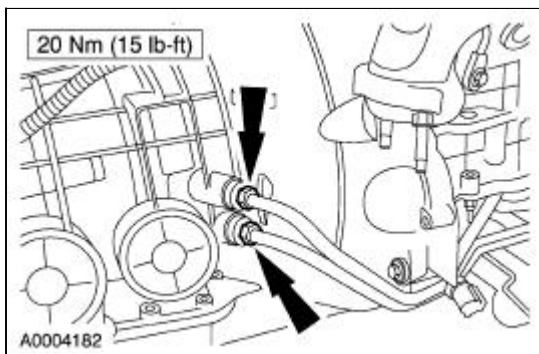
12. Install the power steering high pressure tube bracket and retaining bolt.



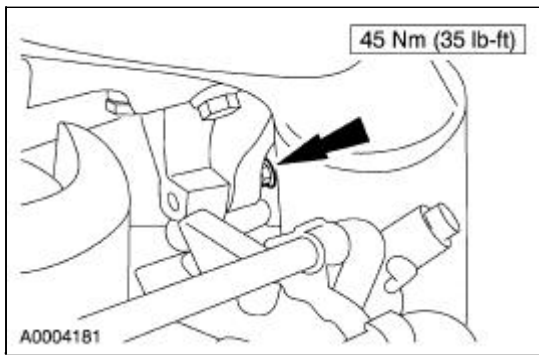
13. Install the four lower engine-to-transmission bolts.



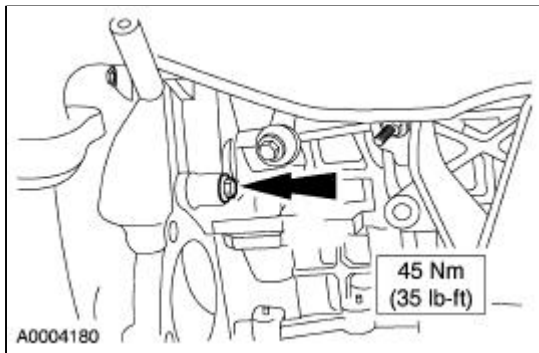
14. If equipped, connect the transmission oil cooler lines.



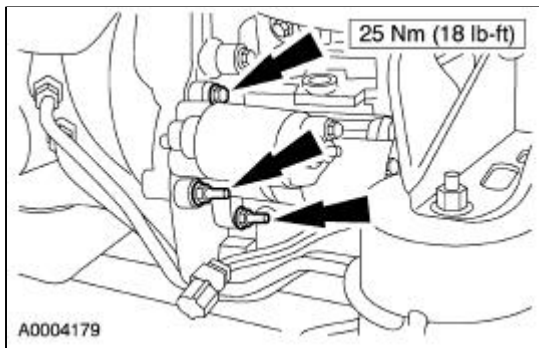
15. Install the transmission-to-engine bolt.



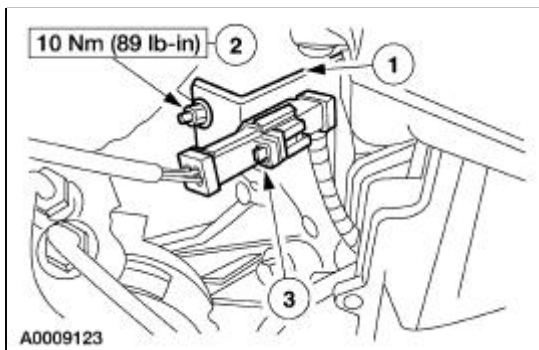
16. Install the transmission-to-engine bolt.



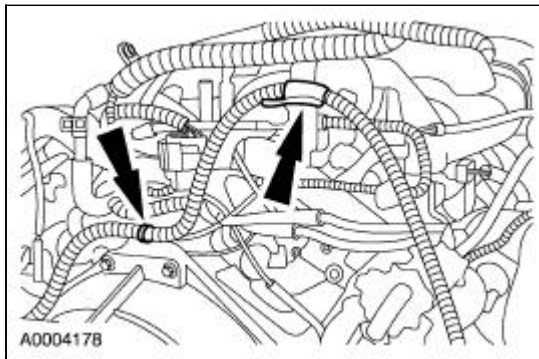
17. Position the starter and install the studs and bolt.



18. Install the heated oxygen sensor (HO2S) bracket.
1. Position the bracket.
 2. Install the nut.
 3. Clip the connector onto the bracket.

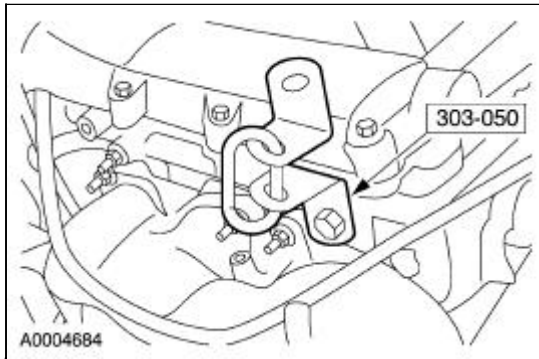


19. Position the wiring harness and attach the two harness retainers.

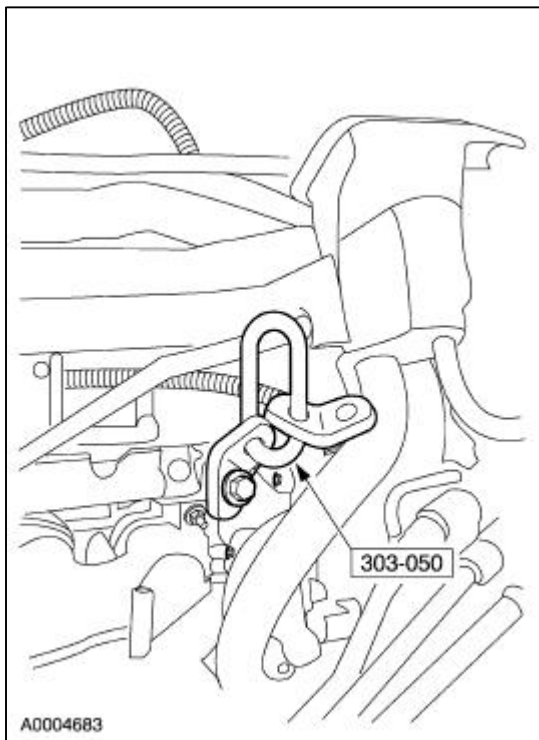


20. Remove the lifting equipment.

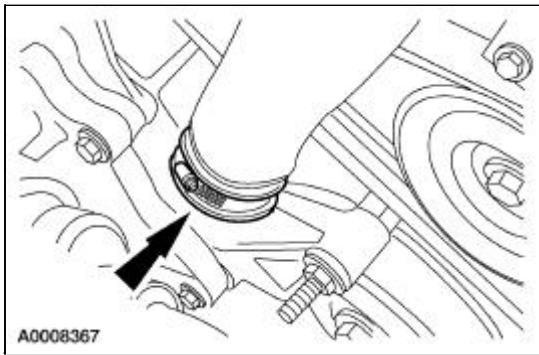
21. Remove the special tool.



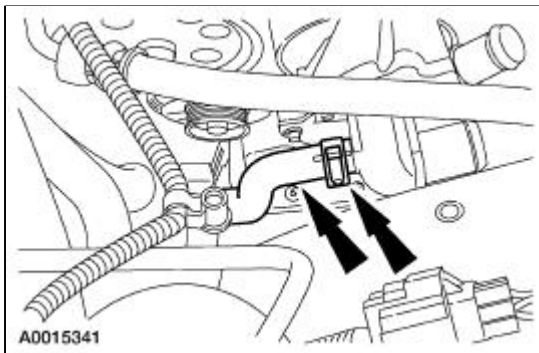
22. Remove the special tool.



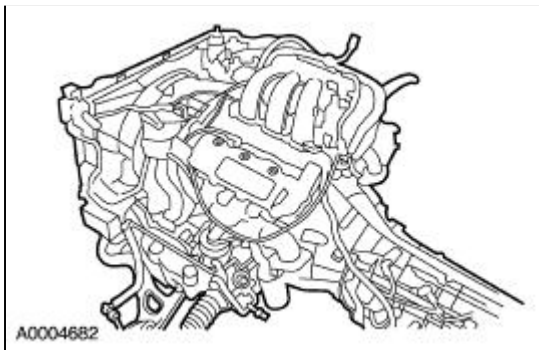
23. Connect the upper radiator hose to the water pump and the water outlet tube.



24. Connect the heater hose to the water pump.

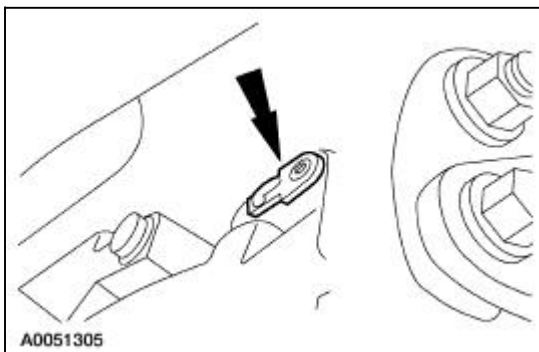


25. Position and carefully raise the entire engine, transmission, cooling and subframe assembly into the vehicle.

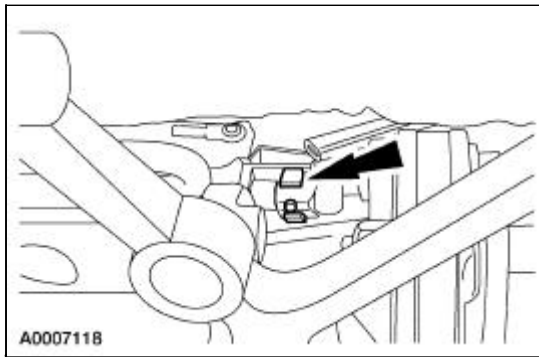


Vehicles with manual transmission

26. Connect the stabilizer shifter rod.

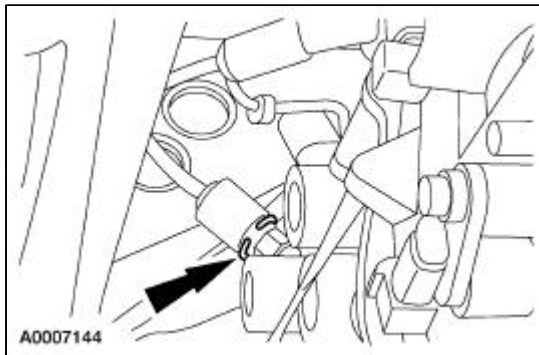


27. Connect the shifter selector rod.



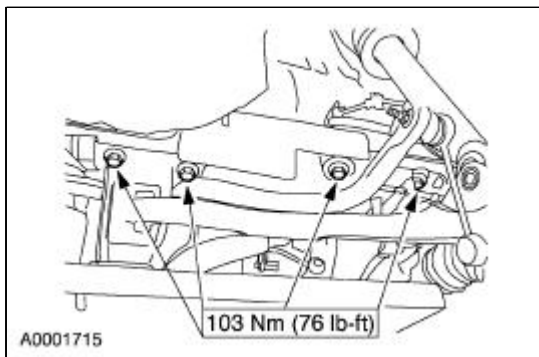
28. **NOTE:** Install a new O-ring seal and clip to the supply tube.

Connect the slave cylinder supply tube.

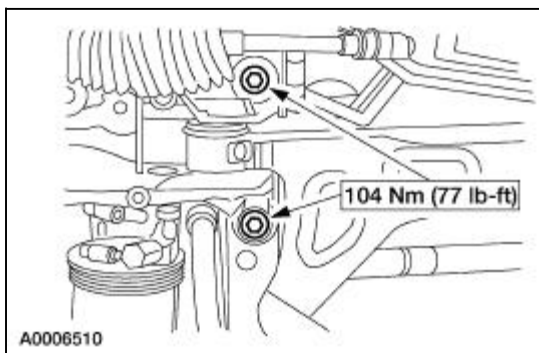


All vehicles

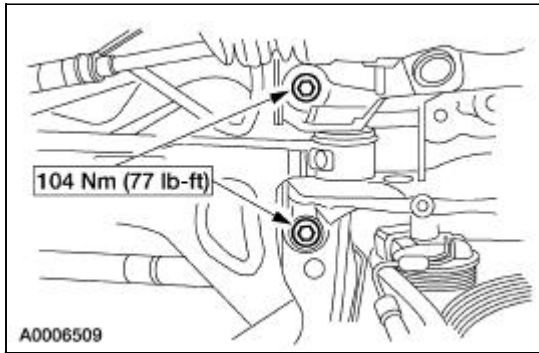
29. Install the crossmember bolts.



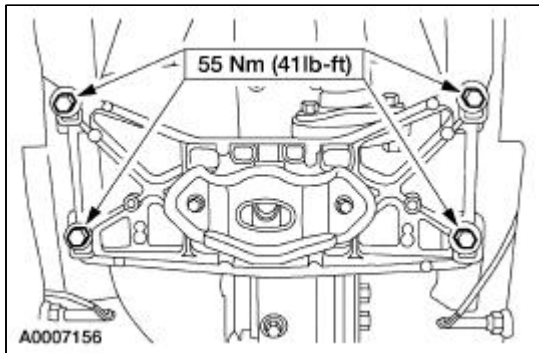
30. Install the RH subframe bolts.



31. Install the LH subframe bolts.



32. Install the transmission support bracket.



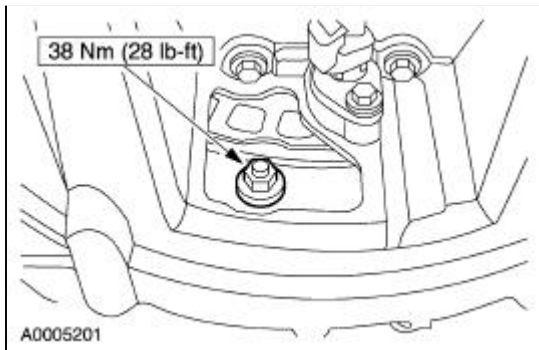
33. Remove the powertrain lift and transmission support bracket.

34. Remove the safety stands from the rear of the vehicle.

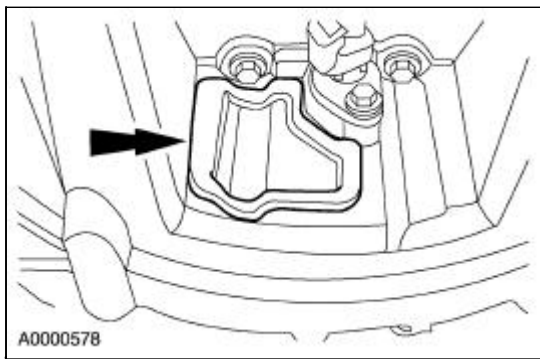
Vehicles with automatic transmission

35. **NOTE:** Align the reference marks made during removal.

Install the nuts.

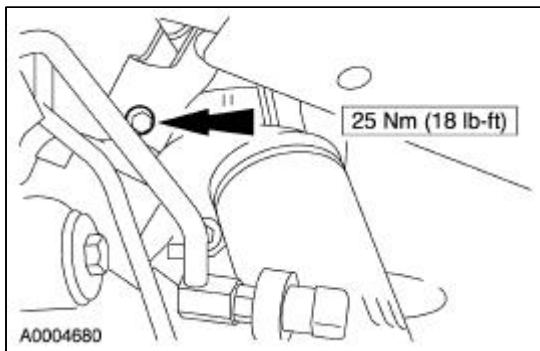


36. Install the access cover.

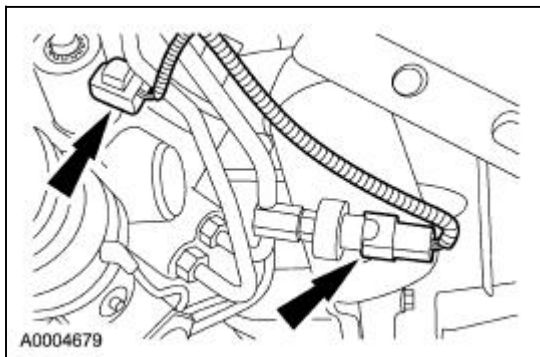


All vehicles

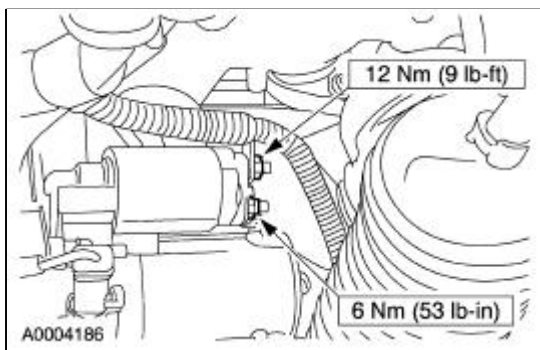
37. Install the steering shaft clamp bolt.



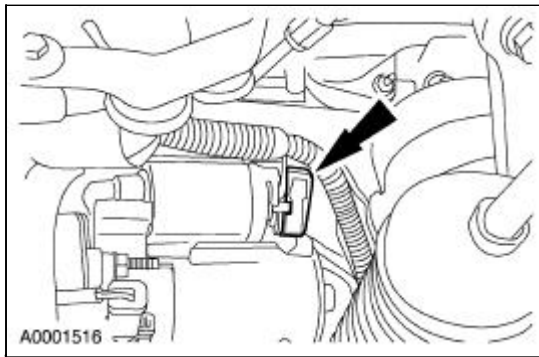
38. Connect the two power steering pressure electrical connectors.



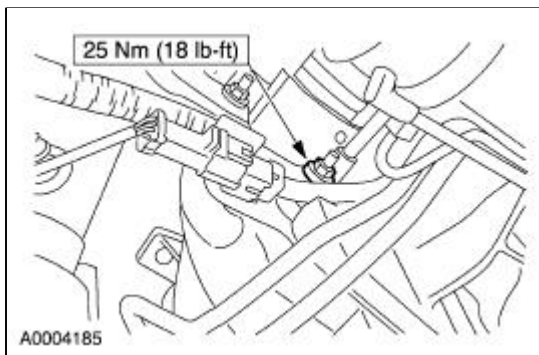
39. Connect the starter wiring.



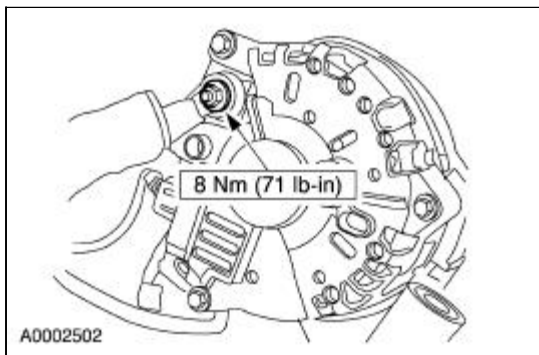
40. Install the starter wiring cover.



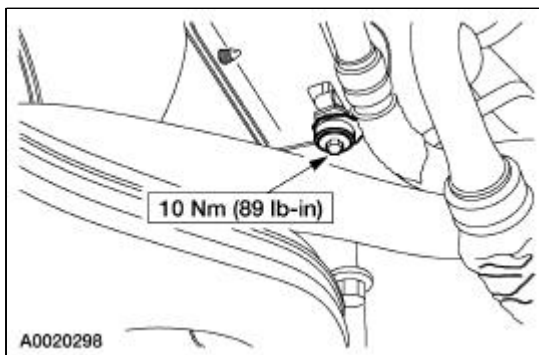
41. Connect the ground wire.



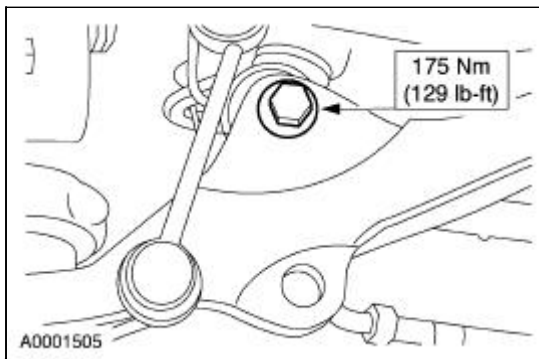
42. Connect the B+ terminal to the generator.



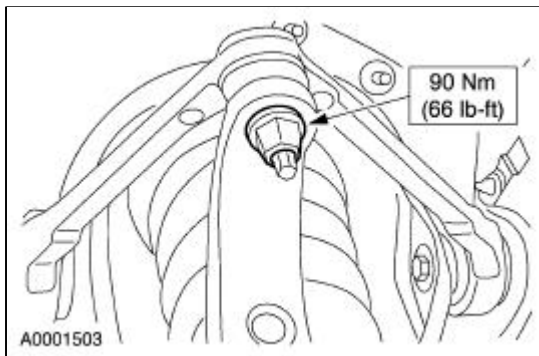
43. Install the power steering tube bracket to the LH frame rail.



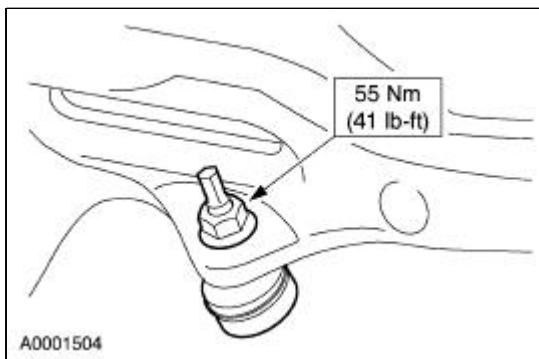
44. Install the lower strut mount bolts.



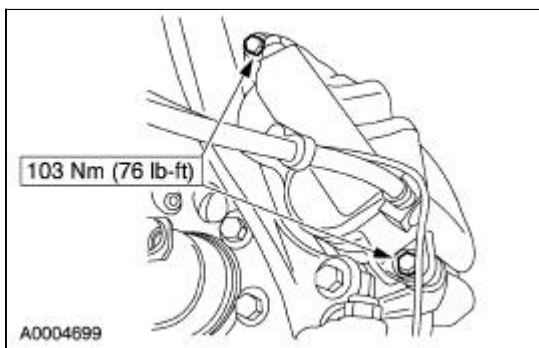
45. Install the upper ball joint nut.



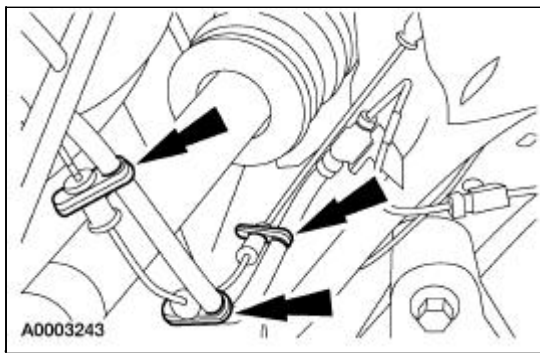
46. Connect the stabilizer link lower mounts and install the nuts.



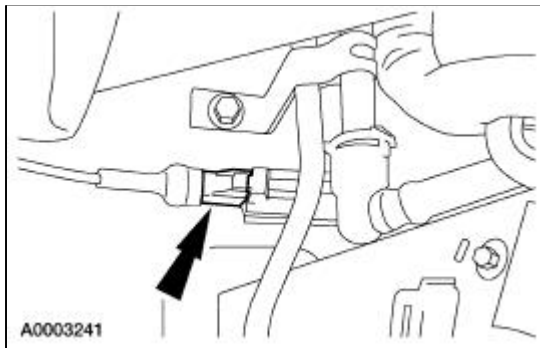
47. Install the front brake calipers.



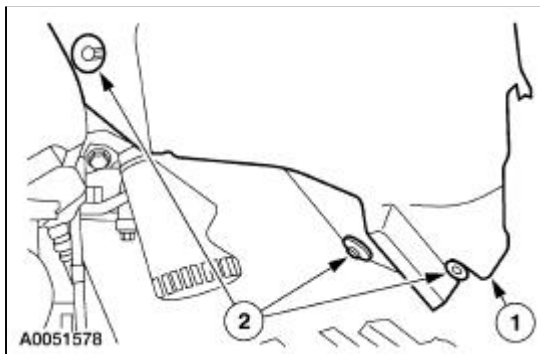
48. Connect the anti-lock brake sensor harness to the brake hose clips.



49. Connect the anti-lock brake sensor electrical connector.



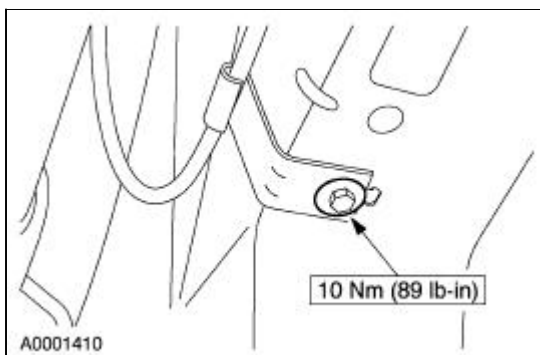
50. Install the inner splash shield.
1. Position the inner splash shield in the installed position.
 2. Install the pin-type retainers.



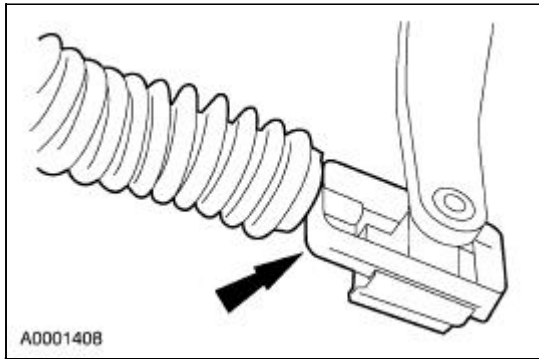
51. Install the front wheels and tires. For additional information, refer to [Section 204-04](#).

Vehicles with automatic transmission

52. Position the cable bracket and install the bolt.

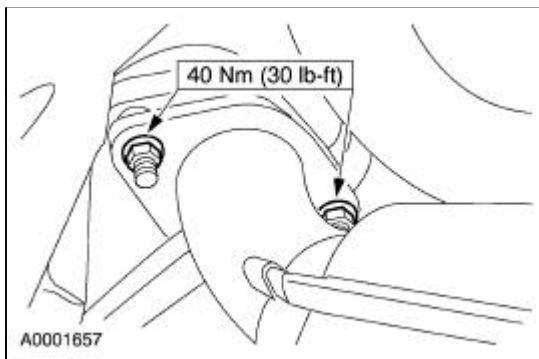


53. Connect the shift cable to the transmission. For cable adjustment, refer to [Section 307-05](#).

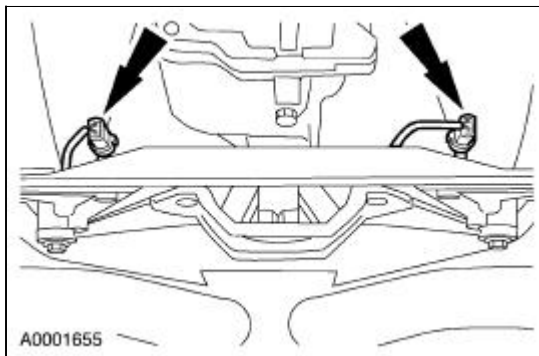


All vehicles

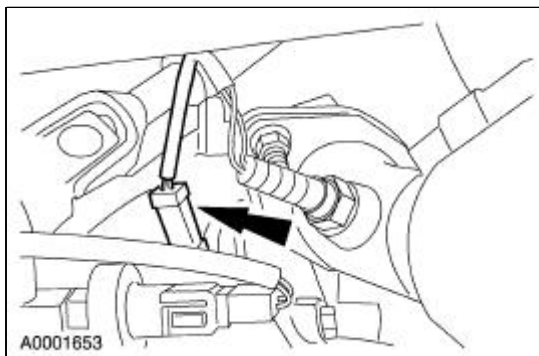
54. Install the three-way catalytic converter and the four nuts.



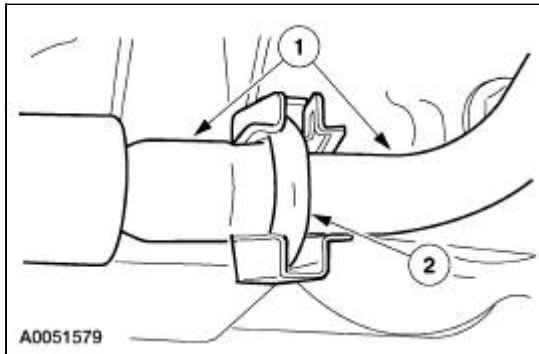
55. Connect the two catalyst monitor connectors.



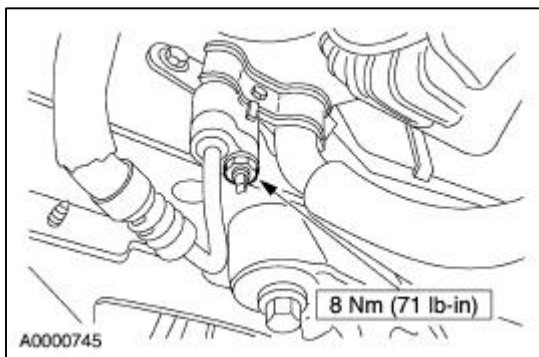
56. Connect the two oxygen sensor electrical connectors.



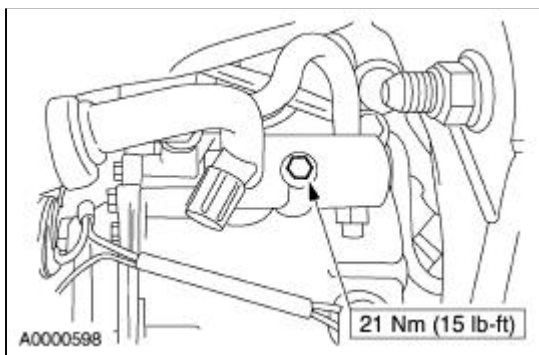
57. Install the driveshaft. For additional information, refer to [Section 205-01](#).
58. Connect the A/C suction tube.
 1. Connect the A/C tube.
 2. Install the safety clip.



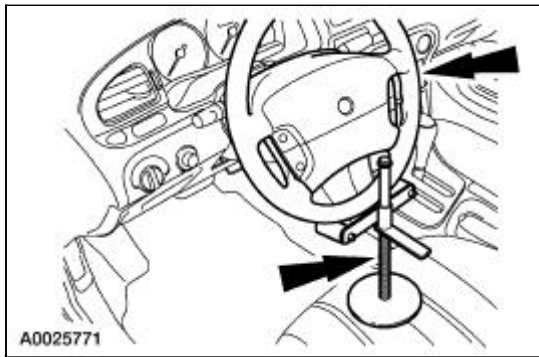
59. Connect the A/C high pressure tube at the right frame rail.



60. Position the A/C manifold assembly and install the bolt.



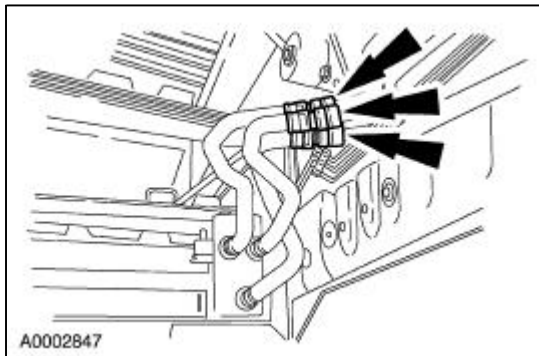
61. Install the center, LH and RH splash shields.
62. Lower the vehicle.
63. Remove the tool holding the steering wheel.



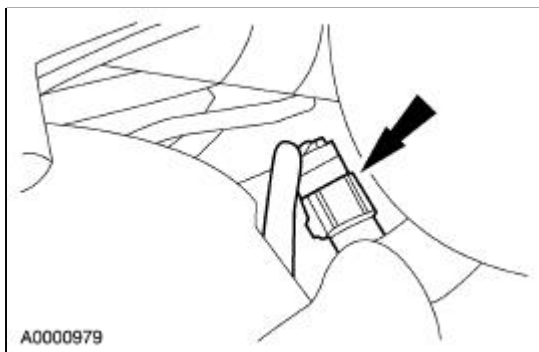
64. **NOTE:** The top heater hose has a green identifying mark to match the hose on the dual coolant flow valve. If the mark is not visible, identify the hoses for location. This will aid in the correct installation of the hose assemblies.

NOTE: Hose assemblies shown with components removed for clarity.

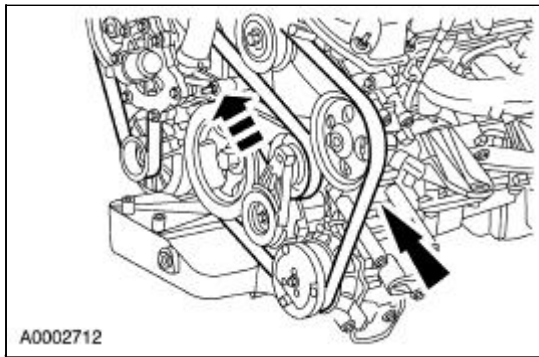
Connect the three quick-disconnect couplings from the coolant control valve hoses. For additional information, refer to [Section 412-00](#).



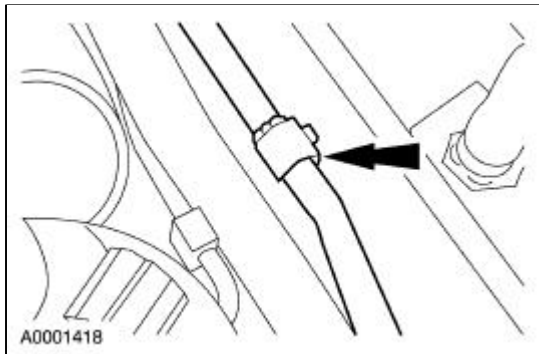
65. Connect the connector located at the end of the coolant valve harness pigtail.



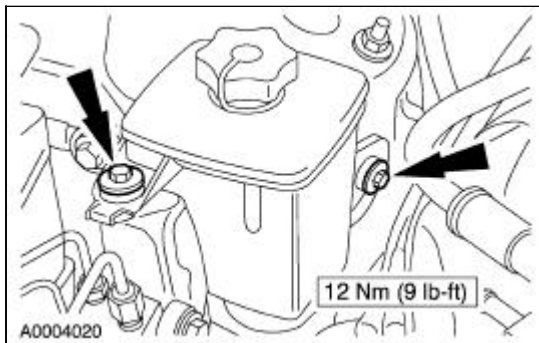
66. Install the front end accessory drive belt.



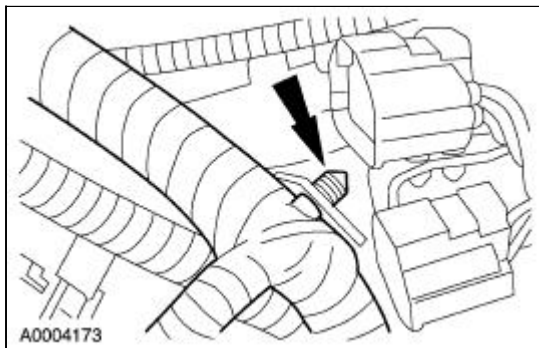
67. Attach the line to the frame.



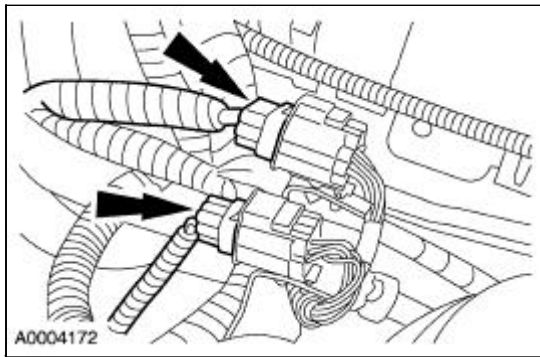
68. Position the hydraulic cooling fan reservoir and install the bolts.



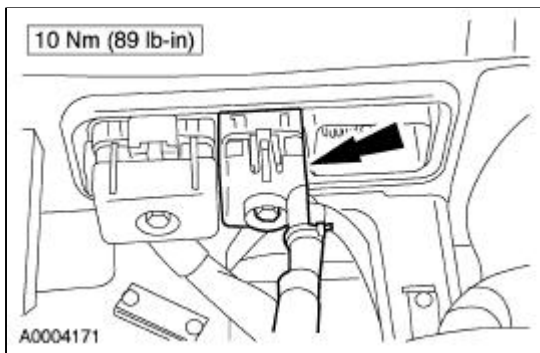
69. Attach the two wiring harness retainers to the bracket.



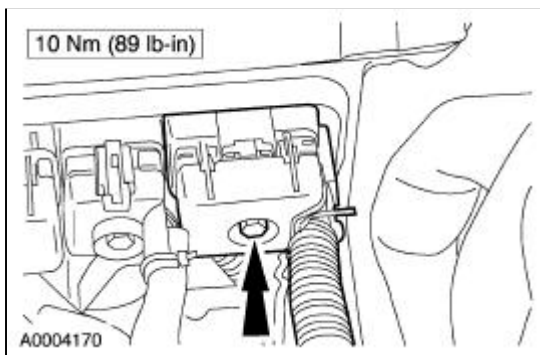
70. Connect the two fuel charging wiring harness electrical connectors.



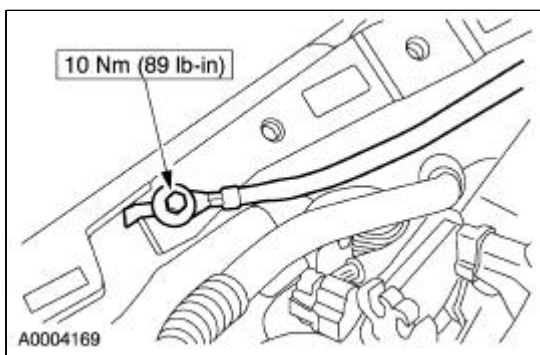
71. Connect the main transmission wiring harness connector and tighten the bolt.



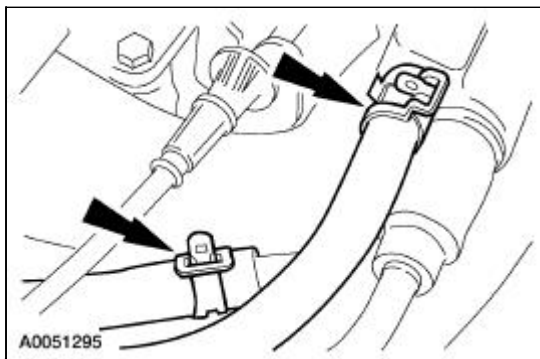
72. Connect the main engine wiring harness connector and tighten the bolt.



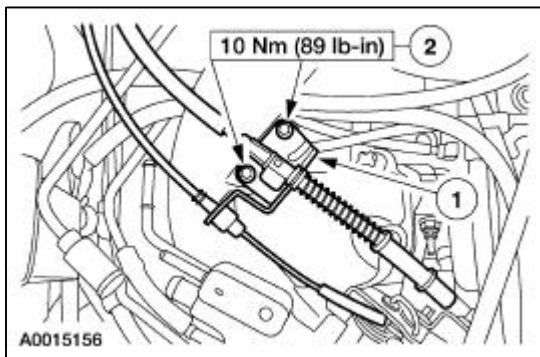
73. Install the ground strap bolt.



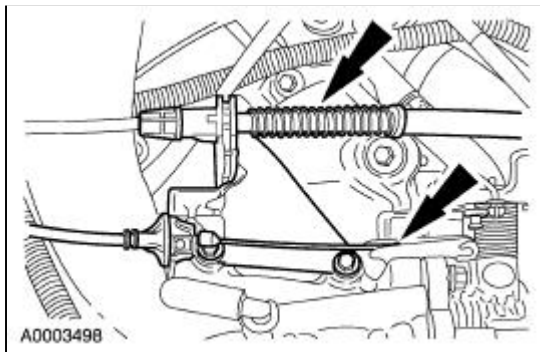
74. Connect the throttle body coolant hoses.



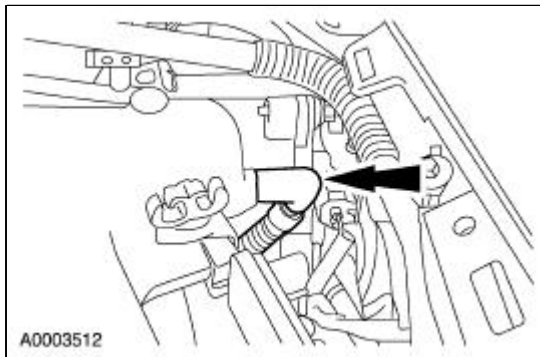
75. Install the cable bracket.
1. Install the bracket.
 2. Install the bolts.



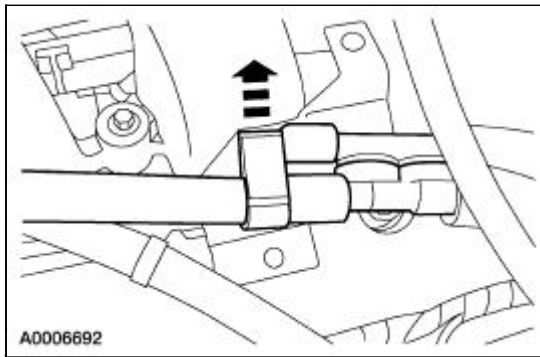
76. Connect the throttle and speed control cables.



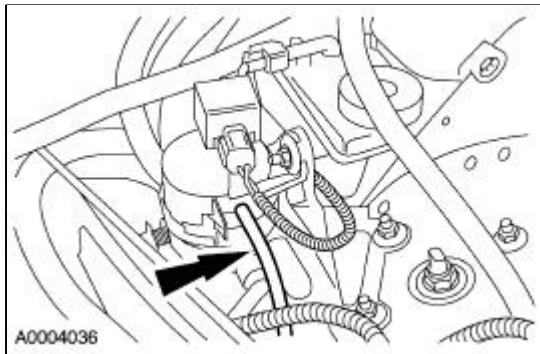
77. Connect the main vacuum hose to the rear of the upper intake manifold.



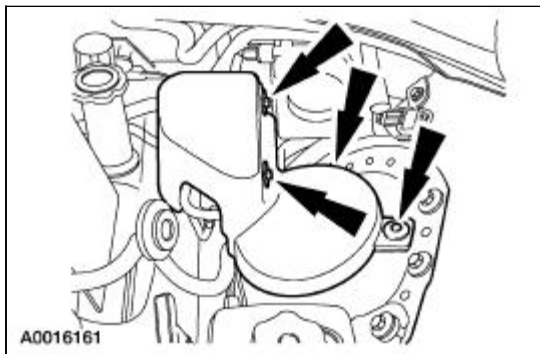
78. Connect the chassis vacuum lines and clip into the support bracket.



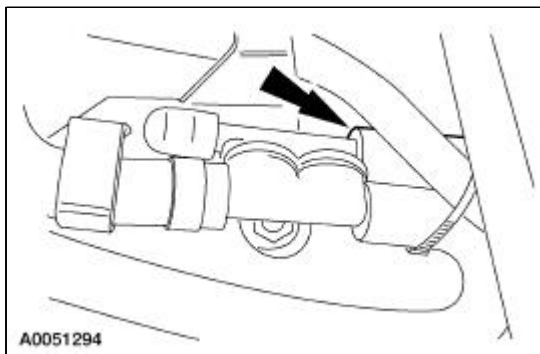
79. Connect the vacuum hose.



80. Install the vapor management valve (VMV) cover.

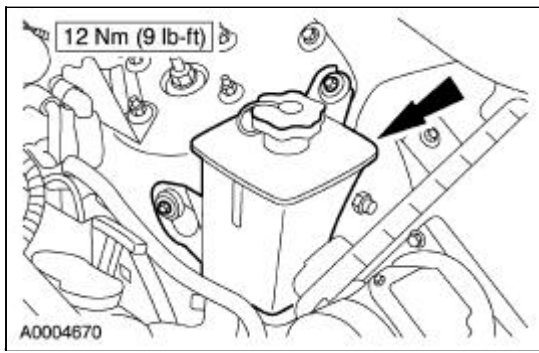


81. Connect the brake booster vacuum hose.

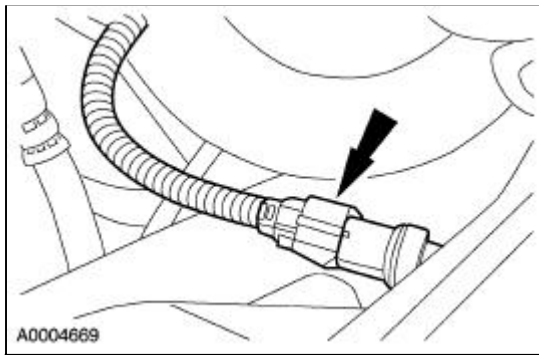


82. Connect the fuel tube spring lock coupling. For additional information, refer to [Section 310-00](#).

83. Position the steering reservoir and install the bolts.

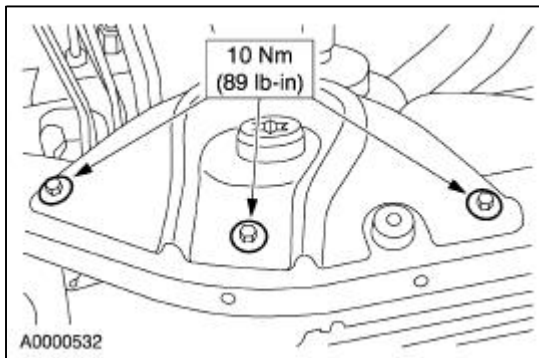


84. Connect the A/C pressure switch.

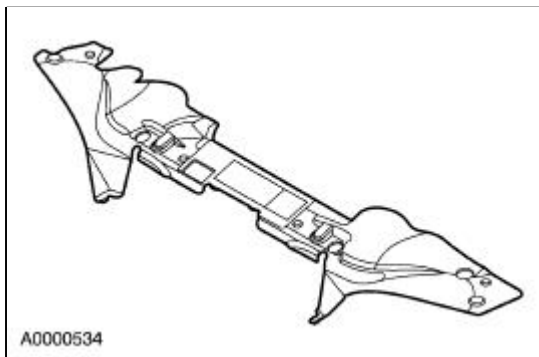


85. **NOTE:** Right side shown; left side similar.

Install the upper radiator support brackets.

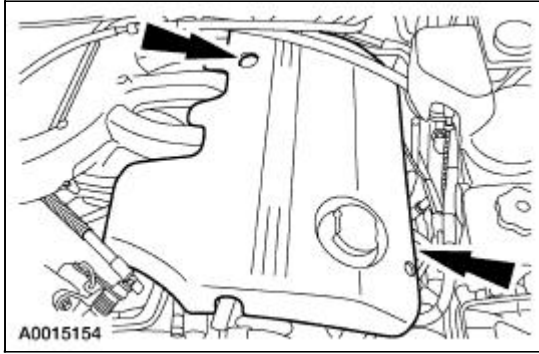


86. Install the upper radiator sight shield.



87. Install the air cleaner and air cleaner outlet tube. For additional information, refer to [Section 303-12](#).

88. Install the engine appearance cover.



89. Connect the battery ground cable. For additional information, refer to [Section 414-01](#).

90. Install the fresh air inlet duct. For additional information, refer to [Section 412-01](#).

91. Fill engine with clean engine oil.

92. Fill and bleed power steering system. For additional information, refer to [Section 211-00](#).

93. Fill and bleed hydraulic cooling fan system. For additional information, refer to [Section 303-03](#).

94. Fill the cooling system. For additional information, refer to [Section 303-03](#).

95. Evacuate and charge the A/C system. For additional information, refer to [Section 412-00](#).

96. Check front end alignment. For additional information, refer to [Section 204-00](#).

General Specifications

Item	Specification
Silicone Gasket and Sealant F7AZ-19554-EA	WSE-M4G323-A4
Super Premium SAE 5W-30 Motor Oil XO-5W30-QSP	WSS-M2C153-G
Metal Surface Cleaner F4AZ-19A536-RA	WSE-M5B392-A
Engine oil capacity (with filter change)	5.7 liters (6.0 quarts)

Torque Specifications

Description	Nm	lb-ft	lb-in
Intake manifold bolts	25	18	—
Throttle body bolts	9	—	80
Thermostat housing bolts	9	—	80
EVR solenoid bolts	6	—	53
EGR valve bolts	25	18	—
EGR valve to exhaust manifold tube nuts	40	30	—
Engine compartment brace bolts	9	—	80
Valve cover bolts	10	—	89
Fuel line bracket bolt	11	—	97
Oil level indicator tube nut	6	—	53
Power steering pump reservoir upper bolt	6	—	53
Power steering pump reservoir lower bolt	12	—	106
Wiring harness bolts	11	—	97
Ignition coil bolts	5	—	44
Coil cover bolts	5	—	44
Evaporative emission purge valve bracket nuts	10	—	89
Wiring harness nuts	11	—	97
Cylinder head bolts	a	—	—
Fresh air box nuts	10	—	89
Fresh air duct nuts	10	—	89
Wiring harness bracket bolts	5	—	44
Hydraulic cooling fan reservoir upper bolt	6	—	53
Hydraulic cooling fan reservoir lower bolt	12	—	106
EGR tube bracket bolts	11	—	97
Crankshaft pulley bolt	a	—	—

Idler pulley bolts	25	18	—
Engine front cover bolts	a	—	—
Power steering pump bracket bolts	25	18	—
Hydraulic cooling fan pump bracket bolts	25	18	—
Power steering pressure line nuts	10	—	89
Lower radiator hose bolts	10	—	89
Water pump bolts	a	—	—
Water pump pulley bolts	a	—	—
Timing chain tensioner bolts	11	—	97
Camshaft sprocket bolts	a	—	—
Timing chain guide bolts	11	—	97
Timing chain tensioner arm bolts	11	—	97
Crankshaft position sensor bolt	10	—	89
Camshaft bearing cap bolts	a	—	—
Exhaust manifold bolts	25	18	—
Exhaust manifold to catalytic converter nuts	40	30	—
Camshaft position sensor bolt	11	—	97
Cylinder head temperature sensor	11	—	97
Power steering pump bolts	25	18	—
Oil filter	b	—	—
Oil filter adapter bolts	25	18	—
Oil pan bolts	a	—	—
Oil pan drain plug	23	17	—
Oil pump bolts	a	—	—
Oil pump screen cover and tube bolts	10	—	89
Flexplate spacer nuts	38	28	—
Engine mount to frame bolts	40	30	—
Engine mount bracket to cylinder block bolts	46	34	—
Upper to lower cylinder block bolts	a	—	—
Connecting rod cap bolts	a	—	—
Oil sump bolts	a	—	—
Knock sensor bolts	20	15	—
Oil pan bolts	a	—	—
Heated oxygen sensor bracket bolts	6	—	53
Generator bolts and nut	a	—	—
Transmission to engine bolts	47	35	—
Transmission wiring harness nuts	10	—	89
Power steering line bracket bolt	20	15	—
Transmission cooler line nuts	10	—	89
Cowl panel support bracket bolts	9	—	80

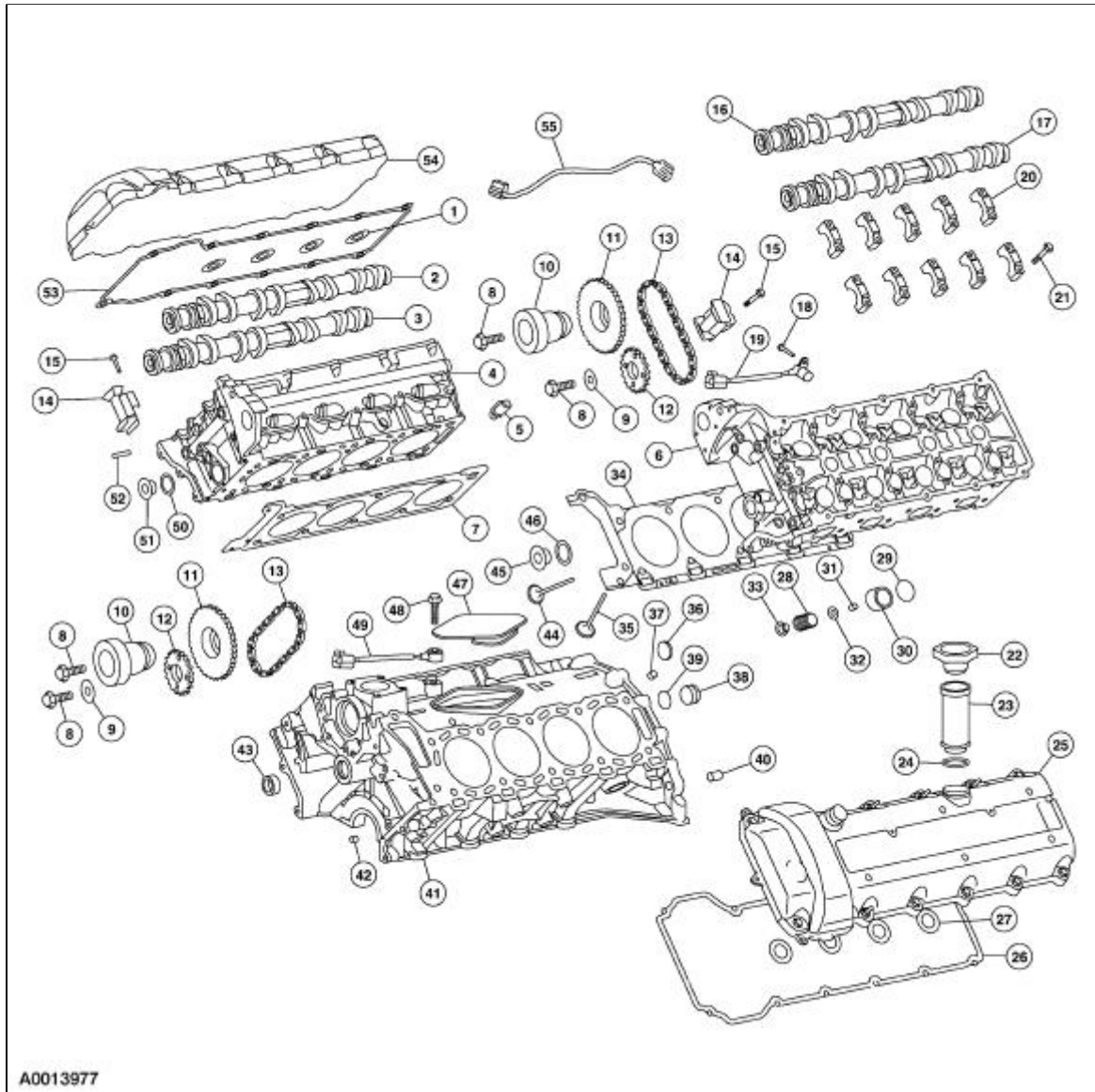
A/C compressor bracket bolts	25	18	—
A/C compressor bolts	25	18	—
Water crossover bolts	11	—	97
Oil cooler assembly	25	18	—
A/C high pressure line	8	—	71
Starter bracket nut	10	—	89
A/C manifold nut	21	15	—
Sub-frame bolts	103	76	—
Steering coupling bolt	35	26	—
Cooling fan line bracket bolt	10	—	89
Lower strut mount bolts	175	129	—
Upper ball joint nuts	90	66	—
Sway bar link nuts	55	41	—
Starter motor wiring harness nut	6	—	53
Oil cooler bolts	58	43	—
Shift cable bracket bolt	10	—	89
Heater hose bracket bolt	10	—	89
Ground strap bolt	10	—	89
Radiator support bracket bolts	10	—	89
Cylinder block flanged plug	20 + 10 degrees	15 + 10 degrees	—
Water jacket plug	25	18	—
M30 cylinder block plugs	50	37	—
EGR heat shield bolts	10	—	89
EGR valve adapter bolts	10	—	89
Radio interference capacitor nuts	6	—	53
Inlet tube support bracket bolts	11	—	97
Drive belt tensioner bolt	50	37	—

^a Refer to procedure for staged torque.

^b Install the oil filter until the seal makes contact. Tighten an additional 270 degrees.

Engine

Cylinder Head and Valve Train



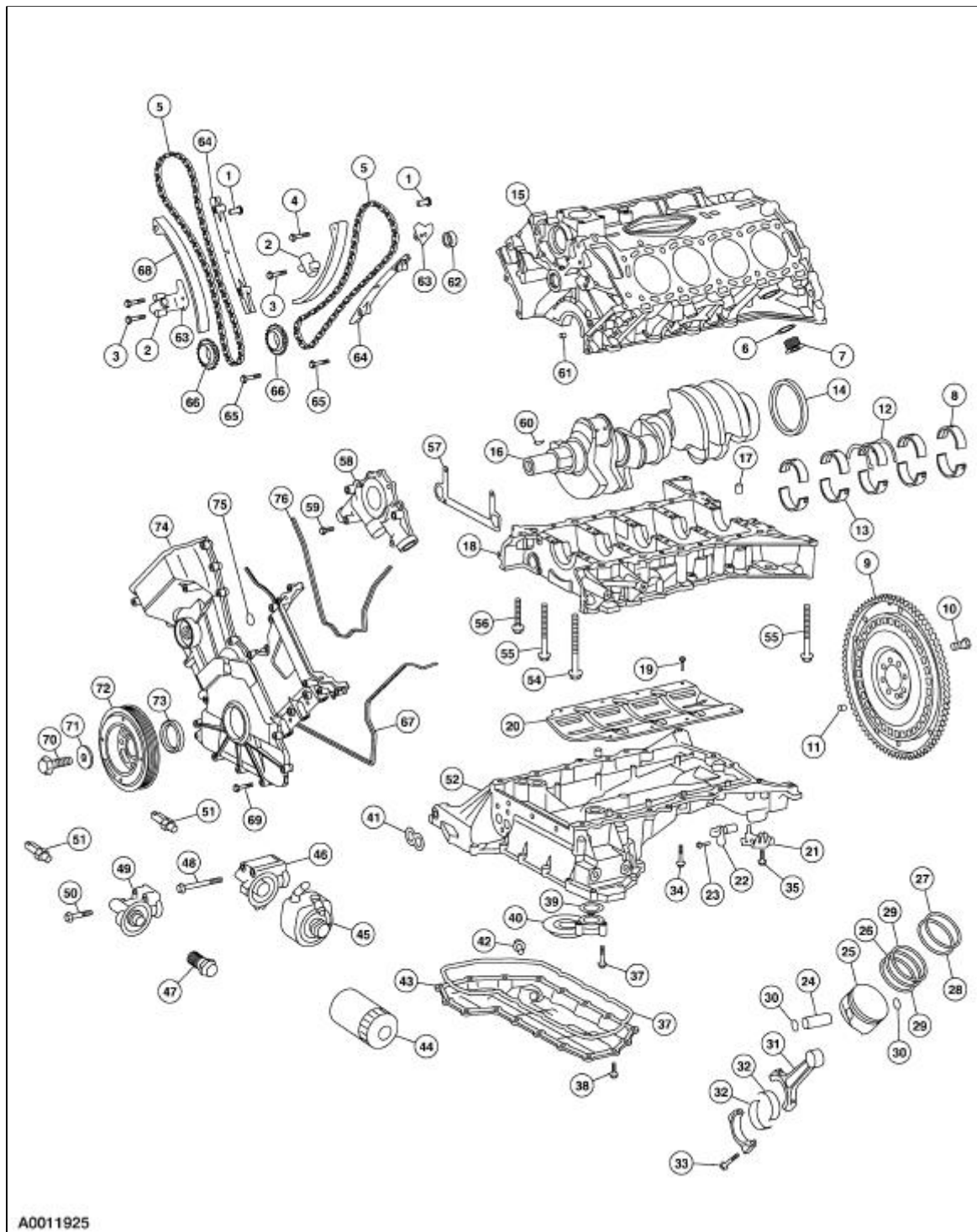
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Item	Part Number	Description
1	12A409	Valve cover gaskets (4 req'd)
2	6A270	Camshaft, intake — RH
3	6A272	Camshaft, exhaust — RH
4	6049	Cylinder head — RH
5	6G004	Cylinder head temperature sensor — RH
6	6050	Cylinder head — LH
7	6051	Head gasket — RH
8	W701512	Bolt (4 req'd)

9	W704842	Washer (2 req'd)
10	6M253	Camshaft damper
11	6256	Intake camshaft sprocket (2 req'd)
12	6C258	Exhaust camshaft sprocket (2 req'd)
13	6268	Secondary timing chain (2 req'd)
14	6B209	Secondary timing chain tensioner
15	W500302	Bolt (4 req'd)
16	6A271	Camshaft, intake — LH
17	6A273	Camshaft, exhaust — LH
18	W500214	Bolt
19	6B288	Camshaft position sensor
20	6A258	Camshaft bearing cap (20 req'd)
21	W701242	Bolt (40 req'd)
22	6766	Oil filler cap
23	6765	Oil filler tube
24	W705327	Seal
25	6P053	Valve cover — LH
26	6P054	Valve cover gasket — LH
27	12A409	Valve cover gasket — LH (4 req'd)
28	6513	Valve spring (32 req'd)
29	6K514	Valve shim (32 req'd)
30	6500	Bucket (32 req'd)
31	6518	Valve keeper key (64 req'd)
32	2762	Valve keeper (32 req'd)
33	6A536	Valve seal (32 req'd)
34	6083	Head gasket — LH
35	6507	Intake valve (16 req'd)
36	W528009	Cup plug (2 req'd)
37	W701705	Dowel (4 req'd)
38	W704848	Flanged plug
39	W703346	Sealing washer
40	6397	Dowel (2 req'd)
41	6L074	Cylinder block assembly
42	6L002	Dowel (2 req'd)
43	W703302	Pipe plug
44	6505	Exhaust valve
45	W704848	Flanged plug
46	W703346	Sealing washer
47	6L033	Valley plug
48	W500310	Bolt (2 req'd)
49	12A699	Knock sensor (2 req'd)
50		

	W703346	Sealing washer
51	W704848	Flanged plug
52	6K253	Dowel (2 req'd)
53	6K260	Valve cover gasket — RH
54	6P040	Valve cover — RH
55	14B102	Jumper harness

Lower End



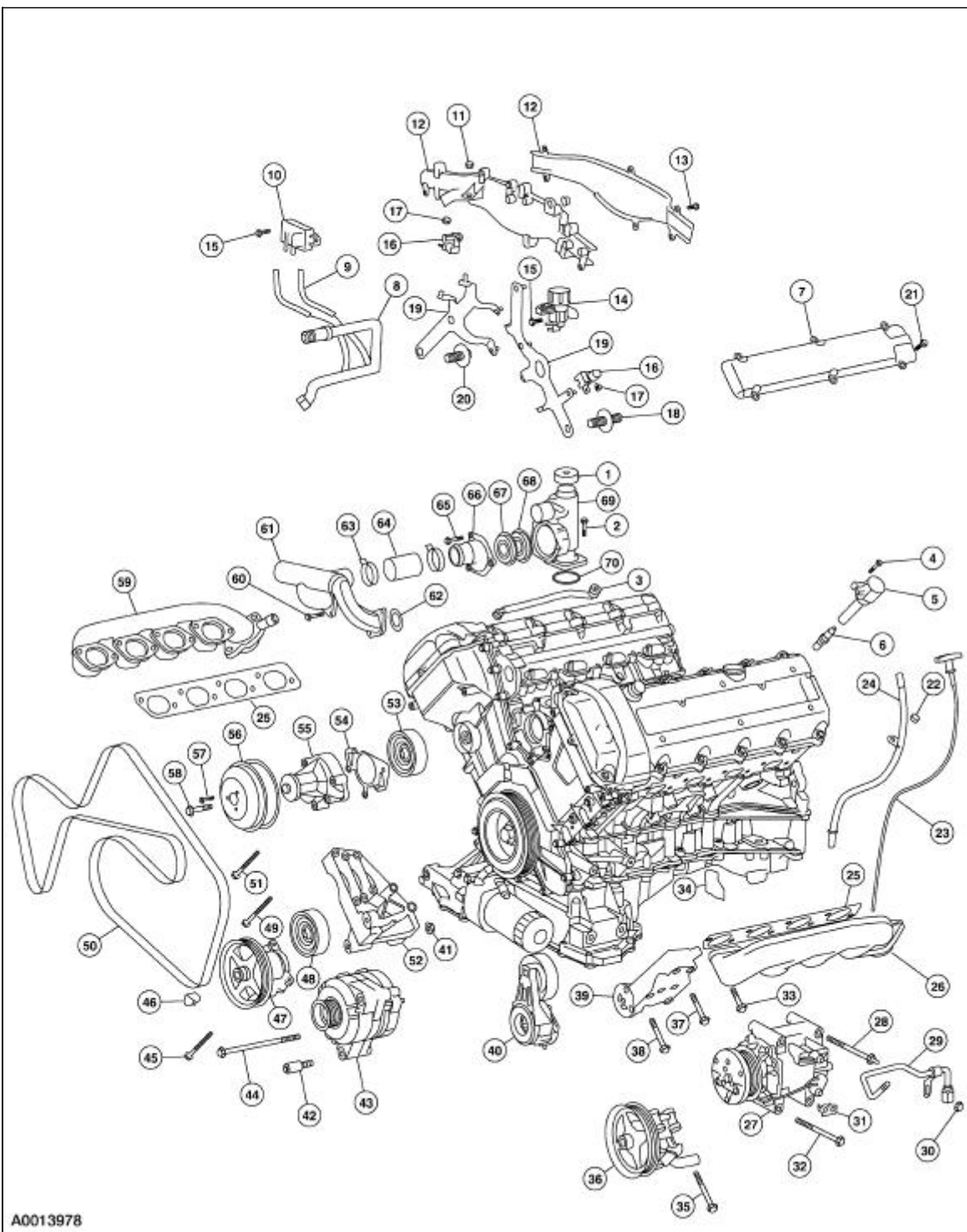
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Part

Item	Number	Description
1	6P044	Sleeve (2 req'd)
2	6K254	Primary timing chain tensioner (2 req'd)
3	W500302	Bolt (4 req'd)
4	W701973	Bolt (2 req'd)
5	6268	Primary timing chain (2 req'd)
6	W703346	Sealing washer
7	W704846	Flanged plug
8	6333	Upper crankshaft bearing (5 req'd)
9	6K375	Flexplate
10	W704862	Bolt (8 req'd)
11	6253	Dowel
12	6308	Thrust washer (2 req'd)
13	6331	Lower crankshaft bearing (5 req'd)
14	6701	Crankshaft rear main seal
15	6L074	Cylinder block assembly
16	6303	Crankshaft
17	W701705	Dowel (10 req'd)
18	6L074	Cylinder block assembly
19	W500203	Bolt (8 req'd)
20	6L712	Oil pan baffle
21	14W163	Heated oxygen sensor bracket (2 req'd)
22	6C315	Crankshaft position sensor
23	W500214	Bolt
24	6135	Piston pin (8 req'd)
25	6110	Piston (8 req'd)
26	6161	Spacer/expander ring (8 req'd)
27	6150	Compression ring — Upper (8 req'd)
28	6152	Compression ring — Lower (8 req'd)
29	6152	Oil control ring, (16 req'd)
30	6140	Snap ring (16 req'd)
31	6200	Connecting rod (8 req'd)
32	6211	Connecting rod bearing (16 req'd)
33	6214	Bolt (16 req'd)
34	W704749	Bolt (16 req'd)
35	W701504	Bolt (2 req'd)
36	W500305	Bolt (3 req'd)
37	6B638	Oil pan gasket
38	W701504	Bolt (17 req'd)
39	6625	Gasket
40	6617	Oil pump screen cover and tube
41		

	6840	Gasket
42	W704995	Oil drain plug
43	6695	Oil pan assembly
44	6714	Oil filter
45	6A642	Oil cooler
46	6A644	Oil filter adapter (oil cooler equipped vehicles)
47	6884	Oil filter fitting (non-oil cooler equipped vehicles)
48	W701532	Bolt (oil cooler equipped vehicles) (3 req'd)
49	6A644	Oil filter adapter (non-oil cooler equipped vehicles)
50	W704816	Bolt (non-oil cooler equipped vehicles) (3 req'd)
51	9278	Oil pressure sensor
52	6C674	Upper sump assembly
53	6C002	Dowel
54	6345A	Bolt (10 req'd)
55	6345B	Bolt (12 req'd)
56	6345C	Bolt (12 req'd)
57	6659	Oil pump gasket
58	6600	Oil pump
59	W500304	Bolt (4 req'd)
60	W704975	Woodruff key
61	6C002	Dowel (2 req'd)
62	W703302	Pipe plug
63	6N089	Blanking plate (2 req'd)
64	6K297	Timing chain guide (2 req'd)
65	W500302	Bolt (2 req'd)
66	6306	Crankshaft timing chain sprocket (2 req'd)
67	6E009	Front cover gasket (outer)
68	6L266	Timing chain tensioner arm
69	W704751	Bolt (24 req'd)
70	W705542	Bolt
71	W704965	Washer
72	6316	Crankshaft pulley
73	6700	Front cover seal
74	6059	Engine front cover assembly
75	6D081	Idler pulley seal
76	6C075	Front cover seal (inner)

Lower End Exterior Dress



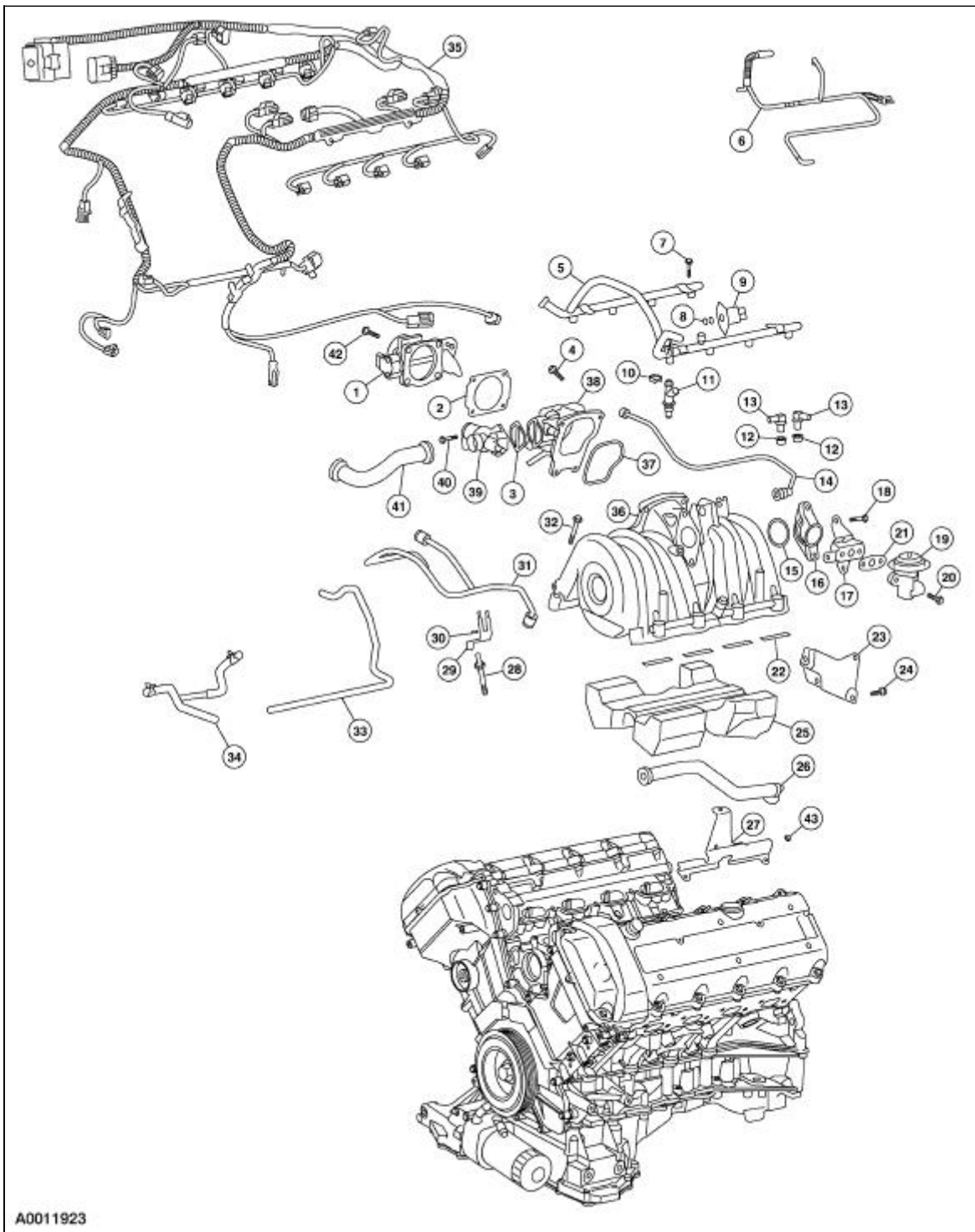
A0013978

Item	Part Number	Description
1	8A511	Thermostat housing cap
2	W500215	Bolt (4 req'd)
3	6C342	Breather hose part load
4	W500205	Bolt (8 req'd)
5	12A366	Ignition coil (8 req'd)
6	12405	Spark plug (8 req'd)
7	12025	Coil cover (2 req'd)

8	9D477	EGR valve to exhaust manifold tube
9	9P761	EGR valve to exhaust manifold vacuum line (2 req'd)
10	9J460	Differential pressure feedback EGR assembly
11	W700430	Nut (2 req'd)
12	14W163	Wire harness channel and cover
13	W500202	Bolt (6 req'd)
14	9J459	EGR vacuum regulator solenoid
15	W500202	Bolt (4 req'd)
16	18801	Radio ignition interference capacitor (2 req'd)
17	W705035	Nut (1 req'd)
18	W520411	Stud bolt
19	14W163	Wiring harness bracket (2 req'd)
20	W705036	Bolt
21	W500205	Bolt (12 req'd)
22	W520411	Nut
23	6752	Oil level indicator
24	6754	Oil level indicator tube
25	9448	Exhaust manifold gasket (2 req'd)
26	9431	Exhaust manifold — LH
27	19D629	A/C compressor
28	W705060	Stud bolt
29	3E576	Jumper tube
30	W520412	Nut
31	3R801	Bracket
32	W704750	Bolt (3 req'd)
33	W701240	Bolt (16 req'd)
34	7N840	Flexplate inspection cover
35	W704752	Bolt (4 req'd)
36	3A696	Power steering pump
37	W500315	Bolt (3 req'd)
38	W704752	Bolt (2 req'd)
39	3K738	PAS bracket
40	6B209	Drive belt tensioner
41	W520414	Nut
42	W70539	Bolt and bushing assembly
43	10300	Generator
44	W704756	Bolt
45	W704752	Bolt (4 req'd)
46	3R801	Bracket
47	8C648	Hydraulic cooling fan pump
48	19A216	Idler pulley — flanged

49	W704752	Bolt (2 req'd)
50	8620	Drive belt
51	W500315	Bolt (3 req'd)
52	3D743	Hydraulic cooling fan pump bracket
53	19A216	Idler pulley — non-flanged
54	8507	Water pump gasket
55	8501	Water pump
56	8509	Water pump pulley
57	W705629	Bolt (3 req'd)
58	W500304	Bolt (5 req'd)
59	9430	Exhaust manifold, RH
60	W500215	Bolt (4 req'd)
61	8A520	Water outlet pipe assembly
62	8255	O-ring seal
63	W525972	Clamp (2 req'd)
64	9F287	Hose
65	W500014	Bolt (3 req'd)
66	8594	Thermostat housing cover
67	8575	Thermostat
68	8A571	O-ring seal
69	8K515	Thermostat housing
70	9K462	O-ring seal

Upper End Exterior Dress



A0011923

Item	Part Number	Description
1	9E926	Throttle body
2	9E936	Throttle body gasket
3	9F670	Idle air control valve gasket
4	W701662	Bolt (4 req'd)
5	9S441	Fuel injection supply manifold
6	9E498	Vacuum harness
7	W500013	Bolt (4 req'd)
8	W705818	O-ring seals (2 req'd)

9	9F972	Fuel pressure sensor
10	9N976	Clip (8 req'd)
11	9F593	Fuel injector (8 req'd)
12	9H490	Seal (2 req'd)
13	9S497	Stub pipe(2 req'd)
14	9D289	Purge hose
15	6L438	Seal
16	9H450	EGR flange
17	9P962	EGR valve adapter
18	W701568	Bolt (3 req'd)
19	9D460	Exhaust recirculation valve
20	N807843	Bolt (2 req'd)
21	9D476	EGR valve gasket
22	9439	Intake manifold gasket (8 req'd)
23	9Y426	Heat shield
24	W500211	Bolt (4 req'd)
25	6N041	Noise insulator
26	9K617	Crankcase ventilation hose
27	6N081	Bracket
28	W705479	Stud bolt
29	14536	Bracket
30	W520411	Nut
31	9P903	Air assist hose
32	W500313	Bolt (9 req'd)
33	9F814	Throttle body heater return hose
34	9F813	Throttle body heater feed hose
35	12B637	Engine sensor control wiring harness
36	9425	Intake manifold
37	6C653	Throttle body adapter gasket
38	9632	Throttle body adapter
39	9F715	Idle air control valve
40	W701662	Bolt (2 req'd)
41	9P903	Air assist tube
42	W701568	Bolt (4 req'd)
43	W520411	Nut (2 req'd)

Identification

For quick identification refer to the safety certification decal.

- The decal is located on the LH front door lock face panel.
- Find the engine code (letter or number) on the decal, then refer to the Engine Identification Chart to determine engine type and size. For additional information, refer to [Section 100-01](#).

- The symbol code on the identification tag identifies each engine for determining parts usage; for instance, engine displacement in liters or cubic inch displacement and model year.

Engine Code Information

The engine code information label is located on the valve cover. The label contains, among other information:

- the engine calibration number
- the engine build date
- the engine plant code
- the engine code

Emission Calibration Label

NOTE: The engine codes and the calibration numbers must be used when making inquiries or ordering parts.

The emission calibration number label is located on the LH side door or LH door post pillar. It identifies:

- the engine calibration number
- the engine code number
- the revision level

These numbers are used to determine if parts are unique to specific engines.

Exhaust Emission Control System

Refer to the Powertrain Control/Emissions Diagnosis (PC/ED) manual.

Induction System

The air/fuel mixture needed for burning in the cylinders is provided by the multiport fuel injection (MFI) system. Refer to [Section 303-04B](#) for additional information.

Fuel is:

- supplied from the fuel tank by the fuel pump.
- regulated by the fuel pressure sensor.
- delivered to the injector supply manifold.

A dual damper has been added to reduce pressure fluctuations caused by the fuel injectors.

Crankshaft

The crankshaft is supported on the bottom of the cylinder block by five steel-backed, over-plated, aluminum crankshaft main bearings.

To provide smooth engine operation, the piston crankpins are positioned to provide a power impulse every 90 degrees of crankshaft rotation. The spacing provides smooth and quiet operation.

Camshafts

The camshafts:

- are arranged in pairs, one each (intake and exhaust) on each cylinder head.
- are synchronized through a secondary timing chain.
- depress the direct acting mechanical tappets to actuate the valves.

Valve Train

The valves are actuated by a direct acting mechanical bucket and shim. The direct acting mechanical tappets and shims:

- provide lash adjustment through a shim selected by thickness.
- ride on the camshaft lobes.

Positive Crankcase Ventilation System

The engine is equipped with a positive, closed-type crankcase ventilation system which recycles the crankcase vapors to the throttle body.

Engine Lubrication System

The engine lubrication system is of the force-feed type in which oil is supplied under full pressure to the:

- crankshaft main bearings
- crankshaft thrust main bearing
- connecting rod bearings

All other parts are lubricated by gravity flow or splash of the oil.

Oil Pump

The rotary spur oil pump develops the oil pressure.

- The oil pump is bolted to the front of the cylinder block.
- The oil pump is rotated by the crankshaft.
- A full flow oil filter is externally mounted on the upper sump.

If the filter element should become blocked a spring-loaded bypass valve will open and allow an uninterrupted flow of oil to the engine.

Engine Cooling System

The engine is liquid-cooled:

- by a centrifugal water pump driven by the drive belt.
- a water thermostat is used to restrict coolant flow until the engine reaches normal operating temperature.

Drive Belt System

Accessories mounted on the front of the engine are belt-driven by the crankshaft and an automatically tensioned serpentine drive belt is routed over the following components:

- water pump
 - A/C compressor
 - generator (GEN)
 - drive belt tensioner
 - drive belt idler pulley
 - crankshaft pulley
 - power steering pump
 - hydraulic cooling fan pump
-

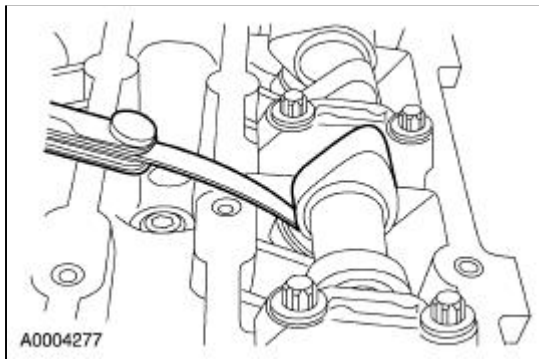
Engine

Refer to [Section 303-00](#) .

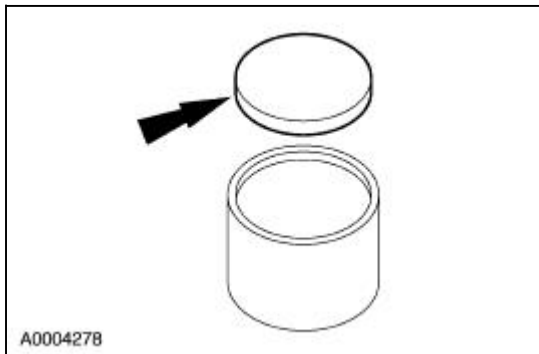
Valve —Clearance Adjust

1. Remove the timing chains. For additional information, refer to [Timing Drive Components—Secondary](#) in this section.
2. **NOTE:** Measure each valve clearance at base circle before removing the camshafts. The shims are not repairable with the camshafts in place. Failure to measure all clearances prior to removing the camshafts will cause unnecessary repetition of the procedure.

Use a feeler gauge to measure each valve clearance and record its location.



3. Remove the camshafts. For additional information, refer to [Camshaft](#) in this section.
4. Remove the shims.



5. **NOTE:** The shims are marked for thickness; example: 2.22 mm = 222 on shim.

NOTE: The corrected shims allow the following valve clearances.

- Intake valve clearance: 0.18-0.22mm (0.00709-0.00866 in)
- Exhaust valve clearance: 0.23-0.27mm (0.00906 - 0.01063 in)

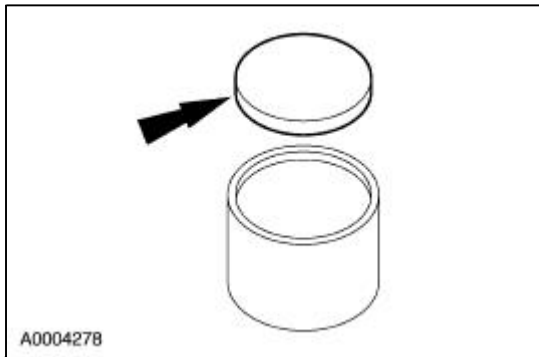
NOTE: A midrange clearance is the most desirable:

- Intake: 0.20 mm (0.00787 in)
- Exhaust: 0.25 mm (0.01 in)

NOTE: Select shims using this formula: required shim thickness = measured clearance plus the base shim thickness minus most desirable clearance.

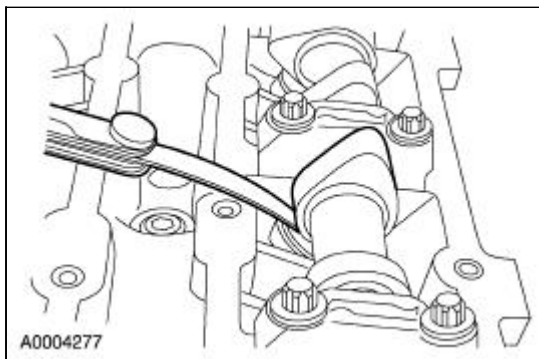
Select shims and mark the installation location.

6. Replace the shims.



7. Install the camshaft. For additional information, refer to [Camshaft](#) in this section.

8. Measure the new valve clearances.



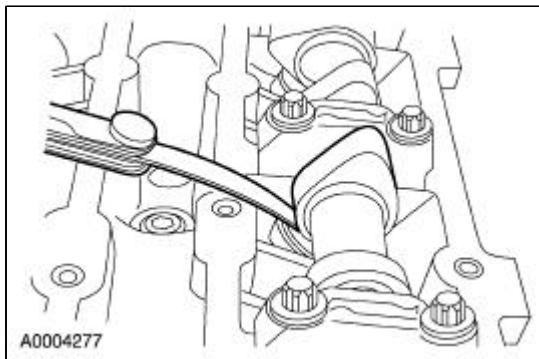
9. Install the timing chains. For additional information, refer to [Timing Drive Components—Secondary](#) in this section.
-

Valve —Clearance Inspection

1. Remove the valve covers. For additional information, refer to [Valve Cover—RH](#) and [Valve Cover—LH](#) in this section.
2. Remove the spark plugs.
3. **NOTE:** The engine will have to be rotated with the crankshaft pulley bolt to bring each valve to base circle.

NOTE: The valve clearance must be measured with the camshaft at base circle.


Measure and record all valve clearances.



4. If the valve clearances are out of specification, refer to [Valve —Clearance Adjust](#) in this section.
 5. To assemble, reverse the inspection procedure.
-

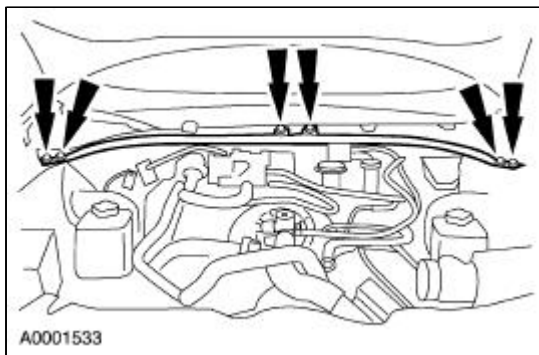
Intake Manifold

Removal

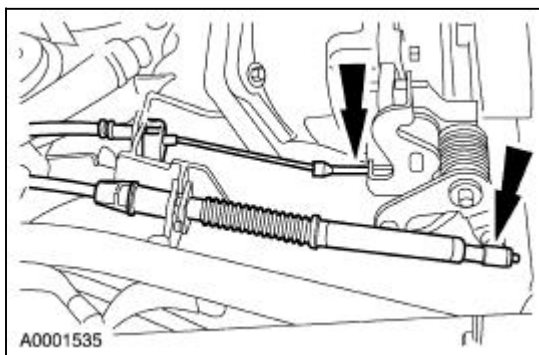
1. Disconnect the battery ground cable. For additional information, refer to [Section 414-01](#).
2. Remove the air cleaner outlet tube. For additional information, refer to [Section 303-12](#).
3.  **CAUTION: The coolant drain procedure must be followed exactly or damage to the engine may occur.**

Drain the engine cooling system. For additional information, refer to [Section 303-03](#).

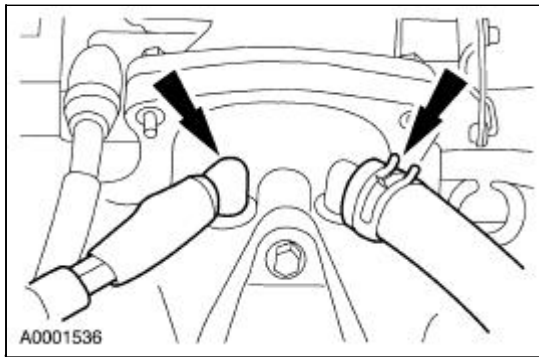
4. Remove the cowl vent screen. For additional information, refer to [Section 501-02](#).
5. Remove the engine compartment brace.



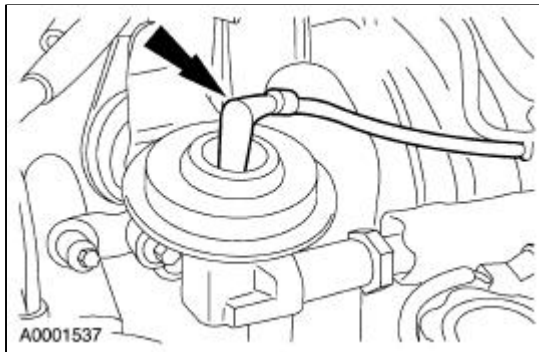
6. Disconnect the accelerator and speed control cables.



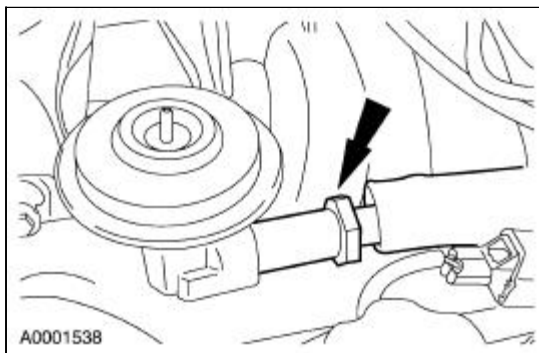
7. Disconnect the vacuum hoses.



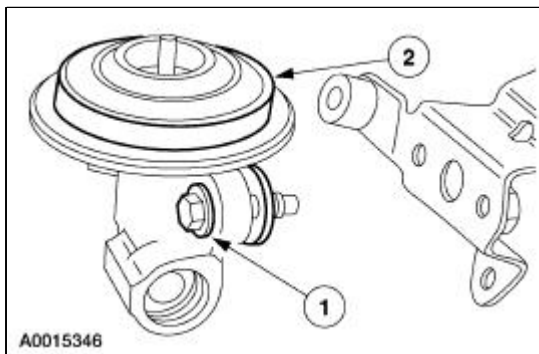
8. Disconnect the vacuum line.



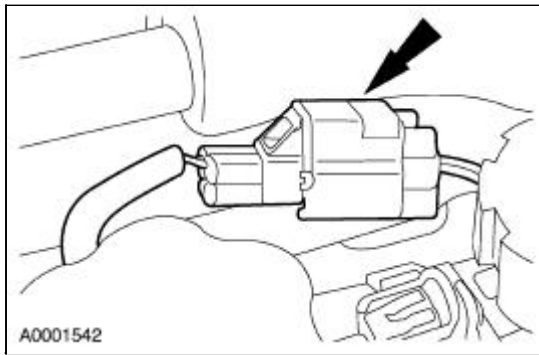
9. Disconnect the EGR valve to exhaust manifold tube.



10. Remove the EGR valve.
 1. Remove the two bolts.
 2. Remove the valve and discard the gasket.

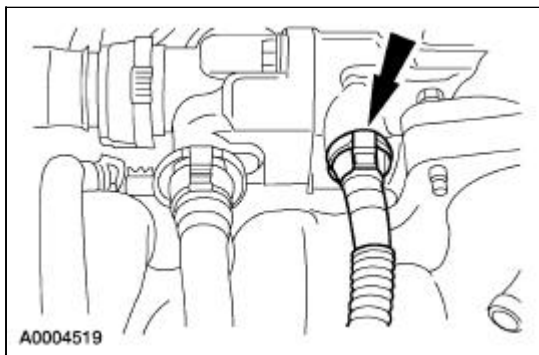


11. Disconnect the camshaft position (CMP) sensor electrical connector and separate the connector from the fuel injection supply manifold.

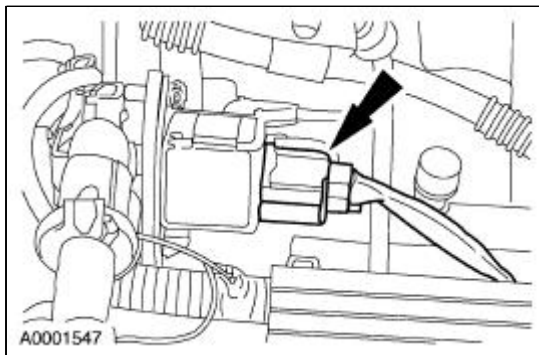


12.  **CAUTION:** To remove normal fittings, squeeze the tabs and pull straight out or damage to the fitting may occur.

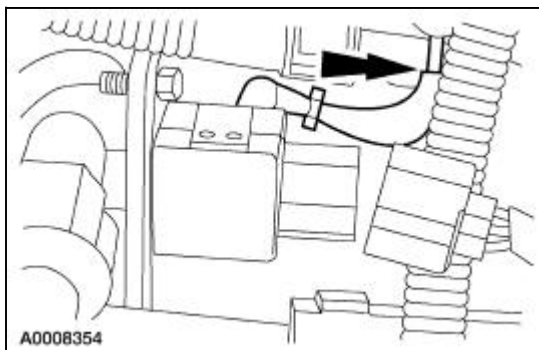
Disconnect the evaporative emission canister purge valve line.



13. Disconnect the fuel pressure sensor electrical connector.

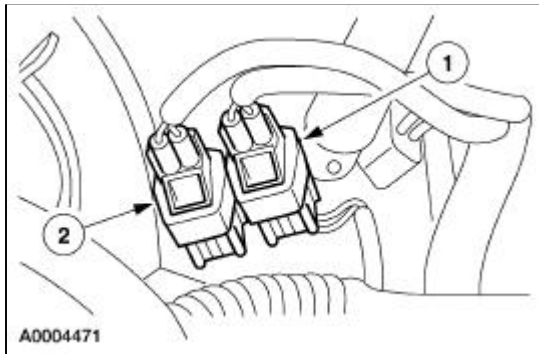


14. Disconnect the vacuum connector from the fuel pressure sensor.

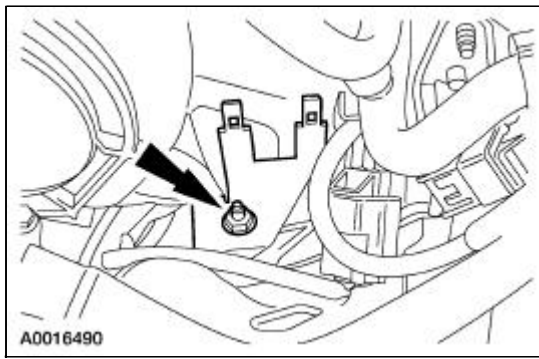


15. Disconnect the fuel line. For additional information, refer to [Section 310-00](#).

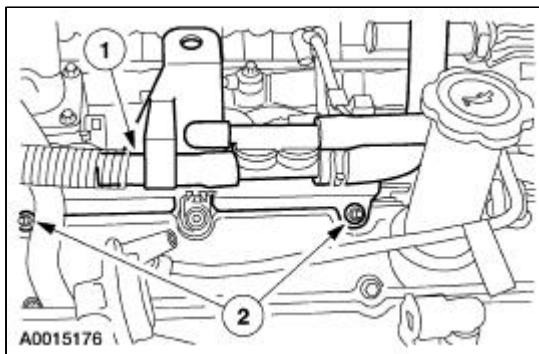
16. Remove the electrical connectors from the bracket.
 1. LH knock sensor (KS).
 2. Cylinder head temperature (CHT) sensor.



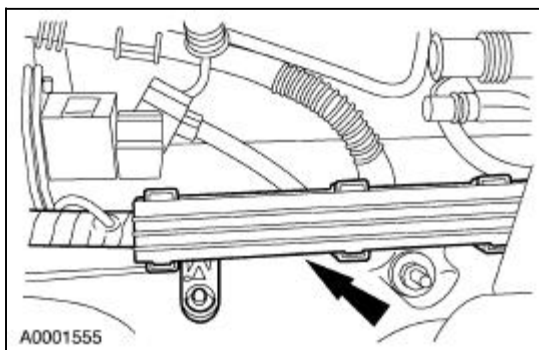
17. Remove the nut and the bracket.



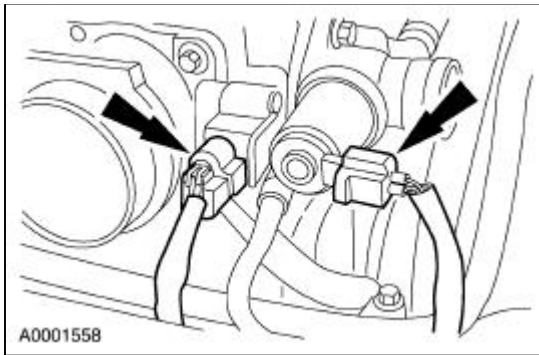
18. Remove the bracket.
 1. Remove the hose.
 2. Remove the nuts and the bracket.



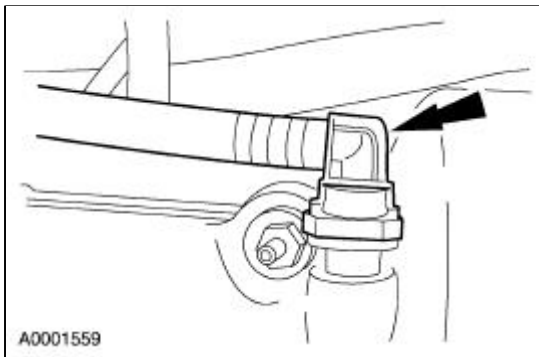
19. Raise the engine wiring harness and disconnect the LH fuel injector connectors.



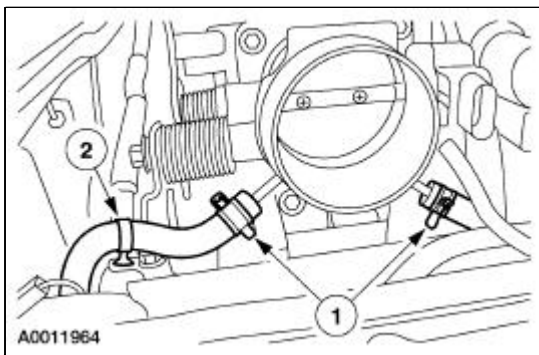
20. Disconnect the electrical connectors.
- Idle air control (IAC) valve.
 - Throttle position (TP) sensor.



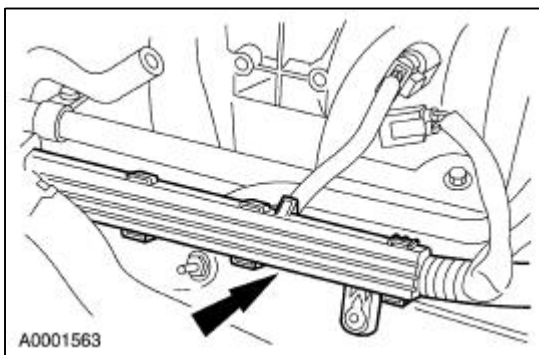
21. Disconnect the crankcase ventilation tube from the RH valve cover.



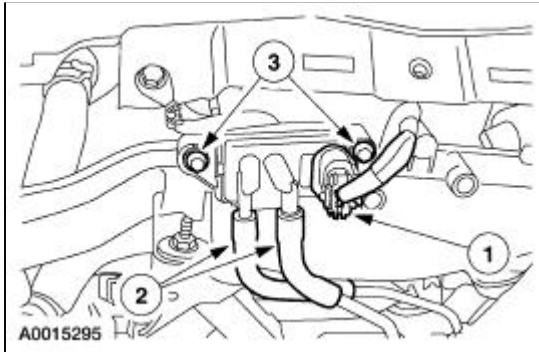
22. Disconnect the hoses (1) from the throttle body and the retaining clips (2).



23. Raise the engine wiring harness and disconnect the RH fuel injectors.

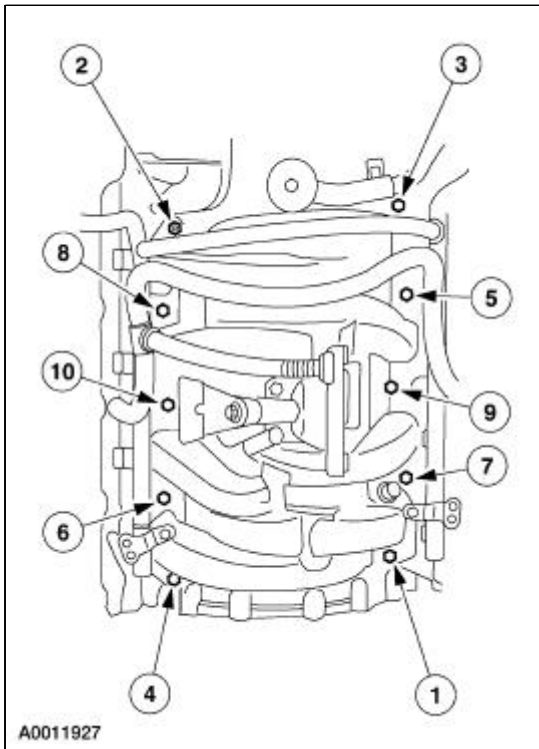


24. Remove the Delta PFE sensor.
1. Disconnect the electrical connector.
 2. Disconnect the hoses.
 3. Remove the bolts and the sensor.



25. **NOTE:** The throttle body and adapter are shown removed for clarity. It is not necessary to remove the throttle body and adapter to remove the intake manifold.

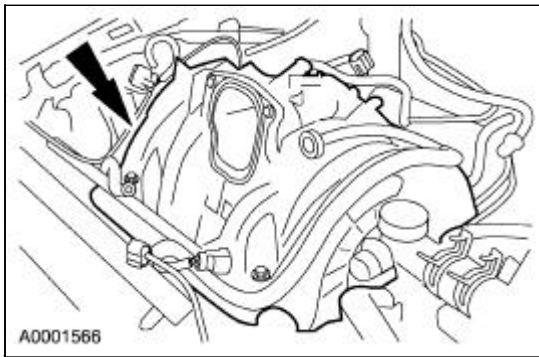
Remove the bolts and the stud (2) in the sequence shown.



26. **NOTE:** The throttle body, adapter and EGR valve are shown removed for clarity.

NOTE: Position the throttle body heater return hose out of the way before removing the throttle body.

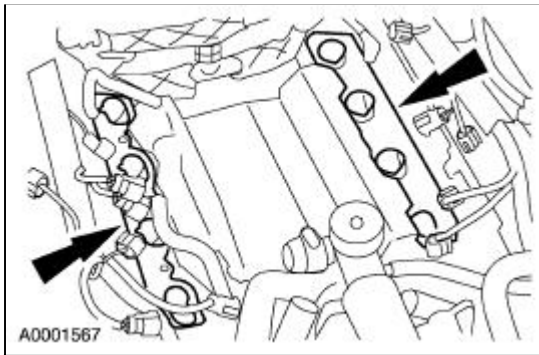
Remove the intake manifold.



27. **⚠ CAUTION:** Do not use metal scrapers, wire brushes, power abrasive discs or other abrasive means to clean the sealing surfaces. These tools cause scratches and gouges, which make leak paths. Use a plastic scraping tool to clean the surfaces.

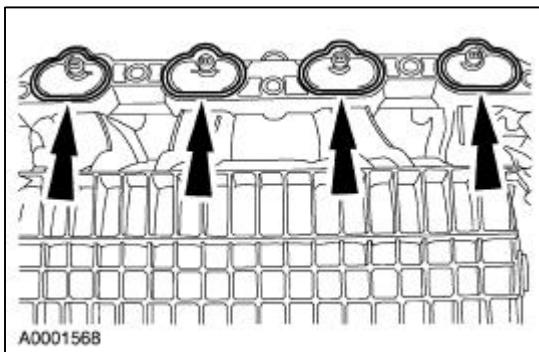
Clean the sealing surfaces.

- Inspect the gaskets and install new gaskets if necessary.



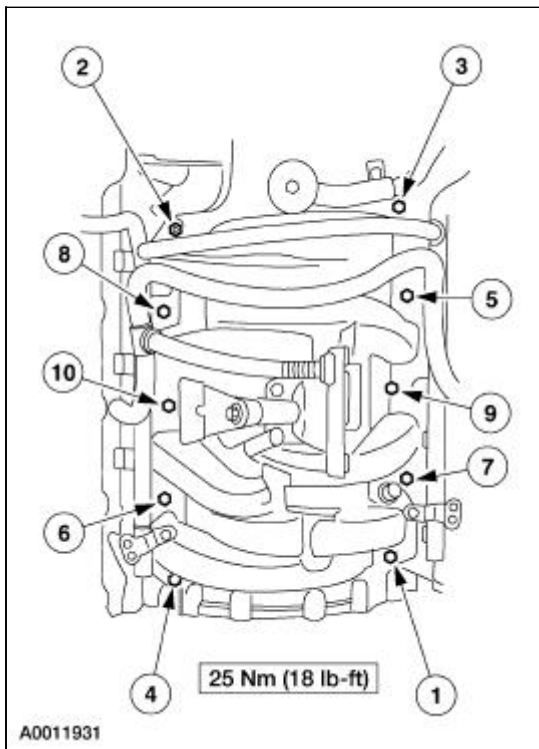
Installation

1. If removed, install the gaskets.

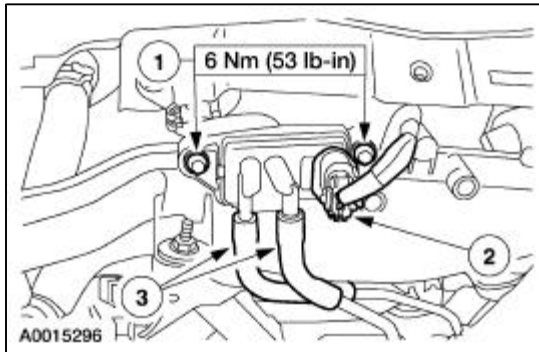


2. **NOTE:** Make sure that the throttle body heater return hose is positioned between the heat shield and the intake manifold.

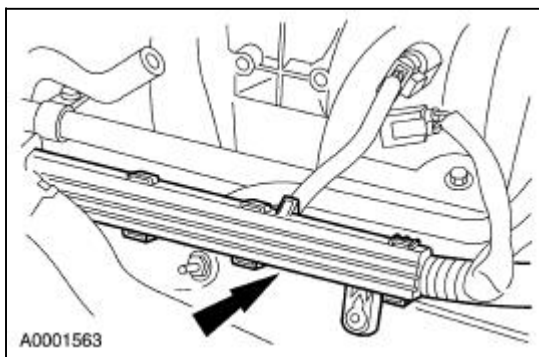
Install the intake manifold and tighten the bolts in the sequence shown.



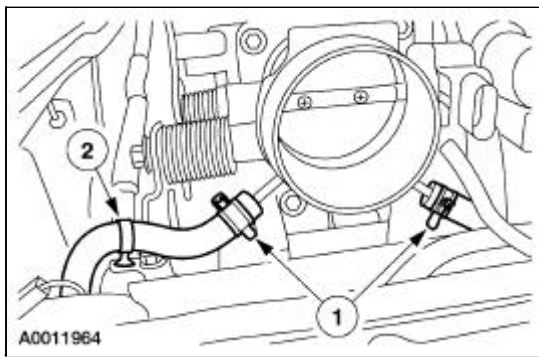
3. Install the Delta PFE sensor.
 1. Install the sensor and the bolts.
 2. Connect the electrical connector.
 3. Connect the hoses.



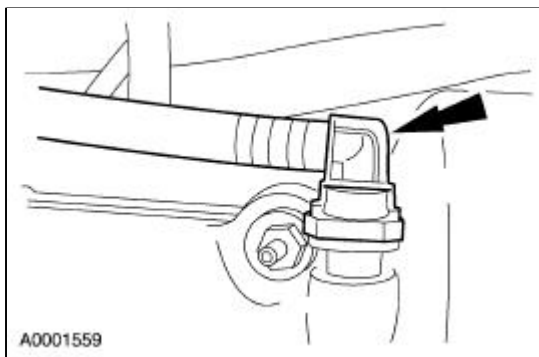
4. Connect the RH fuel injectors and position the engine wiring harness.



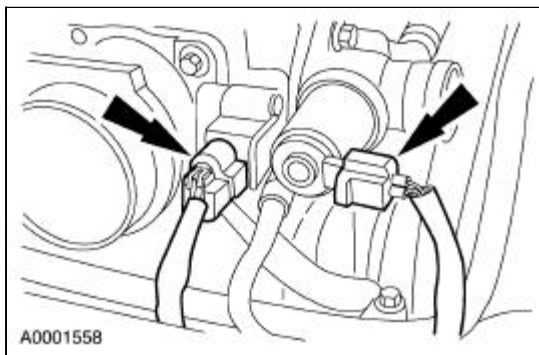
5. Connect the hoses (1) and install the hose in the clip (2).



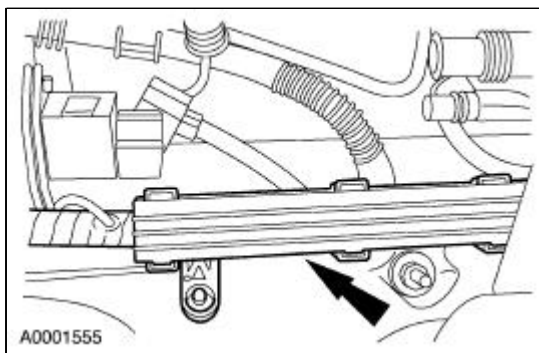
6. Connect the crankcase ventilation tube.



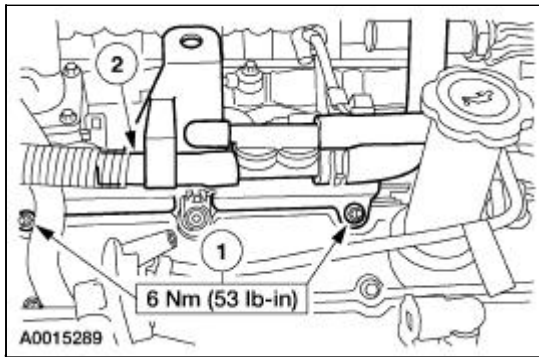
7. Connect the IAC valve and TPS electrical connectors.



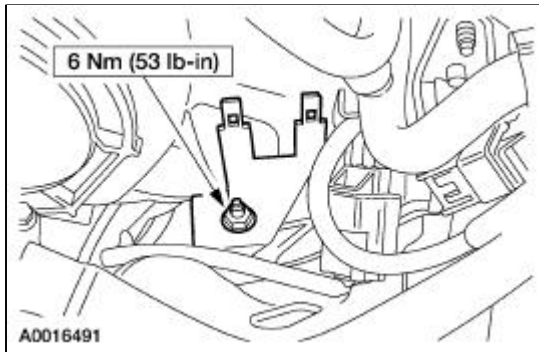
8. Connect the LH fuel injector connectors and position the engine wiring harness.



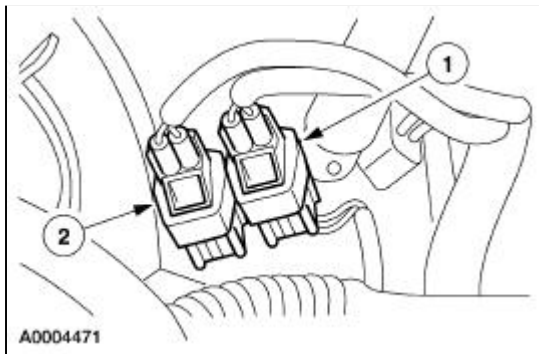
9. Install the bracket.
 1. Install the bracket and nuts.
 2. Install the hose.



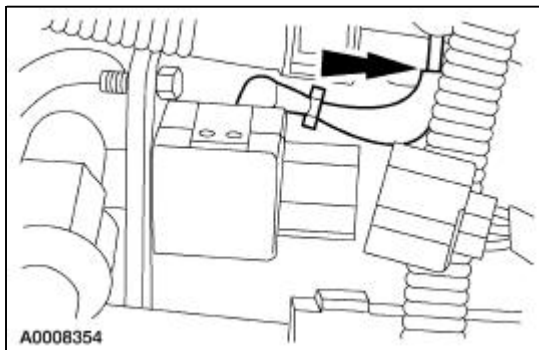
10. Install the bracket and the nut.



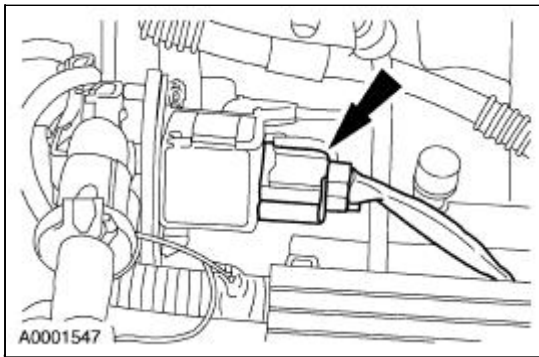
11. Install the electrical connectors on the bracket.
 1. Install the LH KS connector.
 2. Install the CHT sensor connector.



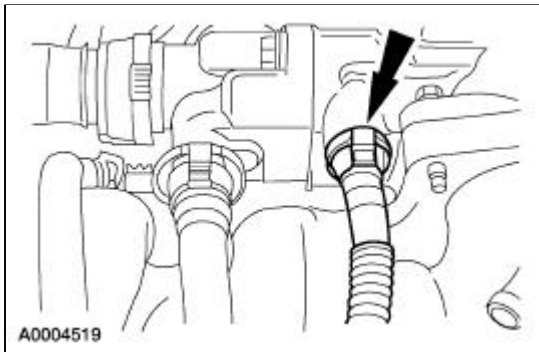
12. Connect the fuel line. For additional information, refer to [Section 310-00](#).
13. Connect the vacuum connector to the fuel pressure sensor.



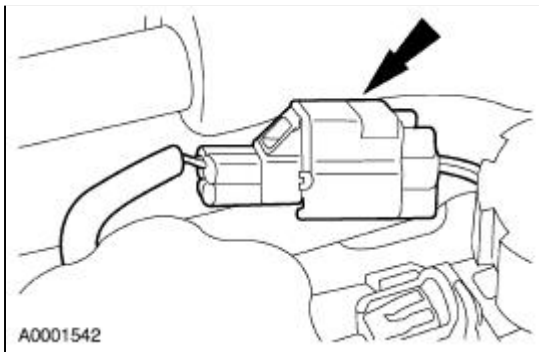
14. Connect the fuel pressure sensor electrical connector.



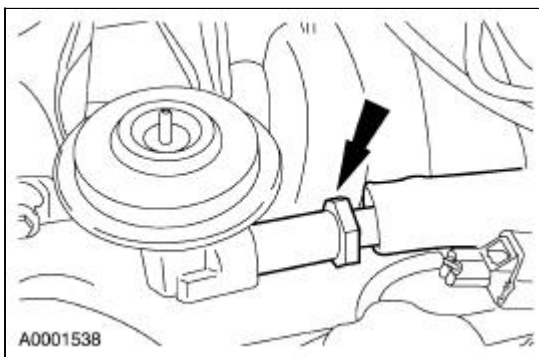
15. Connect the evaporative emission canister purge valve line.



16. Connect the CMP sensor electrical connector and position the connector on the fuel injection supply manifold.



17. Connect the EGR valve to exhaust manifold tube.

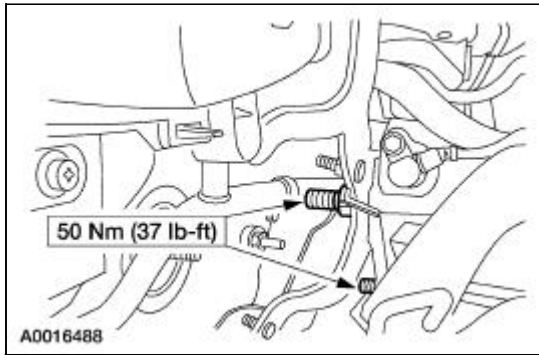


18. **NOTE:** EGR valve to exhaust manifold tube is removed for clarity.

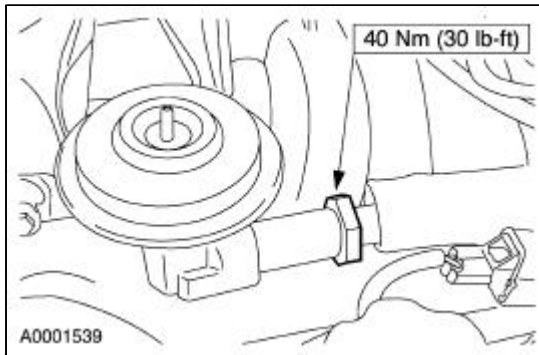
Install the EGR valve.

1. Install a new gasket and the valve.

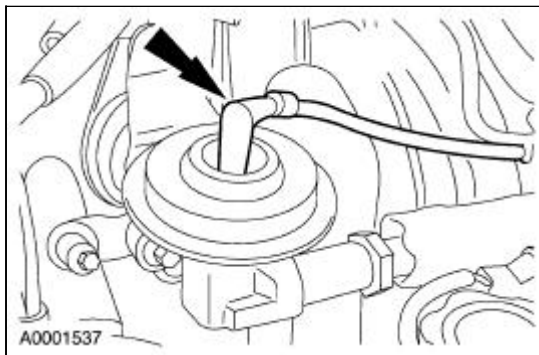
2. Install the two bolts.



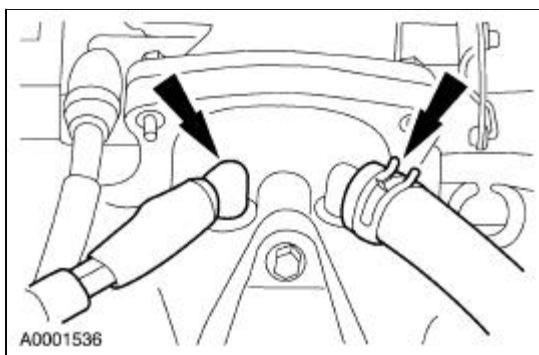
19. Tighten the tube.



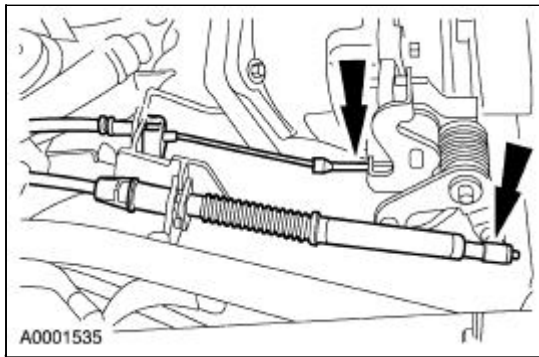
20. Connect the vacuum line.



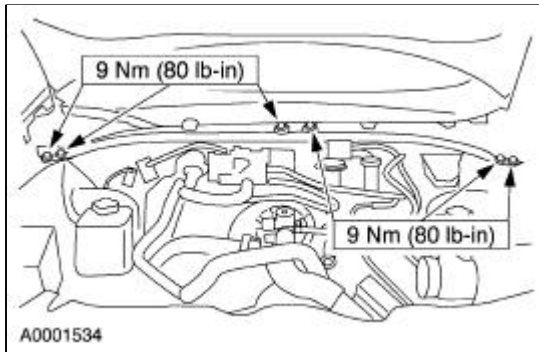
21. Connect the vacuum hoses.




22. Connect the accelerator and speed control cables.



23. Install the engine compartment brace.



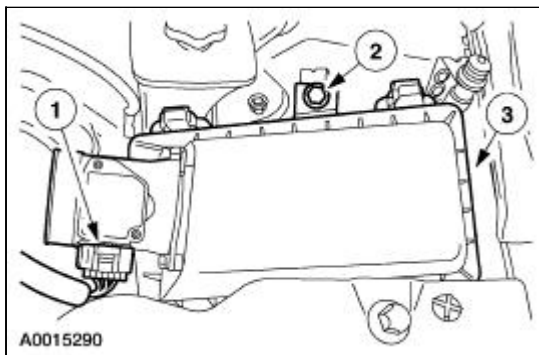
24. Install the cowl vent screen. For additional information, refer to [Section 501-02](#).
25. Install the air cleaner outlet tube. For additional information, refer to [Section 303-12](#).
26. Connect the battery ground cable. For additional information, refer to [Section 414-01](#).
27.  **CAUTION: The cooling system filling and bleeding procedure must be followed exactly or damage to the engine may occur.**

Fill and bleed the engine cooling system. For additional information, refer to [Section 303-03](#).

Valve Cover —LH

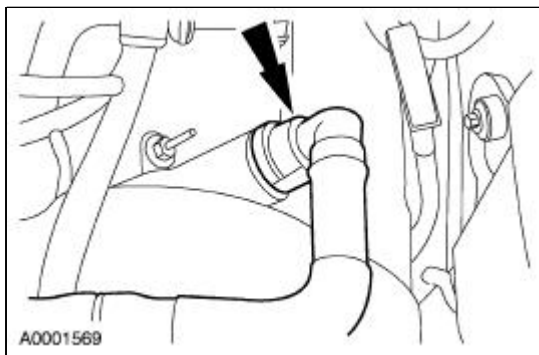
Removal

1. Disconnect the battery ground cable. For additional information, refer to [Section 414-01](#).
2. Remove the air cleaner outlet tube. For additional information, refer to [Section 303-12](#).
3. Remove the air cleaner housing.
 1. Disconnect the mass air flow (MAF) sensor electrical connector.
 2. Remove the bolt.
 3. Remove the housing.

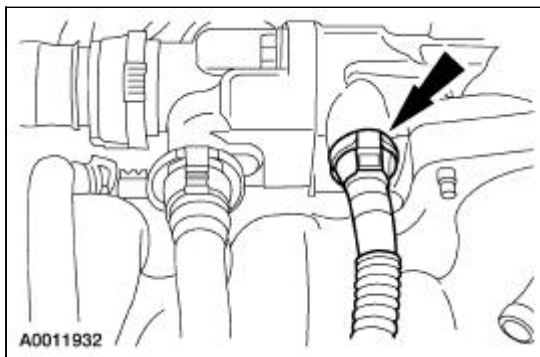


4.  **CAUTION:** To disconnect the normal fitting, squeeze the tabs and pull straight out or damage to the fitting may occur.

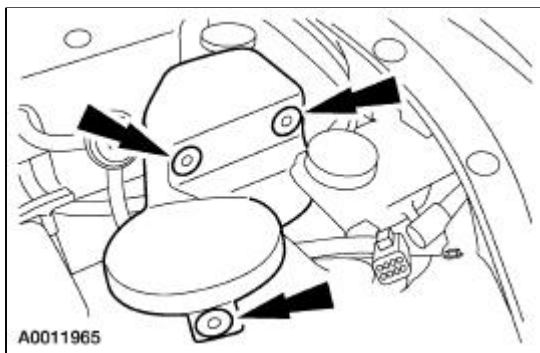
Disconnect the crankcase ventilation tube.



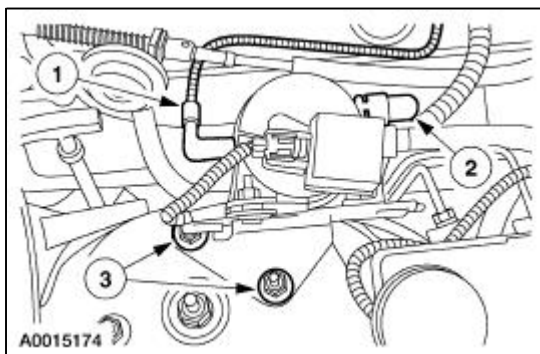
5. Disconnect the fuel line. For additional information, refer to [Section 310-00](#).
6. Disconnect the evaporative emission canister purge valve hose.



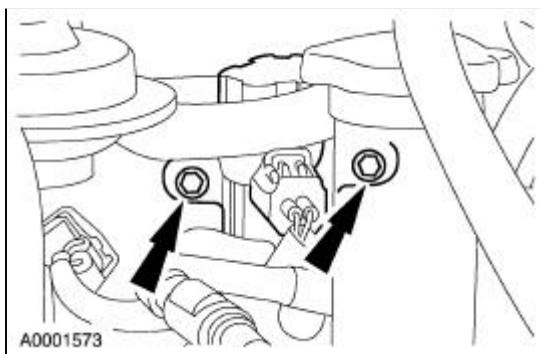
7. Remove the vapor management valve (VMV) cover.



8. Position the VMV aside.
 1. Disconnect the vacuum hose.
 2. Disconnect the purge line.
 3. Remove the nuts and position the valve aside.

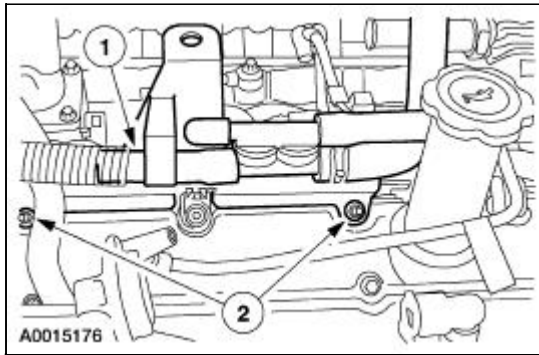


9. Position the engine vacuum regulator (EVR) solenoid aside.

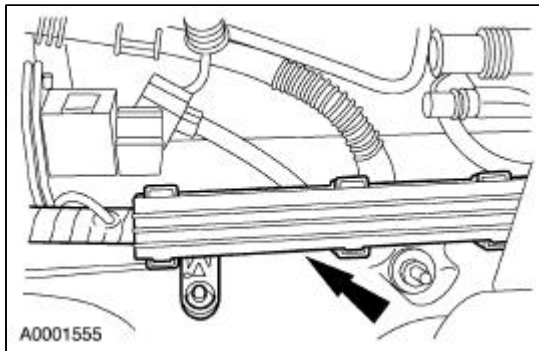


10. Remove the bracket.
 1. Remove the hose.

2. Remove the bracket.

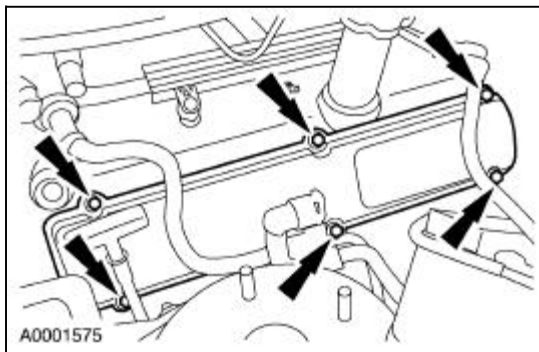


11. Position the engine wiring harness up.

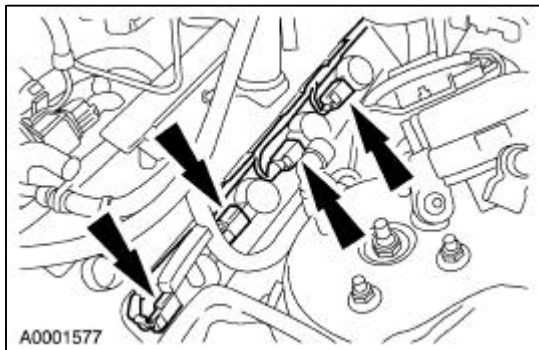


12. Remove the ignition coil cover.

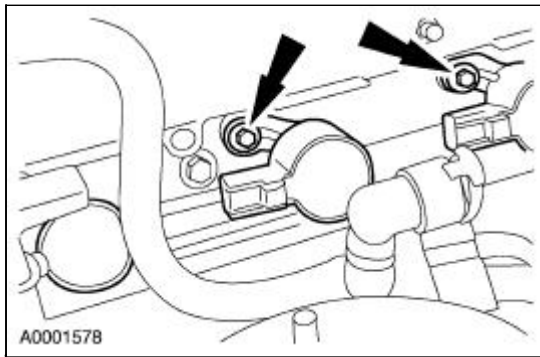
- Inspect the gasket and install a new gasket as necessary.



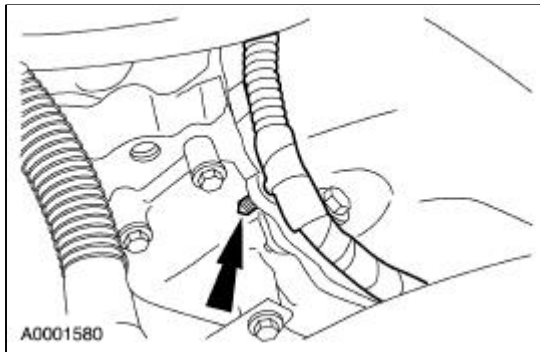
13. Disconnect the ignition coil electrical connectors.



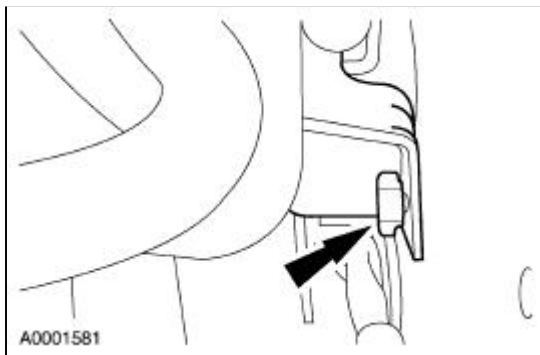
14. Remove the four LH ignition coils.



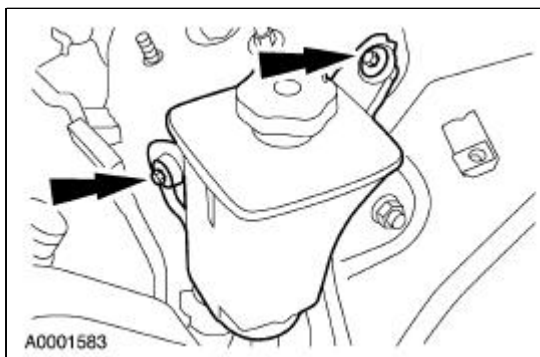
15. Disconnect the four wiring harness retainers.



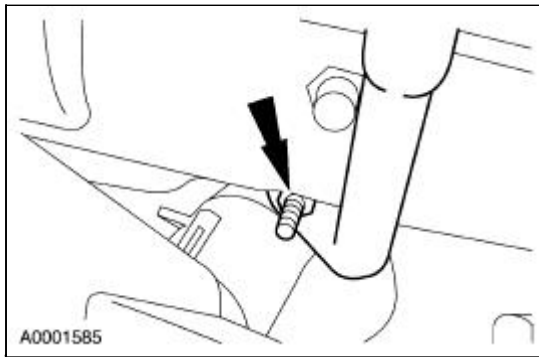
16. Remove the fuel line bracket bolt from the LH shock tower.



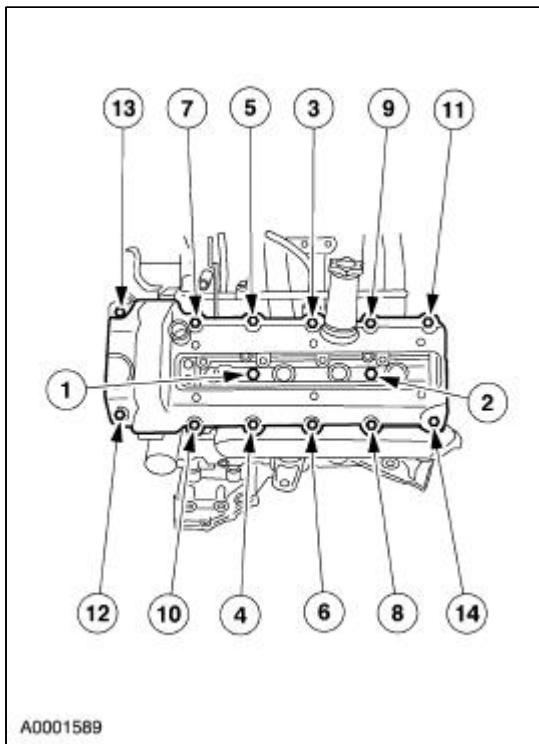
17. Remove the bolts and position the power steering pump reservoir aside.




18. Remove the nut and the oil level indicator tube.

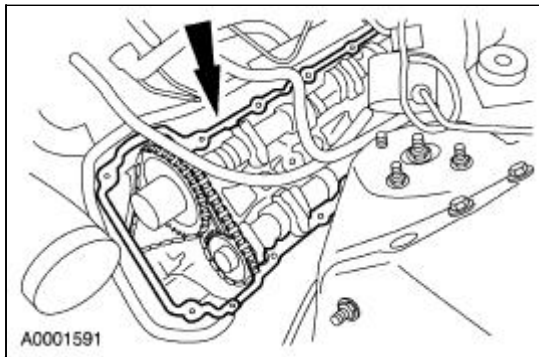


19. Remove the brake line bracket from the LH frame rail.
20. Remove the LH valve cover.
 - Loosen the bolts in the sequence shown.

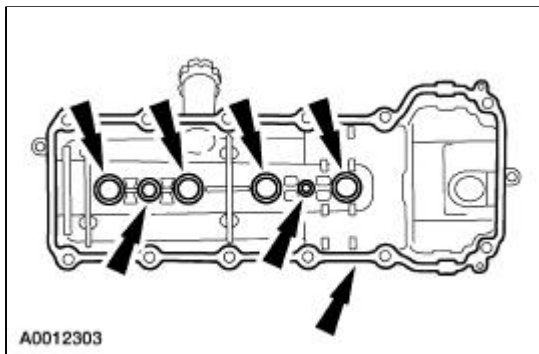


21.  **CAUTION: Do not use metal scrapers, wire brushes, power abrasive discs or other abrasive means to clean the surfaces. These tools cause scratches and gouges, which make leak paths. Use a plastic scraping tool to remove all traces of sealant.**

Clean the sealing surfaces.

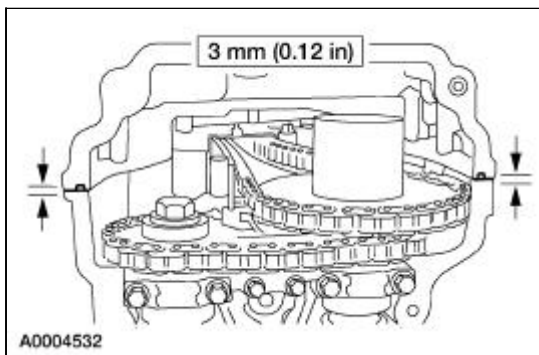


22. Inspect and install new gaskets if necessary.

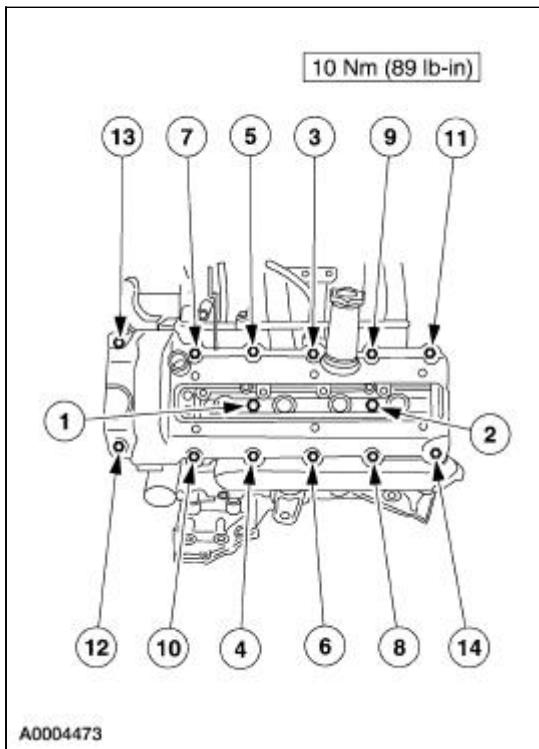


Installation

1. Apply two beads of Silicone Gasket and Sealant F7AZ-19554-EA or equivalent meeting Ford specification WSE-M4G323-A4.



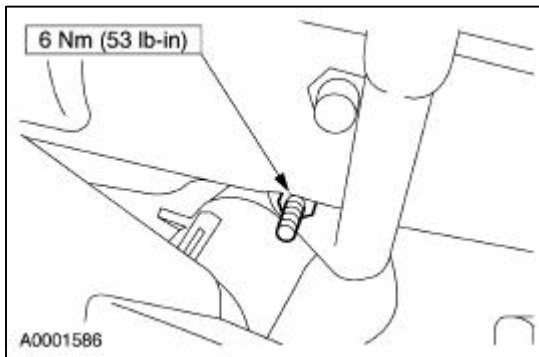
2. Install the LH valve cover.
 - Position the valve cover and tighten the bolts in the sequence shown.



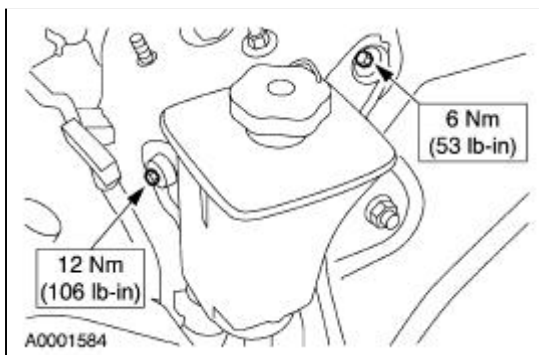
3. Install the brake line bracket.
4. **NOTE:** Lubricate the O-ring seal with Super Premium SAE 5W-30 Motor Oil XO-5W30-QSP or equivalent meeting Ford specification WSS-M2C153-G.

Install the oil level indicator tube.

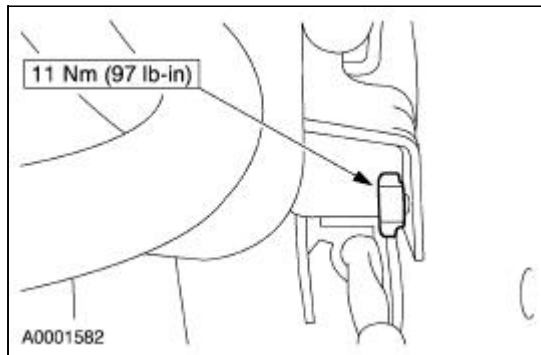
- Inspect the O-ring seal and install a new O-ring seal if necessary.



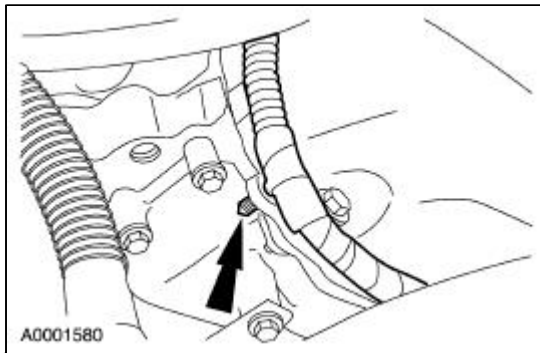
5. Install the power steering pump reservoir.



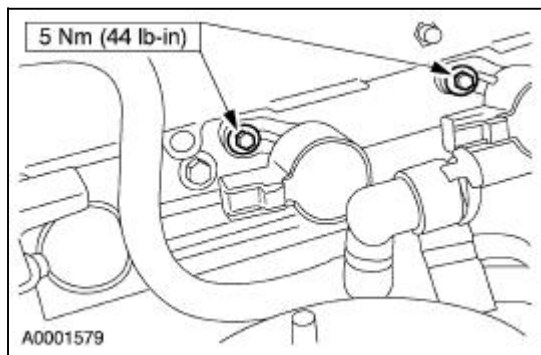
6. Install the fuel line bracket bolt.



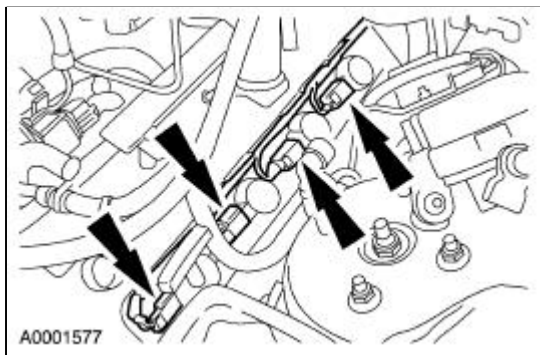
7. Connect the four wiring harness retainers.




8. Install the four LH ignition coils.

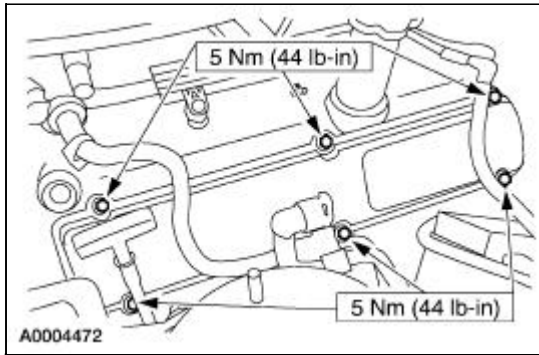


9. Connect the ignition coil electrical connectors.

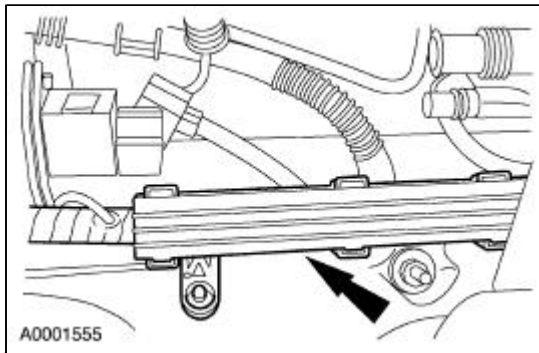


10.  **CAUTION:** Make sure that the wire harness inlet seal is seated on the valve cover or damage to the harness may occur.

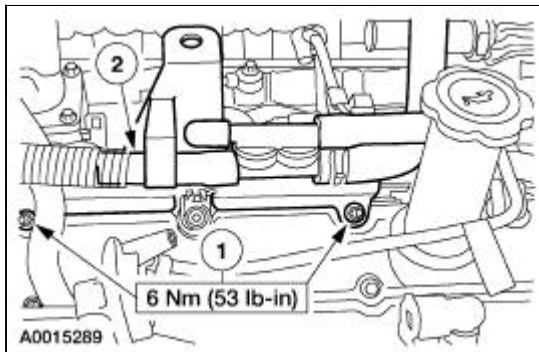
Install the ignition coil cover.



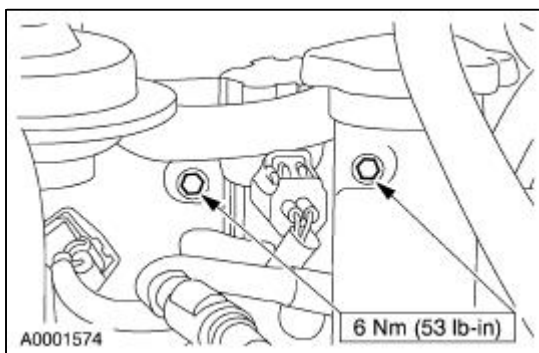
11. Install the engine wiring harness.



12. Install the bracket.
1. Install the bracket.
2. Install the hose.

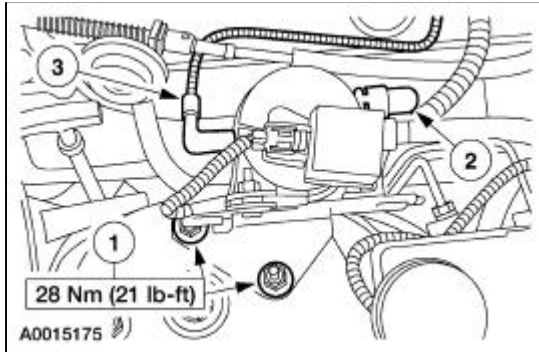


13. Install the EVR solenoid.

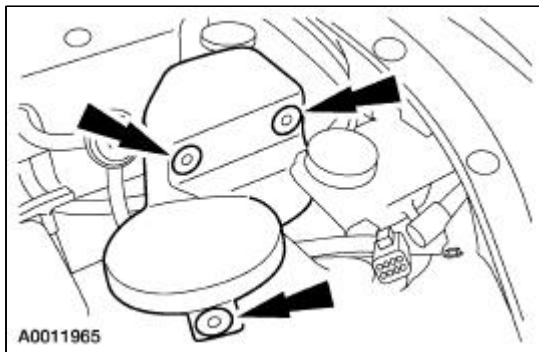


14. Install the VMV.

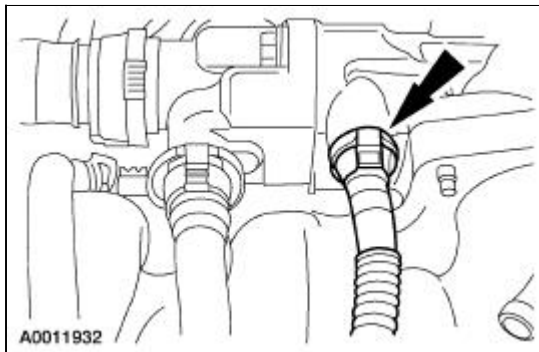
1. Install the nuts.
2. Connect the purge line.
3. Connect the vacuum hose.



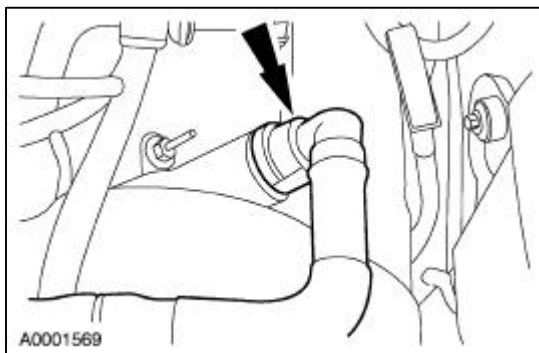
15. Install the VMV cover.



16. Connect the hose.

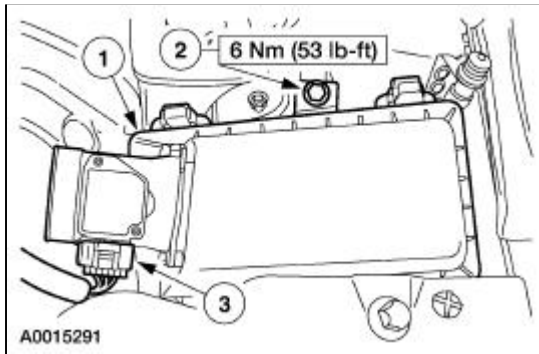


17. Connect the crankcase ventilation tube.



18. Connect the fuel line. For additional information, refer to [Section 310-00](#).

19. Install the air cleaner housing.
 1. Install the housing.
 2. Install the bolt.
 3. Connect the MAF sensor electrical connector.

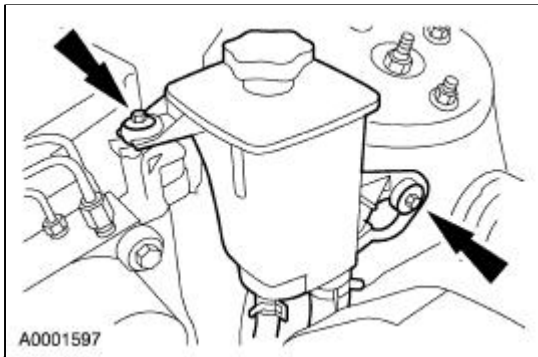


20. Install the air cleaner outlet tube. For additional information, refer to [Section 303-12](#).
 21. Connect the battery ground cable. For additional information, refer to [Section 414-01](#).
-

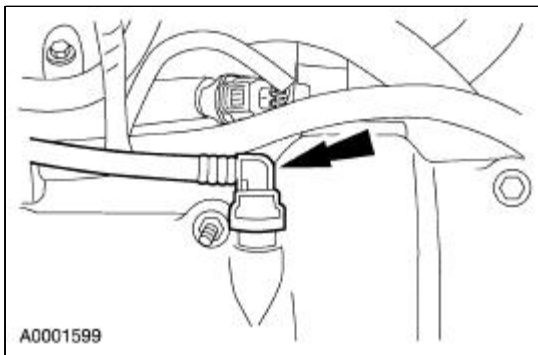
Valve Cover —RH

Removal

1. Disconnect the battery ground cable. For additional information, refer to [Section 414-01](#).
2. Remove the air cleaner outlet tube. For additional information, refer to [Section 303-12](#).
3. Remove the bolts and position the hydraulic cooling fan reservoir aside.

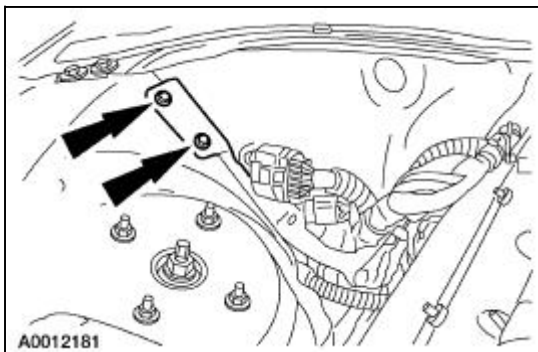


4. Disconnect the crankcase ventilation hose.



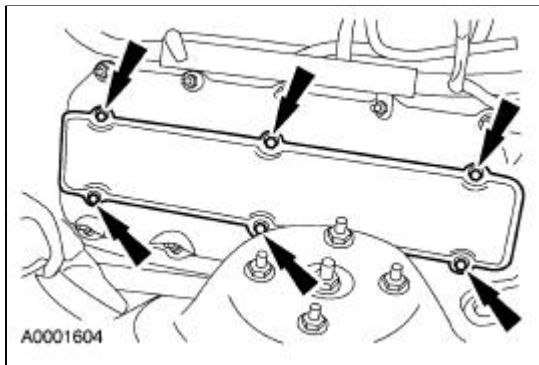
5. **NOTE:** The wiring harness bracket is located on the backside of the RH strut tower.

Remove the bolts and position the wiring harness bracket aside.

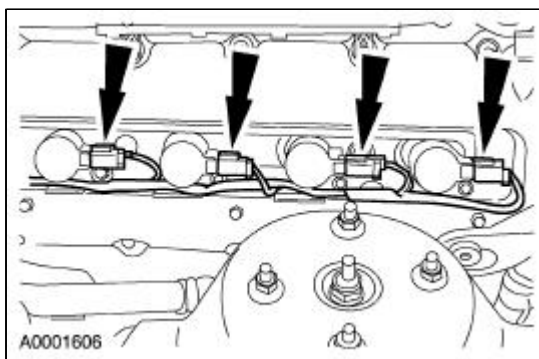


6. Remove the ignition coil cover.

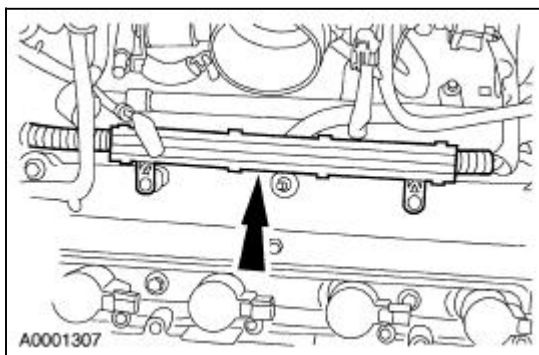
- Inspect the gasket and install a new gasket as necessary.



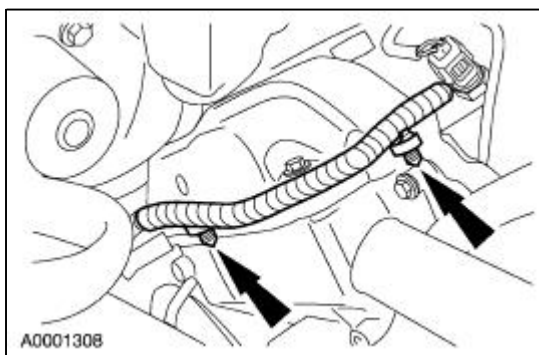
7. Disconnect the ignition coil connectors.



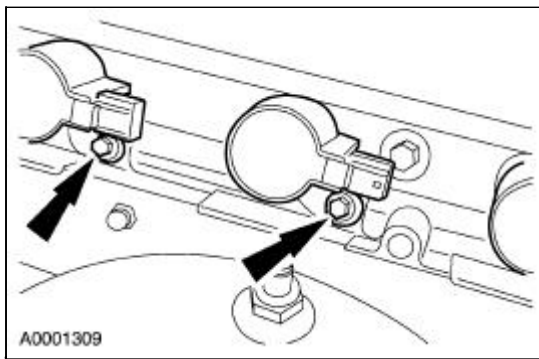
8. Raise the engine wiring harness and disconnect the four fuel injector connectors.



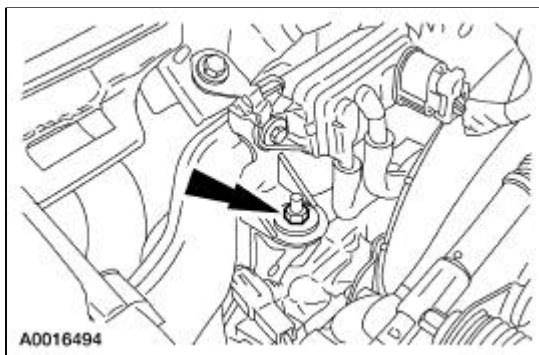
9. Disconnect the four wiring harness retainers.



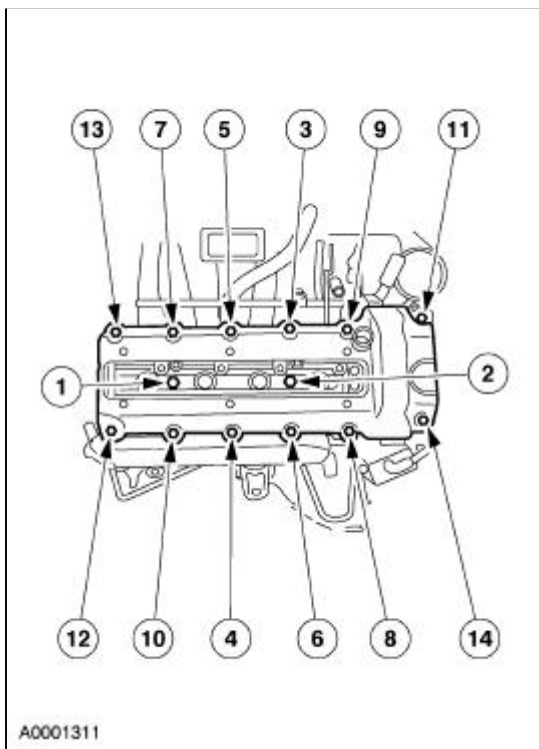
10. Remove the four RH ignition coils.




11. Remove the nut and position the wiring harness aside.

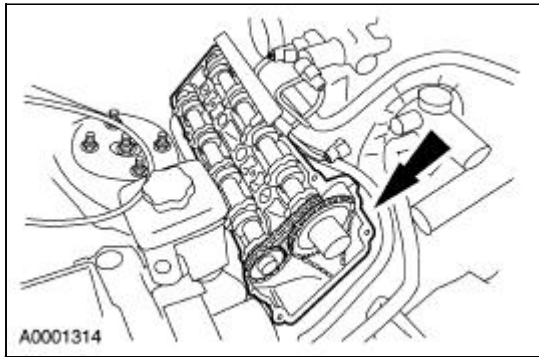


12. Remove the RH valve cover.
 - Loosen the bolts in the sequence shown.

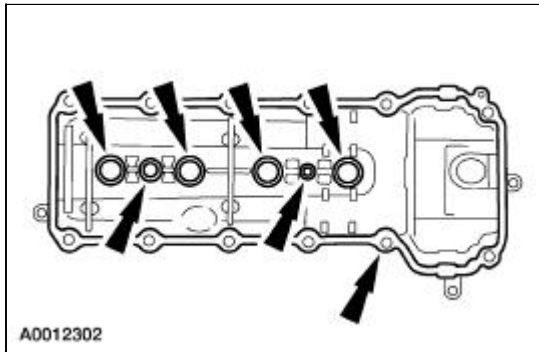


13.  **CAUTION:** Do not use metal scrapers, wire brushes, power abrasive discs or other abrasive means to clean the sealing surfaces. These tools cause scratches and gouges, which make leak paths. Use a plastic scraping tool to remove all traces of sealant.

Clean the sealing surfaces.

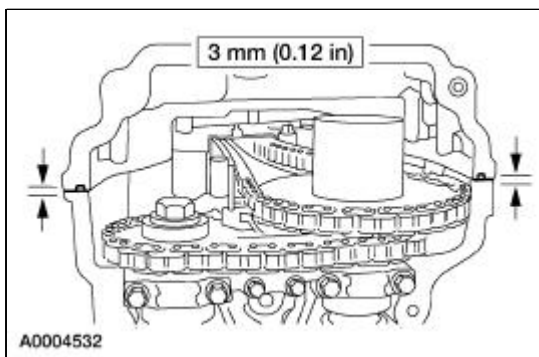


14. Inspect and install new gaskets as necessary.

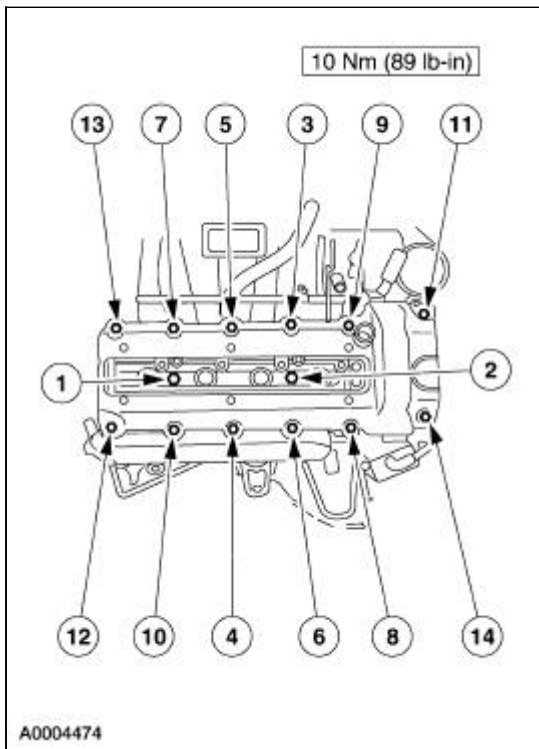


Installation

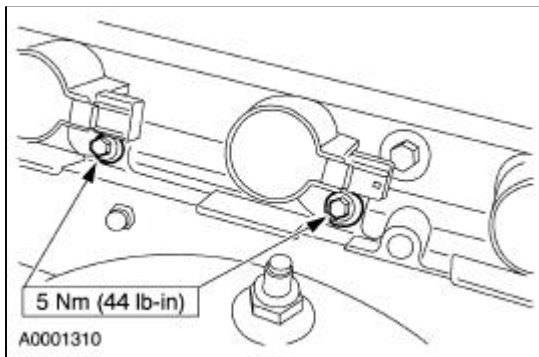
1. Apply two beads of Silicone Gasket and Sealant F7AZ-19554-EA or equivalent meeting Ford specification WSE-M4G323-A4.



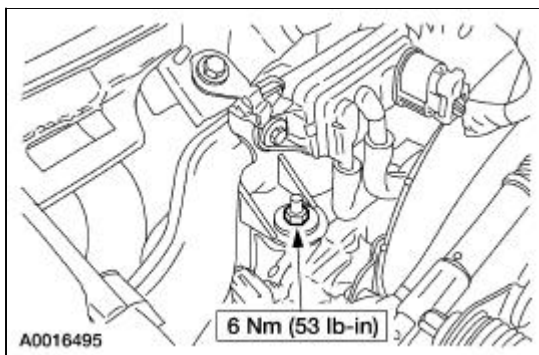
2. Install the RH valve cover.
 - Tighten the bolts in the sequence shown.



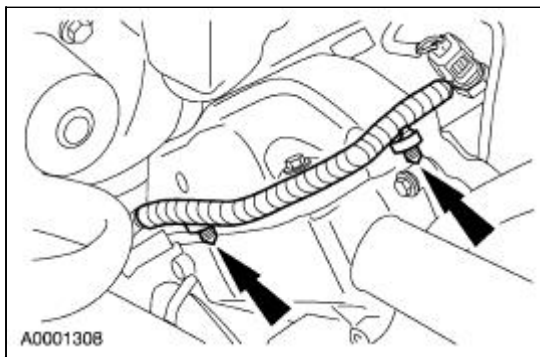
3. Install the ignition coils.



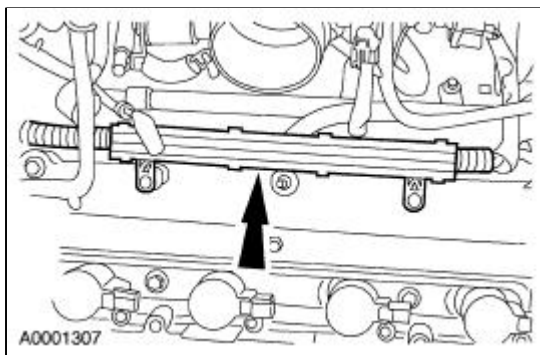
4. Position the wiring harness and install the nut.



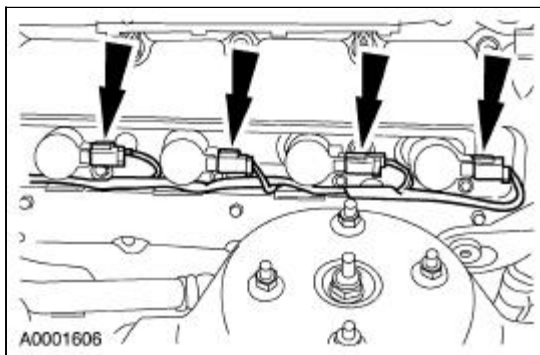
5. Install the four wiring harness retainers.




6. Connect the four fuel injector connectors and position the engine wiring harness.

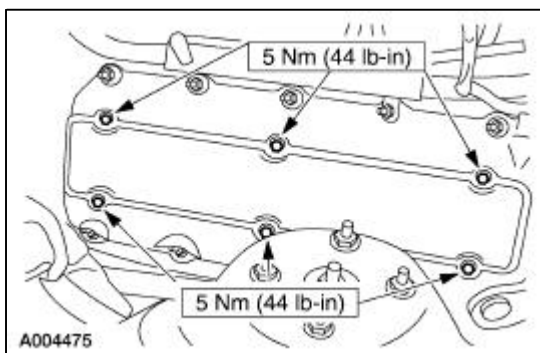


7. Connect the ignition coil connectors.



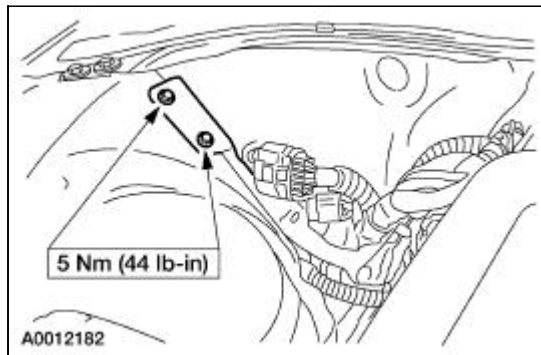
8.  **CAUTION:** Make sure that the wire harness inlet seal is seated in the valve cover or damage to the harness may occur.

Inspect the gasket and install a new gasket as necessary. Install the ignition coil cover.

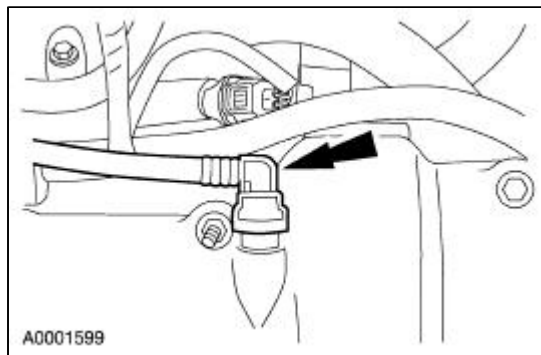


9. **NOTE:** The wiring harness bracket is located on the backside of the RH strut tower.

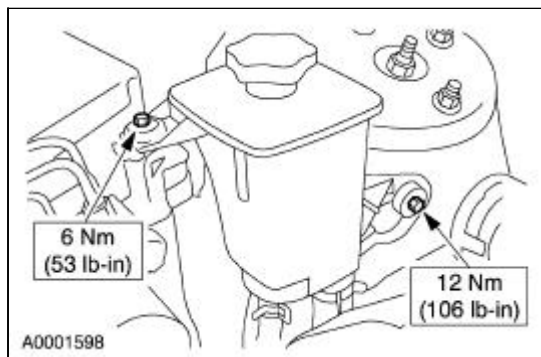
Install the wiring harness bracket.



10. Connect the crankcase ventilation hose.



11. Install the hydraulic cooling fan reservoir.





12. Install the air cleaner outlet tube. For additional information, refer to [Section 303-12](#).

13. Connect the battery ground cable. For additional information, refer to [Section 414-01](#).

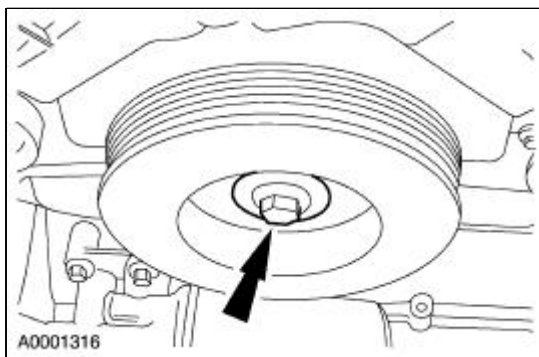
Crankshaft Pulley

Special Tool(s)

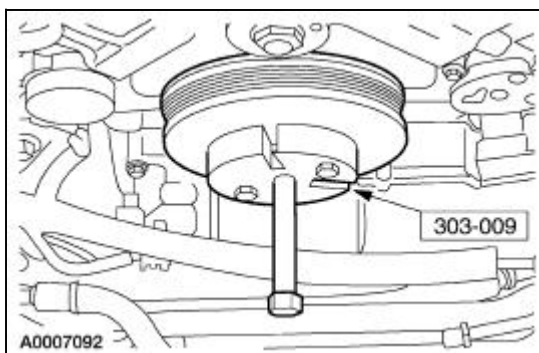
 ST1286-A	Crankshaft Damper Remover 303-009 (T58P-6316-D)
 ST1287-A	Crankshaft Damper Replacer 303-102 (T74P-6316-B)

Removal

1. Remove the hydraulic cooling fan assembly. For additional information, refer to [Section 303-03](#).
2. Remove the drive belt. For additional information, refer to [Section 303-05](#).
3. Remove the bolt.
 - Discard the bolt.

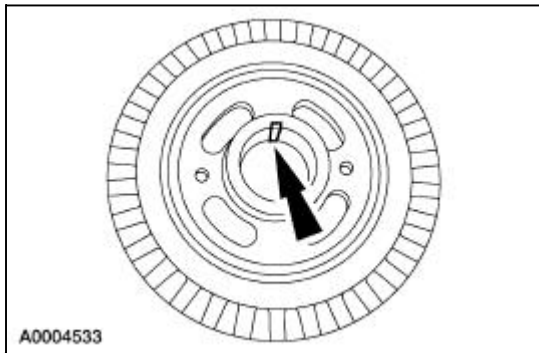


4. Using the special tool, remove the crankshaft pulley.

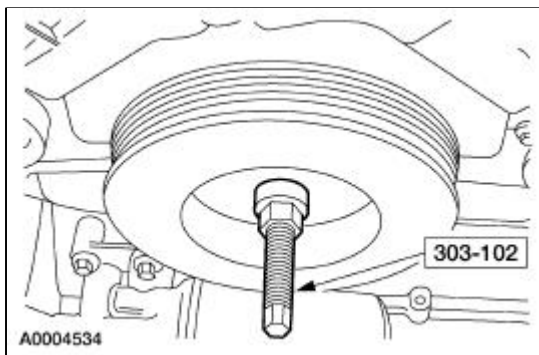


Installation

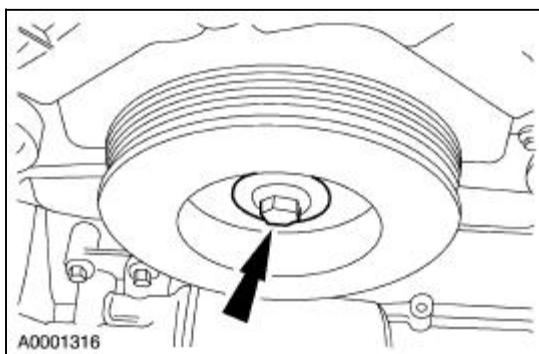
1. Apply a bead of Silicone Gasket and Sealant F7AZ-19554-EA or equivalent meeting Ford specification WSE-M4G323-A4 to the keyway.



2. Using the special tool, install the crankshaft pulley.



3. Install a new bolt and tighten in four stages.
 - Stage 1: Tighten to 80 Nm (59 lb-ft).
 - Stage 2: Loosen the bolt two complete turns.
 - Stage 3: Tighten to 50 Nm (37 lb-ft).
 - Stage 4: Tighten an additional 90 degrees.



4. Install the drive belt. For additional information, refer to [Section 303-05](#).
 5. Install the hydraulic cooling fan assembly. For additional information, refer to [Section 303-03](#).
-

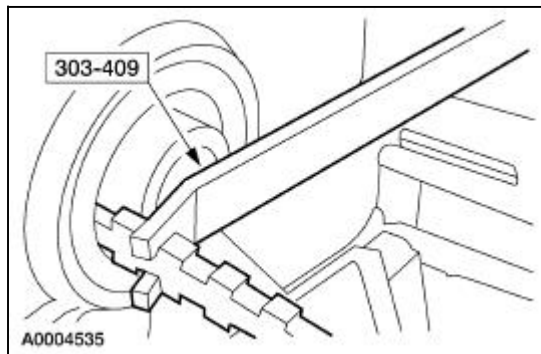
Crankshaft Front Oil Seal

Special Tool(s)

 ST1385-A	Remover, Oil Seal 303-409 (T92C-6700-CH)
 ST2423-A	Installer, Crankshaft Front Oil Seal 303-646

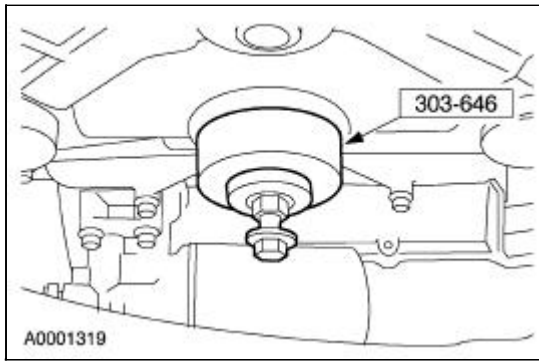
Removal

1. Remove the front crankshaft pulley. For additional information, refer to [Crankshaft Pulley](#) in this section.
2. Using the special tool, remove the front crankshaft seal.
 - Discard the seal.



Installation

1. Using the special tool, install a new front crankshaft seal.

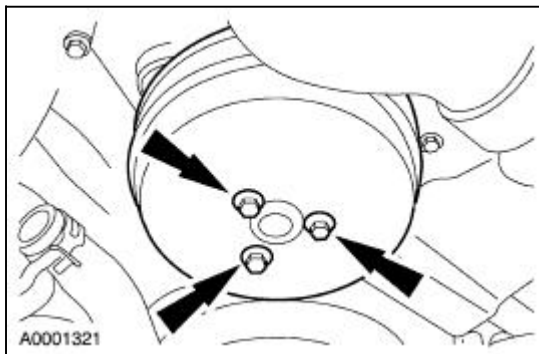


2. Install the crankshaft pulley. For additional information, refer to [Crankshaft Pulley](#) in this section.
-

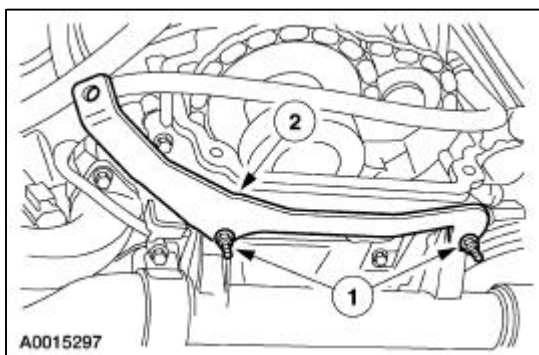
Engine Front Cover

Removal

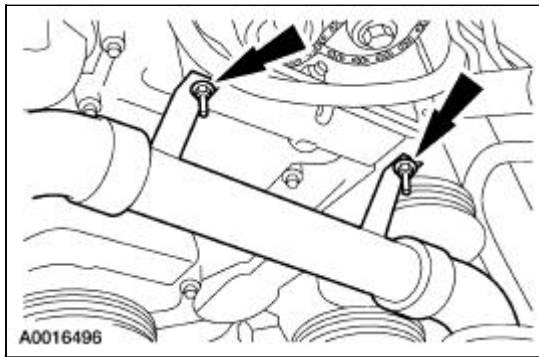
1. Drain the engine cooling system. For additional information, refer to [Section 303-03](#).
2. Remove the LH valve cover. For additional information, refer to [Valve Cover—LH](#) in this section.
3. Remove the RH valve cover. For additional information, refer to [Valve Cover—RH](#) in this section.
4. Remove the engine cooling fan assembly. For additional information, refer to [Section 303-03](#).
5. Loosen the water pump pulley bolts.
6. Remove the generator. For additional information, refer to [Section 414-02](#).
7. Remove the water pump pulley.
 - Discard the bolts.



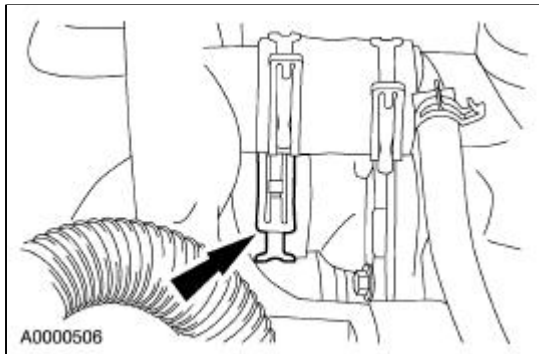
8. Remove the bracket.
 1. Remove the nuts.
 2. Remove the bracket.



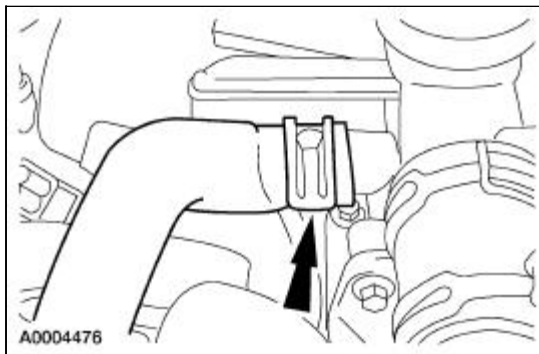
9. Remove the lower radiator hose stud bolts.



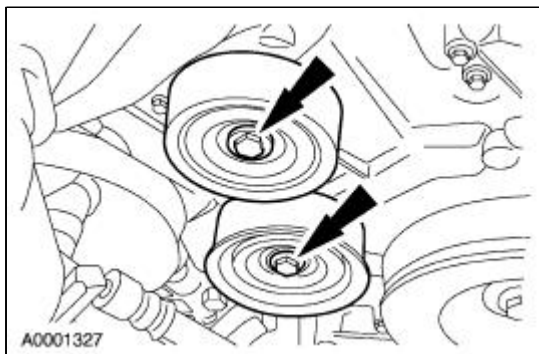
10. Disconnect the lower radiator hose from the thermostat housing.



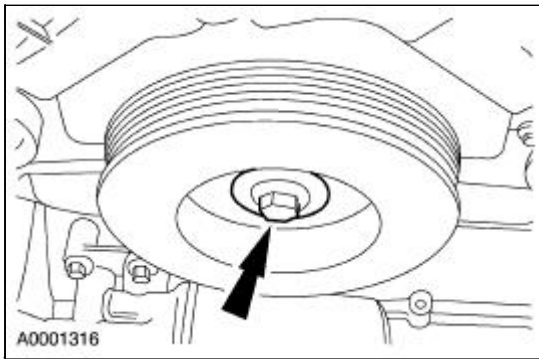
11. Disconnect the heater hose.



12. Remove the idler pulleys.

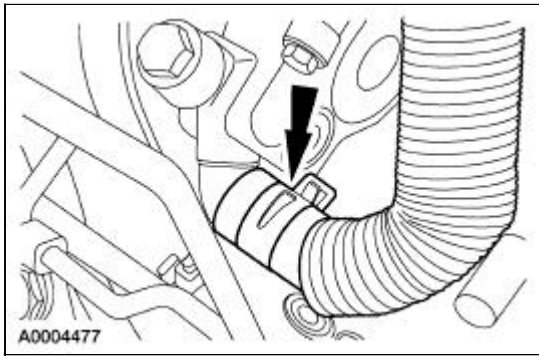


13. Remove the crankshaft pulley. For additional information, refer to [Crankshaft Pulley](#) in this section.



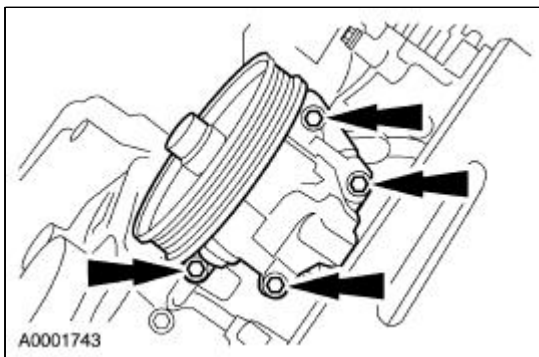
14. Remove the A/C compressor. For additional information, refer to [Section 412-03](#).

15. Disconnect the power steering reservoir hose and drain the reservoir

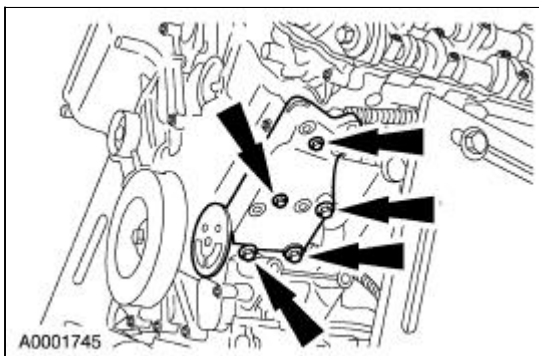


16. **NOTE:** One bolt is blocked by the power steering pressure line and will have to be removed in stages.

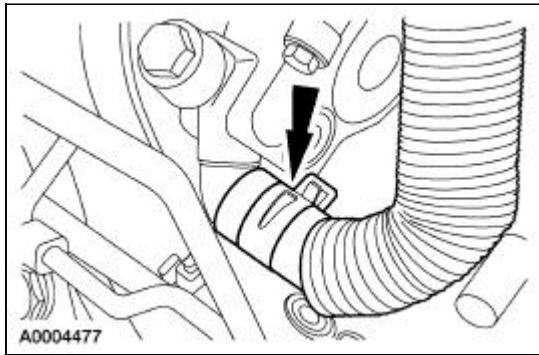
Remove the bolts and position the power steering pump aside.



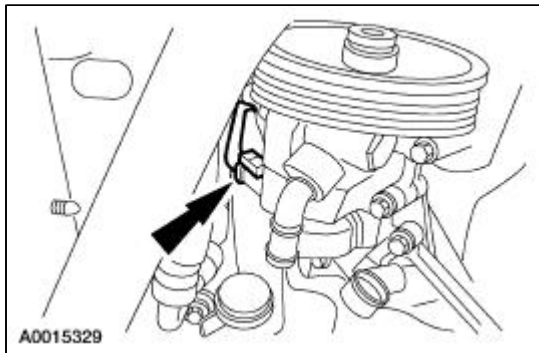
17. Remove the power steering pump bracket.



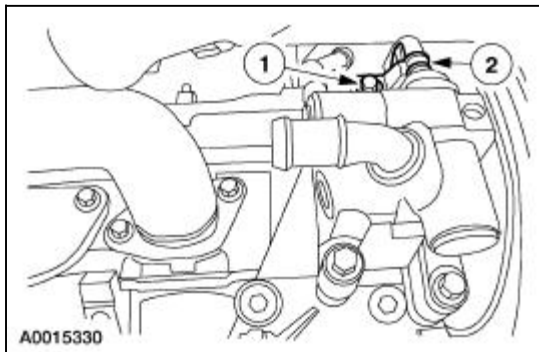
18. Disconnect the hydraulic cooling fan pump reservoir hose and drain the reservoir.



19. Disconnect the electrical connector.

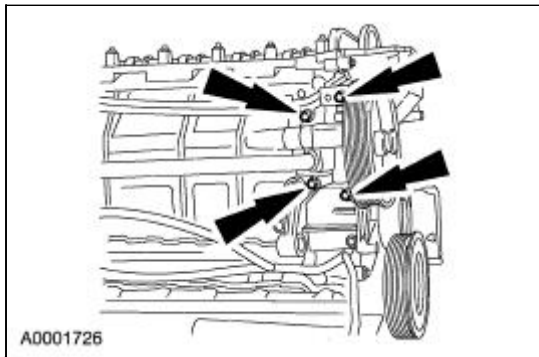


20. Remove the hydraulic fan pump reservoir line bracket.
1. Remove the bolt.
2. Remove the bracket.

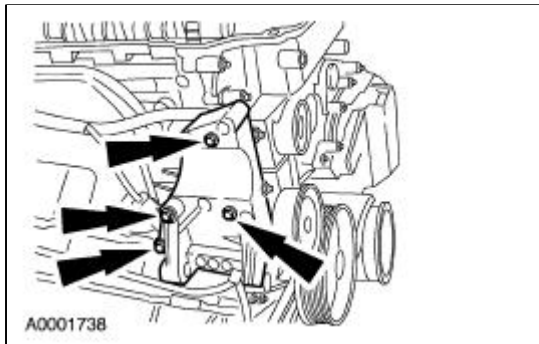


21. **NOTE:** One bolt is blocked by the hydraulic cooling fan pressure line and will have to be removed in stages.

Remove the hydraulic cooling fan pump.

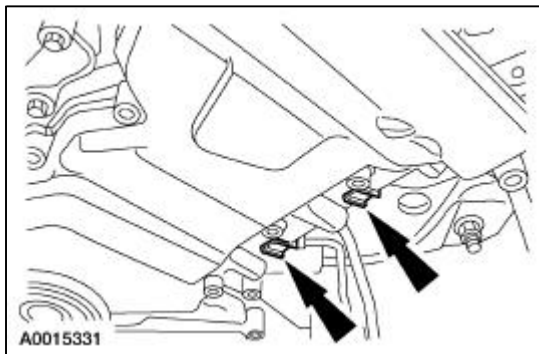


22. Remove the hydraulic cooling fan pump bracket.



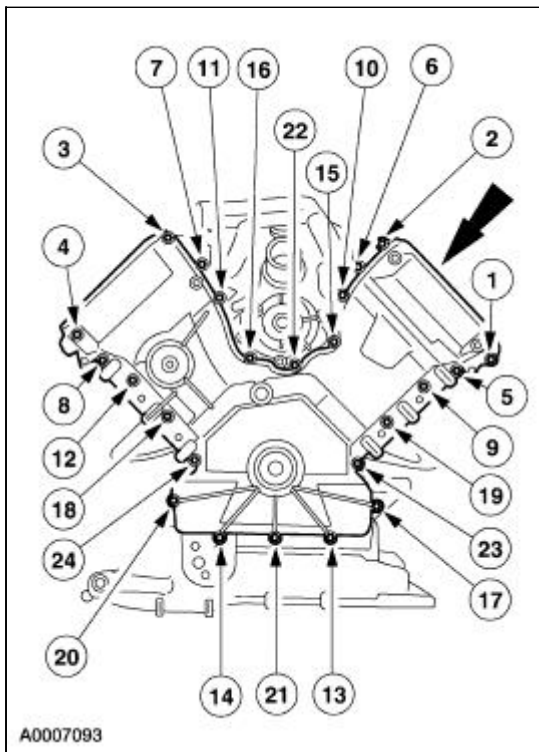
23. Lower the vehicle.


24. Disconnect the five wiring harness clips.



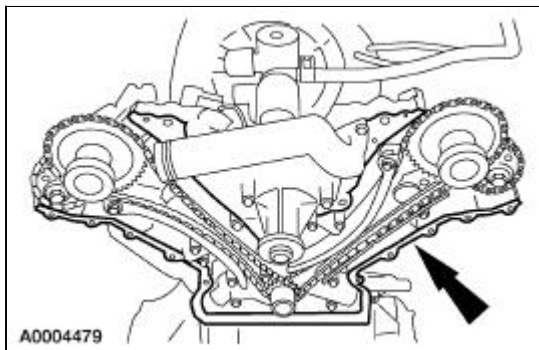
25. Remove the engine front cover.

- Remove the bolts in the sequence shown.
- Remove the engine front cover.



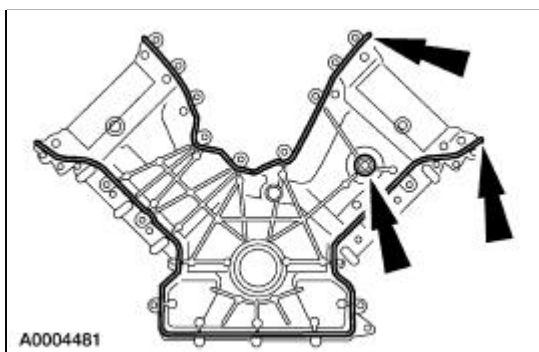
26.  **CAUTION:** Do not use metal scrapers, wire brushes, power abrasive discs or other abrasive means to clean the sealing surfaces. These tools cause scratches and gouges, which make leak paths. Use a plastic scraping tool to remove all traces of sealant.

Clean the sealing surfaces.

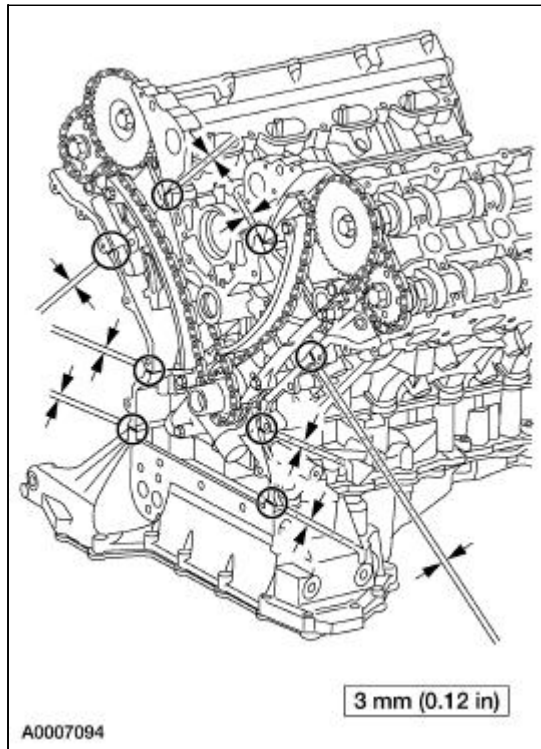


Installation

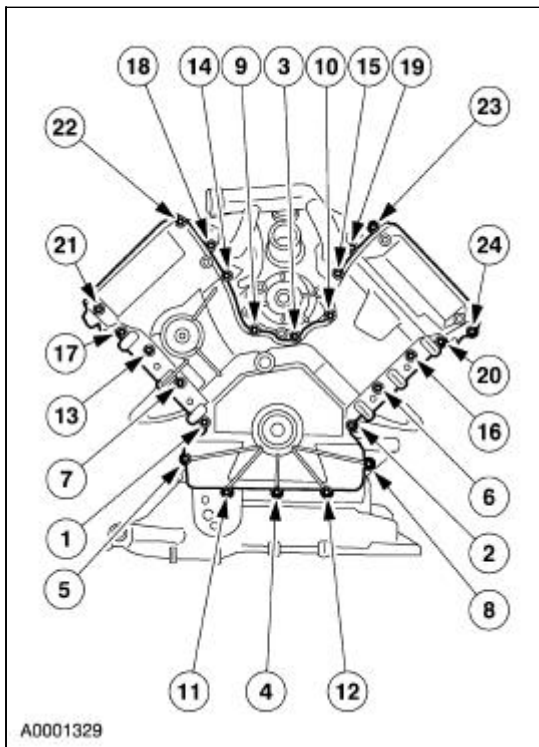
1. Install new gaskets.



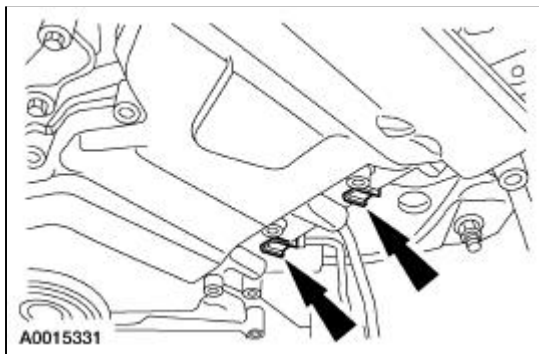
2. Apply Silicone Gasket and Sealant F7AZ-19554-EA or equivalent meeting Ford specification WSE-M4G323-A4 in eight places.



3. Install the engine front cover.
 - Position the engine front cover on the cylinder block.
 - Loosely install the bolts.
 - Tighten the bolts in two stages in the sequence shown.
 - Stage 1: Tighten to 5 Nm (44 lb-in).
 - Stage 2: Tighten to 10 Nm (89 lb-in).

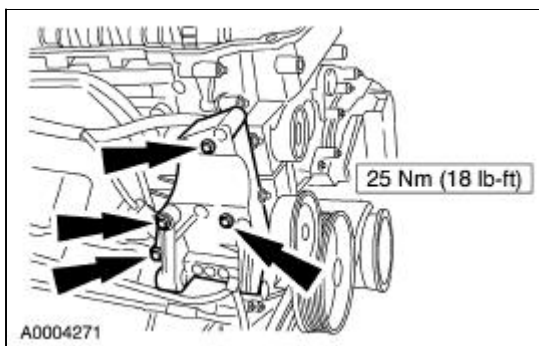


4. Connect the five wiring harness clips.



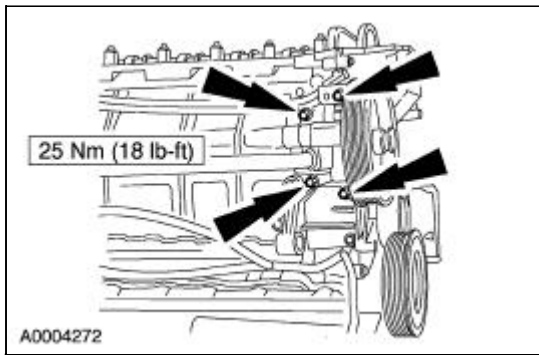
5. Raise the vehicle.
6. **NOTE:** The wiring harness is positioned behind the bracket.

Install the hydraulic cooling fan pump bracket.

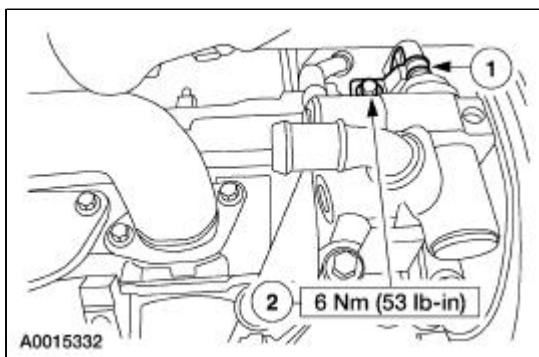


7. **NOTE:** One bolt is blocked by the hydraulic cooling fan pressure line and will have to be installed in stages.

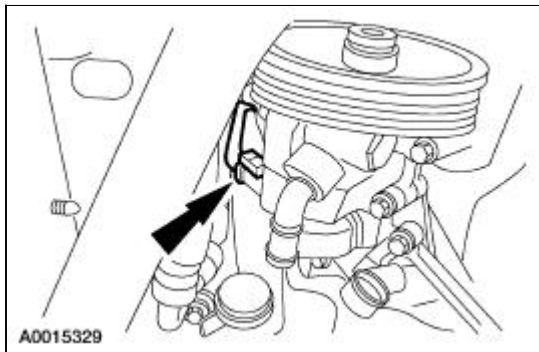
Install the hydraulic cooling fan pump.



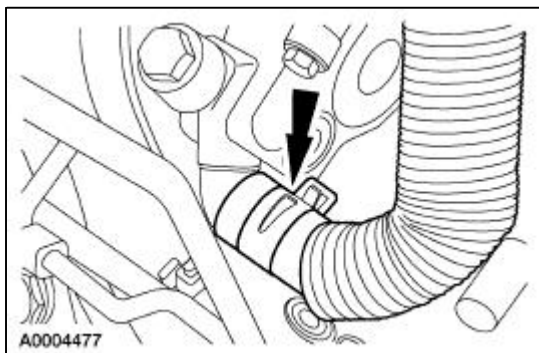
8. Install the hydraulic fan pump reservoir line bracket.
 1. Install the bracket.
 2. Install the bolt.



9. Connect the electrical connector.

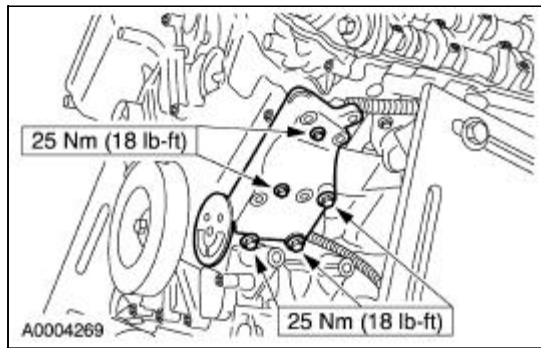


10. Connect the hydraulic cooling fan reservoir hose.



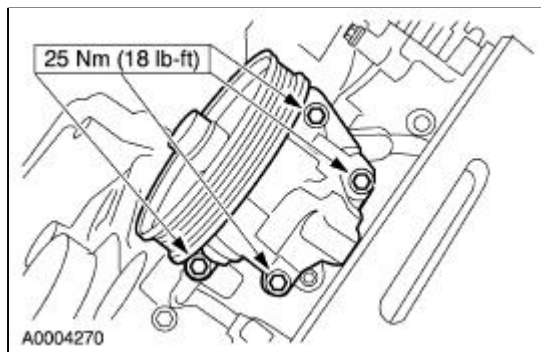
11. **NOTE:** The wiring harness is positioned behind the bracket.

Install the power steering pump bracket.

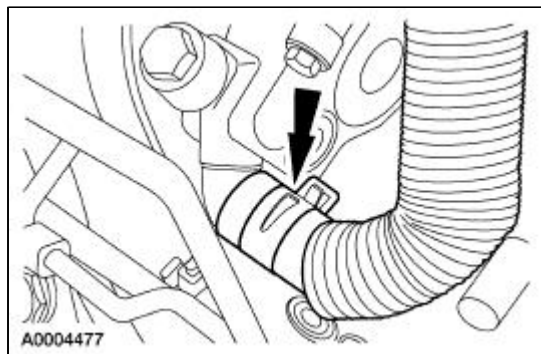


12. **NOTE:** One bolt is blocked by the power steering pressure line and will have to be installed in stages.

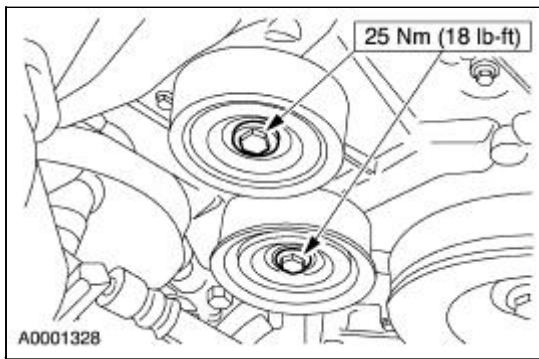
Install the power steering pump.



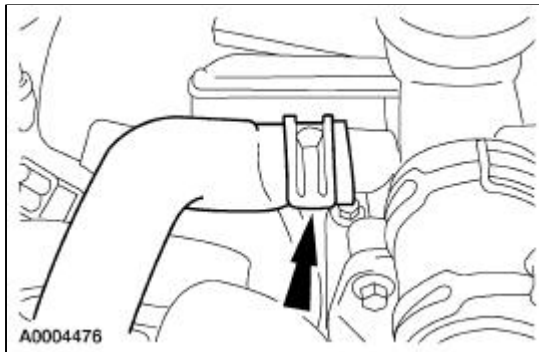
13. Connect the power steering reservoir hose.



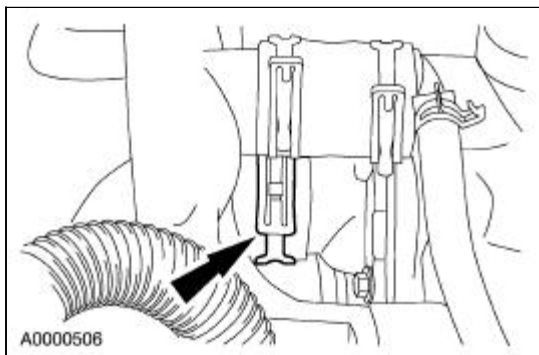
14. Install the A/C compressor. For additional information, refer to [Section 412-03](#).
15. Install the crankshaft pulley. For additional information, refer to [Crankshaft Pulley](#) in this section.
16. Install the idler pulleys.



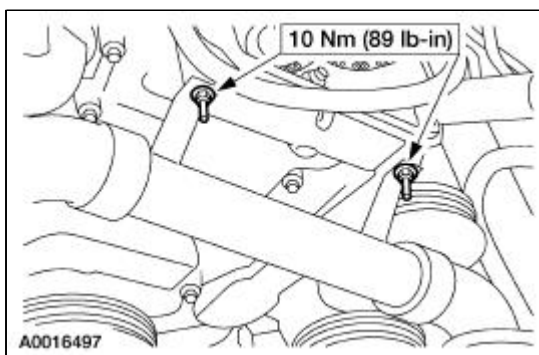
17. Connect the heater hose.



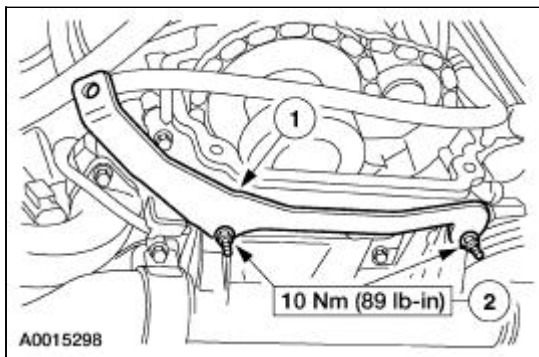
18. Connect the lower radiator hose to the thermostat housing.



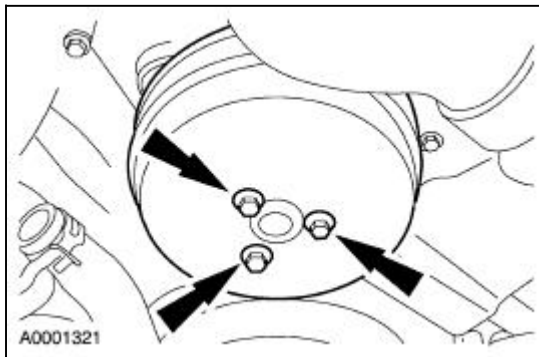
19. Install the stud bolts.



20. Install the bracket.
1. Install the bracket.
2. Install the nuts.





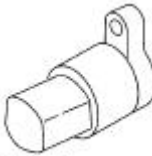
21. Position the water pump pulley and loosely install new bolts.
22. Install the generator. For additional information, refer to [Section 414-02](#).
23. Tighten the bolts in two stages.
 - Stage 1: Tighten to 10 Nm (89 lb-in).
 - Stage 2: Tighten an additional 45 degrees.



24. Install the engine cooling fan assembly. For additional information, refer to [Section 303-03](#).
 25. Install the RH valve cover. For additional information, refer to [Valve Cover—RH](#) in this section.
 26. Install the LH valve cover. For additional information, refer to [Valve Cover—LH](#) in this section.
 27. Fill and bleed the engine cooling system. For additional information, refer to [Section 303-03](#).
 28. Fill and bleed the hydraulic cooling fan. For additional information, refer to [Section 303-03](#).
 29. Fill the power steering system. For additional information, refer to [Section 211-00](#).
-

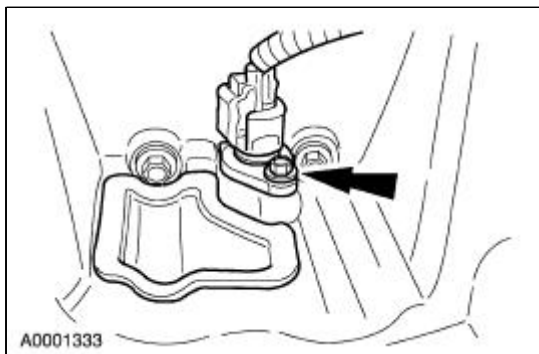
Timing Drive Components —Primary

Special Tool(s)

 ST2398-B	Camshaft Setting/Locking Tool 303-530
 ST2399-A	Timing Chain Tensioning Tool 303-532
 ST2401-A	Crankshaft Positioning Tool 303-645

Removal

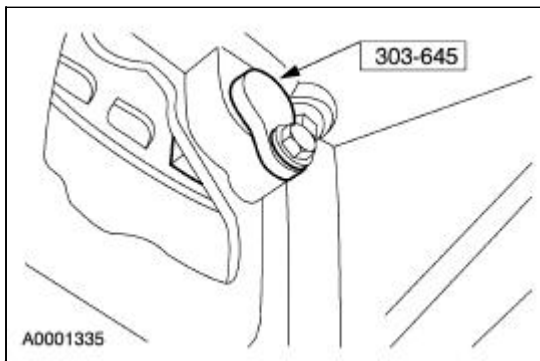
1. Remove the engine front cover. For additional information, refer to [Engine Front Cover](#) in this section.
2. Raise the vehicle.
3. Remove the crankshaft position (CKP) sensor and the torque converter cover.



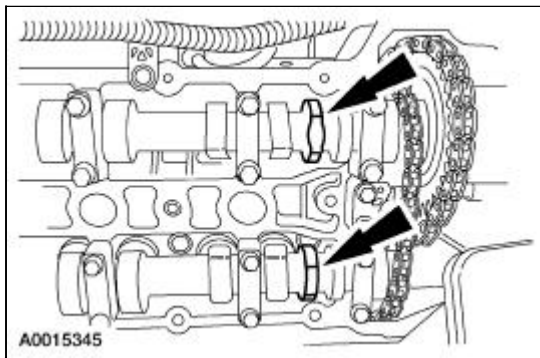
4. **NOTE:** There is one window on the ignition pulse wheel that is unique to accept the special tool.

Install the special tool.

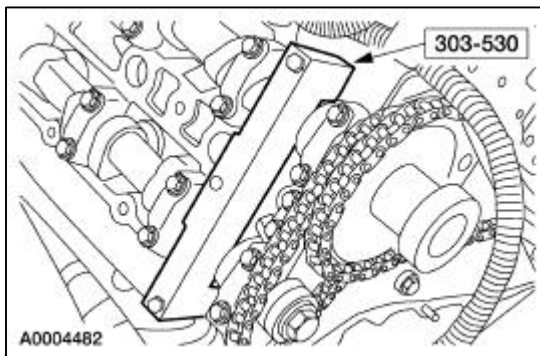
- Turn the crankshaft to 45 degrees ATDC. The crankshaft keyway will be in the 6 o'clock position.
- Install the special tool.



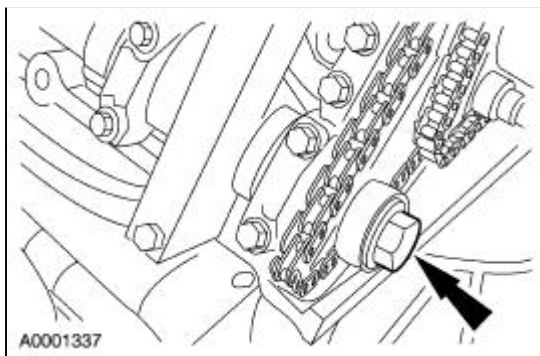
5. Lower the vehicle.
6. Make sure the lobes of the camshaft are facing upwards. If not, repeat Step 4.



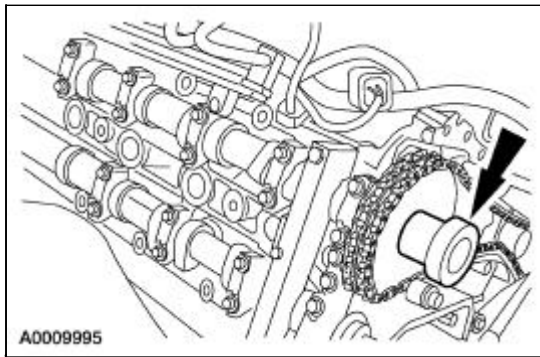
7. Install the special tool on the RH cylinder head.



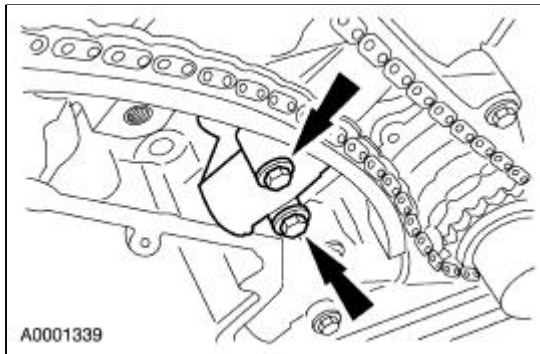
8. Loosen the exhaust camshaft sprocket bolt.



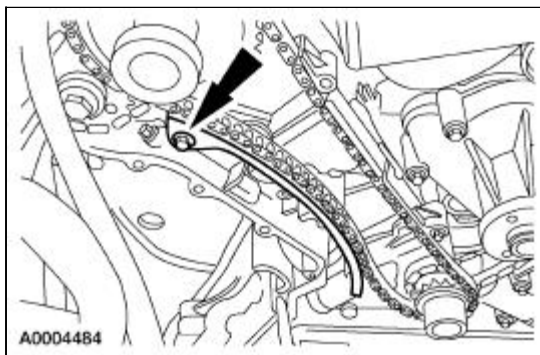
9. Loosen the intake camshaft sprocket bolt and slide the camshaft sprockets forward on the bolts.



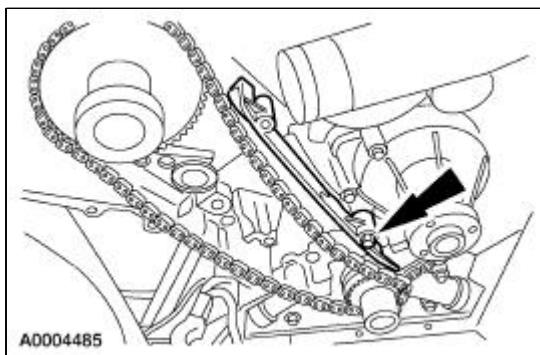
10. Remove the RH timing chain tensioner and blanking plate.



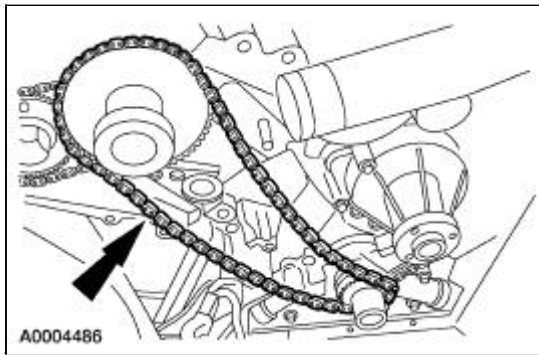
11. Remove the tensioner arm.



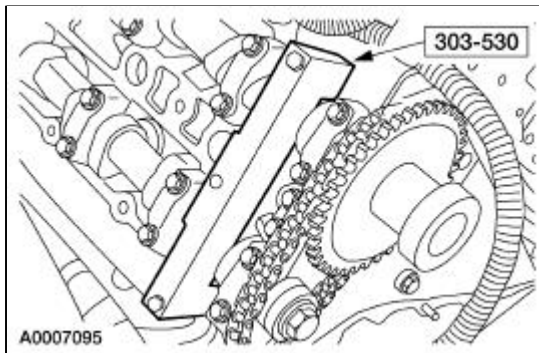
12. Remove the timing chain guide.



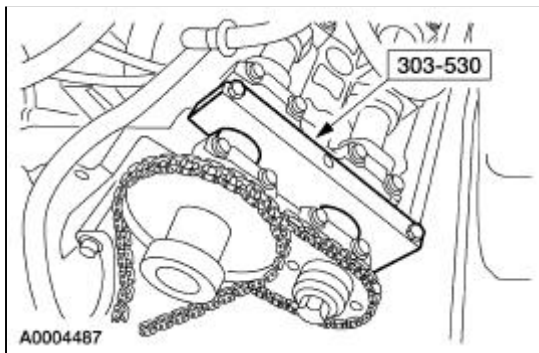
13. Remove the RH primary timing chain and crankshaft sprocket as an assembly.



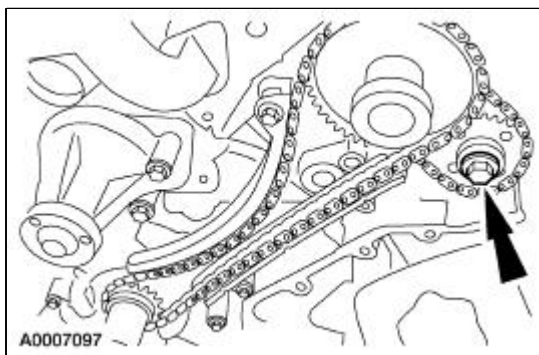
14. Remove the special tool from the RH head.



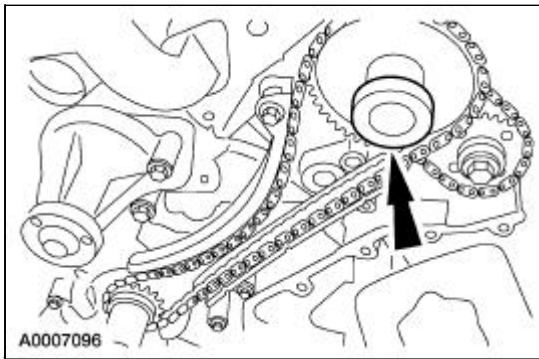
15. Install the special tool on the LH head.



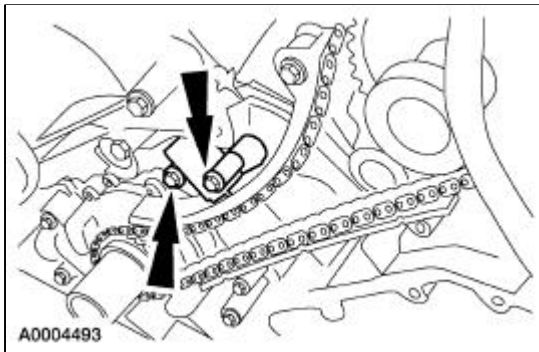
16. Loosen the exhaust camshaft sprocket bolt.



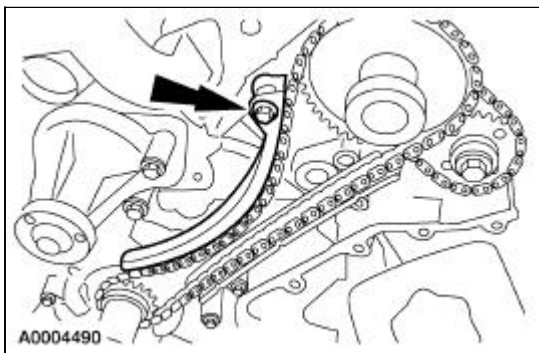
17. Loosen the intake sprocket bolt and slide the camshaft sprockets forward on the bolts.



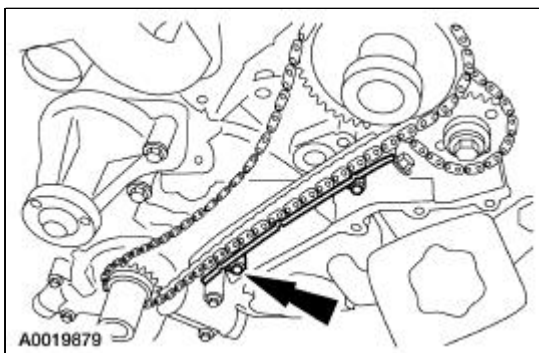
18. Remove the LH timing chain tensioner and blanking plate.



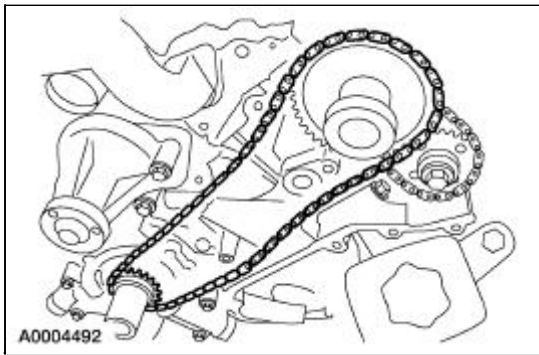
19. Remove the tensioner arm.



20. Remove the timing chain guide.

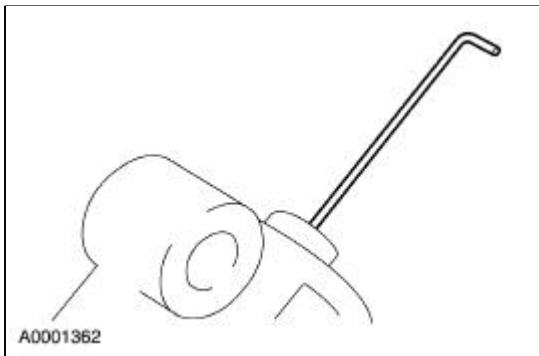


21. Remove the LH primary timing chain and crankshaft sprocket as an assembly.



Installation

1. Reset the timing chain tensioners.
 - Insert a fine wire and dislodge the check ball.
 - Using finger pressure, compress the tensioner.
 - Remove the wire.

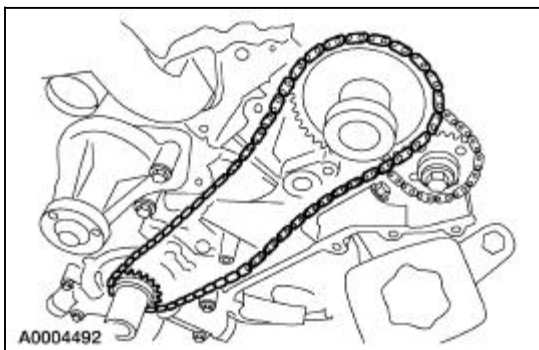


2. **NOTE:** If the timing mark on the LH timing chain crankshaft gear is facing toward the rear of the engine, install the RH timing chain crankshaft gear with the mark facing forward. If the timing mark on the LH timing chain crankshaft gear is facing toward the front of the engine, install the RH timing chain crankshaft gear with the mark facing toward the rear of the engine.

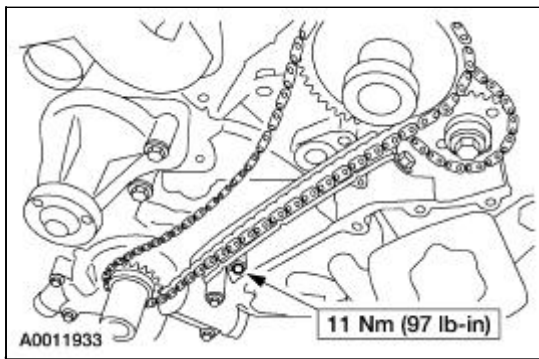
NOTE: The camshaft holding tool should still be installed on the LH cylinder head.

Position the LH timing chain and crankshaft gear.

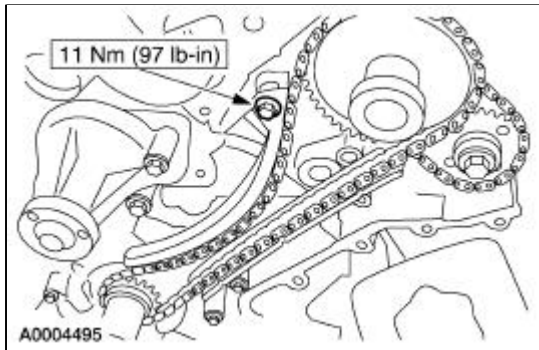
- Position the timing chain over the LH intake camshaft sprocket.
- Position the crankshaft gear in the timing chain.
- Position the timing chain and crankshaft gear over the crankshaft as an assembly.



3. Install the LH timing chain guide.



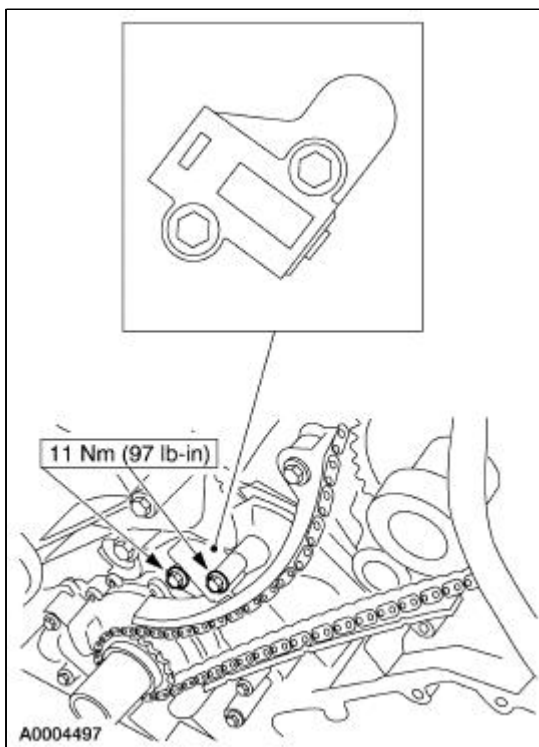
4. Install the LH timing chain tensioner arm.



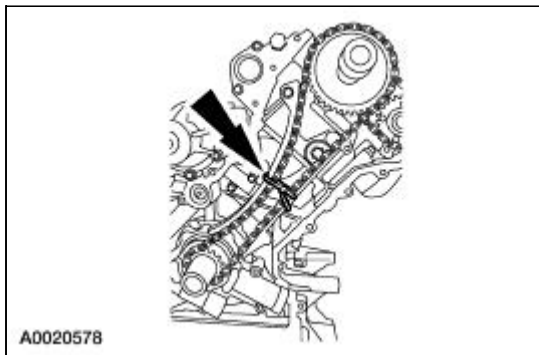
5.  **CAUTION:** The orientation of the blanking plate must be as shown or the oil galley will not seal, resulting in low oil pressure and possible engine damage.

Install the LH timing chain tensioner.

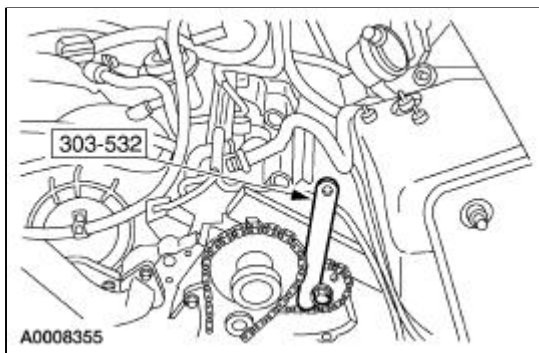
- Position the blanking plate.
- Install the LH timing chain tensioner and blanking plate.



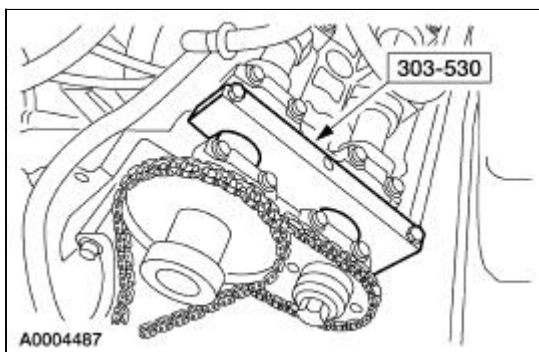
6. Install a tie strap to take up the slack in the timing chain.



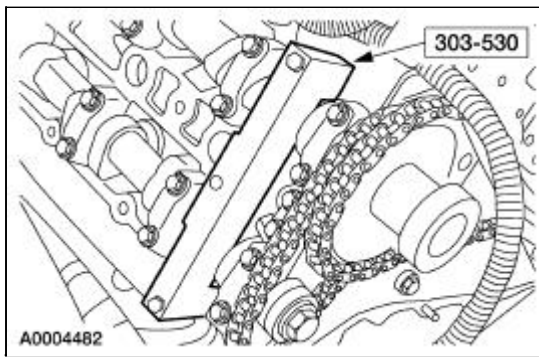
7. Using the special tool, apply tension to the LH exhaust camshaft sprocket and tighten the camshaft sprocket bolts in two stages.
 - Stage 1: Tighten to 20 Nm (15 lb-ft).
 - Stage 2: Tighten an additional 90 degrees.



8. Remove the special tool.



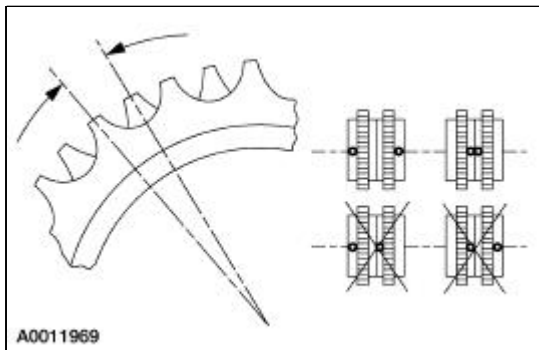
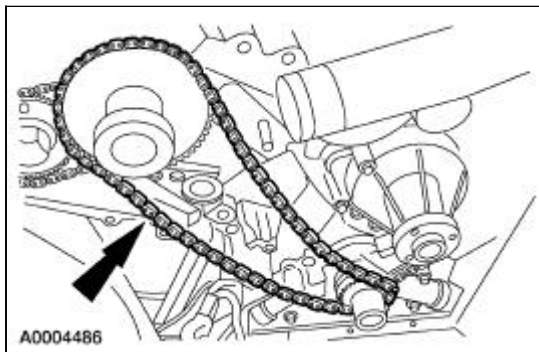
9. Remove the tie strap.
10. Install the special tool on the right cylinder head.



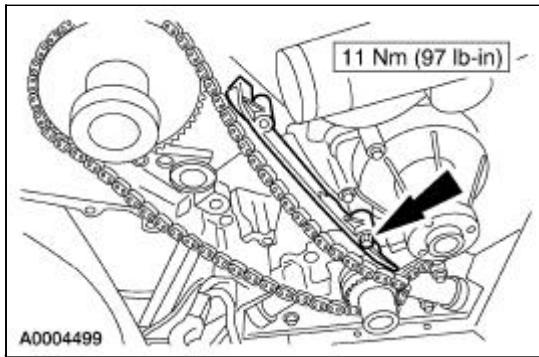
11. **NOTE:** If the timing mark on the LH timing chain crankshaft gear is facing toward the rear of the engine, install the RH timing chain crankshaft gear with the mark facing forward. If the timing mark on the LH timing chain crankshaft gear is facing toward the front of the engine, install the RH timing chain crankshaft gear with the mark facing toward the rear of the engine.

Position the RH timing chain and crankshaft gear.

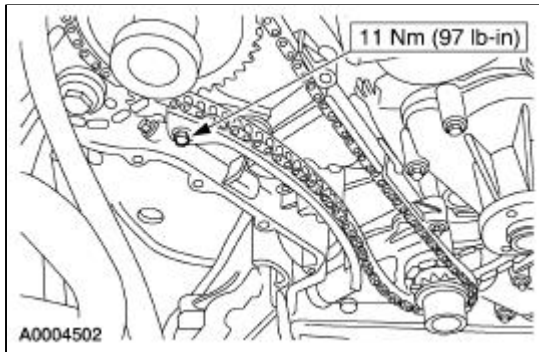
- Position the timing chain over the RH intake camshaft sprocket.
- Position the crankshaft gear in the timing chain.
- Position the timing chain and crankshaft gear over the crankshaft as an assembly.




12. Install the RH timing chain guide.



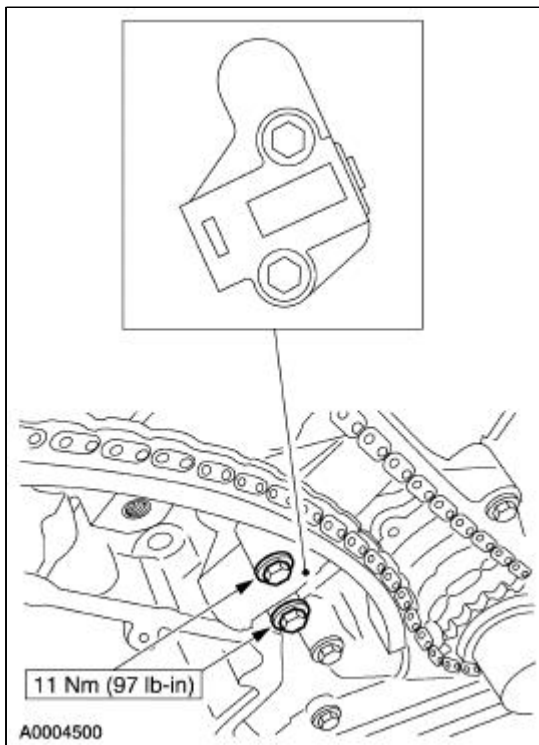
13. Install the RH timing chain tensioner arm.



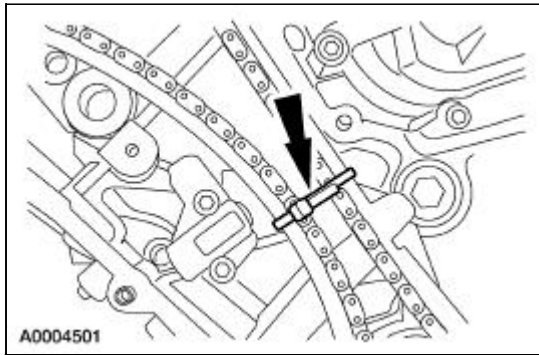
14.  **CAUTION:** The orientation of the blanking plate must be as shown or the oil galley will not seal, resulting in low oil pressure and possible engine damage.

Install the RH timing chain tensioner.

- Position the blanking plate.
- Install the RH timing chain tensioner and blanking plate.



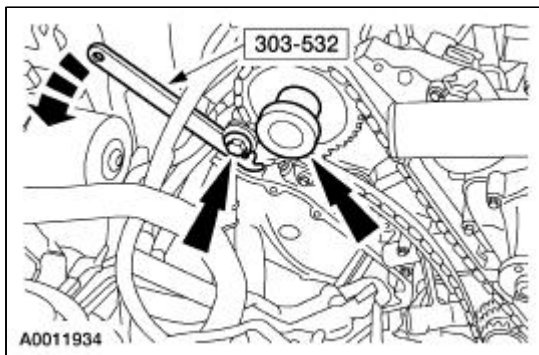
15. Install a tie strap to take up the slack in the timing chain.



16. **NOTE:** The exhaust camshaft sprocket bolt must be fully tightened before tightening the intake camshaft sprocket bolt.

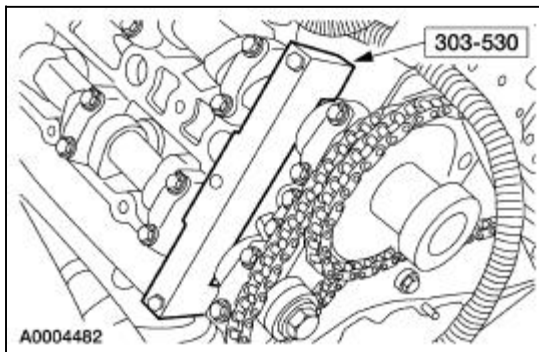
Using the special tool, apply tension to the RH exhaust camshaft sprocket and tighten the camshaft sprocket bolts in two stages.

- Stage 1: Tighten to 20 Nm (15 lb-ft).
- Stage 2: Tighten an additional 90 degrees.



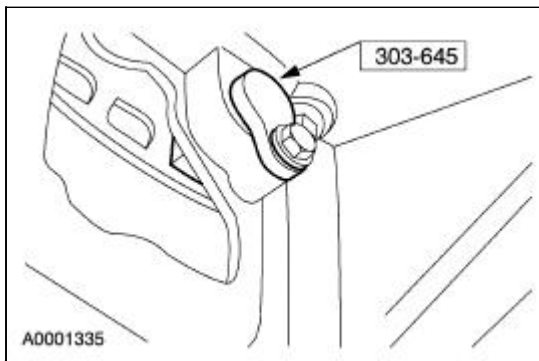
17. Remove the special tool.

- Remove the tie strap.

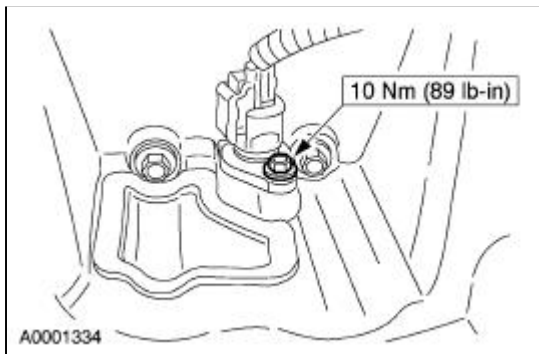


18. Raise the vehicle.

19. Remove the special tool.



20. Install the CKP sensor and the torque converter cover.



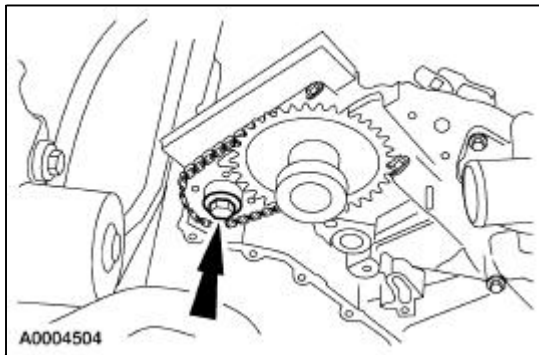
21. Lower the vehicle.
 22. Install the engine front cover. For additional information, refer to [Engine Front Cover](#) in this section.
-

Timing Drive Components —Secondary

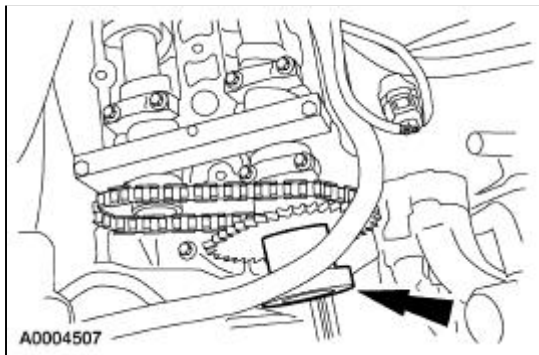
Removal

NOTE: The RH secondary timing chains are shown; the LH secondary timing chains are similar.

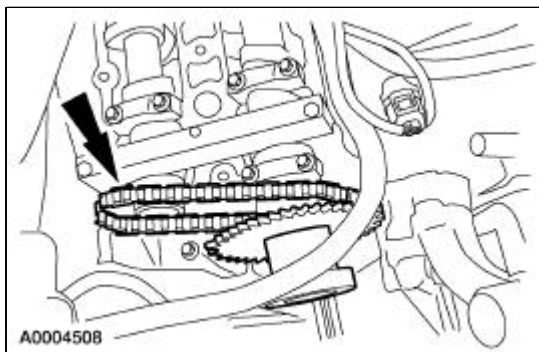
1. Remove the primary timing chains. For additional information, refer to [Timing Drive Components—Primary](#) in this section.
2. Remove the exhaust sprocket bolt.



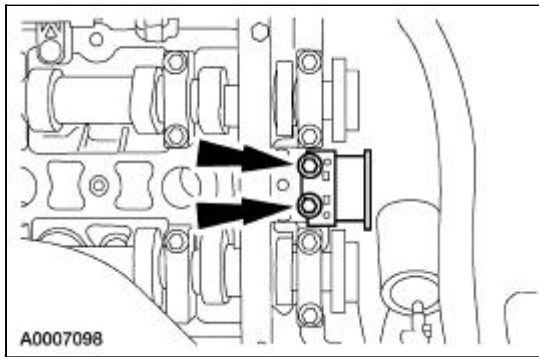
3. Remove the intake sprocket bolt and remove the camshaft damper.



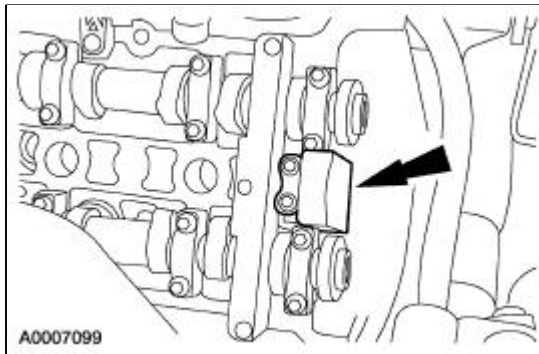
4. Remove the sprockets, damper, and chain as an assembly.



5. Remove the secondary timing chain tensioner bolts.

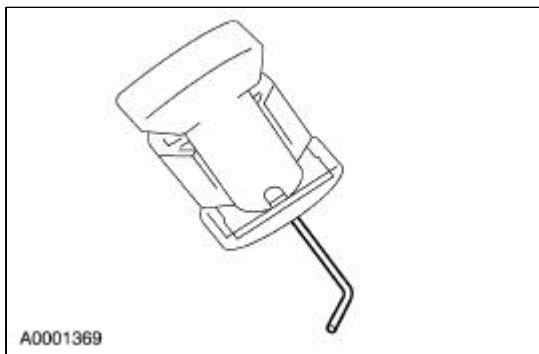


6. Remove the tensioner.

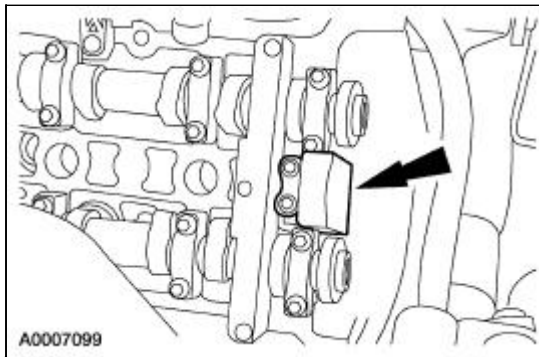


Installation

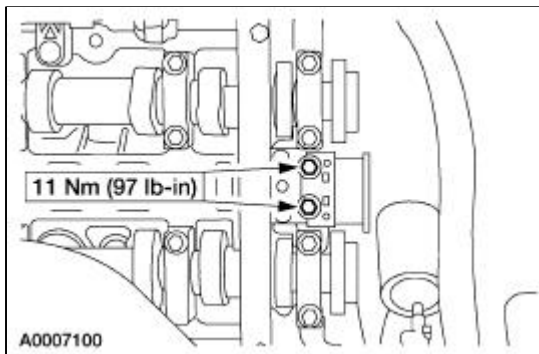
1. Collapse the tensioners.
 - Insert a thin wire into the check valve.
 - Apply hand pressure until the tensioner is fully collapsed.
 - Remove the wire.



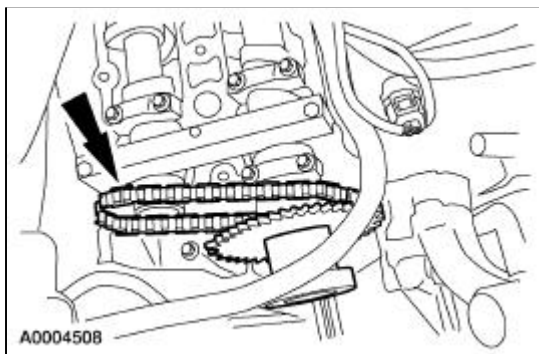
2. Position the tensioner.



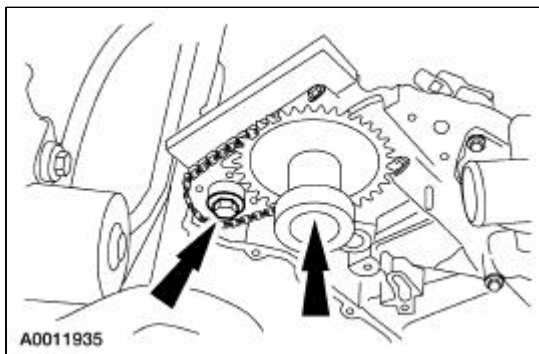
3. Install the timing chain tensioner bolts.



4. Position the intake sprocket, damper, chain and exhaust sprocket on the intake camshaft as an assembly.



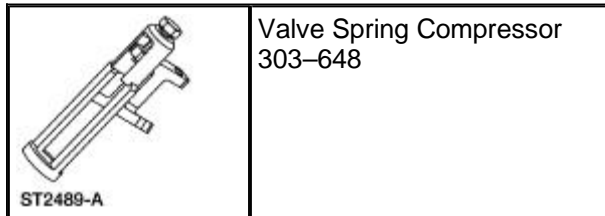
5. Loosely install the intake and exhaust sprocket bolts.



6. Install the primary timing chains. For additional information, refer to [Timing Drive Components—Primary](#) in this section.


Valve —Valve Springs

Special Tool(s)



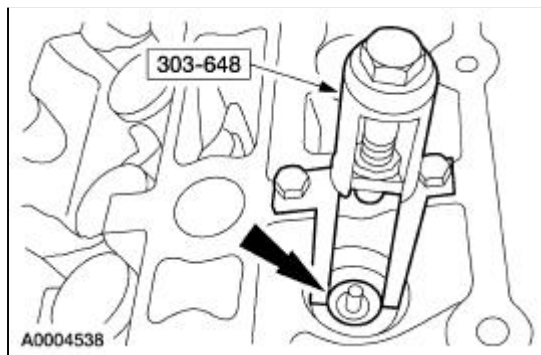
Removal

1. Remove the camshaft. For additional information, refer to [Camshaft](#) in this section.
2. Position the piston at the top of the stroke on the appropriate cylinder.
3. Remove the spark plug and apply compressed air in the cylinder to hold both valves in position.

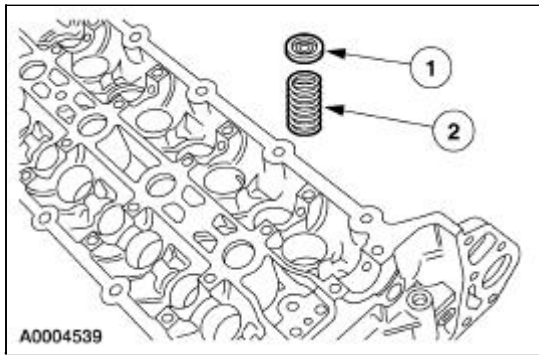
4.  **CAUTION:** If air pressure has forced the piston to the bottom of the cylinder, any loss of air pressure will allow the valve to fall into the cylinder. If air pressure must be removed, support the valve prior to removal.

Remove the bucket tappet and shim from the valve.

5. Using the special tool, remove the retainer keys.



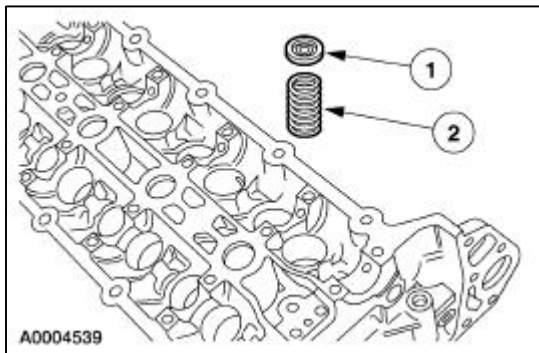
6. Remove the valve springs.
 1. Remove the spring retainers.
 2. Remove the valve springs.



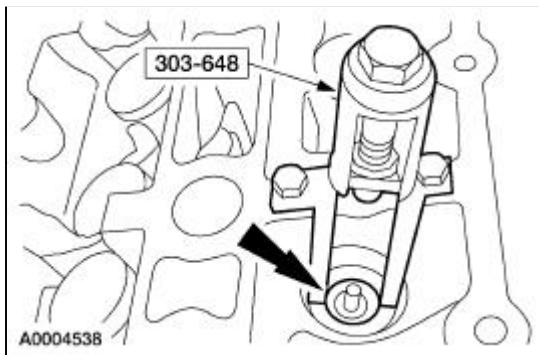
7. Repeat the procedure until all of the valve springs are removed.

Installation

1. Position the valve springs.
 1. Position the spring retainers.
 2. Position the valve springs.



2. Using the special tool, install the retainer keys.

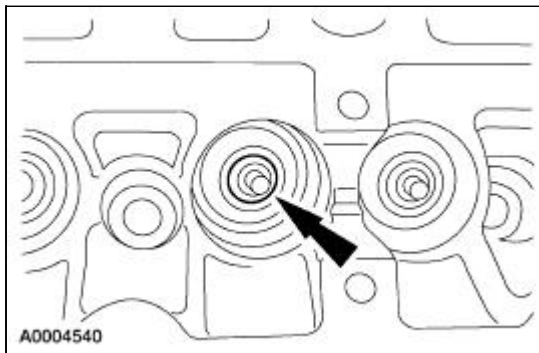


3. Repeat the procedure until all of the valve springs are installed.
 4. Install the camshaft. For additional information, refer to [Camshaft](#) in this section.
-

Valve —Valve Seals

Removal

1. Remove the valve springs. For additional information, refer to [Valve —Valve Springs](#) in this section.
2. Remove the valve stem seals.



Installation

1. **NOTE:** The valve stem seal must be bottomed on the valve seat.


NOTE: Make sure that the garter spring is present in the valve stem seal.

Install the valve stem seals over the valve stems.

2. Install the valve springs. For additional information, refer to [Valve —Valve Springs](#) in this section.
-

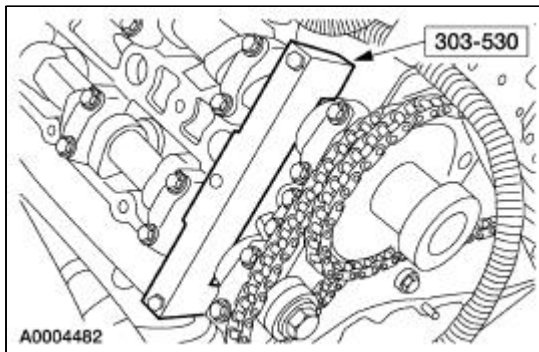
Camshaft


Special Tool(s)

 ST2398-B	Camshaft Setting/Locking Tool 303-530
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Removal

1. Remove the primary timing chains. For additional information, refer to [Timing Drive Components—Primary](#) in this section.
2. Remove the secondary timing chains. For additional information, refer to [Timing Drive Components—Secondary](#) in this section.
3. Remove the special tool.



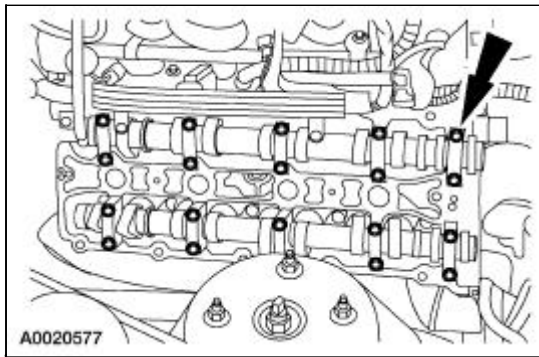
4.  **CAUTION:** Record the camshaft bearing cap locations. The camshaft bearing caps are positional and must be installed in their original locations and orientations or engine damage may occur.

 **CAUTION:** Do not use any means of marking the shims other than a permanent type marker. Any scratches or paint on the shims may result in incorrect lash adjustments and severe engine damage.

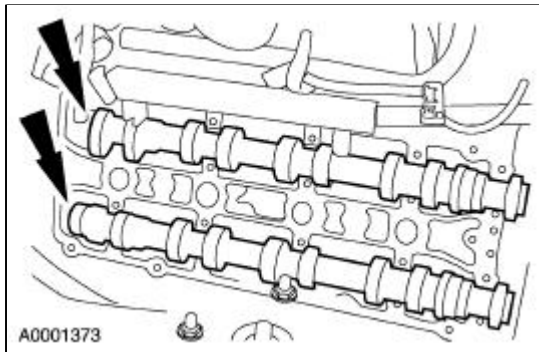
 **CAUTION:** Record the shim and bucket tappet location. The shim and bucket tappet are positional and if installed in the incorrect location, engine damage may occur.


Remove the RH camshaft bearing caps.

- Remove the bolts.
- Remove the RH camshaft bearing caps.




5. Remove the RH camshafts (6A270 intake and 6A272 exhaust).



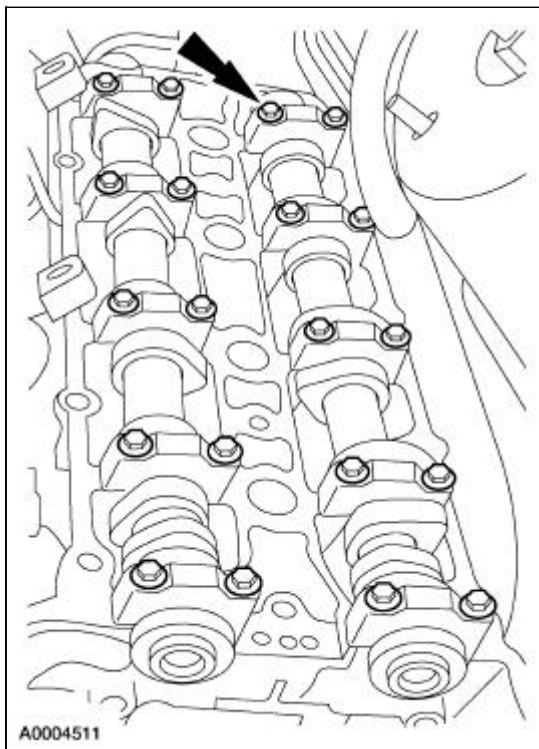
6.  **CAUTION:** Record the camshaft bearing cap locations. The camshaft bearing caps are positional and must be installed in their original locations and orientations or engine damage may occur.

 **CAUTION:** Do not use any means of marking the shims other than a permanent type marker. Any scratches or paint on the shims may result in incorrect lash adjustments and severe engine damage.

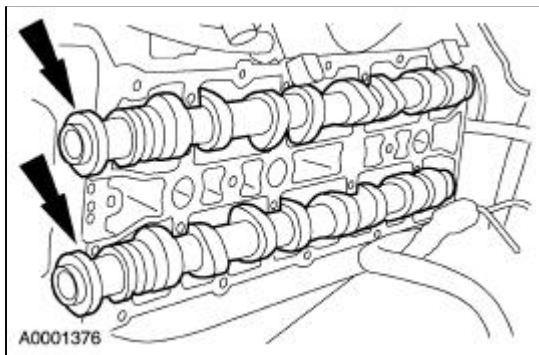
 **CAUTION:** Record the location of the shims and bucket tappets. The bucket tappets and shims are positional and if installed in the incorrect location, engine damage may occur.

Remove the LH camshaft bearing caps.

- Remove the bolts.
- Remove the LH camshaft bearing caps.



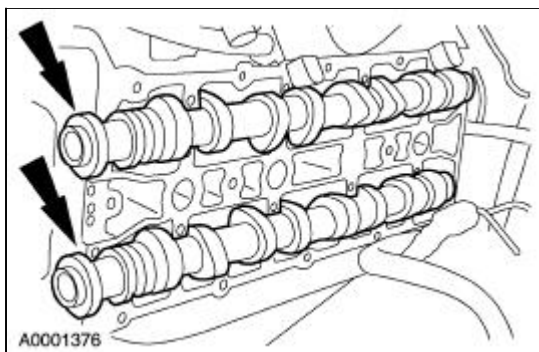
7. Remove the LH camshafts.



Installation

1. **NOTE:** Apply Super Premium SAE 5W-30 Motor Oil XO-5W30-QSP or equivalent meeting Ford specification WSS-M2C153-G to the camshaft journals, the camshaft caps and the camshaft lobes prior to installing the camshafts.

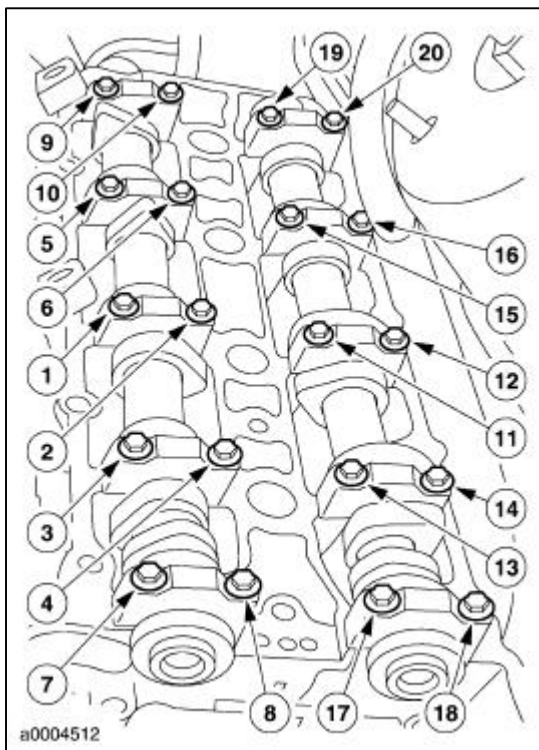
Position the LH camshafts on the camshaft journals.



2.  **CAUTION:** Install the camshaft bearing caps. The camshaft bearing caps are positional and must be installed in their original locations and orientations or engine damage may occur.

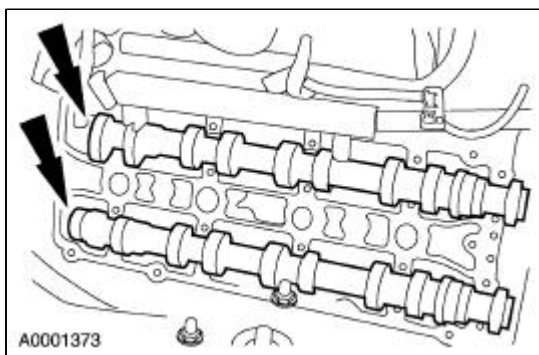
Install the LH camshaft bearing caps.

- Position the bearing caps.
- Install the bearing cap bolts. Tighten the bolts in three stages in the sequence shown.
 - Stage 1: Hand-tighten.
 - Stage 2: Tighten to 6 Nm (53 lb-in).
 - Stage 3: Tighten an additional 90 degrees.



3. **NOTE:** Apply Super Premium SAE 5W-30 Motor Oil XO-5W30-QSP or equivalent meeting Ford specification WSS-M2C153-G to the camshaft journals, the camshaft caps and the camshaft lobes prior to installing the camshafts.

Install the RH camshafts.

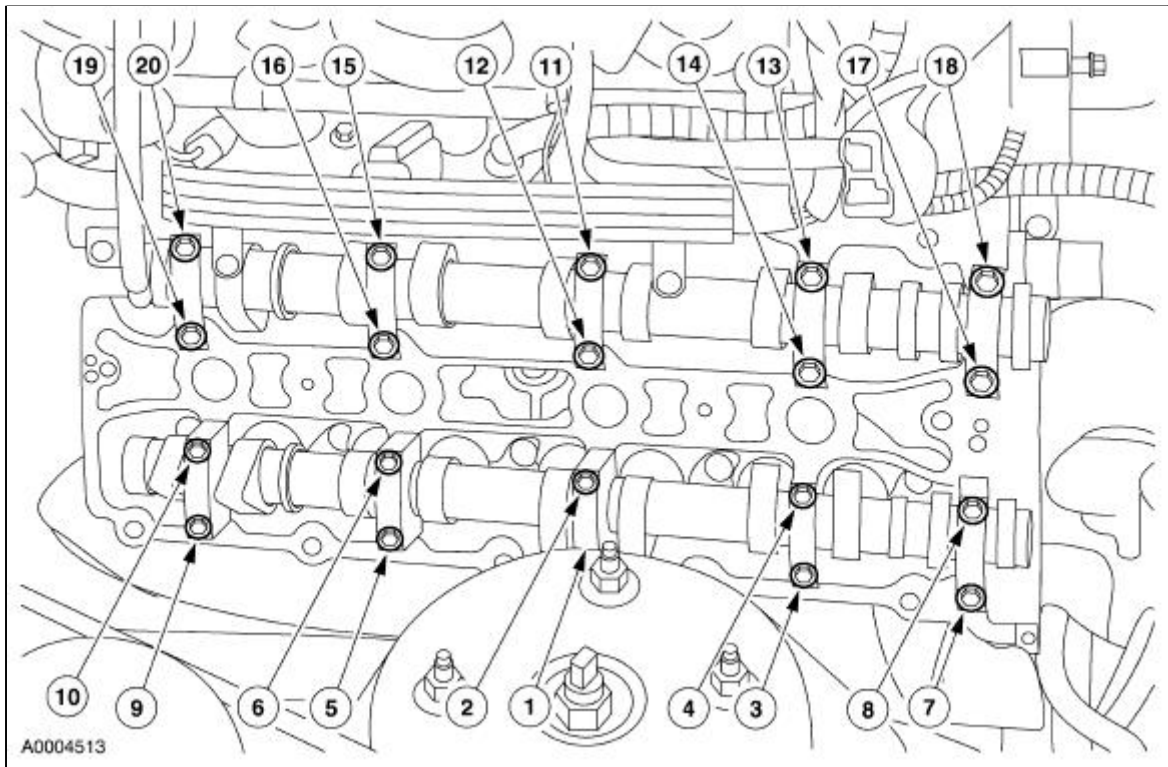


4.  **CAUTION:** Install the camshaft bearing caps. The camshaft bearing caps are positional and must be installed in their original locations and orientations or engine

damage may occur.

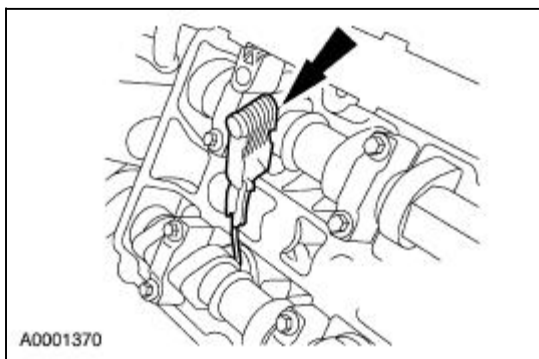
Install the RH camshaft bearing caps.

- Position the bearing caps.
- Install the bolts. Tighten the bolts in three stages in the sequence shown.
 - Stage 1: Hand-tighten.
 - Stage 2: Tighten to 6 Nm (53 lb-in).
 - Stage 3: Tighten an additional 90 degrees.

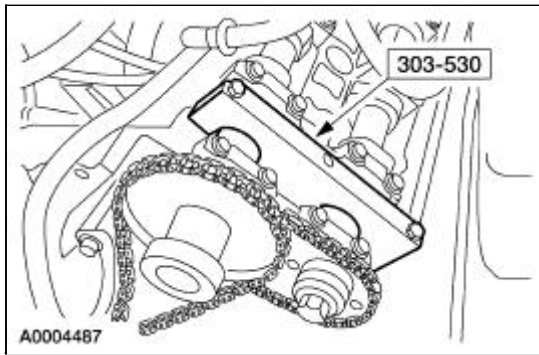


5.  **CAUTION:** If any of the following components are replaced, the engine must be reshimmed or engine damage may occur: The camshafts, the valves, cylinder heads, or bucket tappets .

Using feeler gages, confirm that the tappet and shim clearances are within specification.



6. Install the special tool on the LH head.

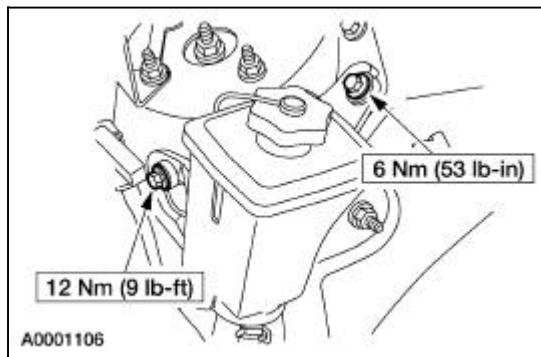


7. Install the primary and secondary timing chains. For additional information, refer to [Timing Drive Components—Primary](#) and [Timing Drive Components—Secondary](#) in this section.
-

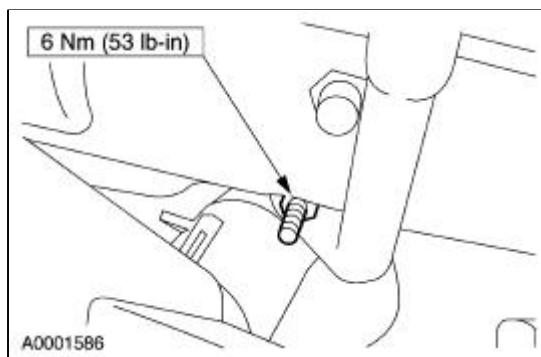
Exhaust Manifold —LH

Removal

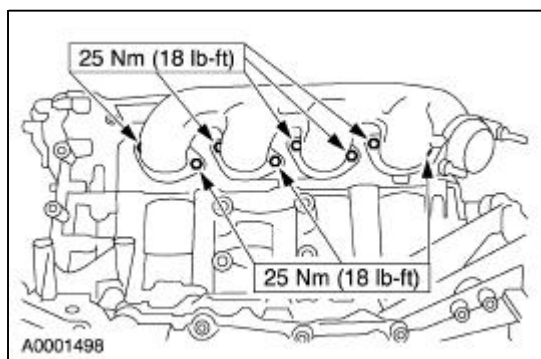
1. Remove the bolts and position the power steering reservoir aside.



2. Remove the nut and position the oil level indicator tube aside.



3. Raise and support the vehicle. For additional information, refer to [Section 100-02](#).
4. Disconnect the three-way catalytic (TWC) converter from the exhaust manifold. For additional information, refer to [Section 309-00](#).
5. Remove the exhaust manifold.
 - Remove the eight bolts.
 - Remove the exhaust manifold and discard the gasket.



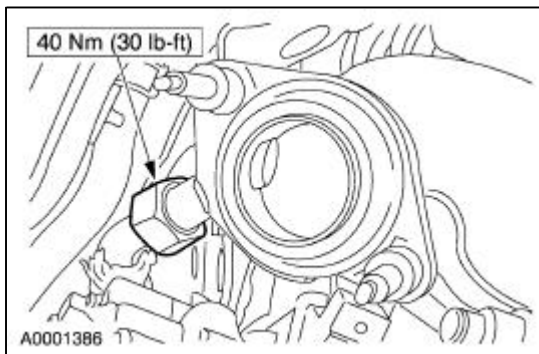
Installation

1. To install, reverse the removal procedure.
 - Install a new gasket.
-

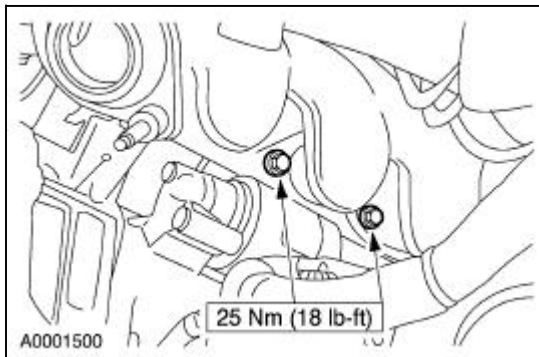
Exhaust Manifold —RH

Removal

1. Raise and support the vehicle. For additional information, refer to [Section 100-02](#).
2. Disconnect the three-way catalytic (TWC) converter from the exhaust manifold. For additional information, refer to [Section 309-00](#).
3. Disconnect the EGR valve to exhaust manifold tube nut at the exhaust manifold.



4. Remove the exhaust manifold.
 - Remove the eight bolts.
 - Remove the exhaust manifold and discard the gasket.




Installation

1. To install, reverse the removal procedure.
 - Install a new gasket.

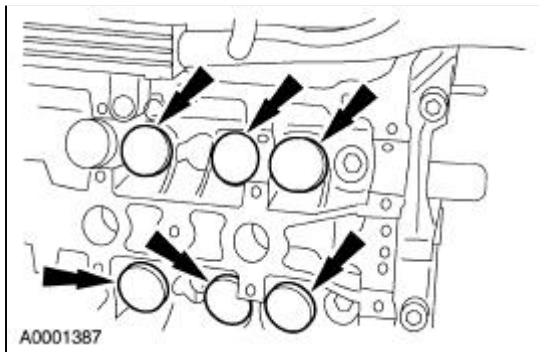
Cylinder Head

Removal

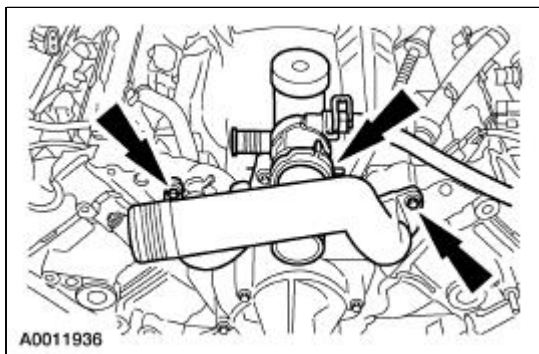
1. Remove the intake manifold. For additional information, refer to [Intake Manifold](#) in this section.
2. Remove the engine sound insulator.
3. Remove the camshafts. For additional information, refer to [Camshaft](#) in this section.
4.  **CAUTION:** The shim and tappets are location-specific. Note the location so that they can be installed in their original locations or shims will have to be reselected during installation.

 **CAUTION:** Do not use any means of marking the shims other than a permanent type marker. Any scratches or paint on the shims can result in incorrect lash adjustments and severe engine damage.

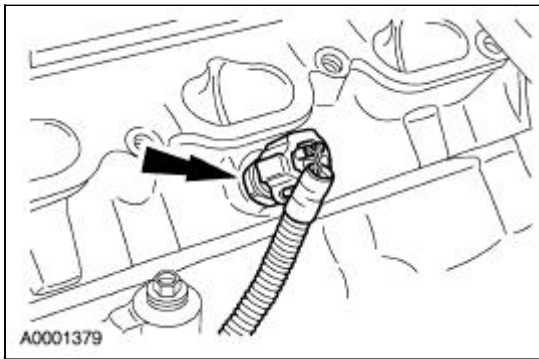
If necessary, remove the tappet bucket and shims.



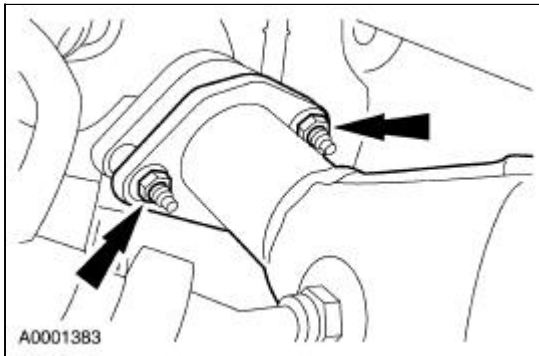
5. Disconnect the clamp, remove the four bolts and the water outlet pipe.



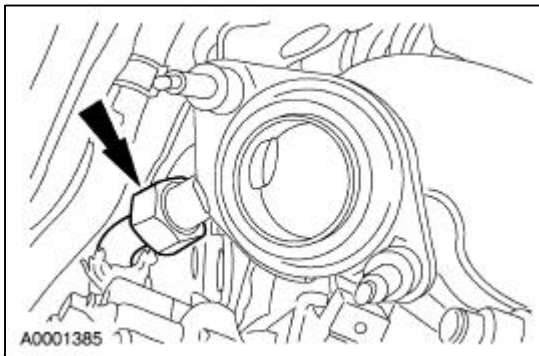
6. Disconnect the cylinder head temperature (CHT) sensor electrical connector.



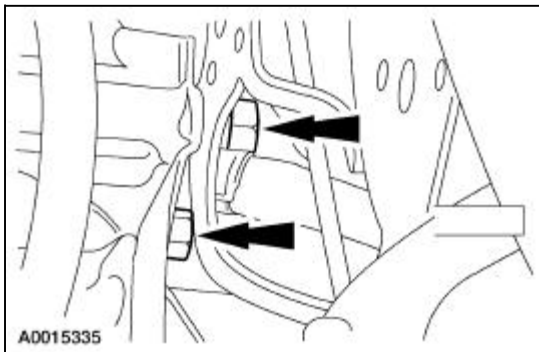
7. Raise and support the vehicle. For additional information, refer to [Section 100-02](#).
8. Disconnect the three-way catalytic (TWC) converter from the exhaust manifolds.



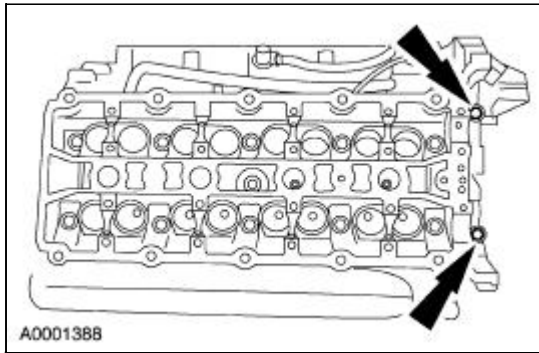
9. Disconnect the EGR valve to exhaust manifold tube.



10. Lower the vehicle.
11. Remove the bolts from the rear of the cylinder head.

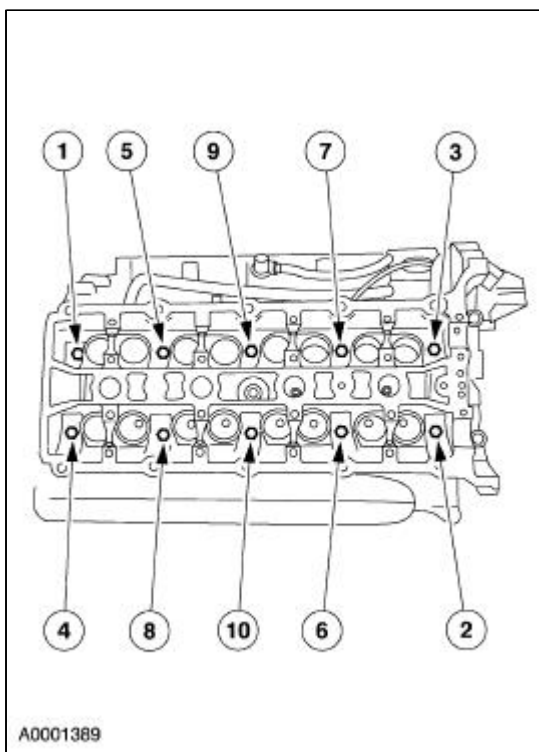


12. Remove and discard the bolts.



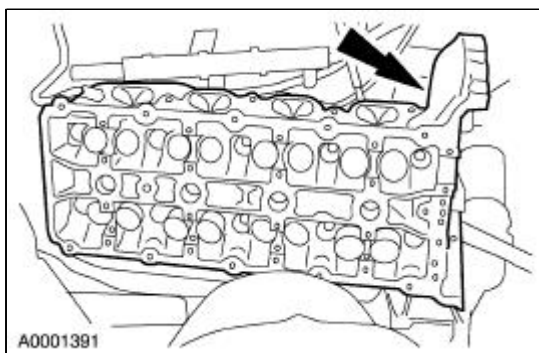
13. Remove the RH bolts in the sequence shown.


- Discard the bolts.



14. Remove the RH cylinder head.

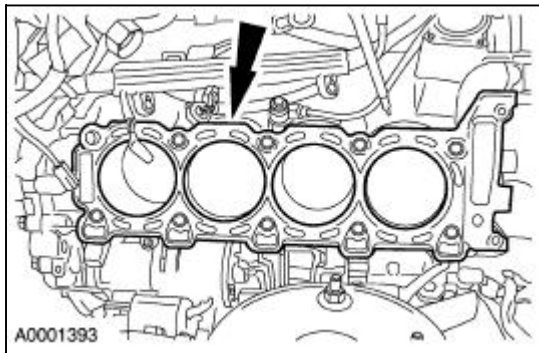
- Discard the gasket.



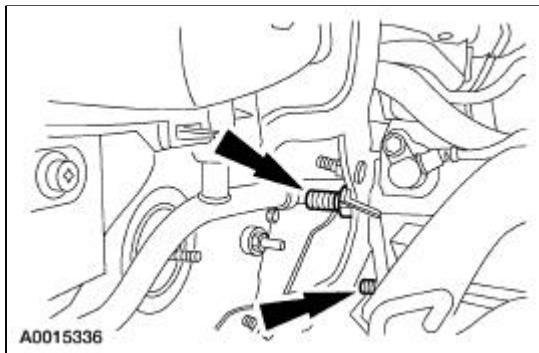
15.  **CAUTION:** Do not use metal scrapers, wire brushes, power abrasive discs or other

abrasive means to clean the sealing surfaces. These tools cause scratches and gouges, which make leak paths. Use a plastic scraping tool to remove all traces of sealant.

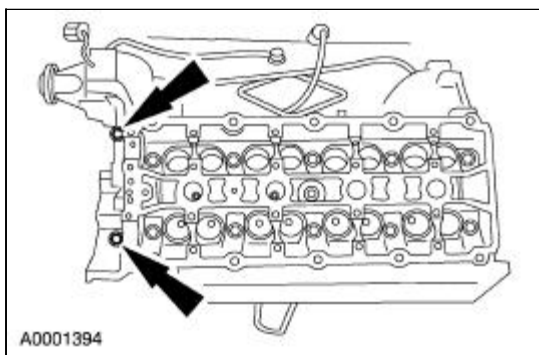
Clean the sealing surfaces.



16. Remove the stud bolts from the rear of the cylinder head.



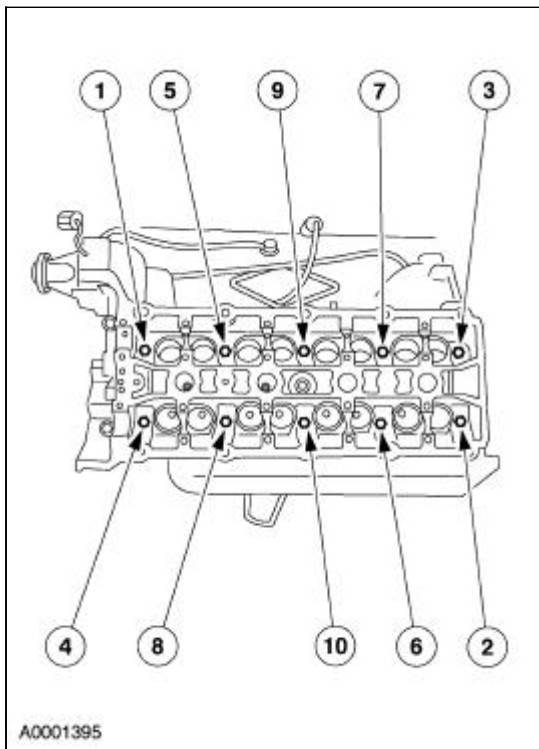
17. Remove and discard the bolts.



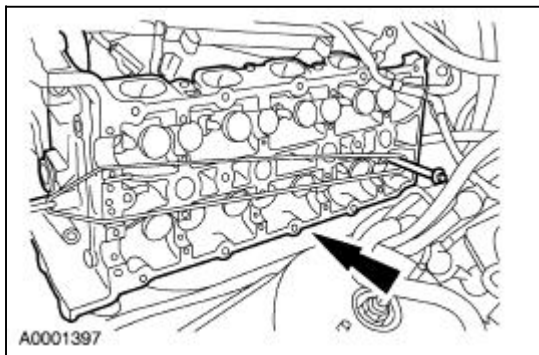
18. **NOTE:** The lower rear bolt cannot be fully removed. This bolt must be retained above the decking surface with a rubber band to remove the LH cylinder head.


Remove the bolts in the sequence shown.

- Discard the bolts.

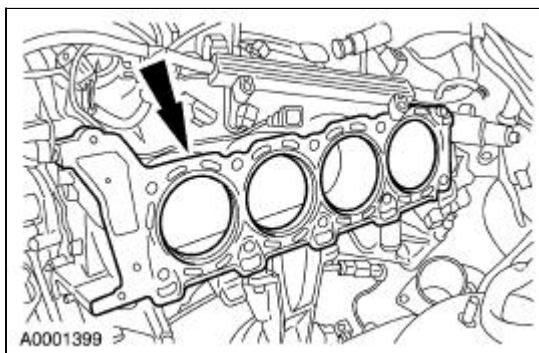


19. Remove the LH cylinder head.
- Discard the gasket.



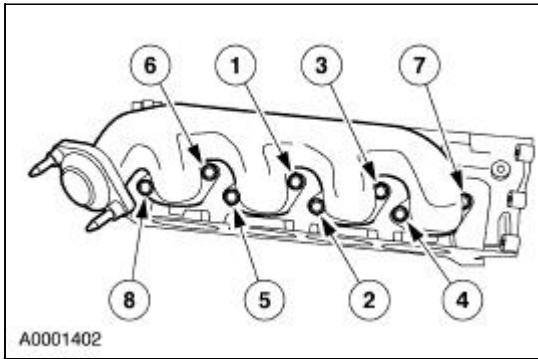
20.  **CAUTION:** Do not use metal scrapers, wire brushes, power abrasive discs or other abrasive means to clean the sealing surfaces. These tools cause scratches and gouges, which make leak paths. Use a plastic scraping tool to remove all traces of sealant.


Clean the sealing surfaces.



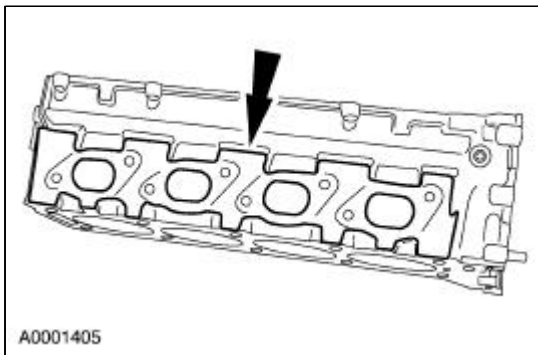
21. Remove the RH exhaust manifold bolts.

- Discard the gasket.



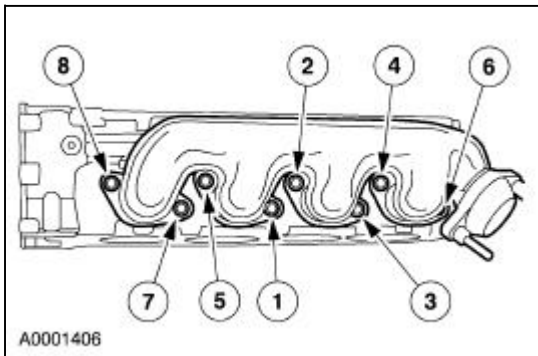
22.  **CAUTION:** Do not use metal scrapers, wire brushes, power abrasive discs or other abrasive means to clean the sealing surfaces. These tools cause scratches and gouges, which make leak paths. Use a plastic scraping tool to remove all traces of sealant.


Clean the sealing surfaces.



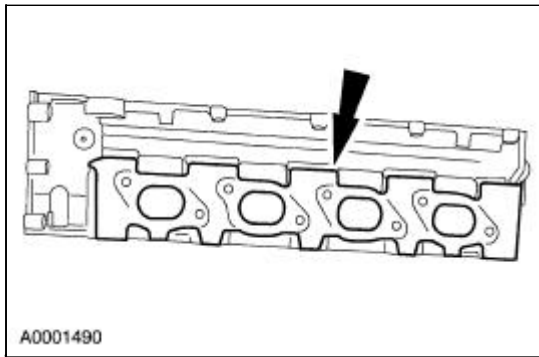
23. Remove the LH exhaust manifold.

- Discard the gasket.



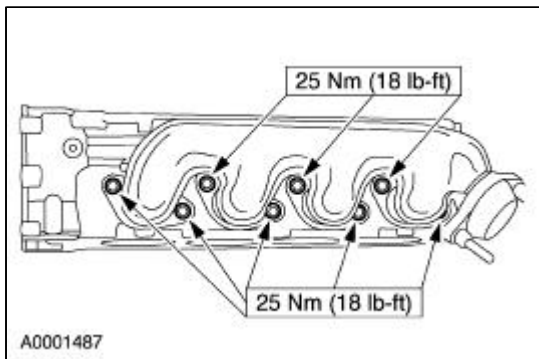
24.  **CAUTION:** Do not use metal scrapers, wire brushes, power abrasive discs or other abrasive means to clean the sealing surfaces. These tools cause scratches and gouges, which make leak paths. Use a plastic scraping tool to remove all traces of sealant.

Clean the sealing surfaces.

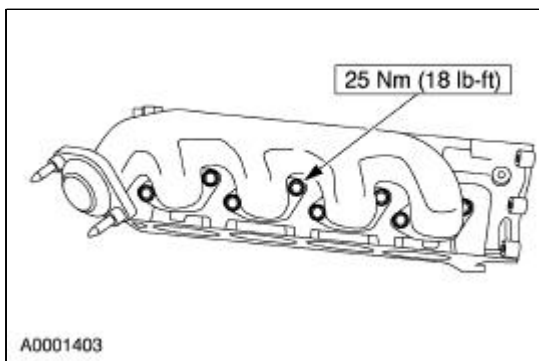


Installation

1. Install the LH exhaust manifold.
 - Install a new gasket.



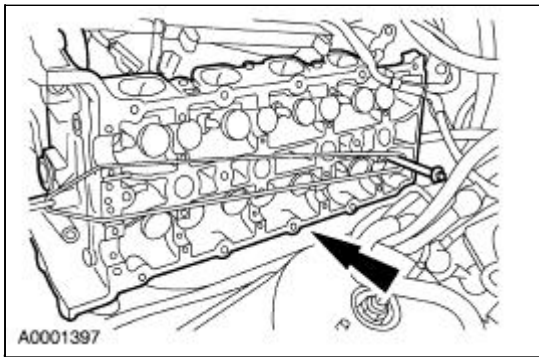
2. Install the RH exhaust manifold.
 - Install a new gasket.



3. **NOTE:** The lower rear bolt cannot be installed with the cylinder head in place. Secure the bolt above deck height with a rubber band prior to cylinder head installation.

Position the LH cylinder head.

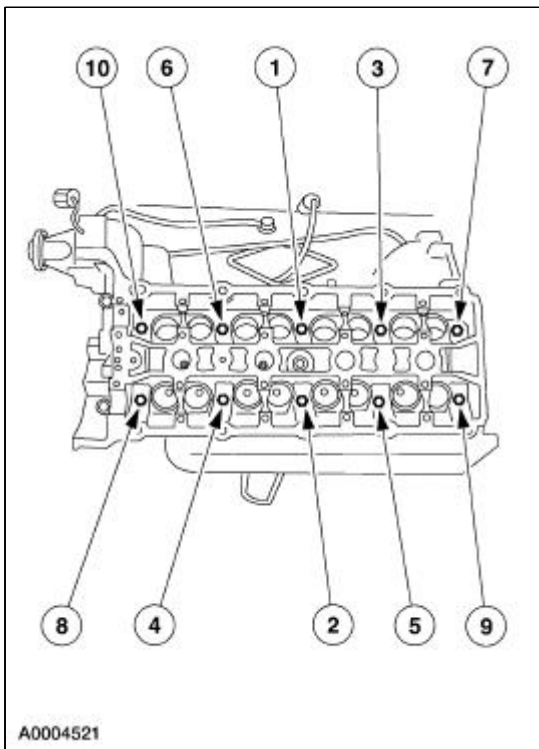
- Install a new gasket.



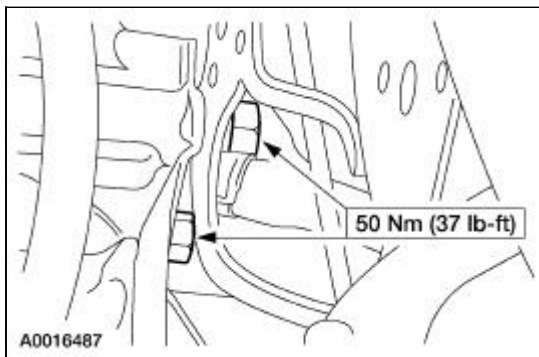
4. **NOTE:** The cylinder head bolts are a torque-to-yield design and must not be reused. Always install new bolts.

Install and tighten the bolts in five stages in the sequence shown.

- Stage 1: Install finger-tight.
- Stage 2: Tighten to 20 Nm (15 lb-ft).
- Stage 3: Tighten to 35 Nm (26 lb-ft).
- Stage 4: Tighten to 45 Nm (33 lb-ft) and an additional 90 degrees.
- Stage 5: Tighten an additional 90 degrees.



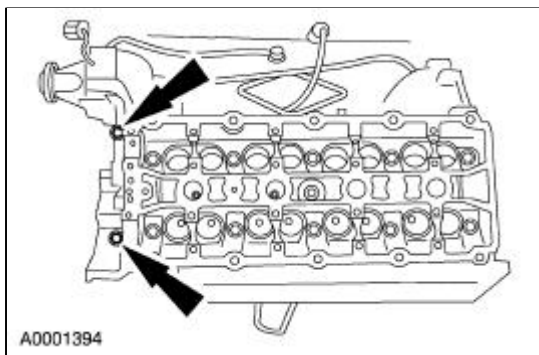
5. Install the bolts on the rear of the cylinder head.



6. **NOTE:** The cylinder head bolts are a torque-to-yield design and must not be reused. Always install new bolts.

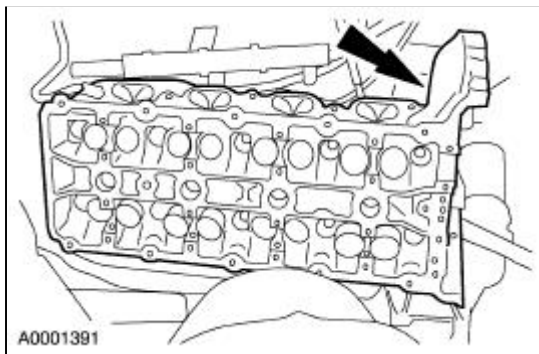
Install and tighten the bolts in two stages.

- Stage 1: Tighten to 20 Nm (15 lb-ft).
- Stage 2: Tighten an additional 90 degrees.



7. Position the RH cylinder head.

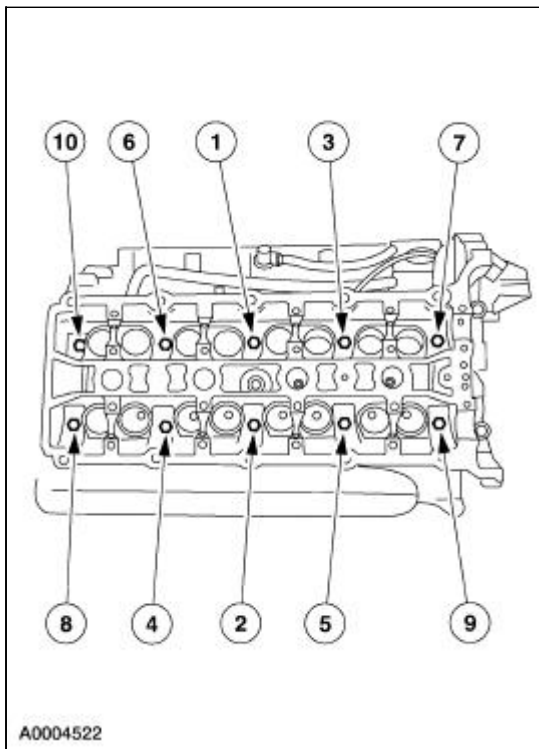
- Install a new gasket.



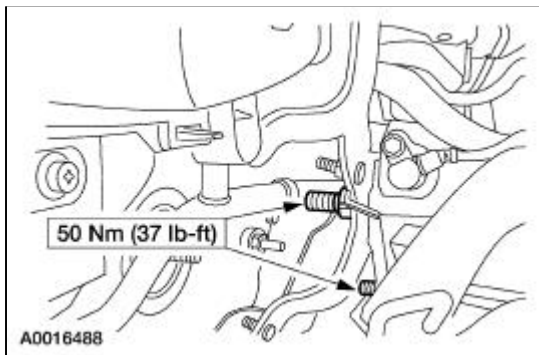
8. **NOTE:** The cylinder head bolts are a torque-to-yield design and must not be reused. Always install new bolts.

Install and tighten the bolts in five stages in the sequence shown.

- Stage 1: Install finger-tight.
- Stage 2: Tighten to 20 Nm (15 lb-ft).
- Stage 3: Tighten to 35 Nm (26 lb-ft).
- Stage 4: Tighten to 45 Nm (33 lb-ft) and an additional 90 degrees.
- Stage 5: Tighten an additional 90 degrees.



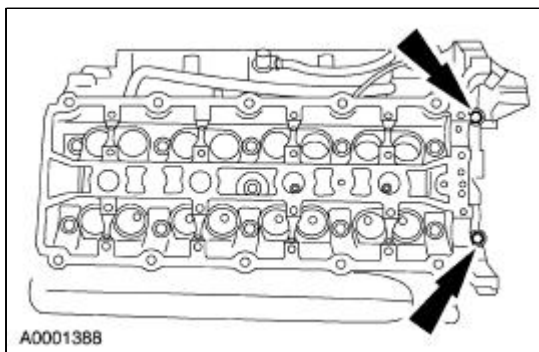
9. Install the stud bolts on the rear of the cylinder head.





10. **NOTE:** The cylinder head bolts are a torque-to-yield design and must not be reused. Always install new bolts.


Install and tighten the bolts in two stages.

- Stage 1: Tighten to 20 Nm (15 lb-ft).
- Stage 2: Tighten an additional 90 degrees.

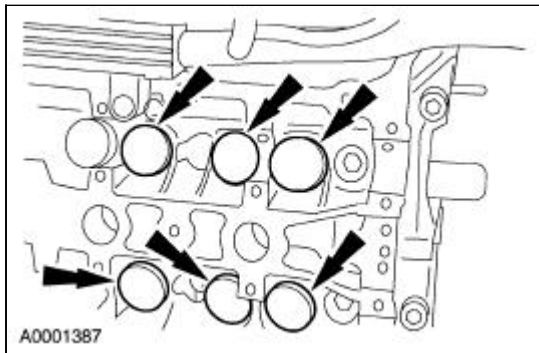


11.  **CAUTION:** The shim and tappets are location-specific. They must be installed in their original locations or shims will have to be reselected during installation.

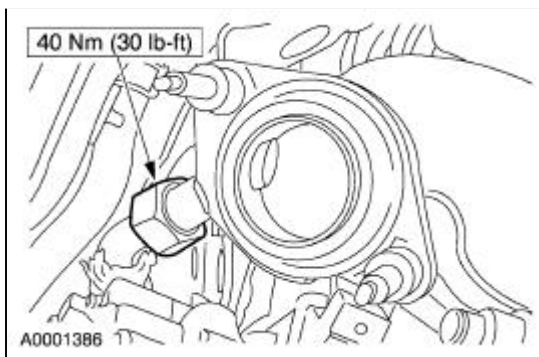
 **CAUTION:** Do not use any means of marking the shims other than a permanent type marker. Any scratches or paint on the shims can result in incorrect lash adjustments and severe engine damage.

 **CAUTION:** If a new cylinder head assembly is being installed, valve clearances must be adjusted or damage to the engine can occur.

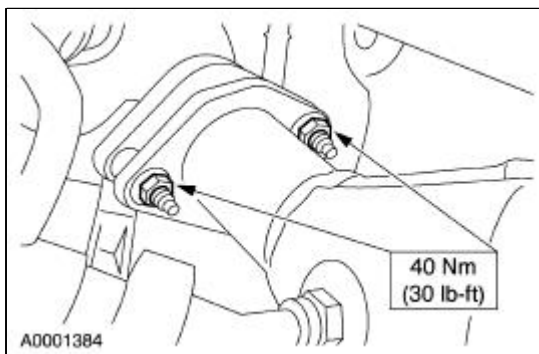
Install the tappets and shims.



12. Raise the vehicle.
13. Connect the EGR valve to exhaust manifold tube.

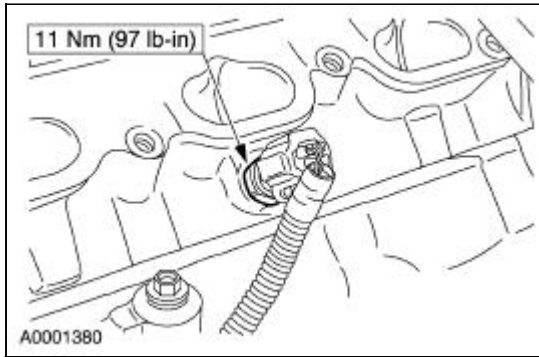


14. Connect the TWC to the exhaust manifolds.



15. Lower the vehicle.

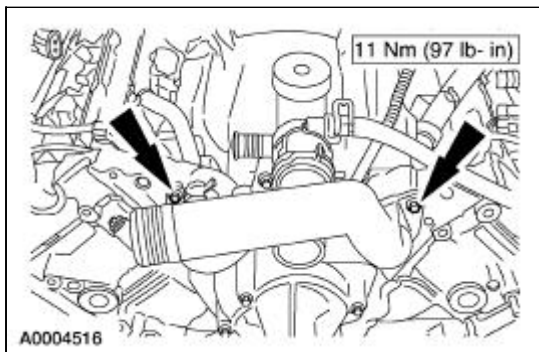
16. Connect the CHT sensor electrical connector.



17. **NOTE:** Make sure that the insulator is clear of the intake manifold sealing surfaces.

Install the engine sound insulator.

18. Install the water crossover and tighten the four bolts and connect the hose.

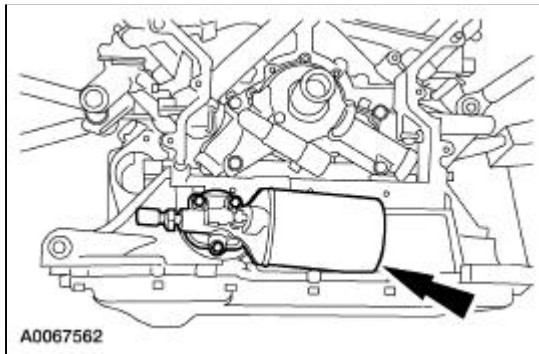


19. Install the camshafts. For additional information, refer to [Camshaft](#) in this section.
 20. Install the intake manifold. For additional information, refer to [Intake Manifold](#) in this section.
-

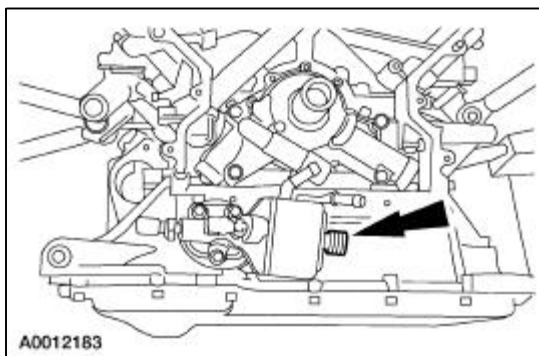
Oil Cooler

Removal

1. Drain the cooling system. For additional information, refer to [Section 303-03](#).
2. Raise the vehicle. For additional information, refer to [Section 100-02](#).
3. Remove the lower splash shield.
4. Drain the engine oil.
5. Remove and discard the oil filter.



6. Disconnect the oil cooler hoses.
7. Remove the oil cooler.
 - Inspect the seal and install a new seal as necessary.

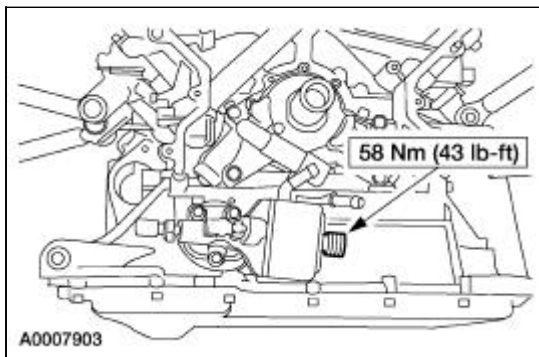


Installation

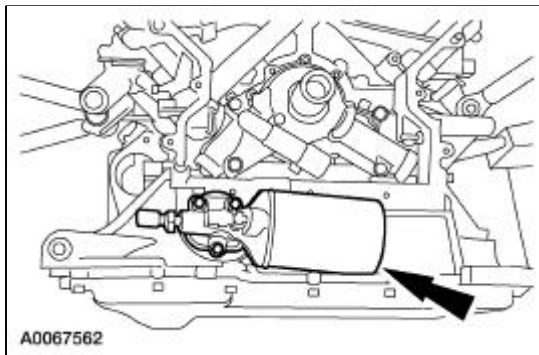
1. **NOTE:** Inspect the gasket and surfaces for contamination prior to installation.

Position the oil cooler and gasket and install the bolt.

- Rotate the cooler clockwise until the locating pin hits the stop.



2. Install the oil cooler hoses.
3. Install the oil filter.
 - Install the oil filter until the seal makes contact.
 - Tighten an additional 270 degrees.

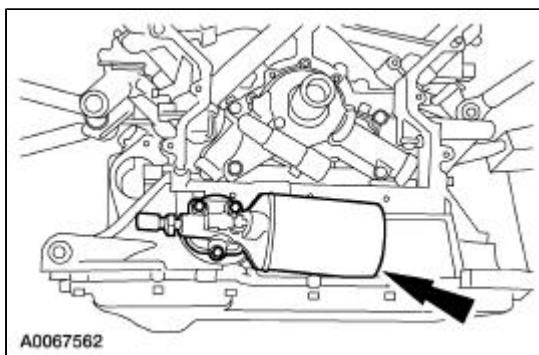


4. Install the lower splash shield.
 5. Lower the vehicle. For additional information, refer to [Section 100-02](#).
 6. Fill the engine with Super Premium SAE 5W-30 Motor Oil XO-5W30-QSP or equivalent meeting Ford specification WSS-M2C153-G.
 7. Fill and bleed the engine cooling system. For additional information, refer to [Section 303-03](#).
-

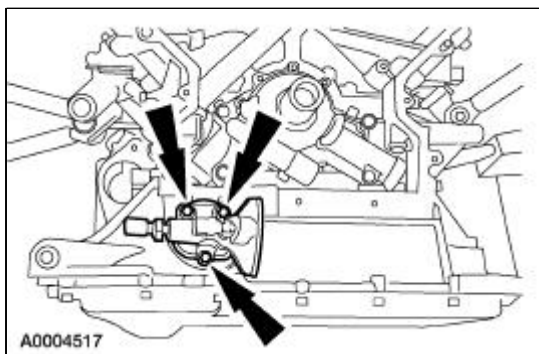
Oil Filter Adapter


Removal

1. Raise and support the vehicle. For additional information, refer to [Section 100-02](#).
2. Drain the engine oil.
3. Remove the lower splash shield.
4. Remove and discard the oil filter.



5. Remove the oil cooler assembly, if equipped. For additional information, refer to [Oil Cooler](#) in this section.
6. Disconnect the oil pressure sender.
7. Remove the oil filter adapter assembly.
 - Discard the seal.

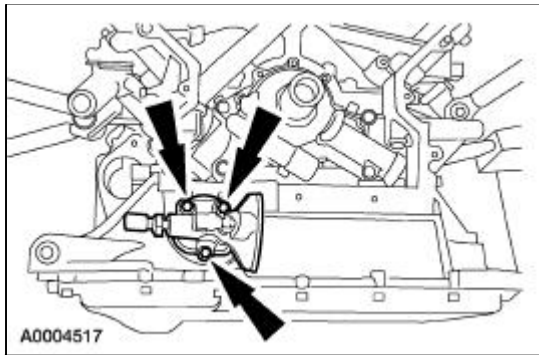


8.  **CAUTION:** Do not use metal scrapers, wire brushes, power abrasive discs, or other abrasive means to clean the sealing surfaces. These tools cause scratches and gouges which make leak paths. Use a plastic scraping tool.

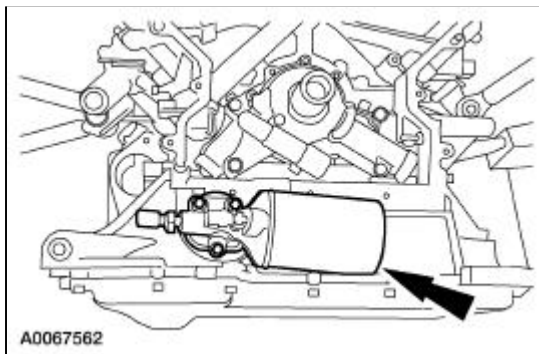
Clean the sealing surfaces.

Installation

1. Install a new seal and the oil filter adapter. Tighten the bolts in two stages.
 - Stage 1: Tighten to 13 Nm (10 lb-ft).
 - Stage 2: Tighten an additional 90 degrees.



2. Connect the oil pressure sender.
3. Install the oil cooler, if equipped. For additional information, refer to [Oil Cooler](#) in this section.
4. Install the oil filter.
 - Install the oil filter until the seal makes contact.
 - Tighten an additional 270 degrees.

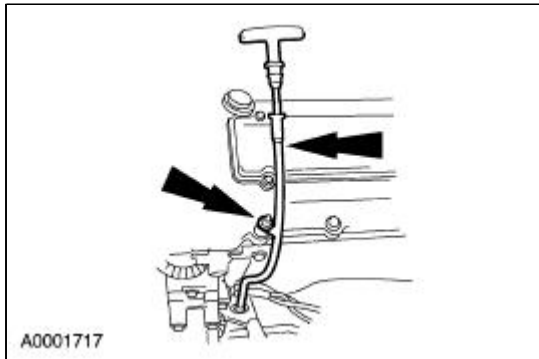


5. Install the lower splash shield.
 6. Lower the vehicle.
 7. Fill the engine with Super Premium SAE 5W-30 Motor Oil XO-5W30-QSP or equivalent meeting Ford specification WSS-M2C153-G.
-

Oil Level Indicator and Tube

Removal

1. Remove the oil level indicator.
2. Remove the nut and the oil level indicator and tube.

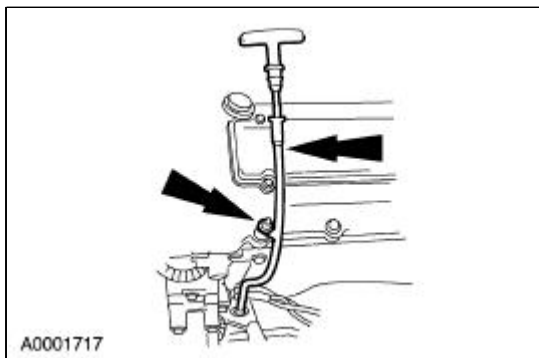


Installation

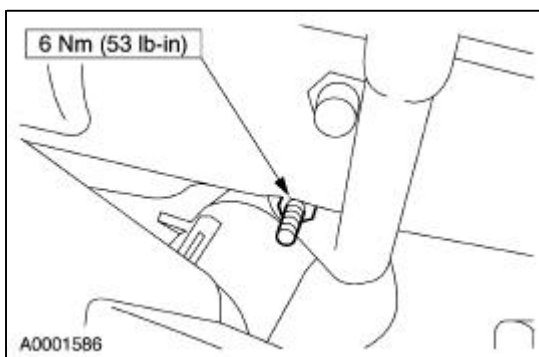
1. **NOTE:** Lubricate the O-ring seal with Super Premium SAE 5W-30 Motor Oil XO-5W30-QSP or equivalent meeting Ford specification WSS-M2C153-G.

Inspect the O-ring seal and install a new O-ring seal as necessary.

- Install the oil level indicator tube.



2. Install the nut.

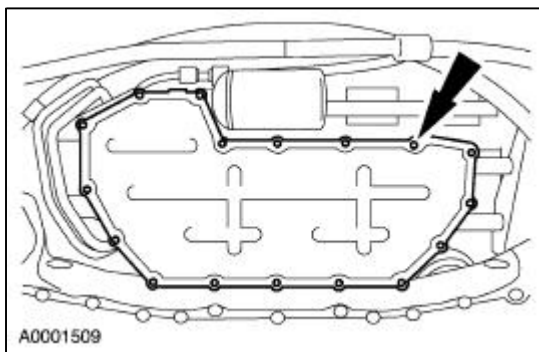


3. Install the oil level indicator.

Oil Pan

Removal

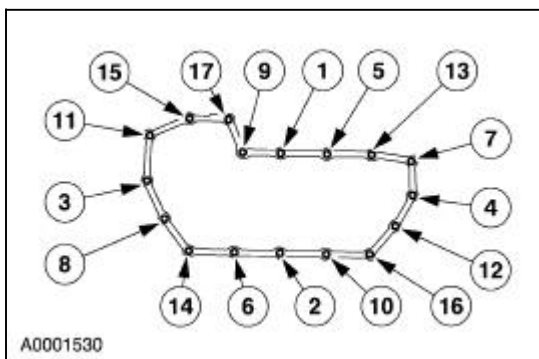
1. Raise and support the vehicle. For additional information, refer to [Section 100-02](#).
2. Drain the engine oil.
3. Remove the oil pan.
 - Inspect the gasket and install a new one if necessary.



Installation

NOTE: Make sure all gasket sealing surfaces are clean and dry.

1. Install the oil pan. Tighten the bolts in the sequence shown in two stages.
 - Stage 1: Tighten to 5 Nm (44 lb-in).
 - Stage 2: Tighten to 12 Nm (9 lb-ft).

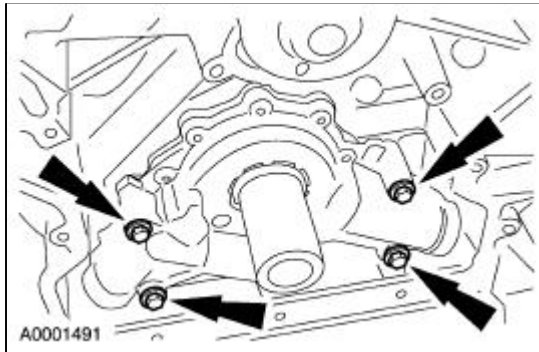



2. Lower the vehicle.
3. Fill the crankcase to the specified level with Super Premium SAE 5W-30 Motor Oil XO-5W30-QSP or equivalent meeting Ford specification WSS-M2C153-G.

Oil Pump

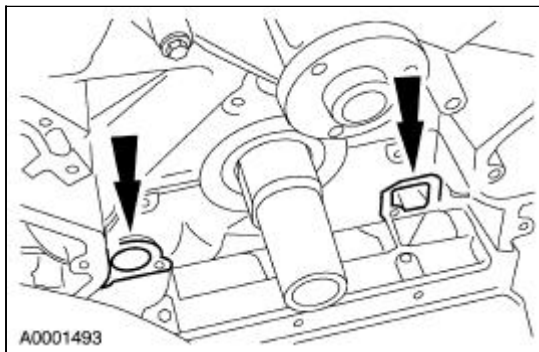
Removal

1. Remove the primary timing chains. For additional information, refer to [Timing Drive Components—Primary](#) in this section.
2. Remove the bolts and the oil pump.
 - Discard the gasket.



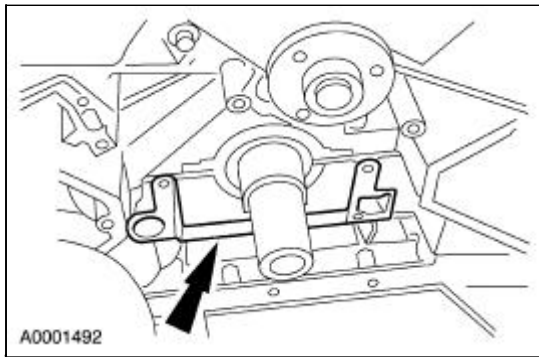
3.  **CAUTION:** Do not use metal scrapers, wire brushes, power abrasive discs or other abrasive means to clean the sealing surfaces. These tools cause scratches and gouges, which make leak paths. Use a plastic scraping tool to remove all traces of sealant.

Clean the sealing surfaces.

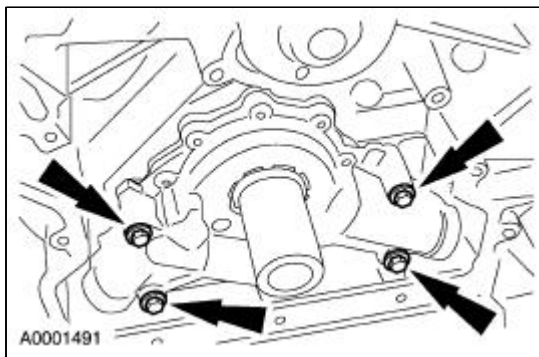


Installation

1. Install a new gasket.



2. Install the oil pump and tighten the bolts in two stages.
 - Stage 1: Tighten to 6 Nm (53 lb-in).
 - Stage 2: Tighten an additional 90 degrees.

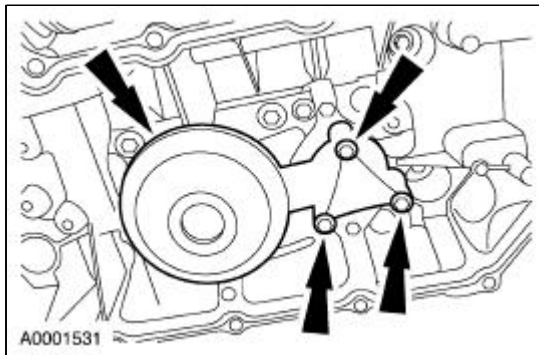


3. Install the primary timing chains. For additional information, refer to [Timing Drive Components—Primary](#) in this section.
-

Oil Pump Screen and Pickup Tube

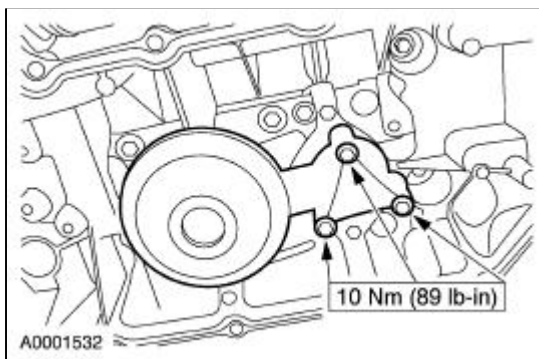
Removal

1. Remove the oil pan. For additional information, refer to [Oil Pan](#) in this section.
2. Remove the bolts and the pump screen cover and tube.
 - Inspect the O-ring seal and install a new one if necessary.



Installation

1. Install the oil pump screen cover and tube.

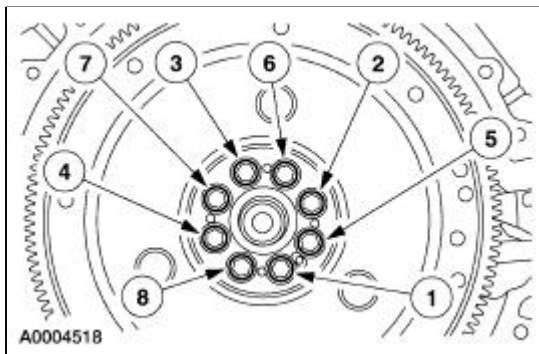


2. Install the oil pan. For additional information, refer to [Oil Pan](#) in this section.

Flexplate

Removal

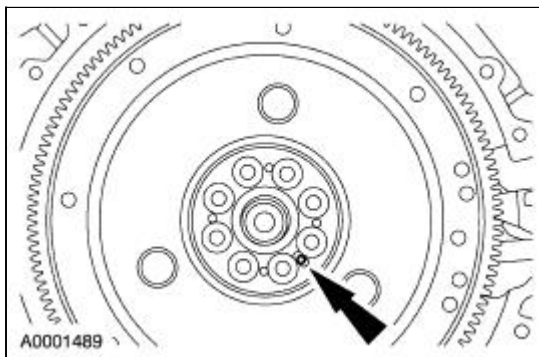
1. Remove the transmission. For additional information, refer to [Section 307-01](#).
2. Remove the flexplate.
 - Remove the bolts in the sequence shown.
 - Remove the flexplate.



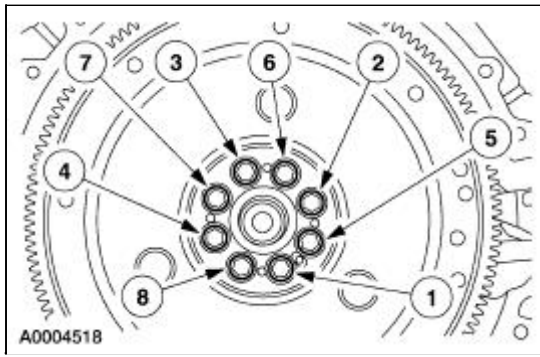
Installation

NOTE: The crankshaft dowel must be positioned below the outer face of the flexplate.

1. Install the flexplate with the elongated hole over the crankshaft dowel.




2. Install the flexplate bolts and tighten in two stages in the sequence shown.
 - Stage 1: Tighten to 15 Nm (11 lb-ft).
 - Stage 2: Tighten to 110 Nm (81 lb-ft).



3. Install the transmission. For additional information, refer to [Section 307-01](#).
-

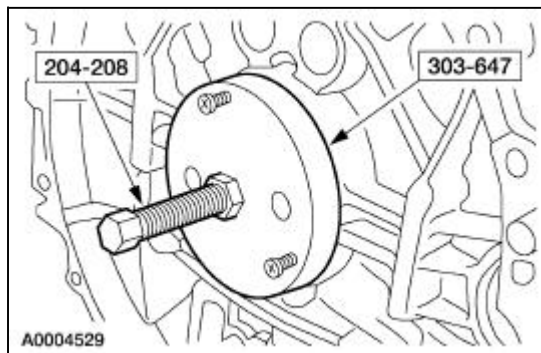
Crankshaft Rear Oil Seal

Special Tool(s)

 ST2495-B	Rear Crankshaft Seal Remover/Installer 303-647
 ST2441-A	Screw 204-208 (T95T-5310-AR2)

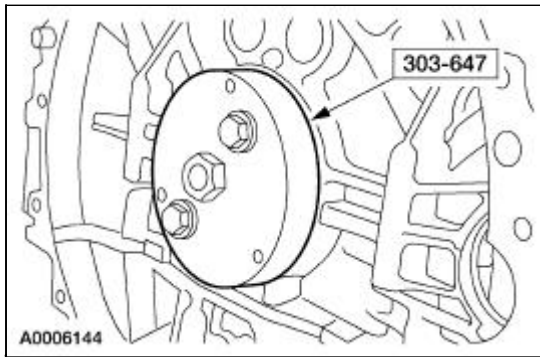
Removal

1. Remove the flexplate. For additional information, refer to [Flexplate](#) in this section.
2. Using the special tools, remove the crankshaft rear oil seal.
 - Discard the seal.



Installation


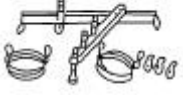
1. Lubricate the outer lips and the inner seal on the crankshaft rear oil seal with Super Premium SAE 5W-30 Motor Oil XO-5W30-QSP or equivalent meeting Ford specification WSS-M2C153-G.
2. Using the special tool, install a new crankshaft rear oil seal.



3. Install the flexplate. For additional information, refer to [Flexplate](#) in this section.
-

Engine Mount

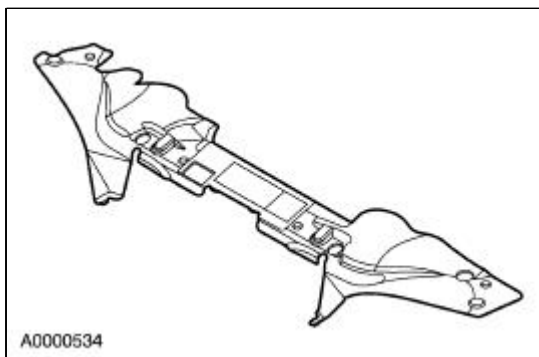
Special Tool(s)

 <p>ST1595-A</p>	Lifting Bracket, Engine 303-050 (T70P-6000)
 <p>ST1703-A</p>	Support Bar, Engine 303-D063 (D88L-6000-A)

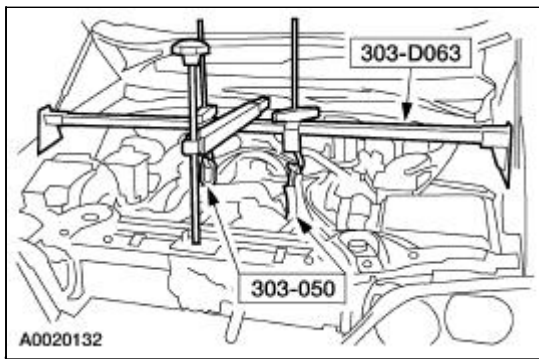
Removal

For LH and RH

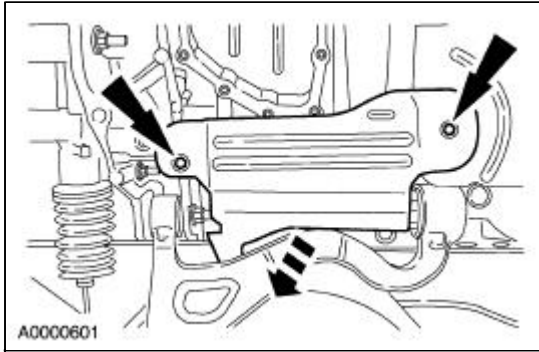
1. Disconnect the battery ground cable (14301). For additional information, refer to [Section 414-01](#).
2. Remove the air cleaner outlet tube. For additional information, refer to [Section 303-12](#).
3. Remove the upper radiator sight shield.



4. Install the special tools and support the engine.

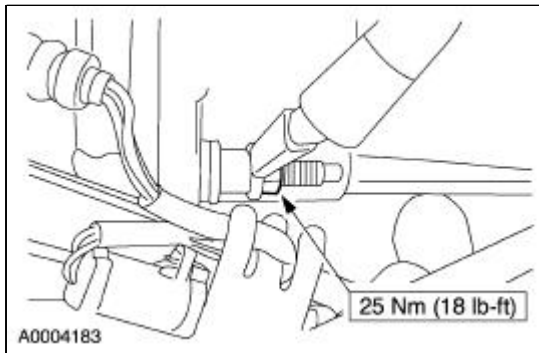


5. Raise and support the vehicle. For additional information, refer to [Section 100-02](#).
6. Remove the LH and the RH lower splash shield.

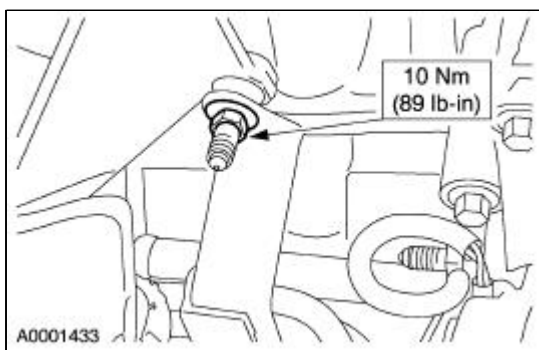


For RH

7. Remove the nut and disconnect the starter motor ground cable.

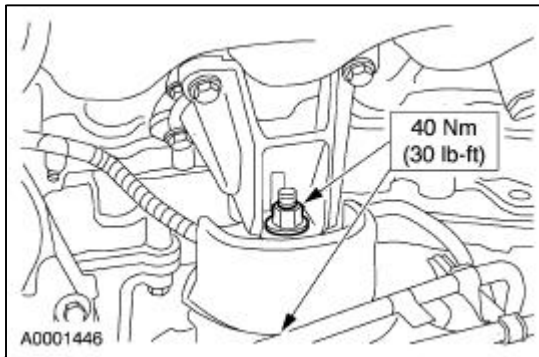


8. Remove the nut and disconnect the wiring harness support bracket from the engine mount bracket.

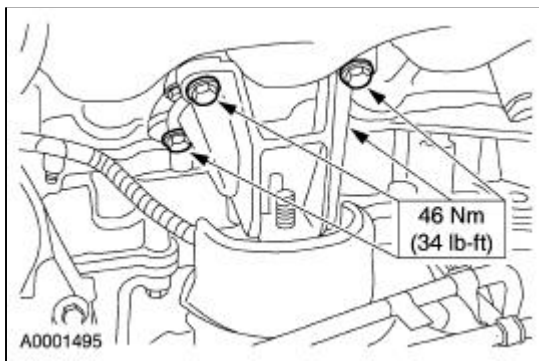


For LH and RH

9. Remove the two nuts from the top and bottom of the engine mounts.




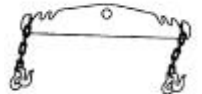
10. Remove the four bolts, the engine mounts and the brackets.



11. To install, reverse the removal procedure.
-


Engine

Special Tool(s)

 ST1595-A	Engine Lifting Brackets 303-050 (T70P-6000)
 ST1602-A	Spreader Bar 303-D089 (D93P-6001-A3)

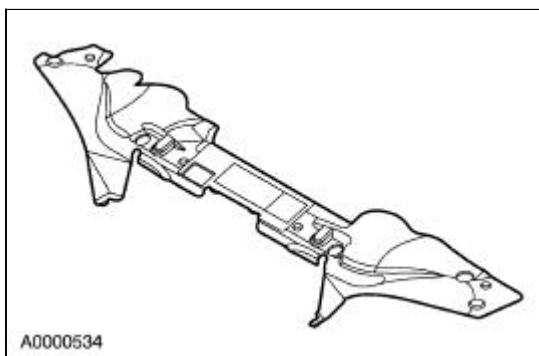
Removal

1. Disconnect the battery ground cable (14301). For additional information, refer to [Section 414-01](#).
2. Remove the air cleaner inlet. For additional information, refer to [Section 303-12](#).

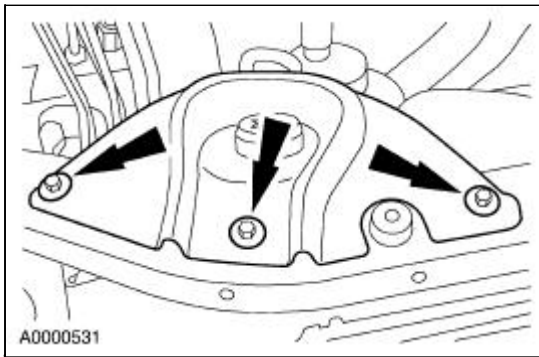
3.  **CAUTION: The coolant drain procedure must be followed exactly or damage to the engine may occur.**

Drain the engine coolant. For additional information, refer to [Section 303-03](#).

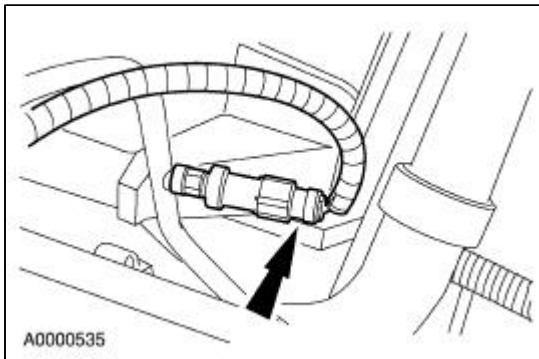
4. Remove the upper radiator sight shield.



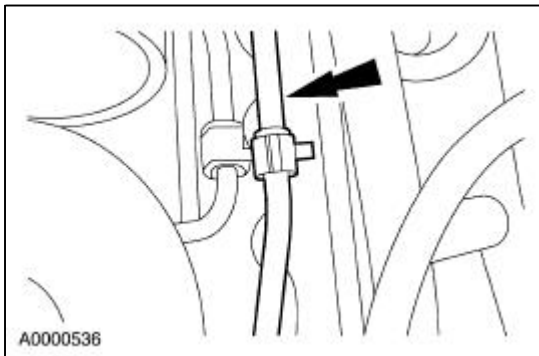
5. Remove the two upper radiator support brackets.



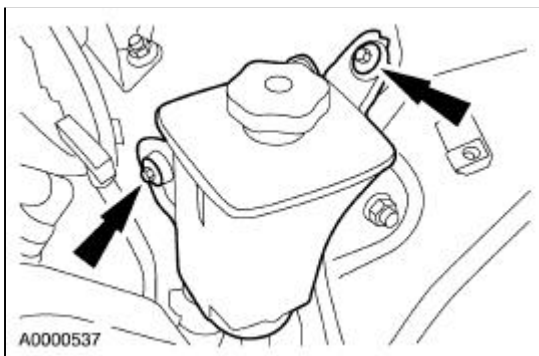
6. Discharge the A/C system. For additional information, refer to [Section 412-00](#).
7. Disconnect the A/C pressure switch electrical connector.



8. Release the power steering return line from the pressure line clip.

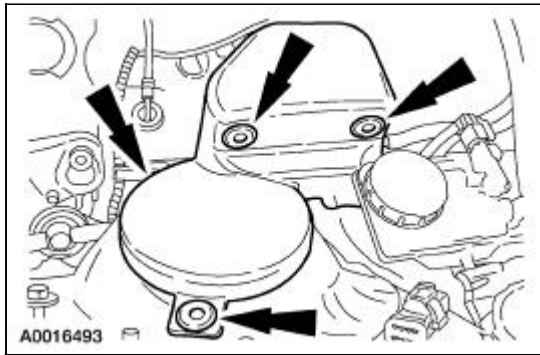



9. Remove the power steering pump reservoir and secure the reservoir to the engine.



10. Disconnect the fuel line. For additional information, refer to [Section 310-00](#).

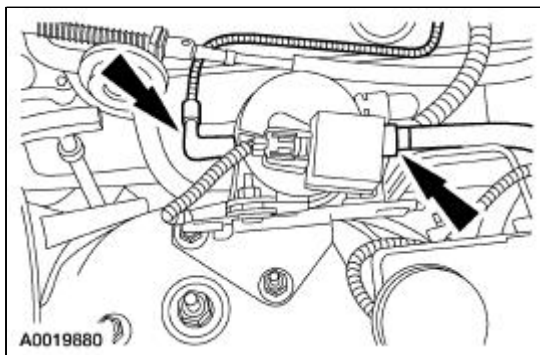
11. Remove the vapor management valve (VMV) cover.



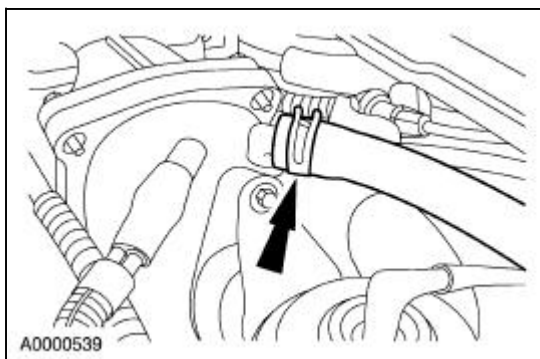
12.  **CAUTION:** To disconnect the fitting, squeeze the tabs and pull straight out or damage to the fitting may occur.

Disconnect the VMV.

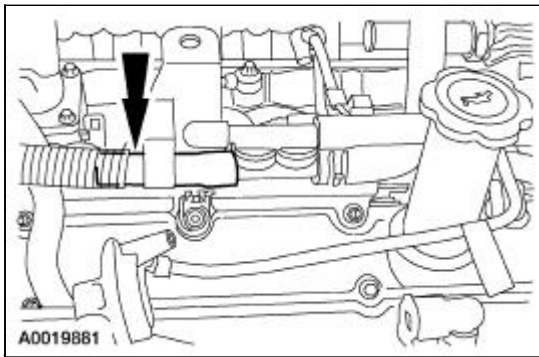
- Canister purge hose.
- Vacuum hose.



13. Disconnect the main vacuum supply hose.

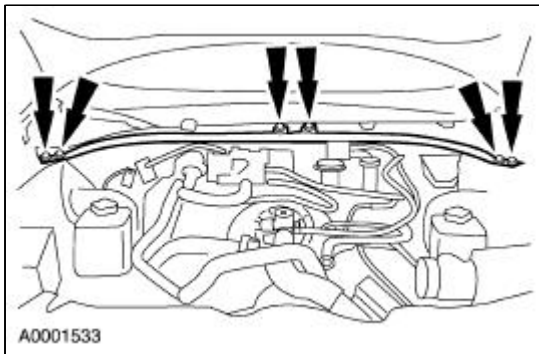


14. Remove the cowl vent screens. For additional information, refer to [Section 501-02](#).
15. Unclip the hose and position aside.

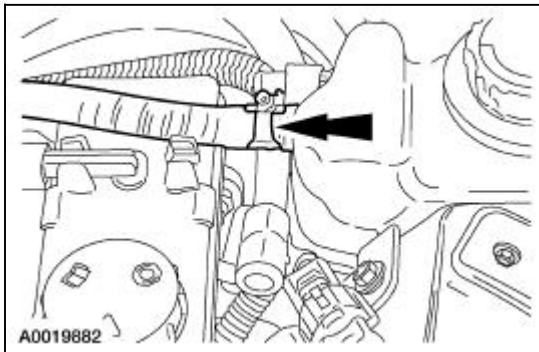


16. Remove the bracket.

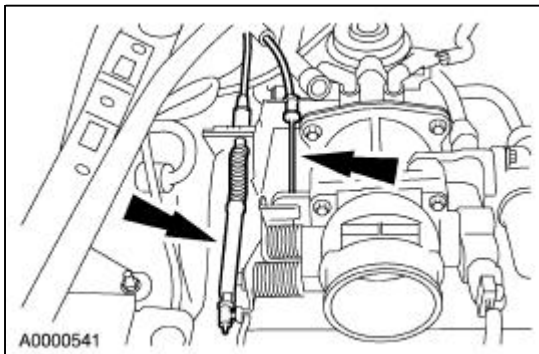
- Remove the seven bolts and one nut.
- Remove the windshield washer hose.
- Remove the bracket.



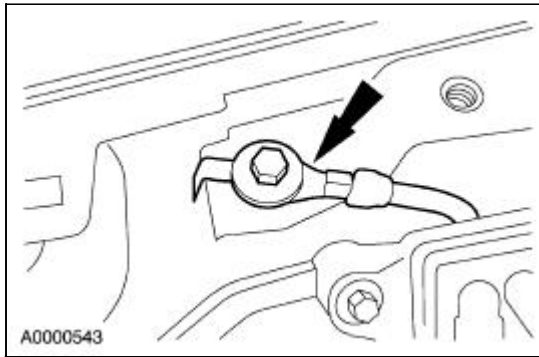
17. Disconnect the degas bottle.



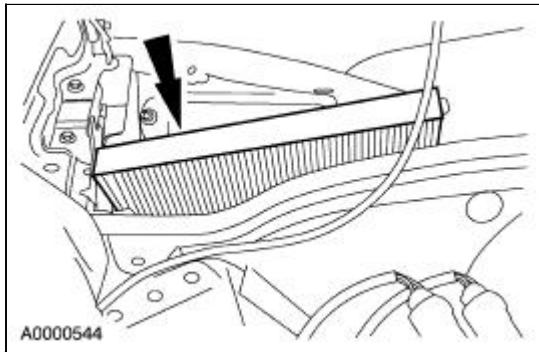
18. Disconnect the accelerator cable and the speed control cable.



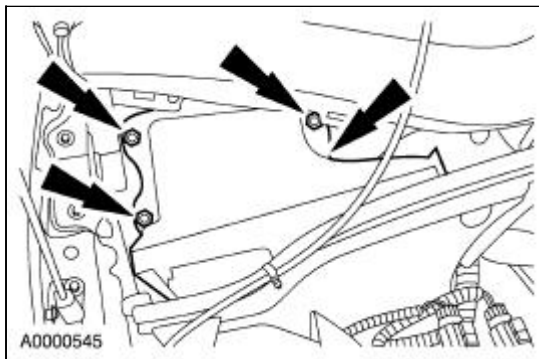
19. Disconnect the ground strap.



20. Remove the fresh air filter.

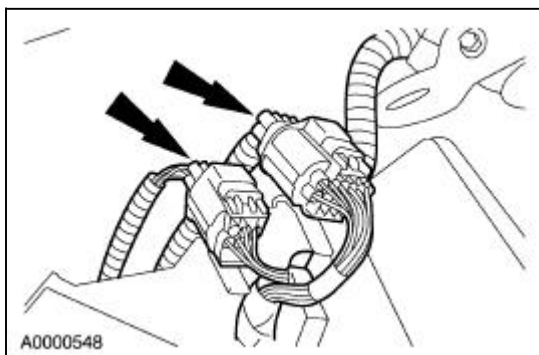


21. Remove the fresh air filter housing.

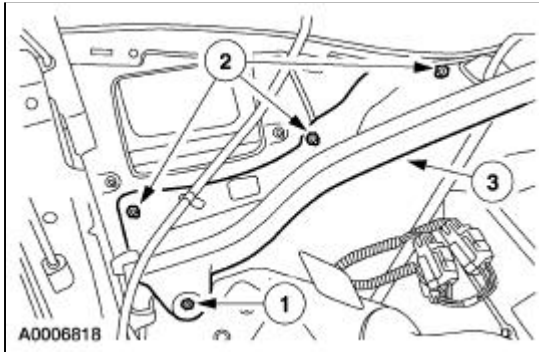


22. **NOTE:** The connectors are located on the backside of the RH strut tower.

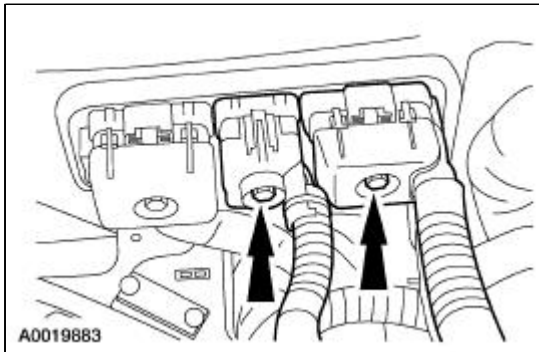
Disconnect the powertrain bulkhead electrical connectors.



23. Remove the fresh air filter panel.
 1. Remove the pin-type retainer.
 2. Remove the nuts.
 3. Remove the panel.

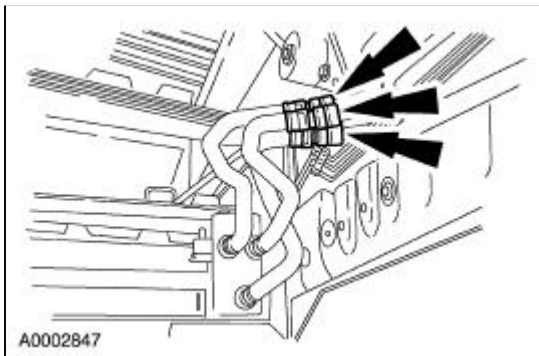


24. Disconnect the connectors.

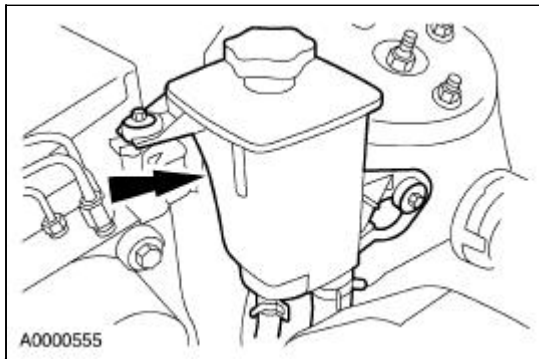


25. **NOTE:** Mark the position of the heater hoses for correct installation.

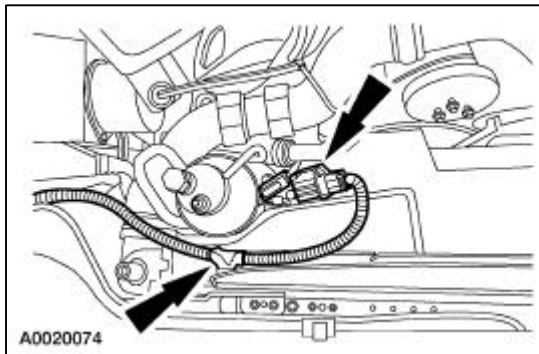
Disconnect the heater hoses from the water control valve.



26. Remove the hydraulic cooling fan reservoir and secure the reservoir to the engine.



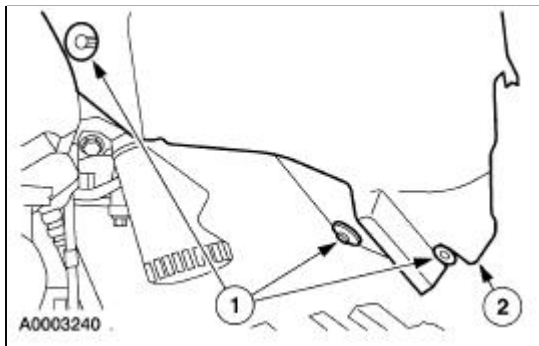
27. Disconnect the water valve electrical connector, unclip from the radiator support and position the harness aside.



28. Remove the front wheels and tires. For additional information, refer to [Section 204-04](#) .
29. **NOTE:** LH shown; RH similar.

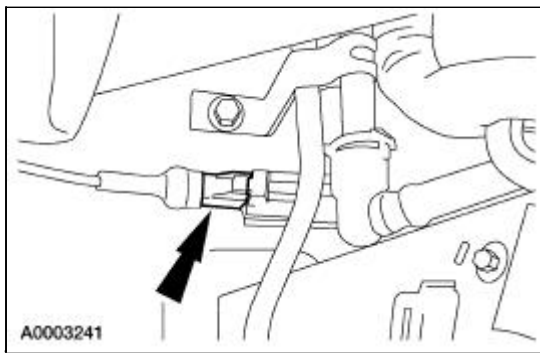
Position the LH and the RH inner splash shields aside.

1. Remove the pin-type retainers.
2. Position the shields aside.



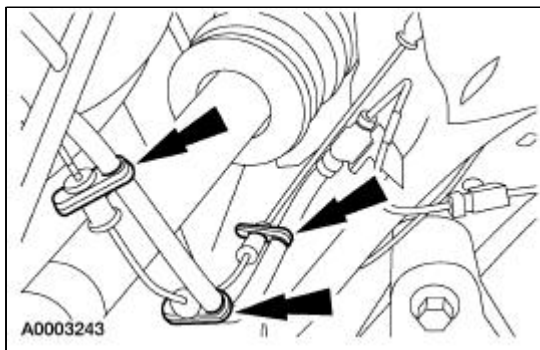
30. **NOTE:** LH shown; RH similar.

Disconnect the LH and the RH anti-lock brake sensor electrical connectors.



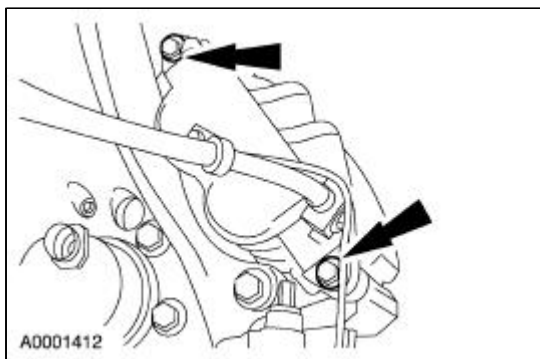
31. **NOTE:** LH shown; RH similar.

Unclip the LH and the RH anti-lock brake harness from the brake hoses.



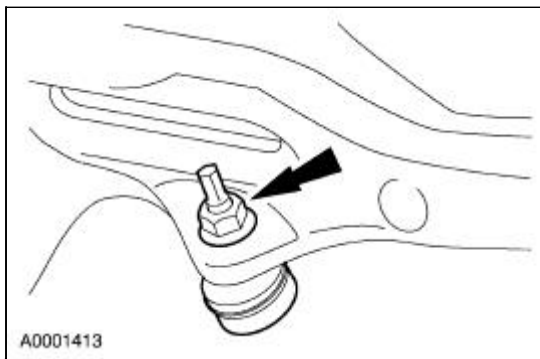
32. **NOTE:** LH shown; RH similar.

Remove the LH and the RH brake calipers and position the calipers aside.



33. **NOTE:** LH shown; RH similar.

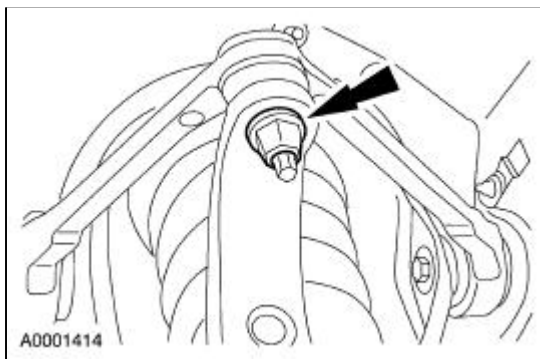
Remove the LH and the RH sway bar lower nuts.



34. **NOTE:** LH shown; RH similar.

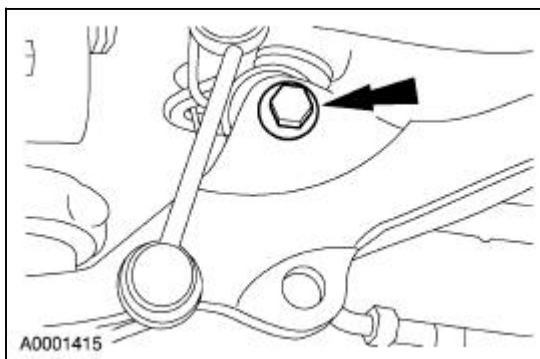
NOTE: Hold external hex when removing the ball joint nuts to prevent damage to the ball joints.

Remove the LH and the RH nuts and separate the ball joints from the spindles.



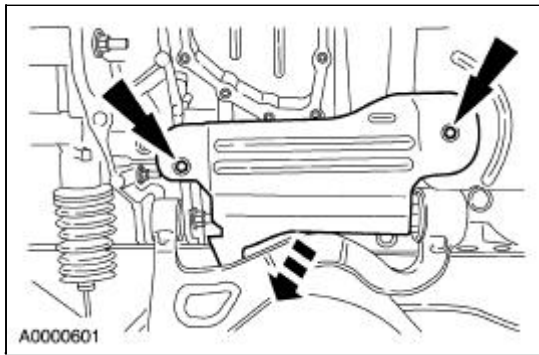
35. **NOTE:** LH shown; RH similar.

Remove the LH and the RH lower strut mount bolts.

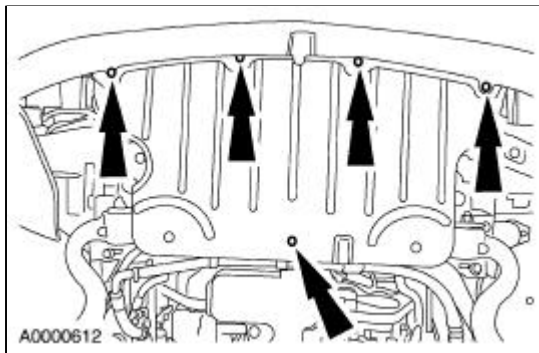


36. **NOTE:** LH shown; RH similar.

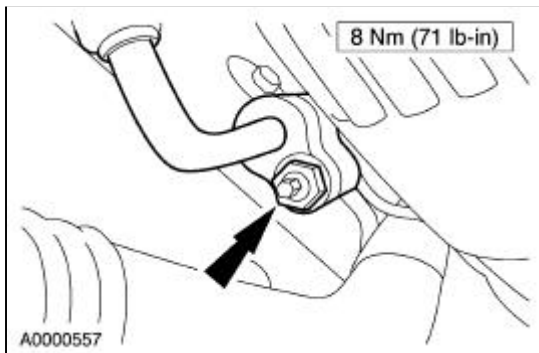
Remove the LH and the RH splash shields.



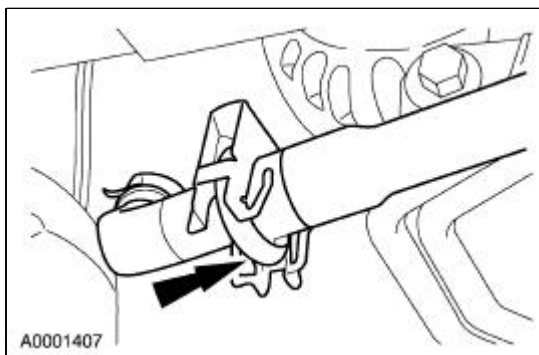
37. Remove the center splash shield.



38. Remove the nut and disconnect the A/C high pressure line.

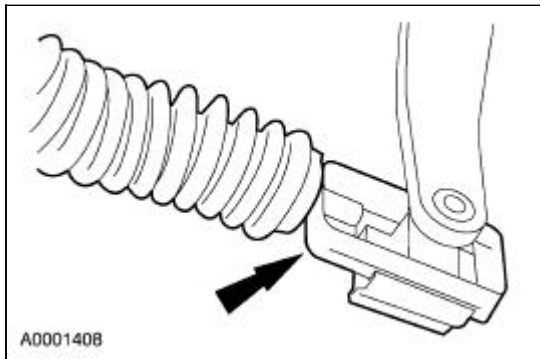


39. Disconnect the low pressure A/C line.

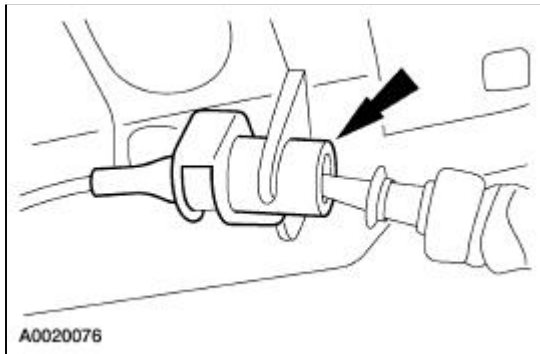


40. Remove the driveshaft. For additional information, refer to [Section 205-01](#).

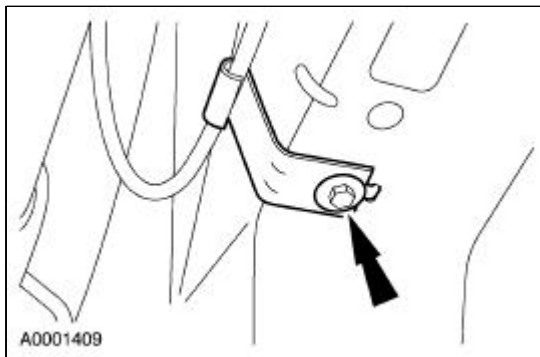
41. Disconnect the shift cable from the shifter.



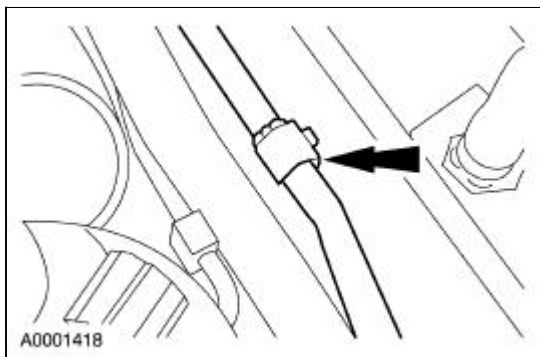
42. Unclip the shift cable from the bracket.



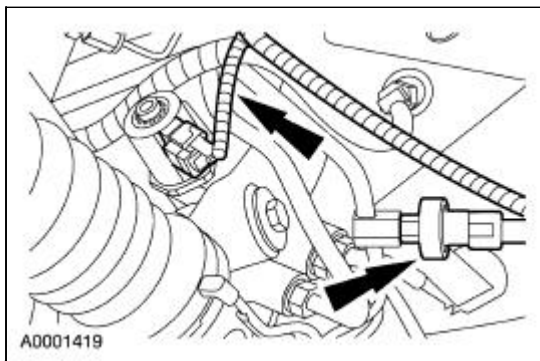
43. Remove the shift cable bracket.



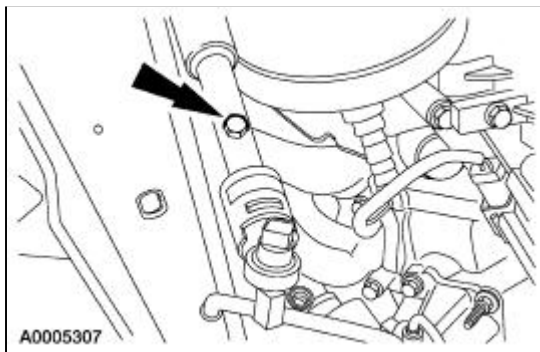
44. Release the power steering lines from the LH frame rail.



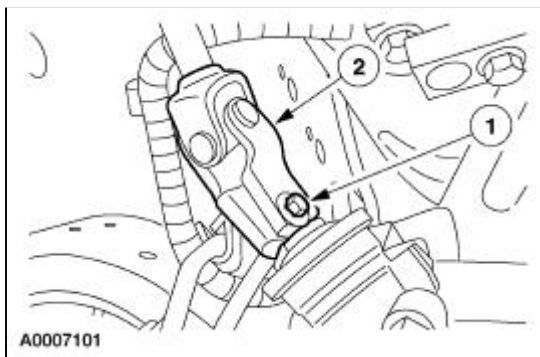
45. Disconnect the rack and pinion steering unit electrical connectors.



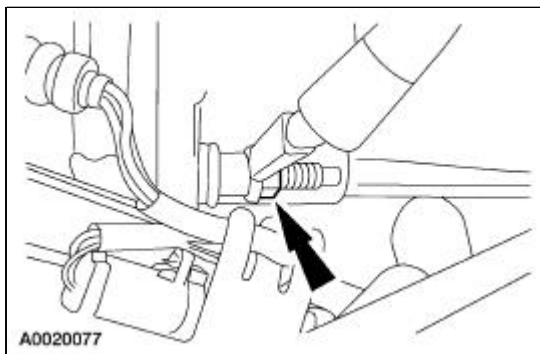
46. Remove the steering shaft bolt.



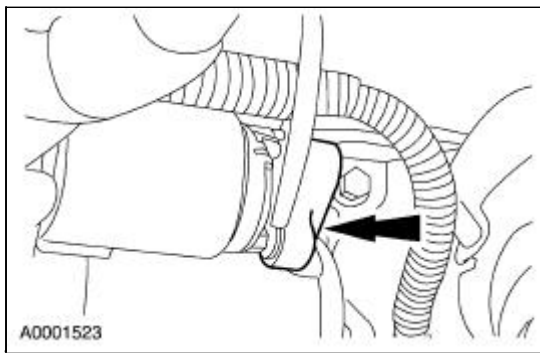
47. Disconnect the steering coupling.
1. Remove the bolt.
2. Disconnect the coupling.



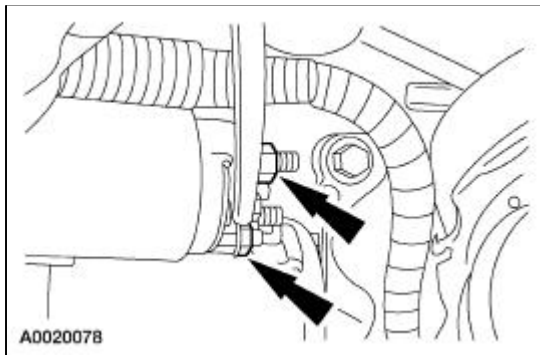
48. Remove the starter motor ground cable.



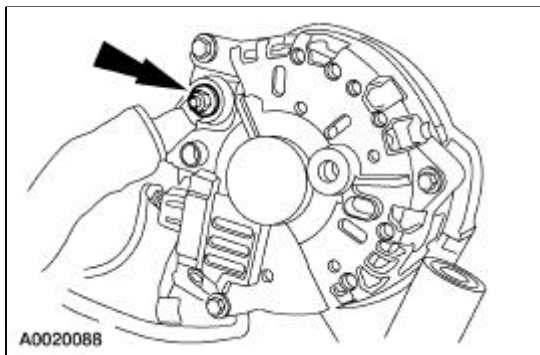
49. Remove the cover.



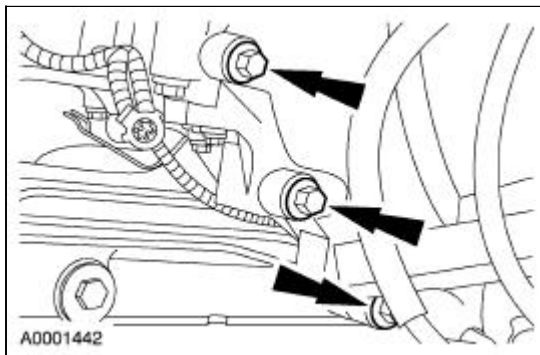
50. Disconnect the starter motor electrical connectors.



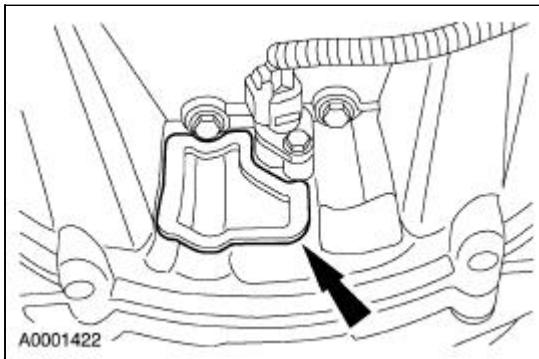
51. Disconnect the generator electrical connector.



52. Remove the six lower transmission to engine bolts.

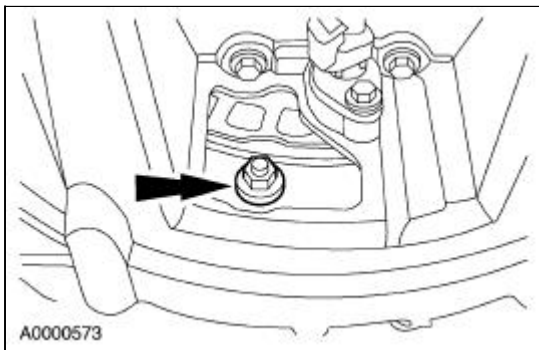


53. Remove the cover.

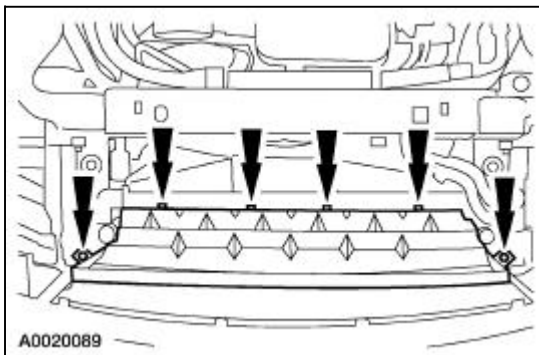


54. **NOTE:** Make an identifying mark on the nut, stud, and adapter plate to allow for correct installation.

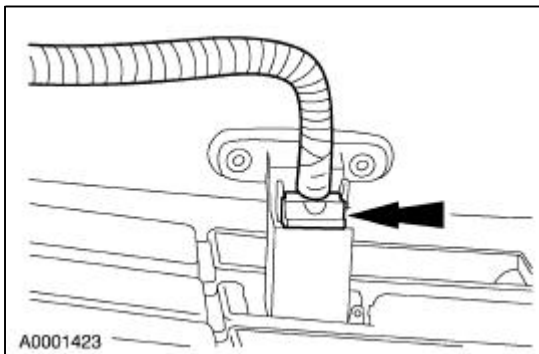
Remove the eight torque converter nuts.



55. Remove the inner air deflector.

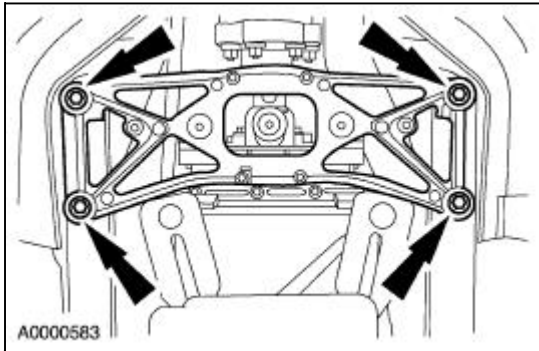


56. Remove the engine block heater plug, if equipped.

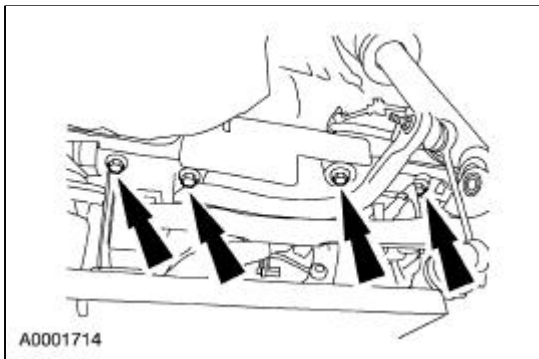


57. Support the rear of the vehicle with suitable safety stands.

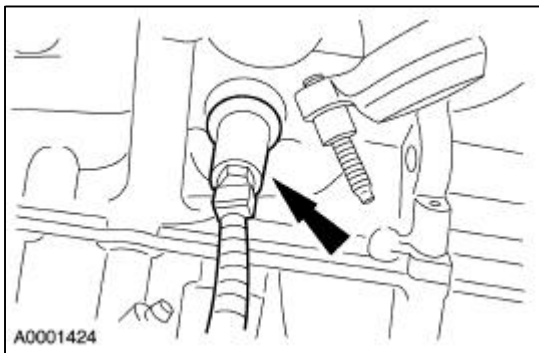
58. Support the engine, transmission, front and center crossmembers, and the cooling system with a powertrain lift and a transmission support bracket.
59. Remove the transmission crossmember bolts.



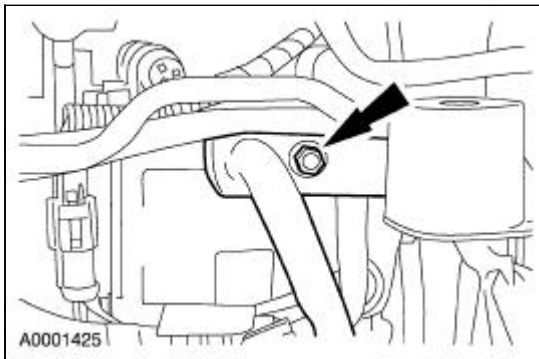
60. Remove the four front and the four center crossmember bolts.



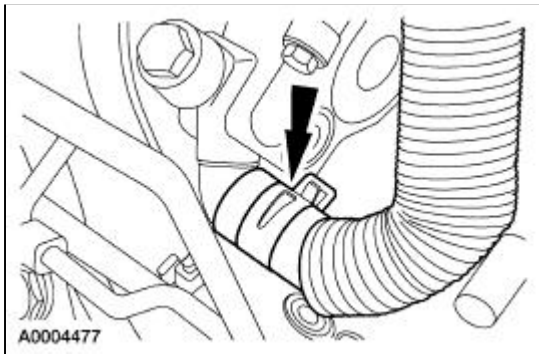
61. Carefully lower the entire assembly from the vehicle.
62. Disconnect the block heater, if equipped.



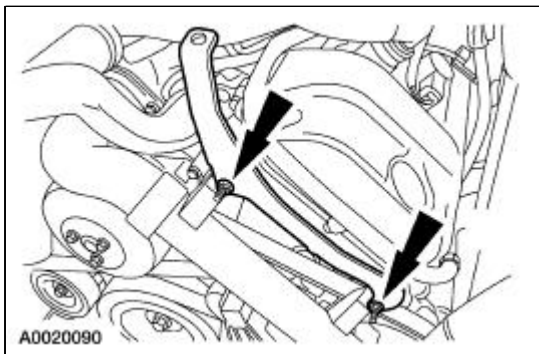
63. Disconnect the A/C manifold and tube.



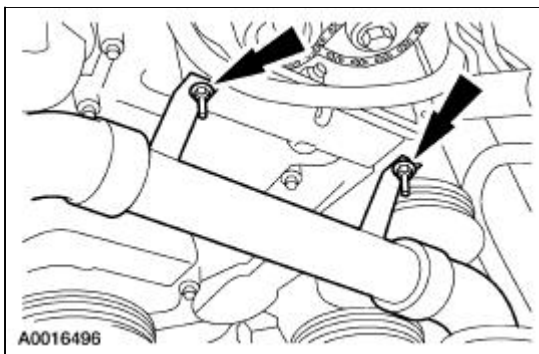
64. Disconnect the power steering pump and hydraulic cooling fan pump return hoses.



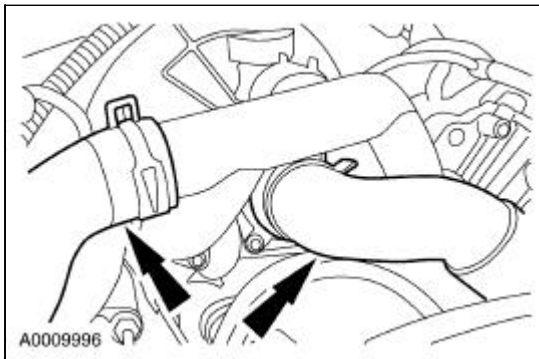
65. Remove the bracket.



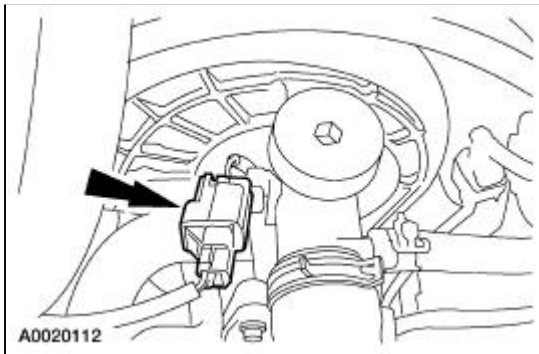
66. Remove the lower radiator hose.



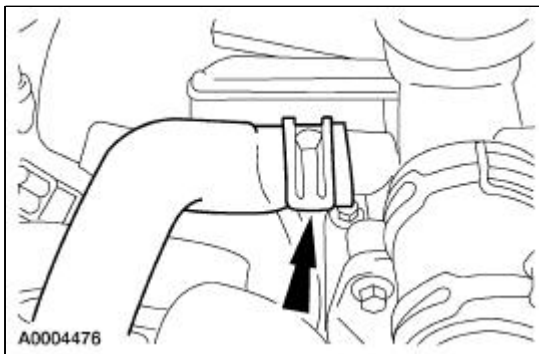
67. Disconnect the radiator hoses.



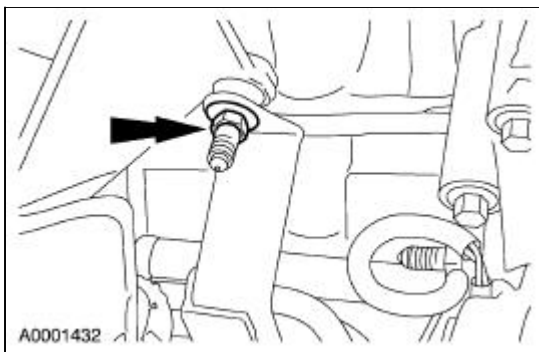
68. Disconnect the knock sensor (KS) electrical connector.



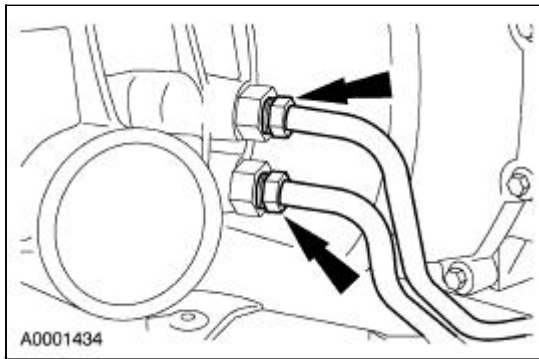
69. Disconnect the heater hose.



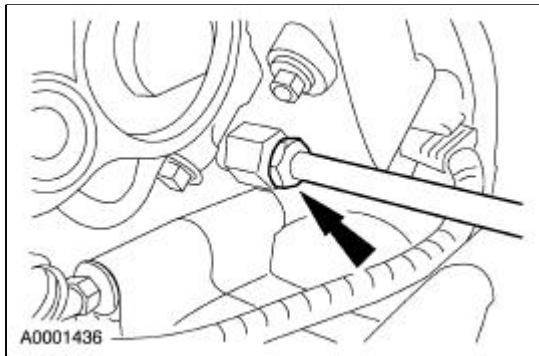
70. Remove the transmission cooler line bracket.



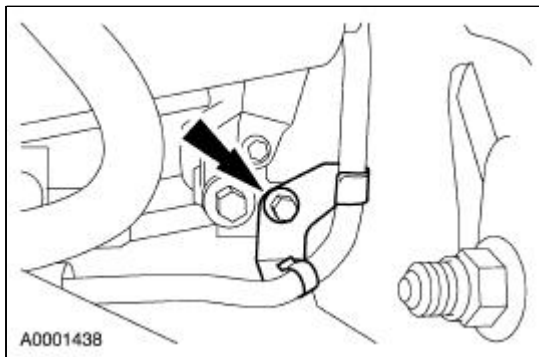
71. Disconnect the transmission cooler lines.



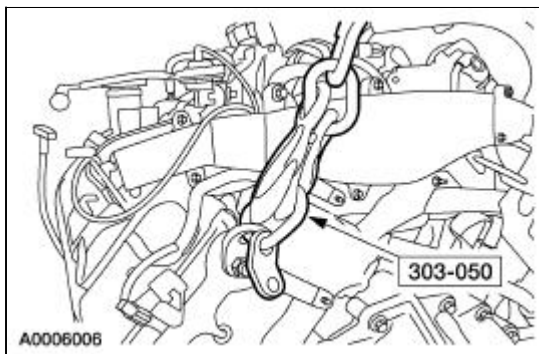
72. Disconnect the power steering pressure line.



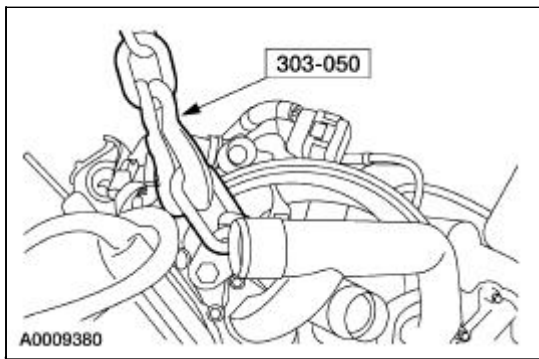
73. Remove the power steering line bracket.



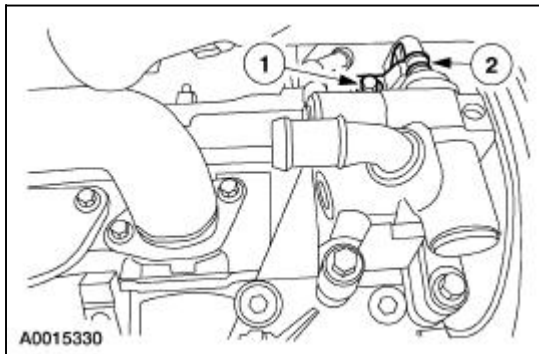
74. Install the special tool.



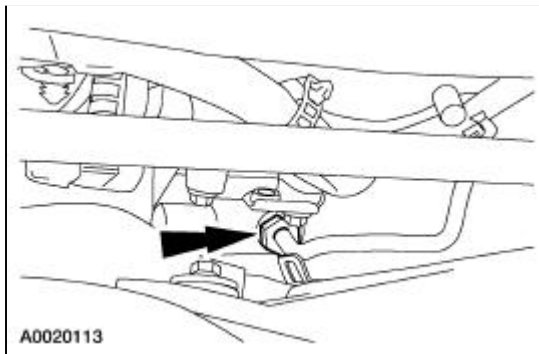
75. Install the special tool.



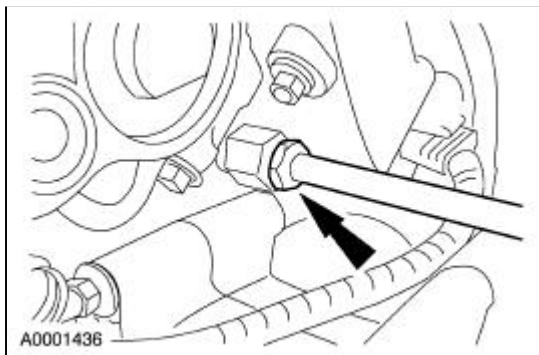
76. Remove the hydraulic fan pump bracket.
1. Remove the bolt.
 2. Remove the bracket.



77. Disconnect the hydraulic fan pump line.

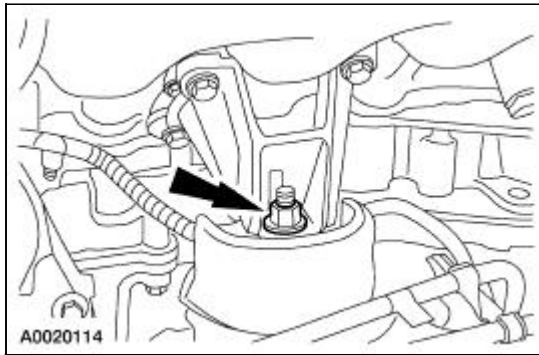


78. Using the special tool and an engine crane, support the engine and transmission in the front sub-frame.

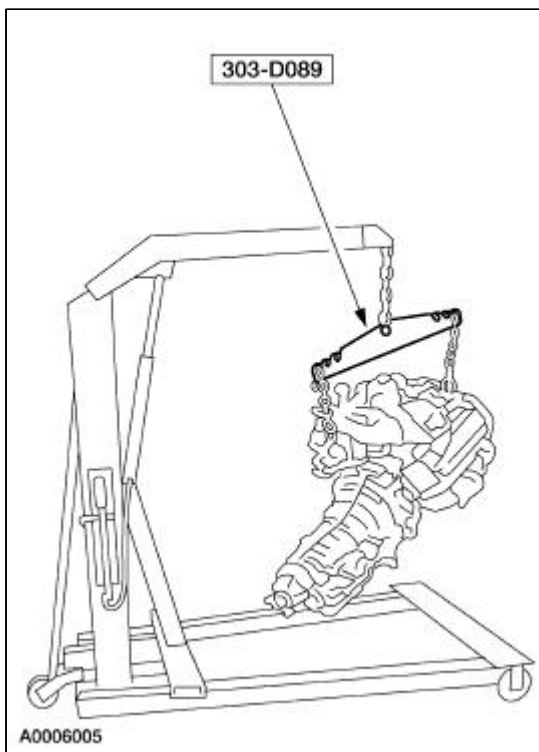


79. **NOTE:** LH shown; RH similar.

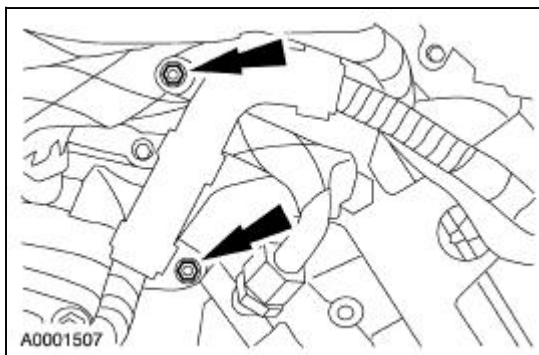
Remove the LH and the RH upper engine mount nuts.



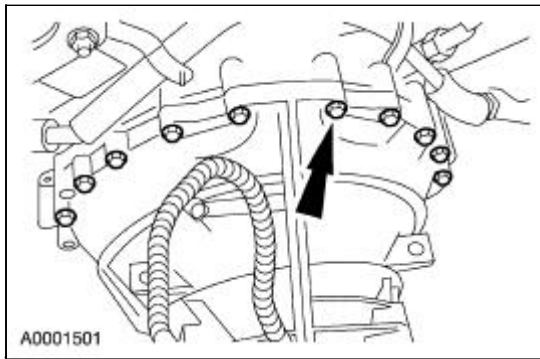
80. Using the special tool and an engine crane, move the engine and transmission from the sub-frame to rest on the floor or on a bench.



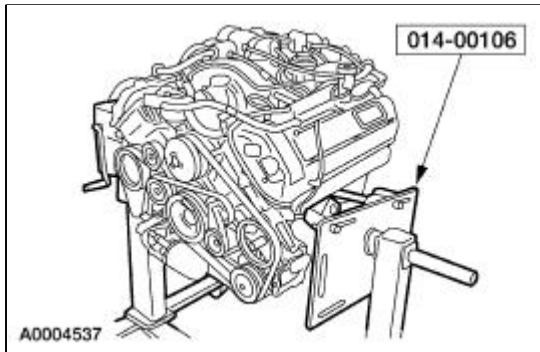
81. Remove the nuts and position the wiring harness aside.



82. Remove the bolts and separate the engine from the transmission.



83. Mount the engine on an engine stand.



84. Remove the engine lifting equipment.

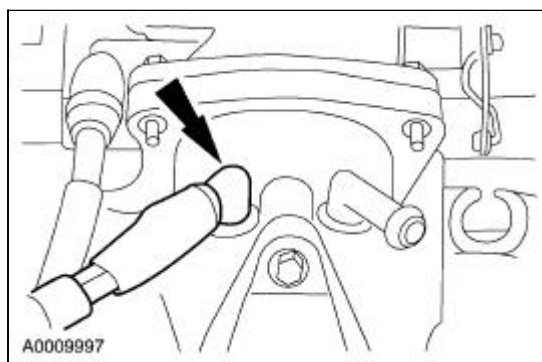
Engine

Special Tool(s)

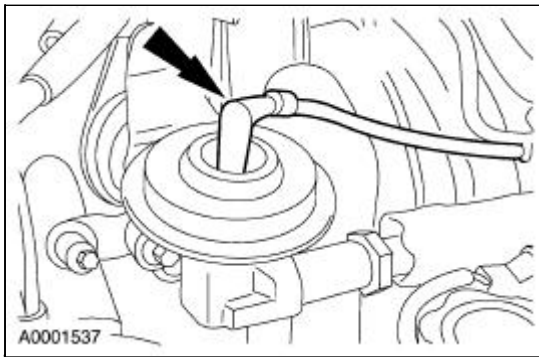
 ST1286-A	Crankshaft Damper Remover 303-009 (T58P-6316-D)
 ST2495-B	Crankshaft Rear Seal Remover/Installer 303-647
 ST2441-A	Screw 204-208 (T95T-5310-AR2)

Disassembly

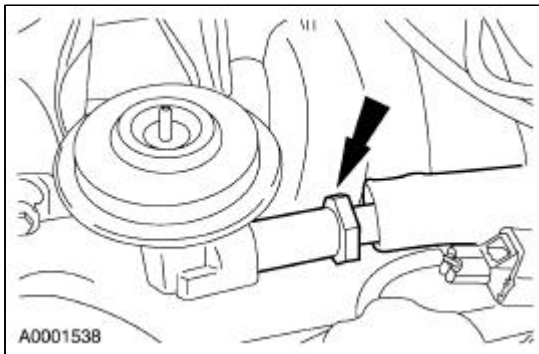
1. Disconnect the vacuum harness.



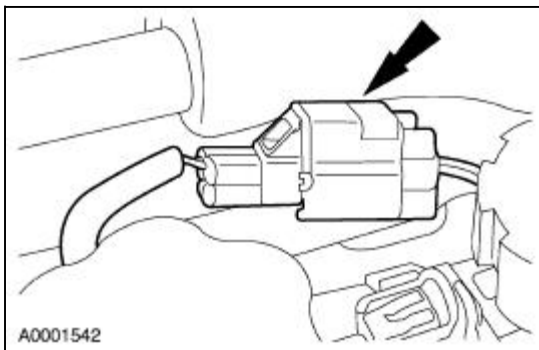
2. Disconnect the vacuum line.



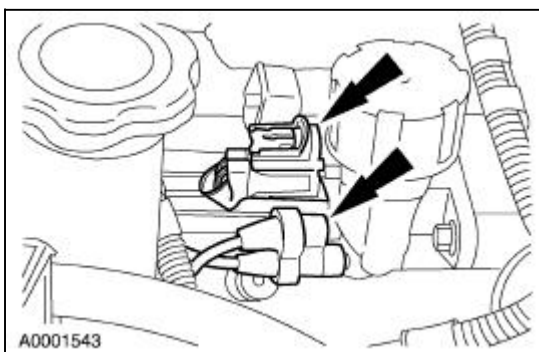
3. Remove the EGR valve to exhaust manifold tube.
 - Disconnect the upper fitting.
 - Disconnect the hoses.
 - Disconnect the lower fitting.



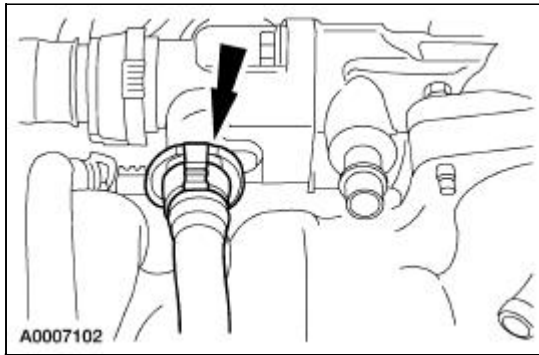
4. Disconnect the camshaft position (CMP) sensor electrical connector and separate the connector from the fuel injection supply manifold.



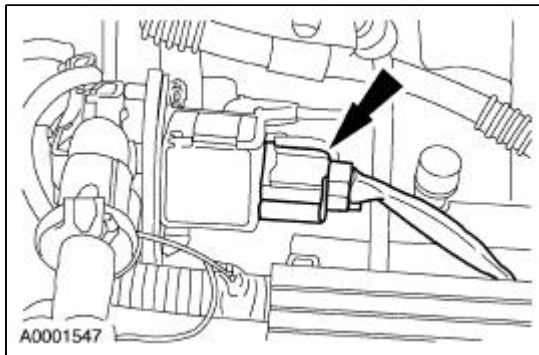
5. Disconnect the EGR vacuum regulator (EVR) electrical connector and the vacuum line.



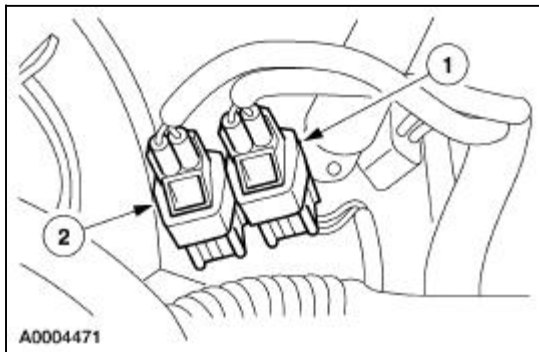
6. Disconnect the air assist tube.



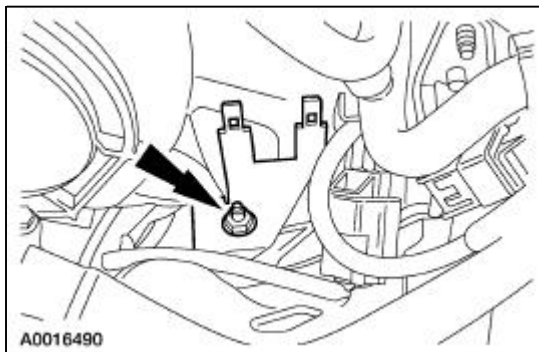
7. Disconnect the fuel pressure sensor electrical connector.



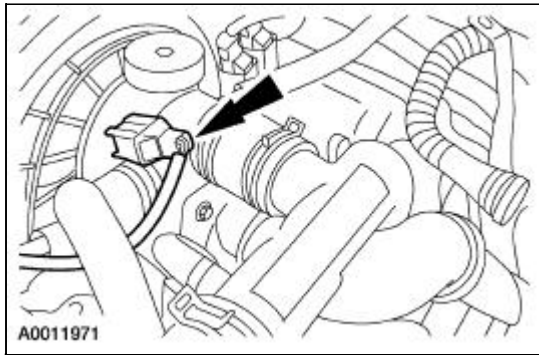
8. Remove the electrical connectors from the bracket.
 1. LH knock sensor (KS).
 2. Cylinder head temperature (CHT) sensor.



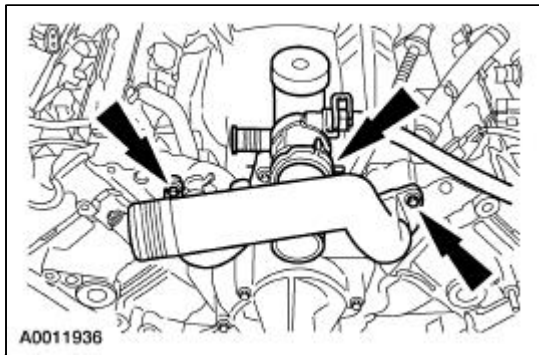
9. Remove the nut and the bracket.



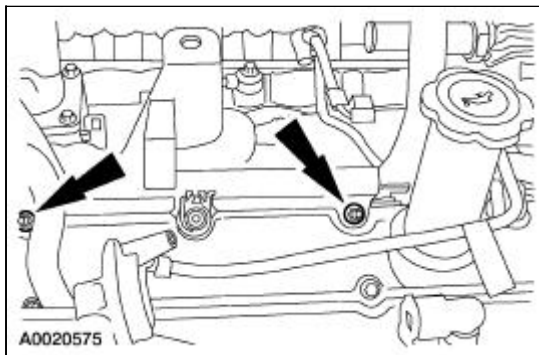
10. Disconnect the RH KS and remove the electrical connector from the bracket.



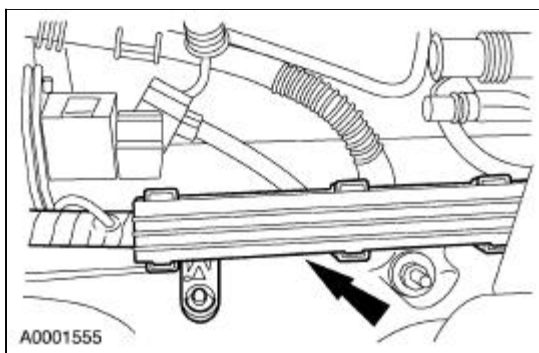
11. Remove the four bolts. Disconnect the hoses and remove the coolant outlet pipe.



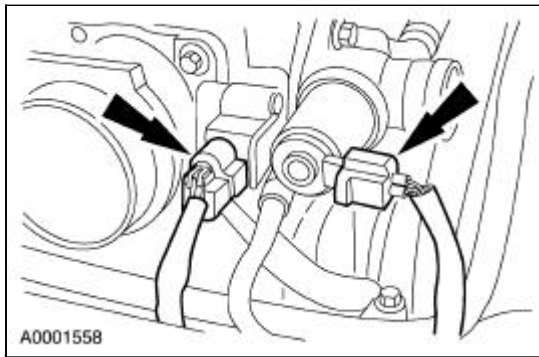
12. Remove the two nuts and the bracket.



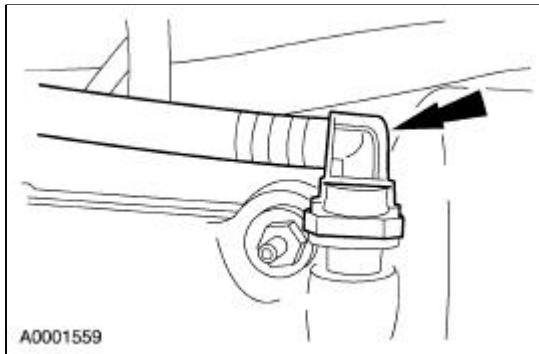
13. Raise the engine wiring harness and disconnect the LH fuel injector connectors.



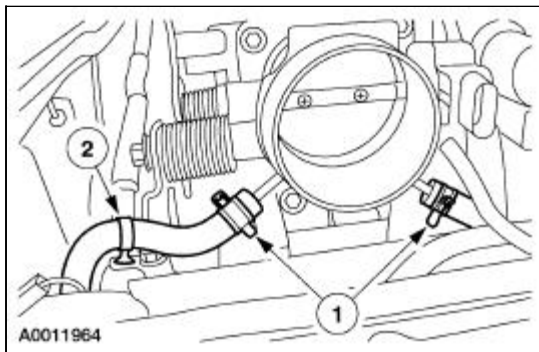
14. Disconnect the idle air control (IAC) valve and the throttle position sensor (TPS) electrical connectors.



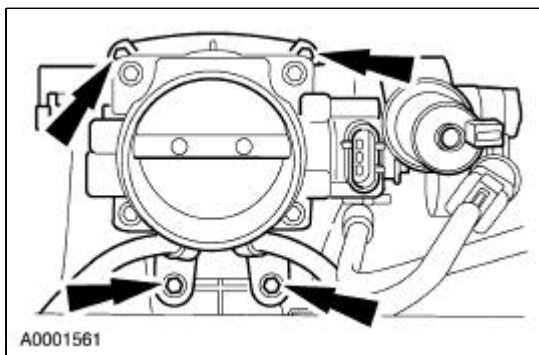
15. Disconnect the PCV tube.



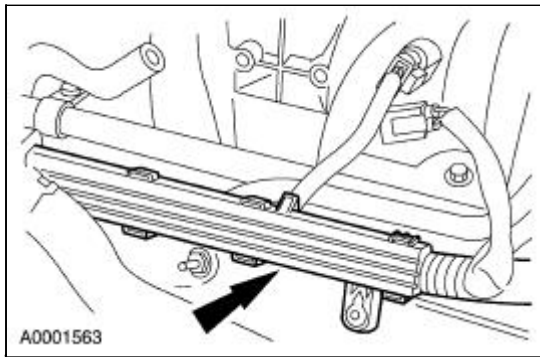
16. Disconnect the hoses (1) from the throttle body and the clip (2).



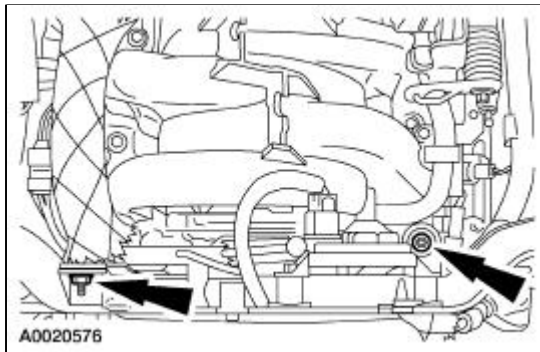
17. Remove the throttle body.



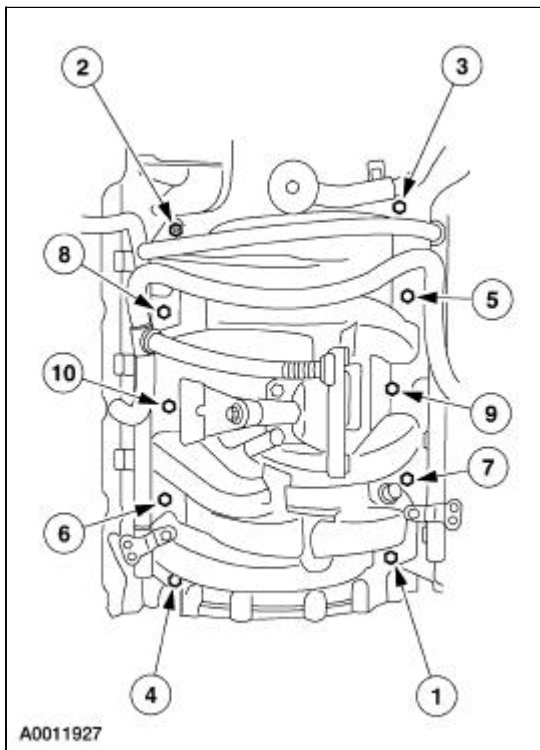
18. Raise the engine wiring harness and disconnect the RH fuel injectors.



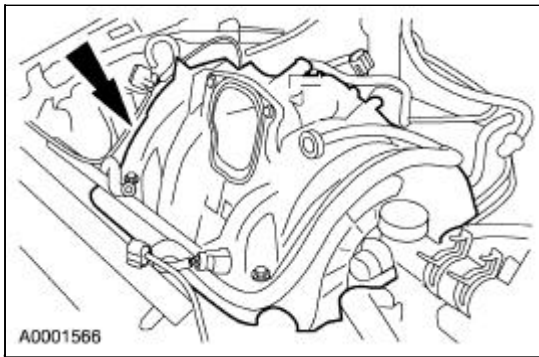
19. Remove the nuts and position the wiring harness aside.



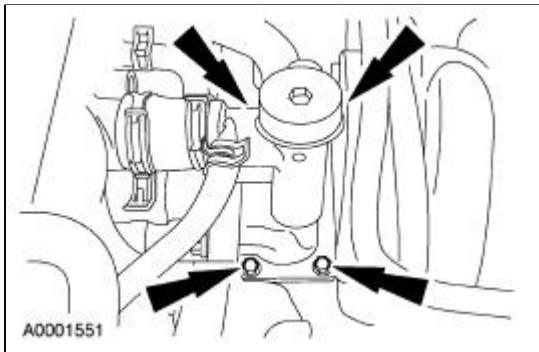
20. Remove the nine bolts and one stud (2) in the sequence shown.




21. Remove the intake manifold.

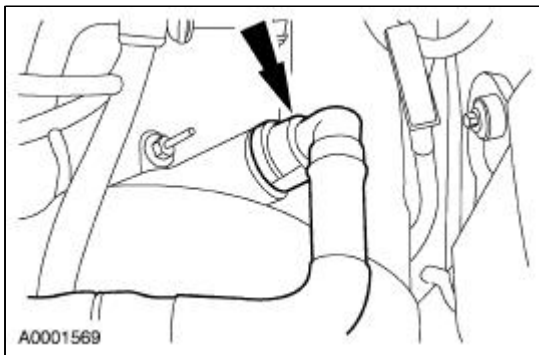


22. Remove the four bolts and the thermostat housing.

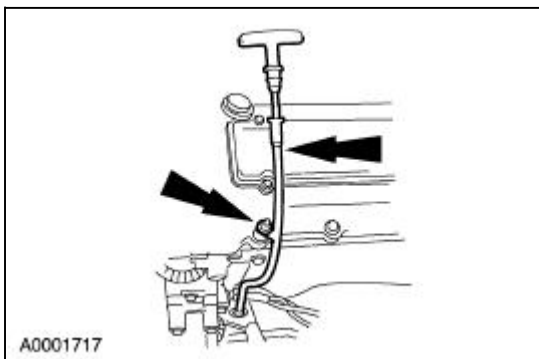


23.  **CAUTION:** To remove normal fittings, squeeze the tabs and pull straight out or damage to the fitting may occur.

Disconnect the crankcase ventilation tube.

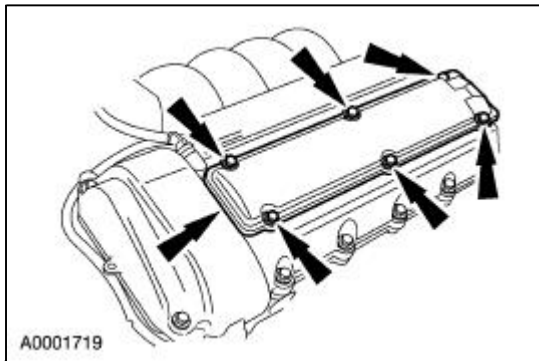


24. Remove the nut and the oil level indicator and tube.



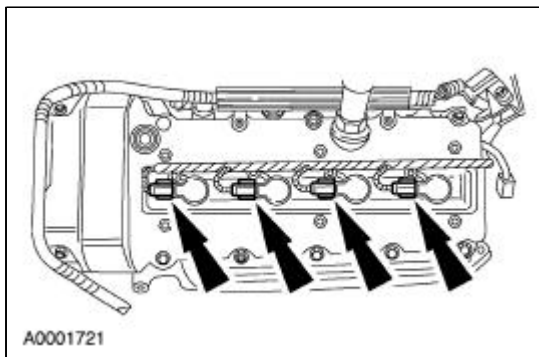
25. **NOTE:** LH shown; RH similar.

Remove the RH and LH coil covers.



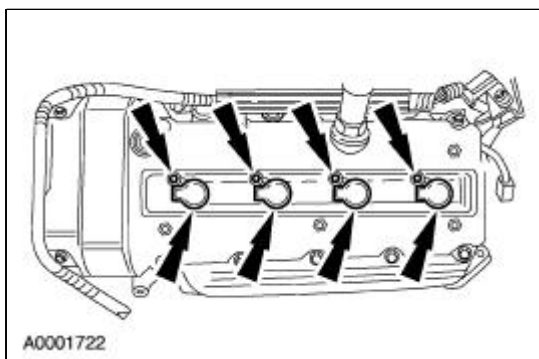
26. **NOTE:** LH shown; RH similar.

Disconnect the RH and LH ignition coil connectors.

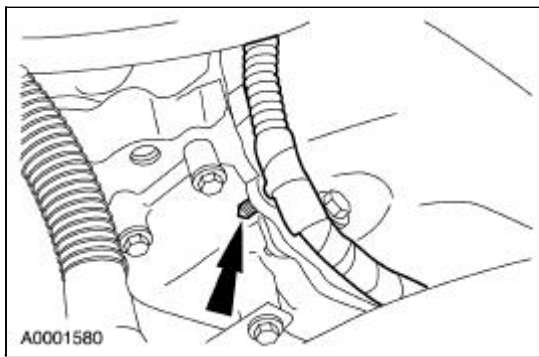


27. **NOTE:** LH shown; RH similar.

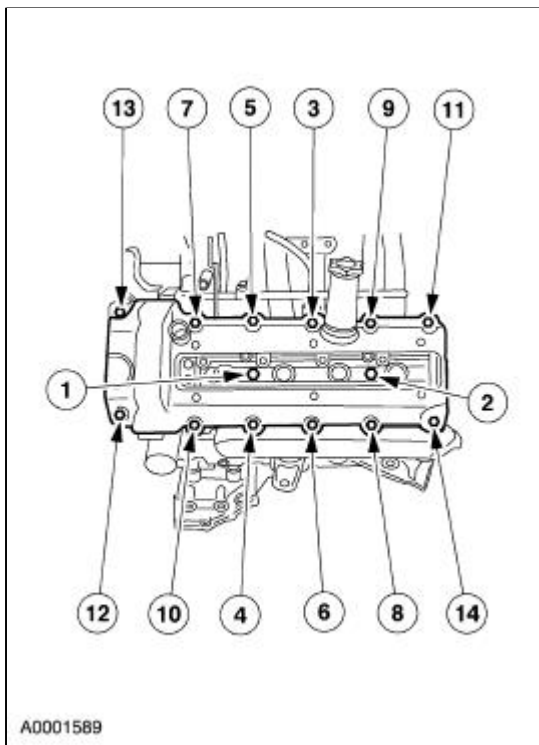
Remove the RH and LH ignition coils.



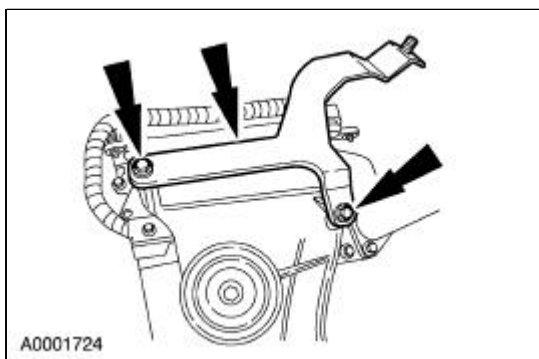
28. Disconnect the wiring harness retainers from the LH valve cover.



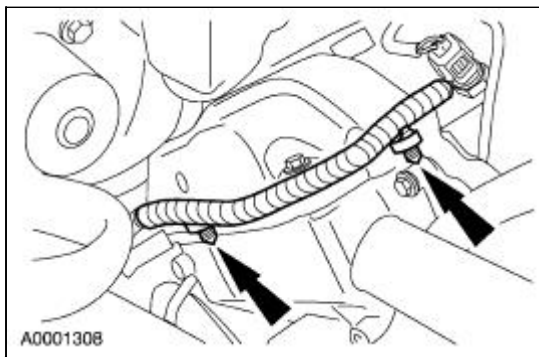
29. Remove the bolts in the sequence shown and remove the LH valve cover.



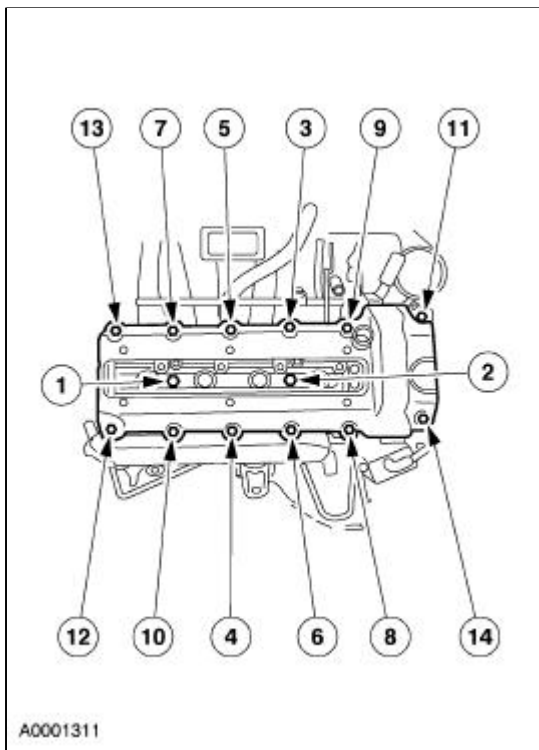
30. Remove the bracket.



31. Disconnect the four wiring harness retainers from the RH valve cover.



32. Remove the bolts in the sequence shown and remove the RH valve cover.

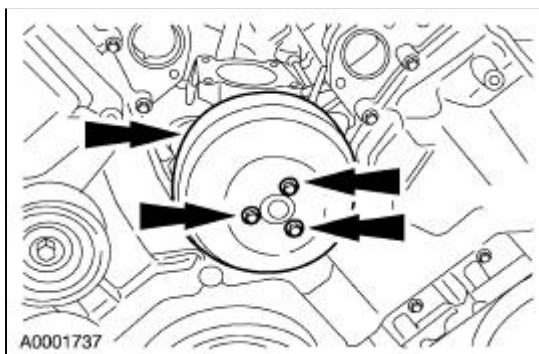



33. Loosen the water pump pulley bolts.

34. Remove the drive belt and tensioner. For additional information, refer to [Section 303-05](#).

35. Remove the water pump pulley.

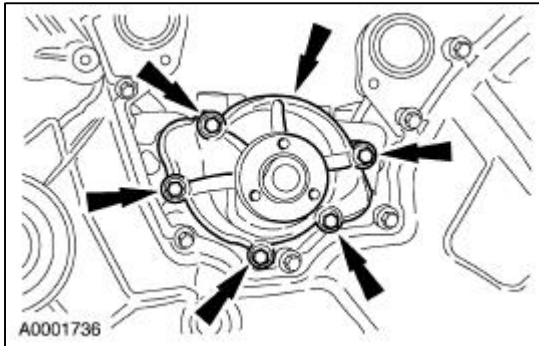
- Remove and discard the bolts.
- Remove the pulley.



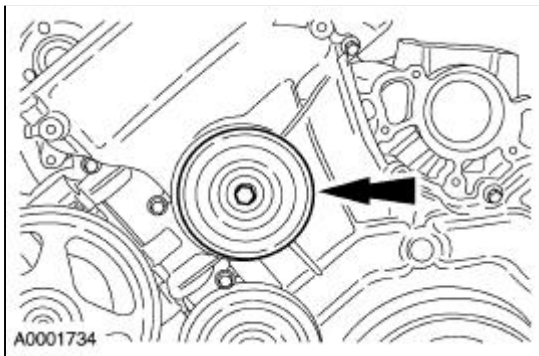
36.  **CAUTION: Do not use metal scrapers, wire brushes, power abrasive discs or other abrasive means to clean the sealing surfaces. These tools cause scratches and gouges, which make leak paths. Use a plastic scraping tool to remove all traces of the gasket.**

Remove the water pump.

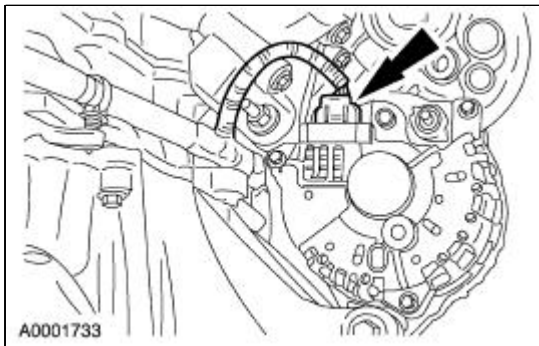
- Remove the bolts.
- Remove the water pump.
- Discard the gasket.
- Clean and inspect the O-ring seal. Install a new seal if necessary.



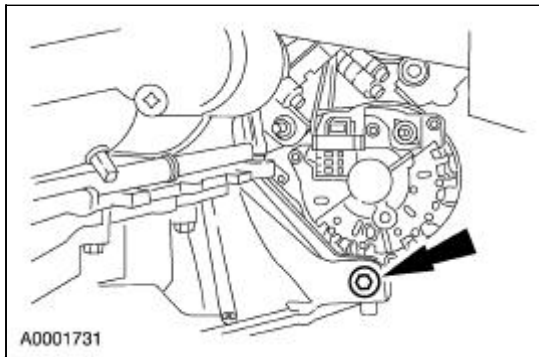
37. Remove the two idler pulleys.



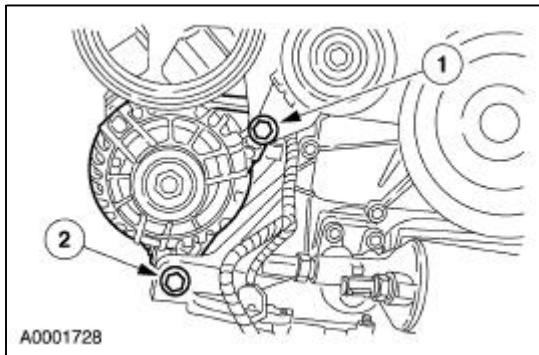
38. Disconnect the electrical connector at the rear of the generator.



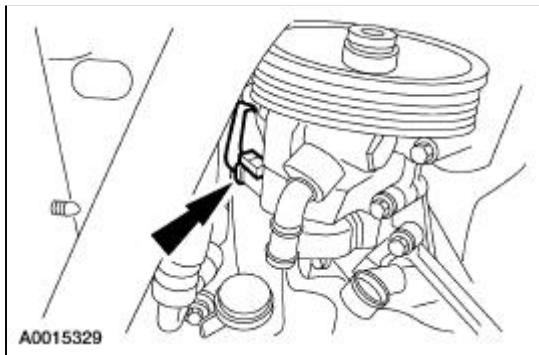
39. Remove the bolt.



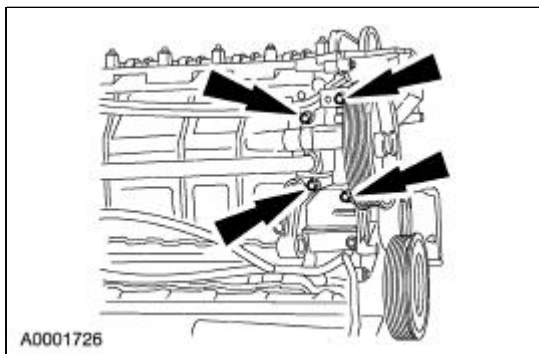
40. Remove the generator.
1. Remove the upper bolt.
 2. Remove the lower bolt.



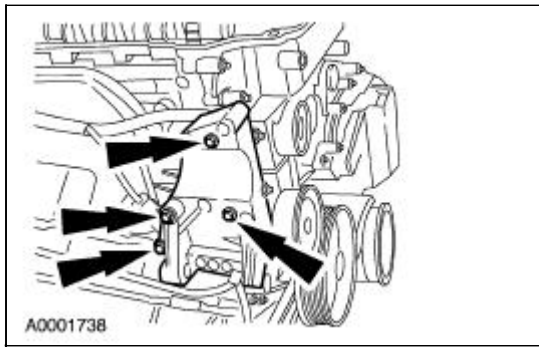
41. Disconnect the electrical connector.



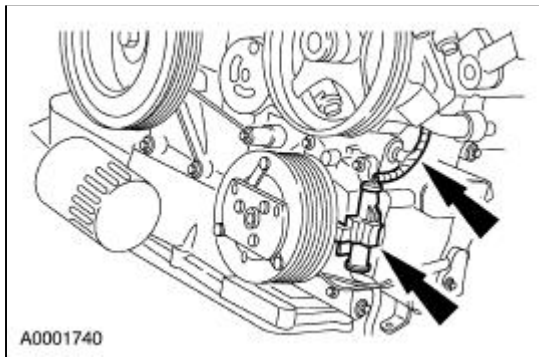
42. Remove the hydraulic cooling fan pump.



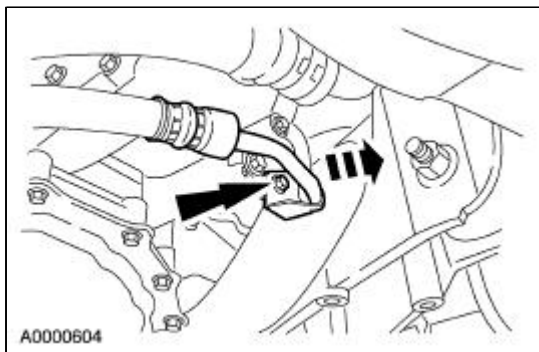
43. Remove the hydraulic pump bracket.



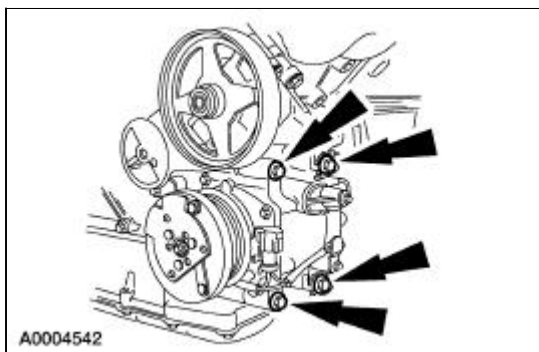
44. Disconnect the A/C electrical connector and the retaining clip.



45. Remove the two power steering hose brackets.

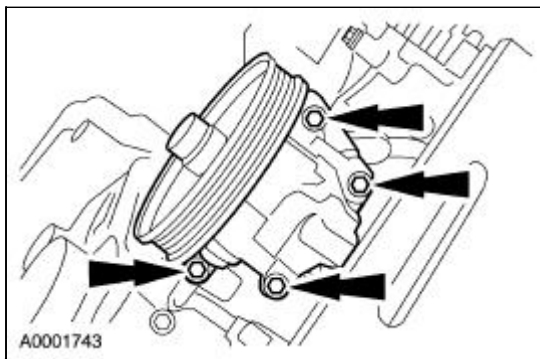


46. Remove the A/C compressor (19703).

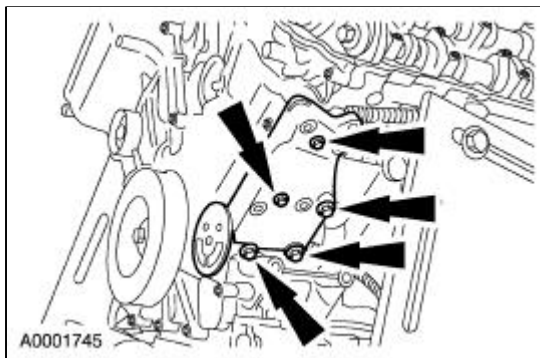


47. **NOTE:** One bolt is blocked by the power steering pressure line and will have to be removed in stages.

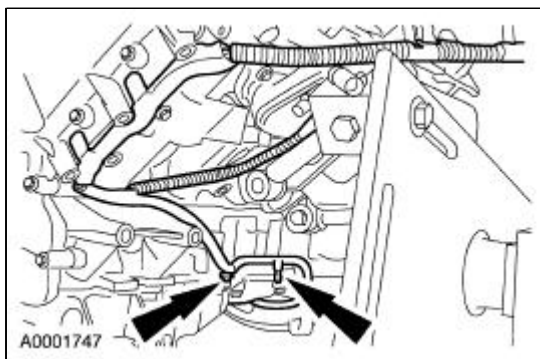
Remove the power steering pump.



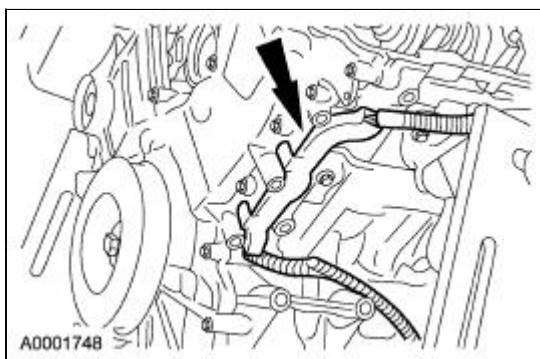
48. Remove the power steering pump bracket.



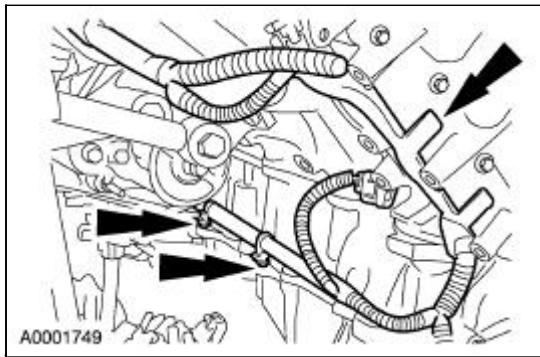
49. Disconnect the two pin-type retainers.



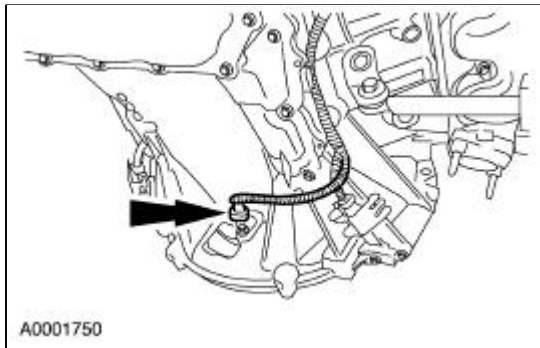
50. Remove the wiring harness from the front cover.



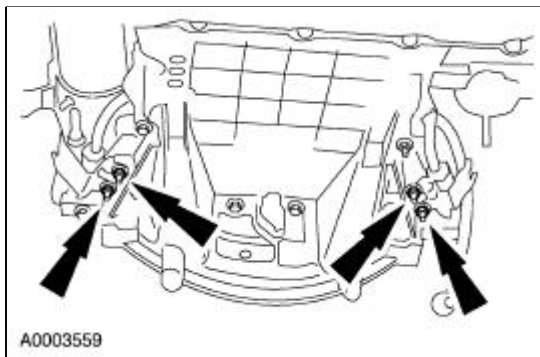
51. Remove the wiring harness from the front cover.



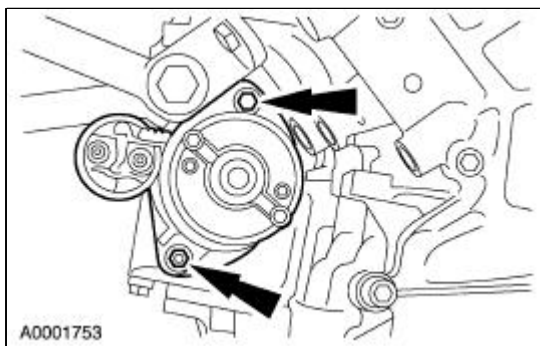
52. Disconnect the crankshaft position (CKP) sensor electrical connector.



53. Remove the exhaust gas oxygen sensor (HO2S) connectors from the brackets.

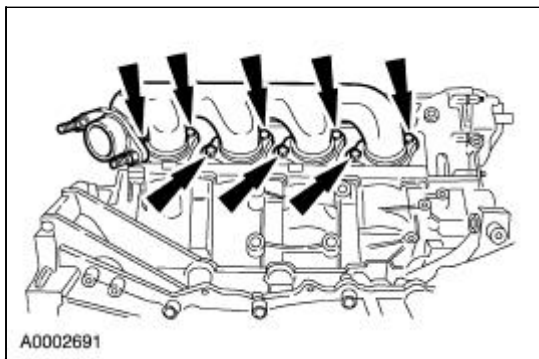


54. Remove the starter motor.

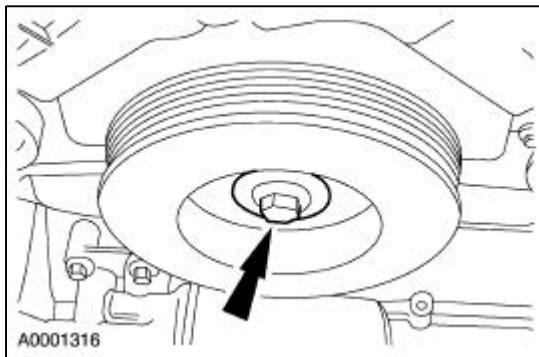


55. **NOTE:** RH shown; LH similar.

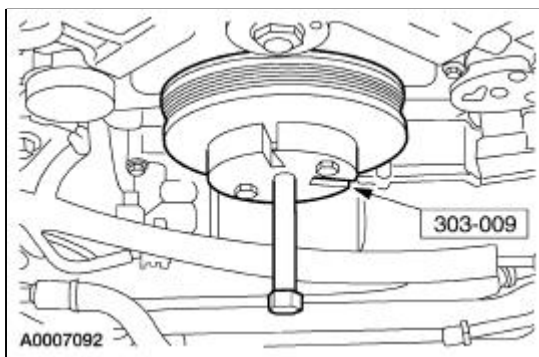
Remove the RH and LH exhaust manifolds.



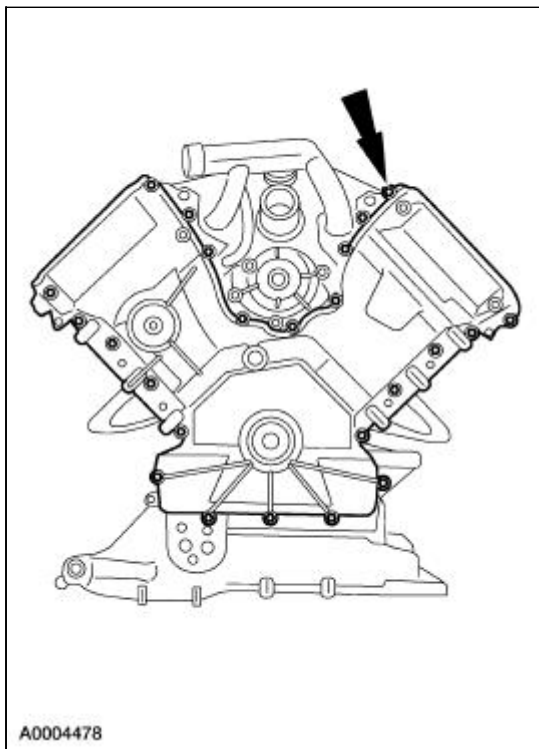
56. Remove the bolt and washer.
- Discard the bolt.



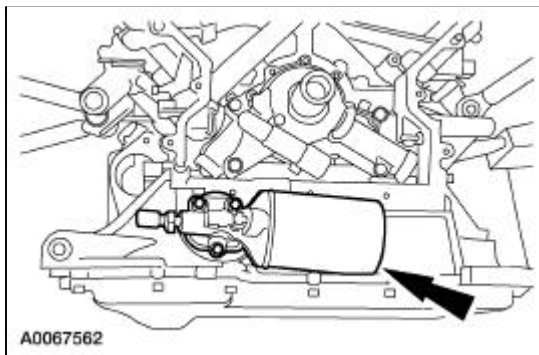
57. Using the special tool, remove the crankshaft damper.



58. Remove the bolts and remove the front cover.

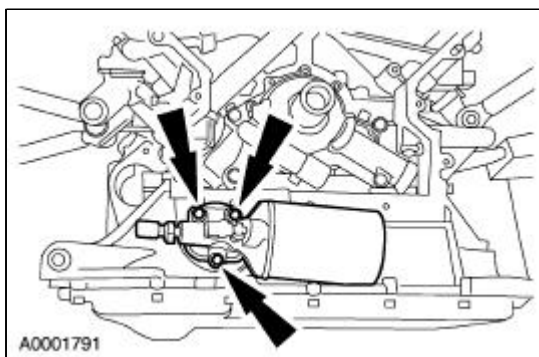


59. Remove and discard the oil filter.



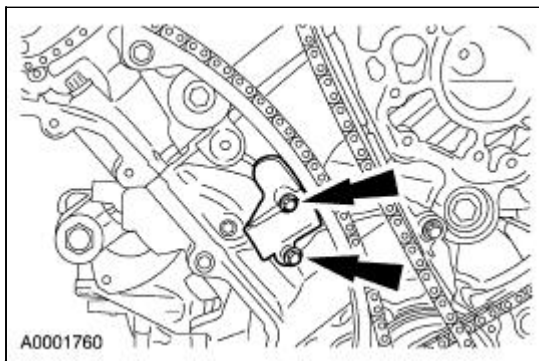
60. Remove the oil filter adapter.

- Discard the seal.

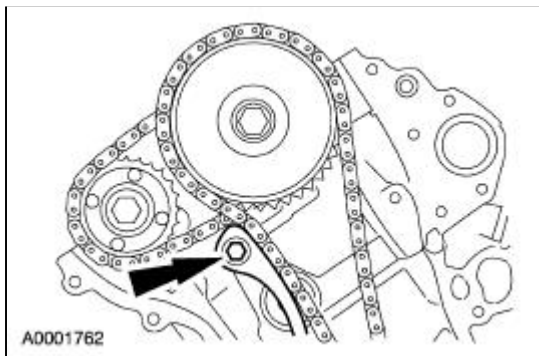


61. Turn the crankshaft to 45 degrees ATDC. The crankshaft keyway will be in the 6 o'clock position.

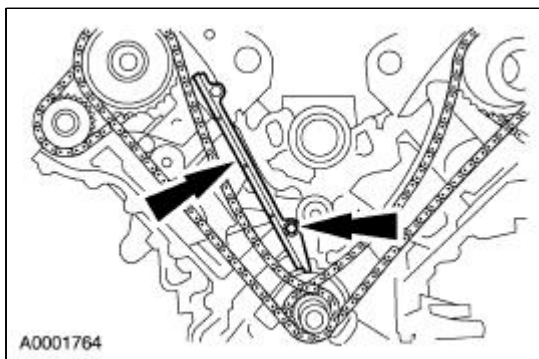
62. Remove the RH primary chain tensioner and the blanking plate.



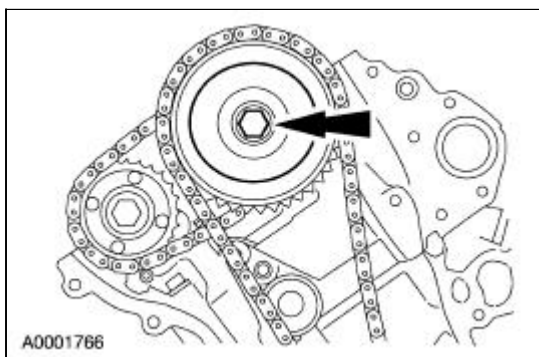
63. Remove the RH lower primary chain tensioner arm.



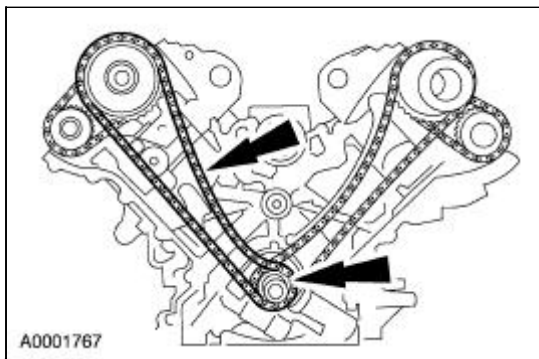
64. Remove the RH upper primary chain tensioner guide.



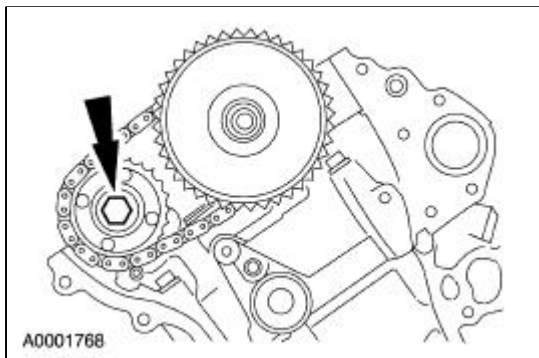
65. Remove the bolt and the RH camshaft damper.



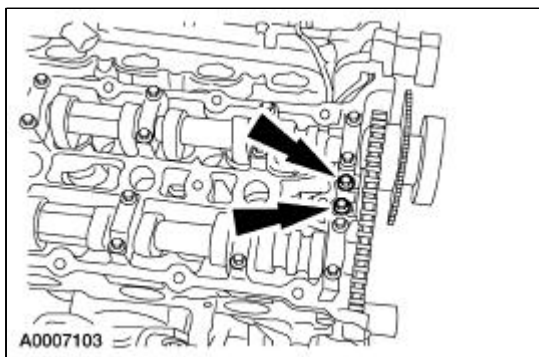
66. Remove the RH primary chain (6268) and crankshaft sprocket.



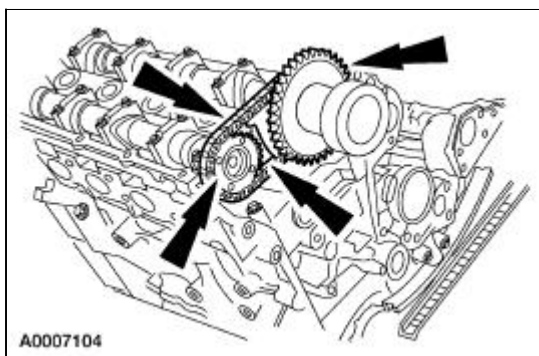
67. Remove the exhaust camshaft sprocket bolt.



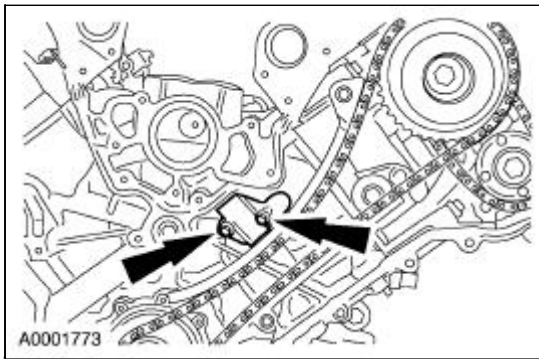
68. Remove the secondary timing chain tensioner bolts.



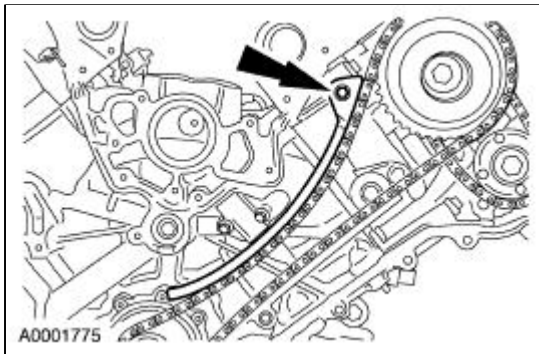
69. Remove the RH camshaft chain, tensioner and sprockets as an assembly.



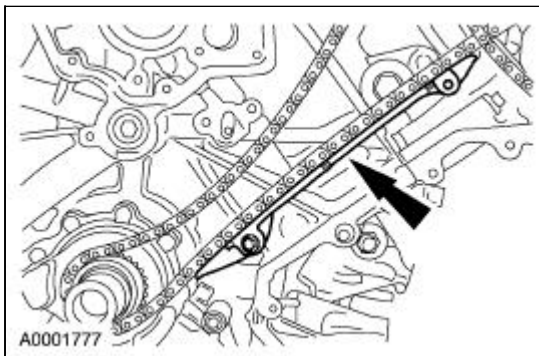
70. Remove the bolts and the LH primary chain tensioner and the blanking plate.



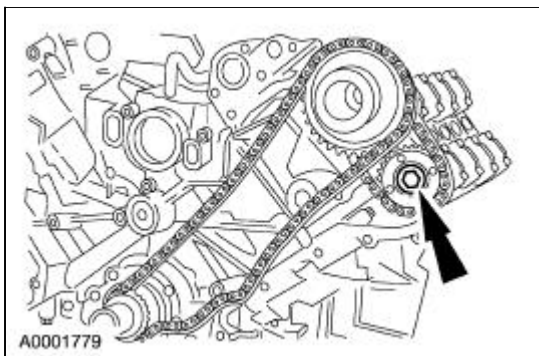
71. Remove the LH upper primary chain tensioner arm.



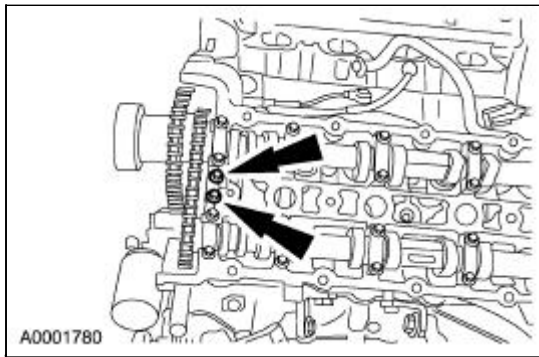
72. Remove the LH lower primary chain tensioner guide.



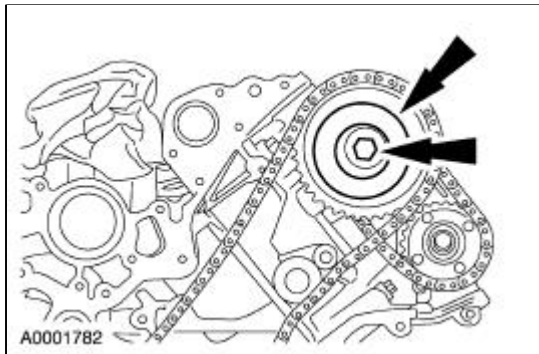
73. Remove the exhaust camshaft sprocket bolt.



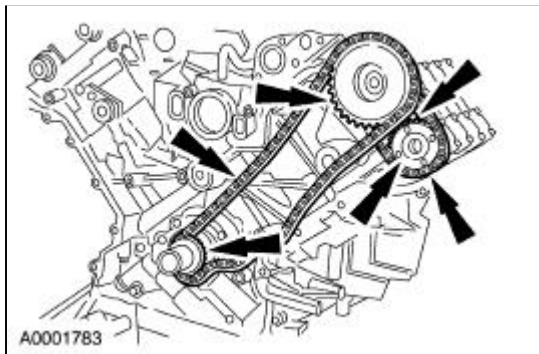
74. Remove the secondary timing chain tensioner bolts.



75. Remove the intake sprocket bolt and the camshaft damper.



76. Remove the LH camshaft chain, tensioner sprockets, primary chain and crankshaft sprocket as an assembly.

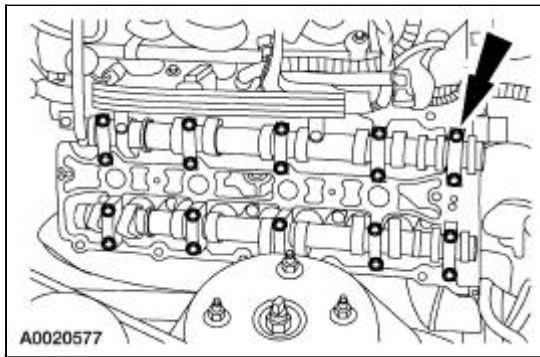


77.  **CAUTION: Mark the camshaft caps for correct location and orientation during assembly.**

NOTE: RH shown; LH similar.

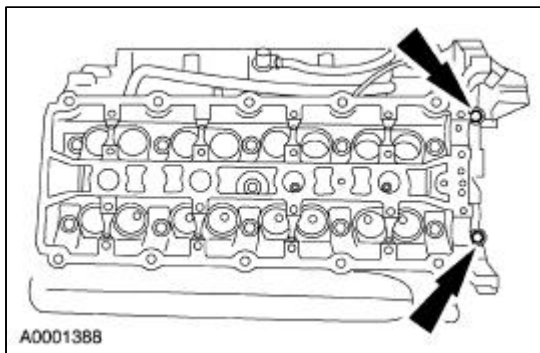
Remove the camshafts from the RH and LH cylinder heads.

- Remove the bolts.
- Remove the caps.
- Remove the camshafts.

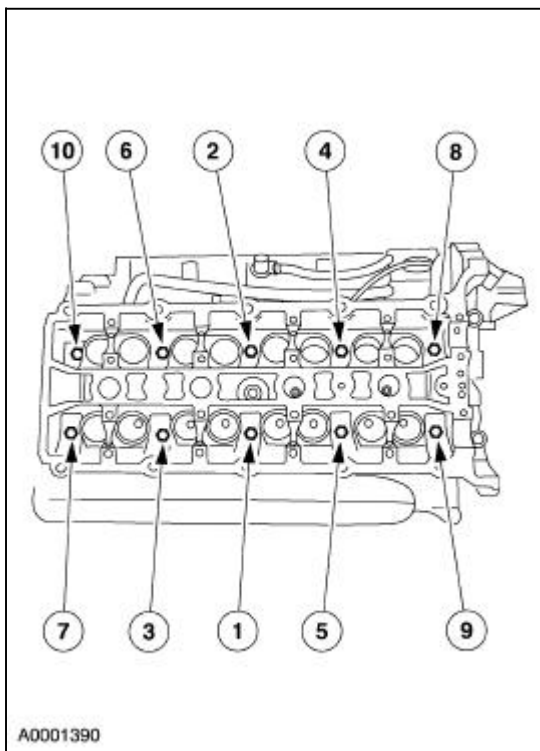


78. **NOTE:** RH shown; LH similar.

Remove the bolts from the RH and LH cylinder heads.

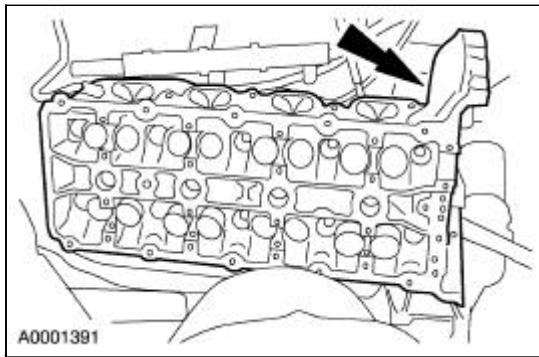



79. Remove the bolts in sequence shown from both cylinder heads.



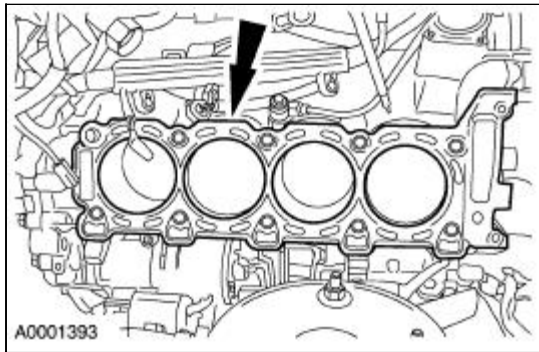
80. Remove the cylinder heads.

- Discard the gaskets.

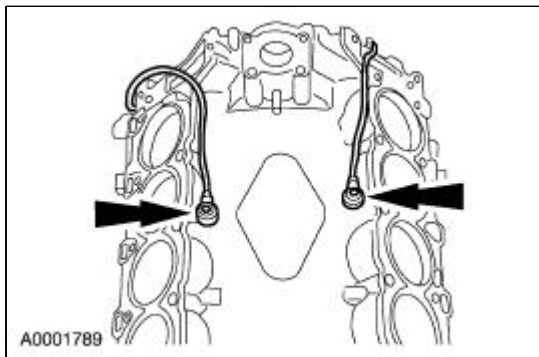


81.  **CAUTION:** Do not use metal scrapers, wire brushes, power abrasive discs or other abrasive means to clean the sealing surfaces. These tools cause scratches and gouges, which make leak paths. Use a plastic scraping tool to remove all traces of sealant.

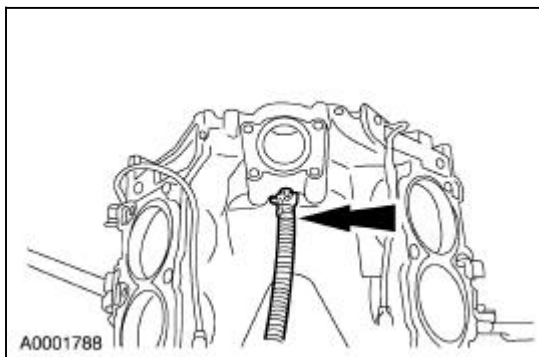
Clean the sealing surfaces.



82. Remove the knock sensors.

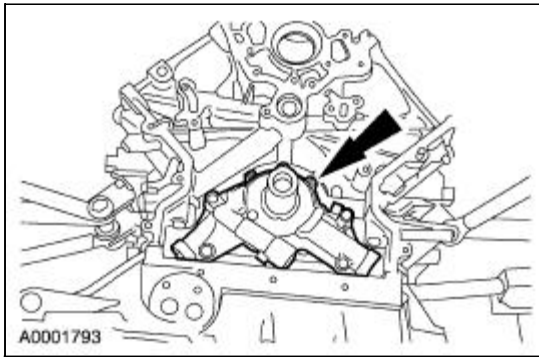


83. Remove the throttle body heater return hose.

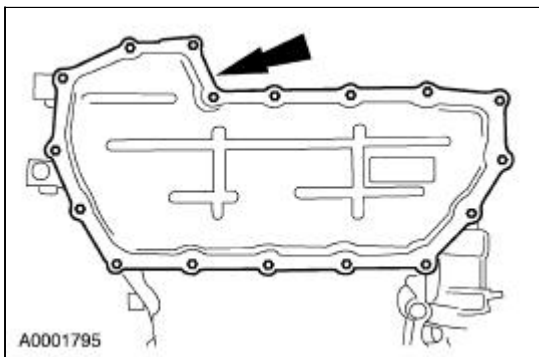


84. Remove the four bolts and the oil pump.

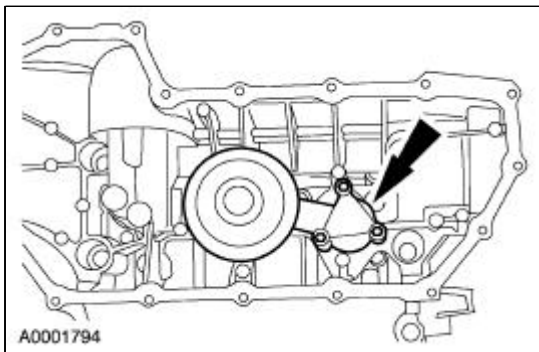
- Discard the gasket.



85. Remove the bolts and the oil pan.

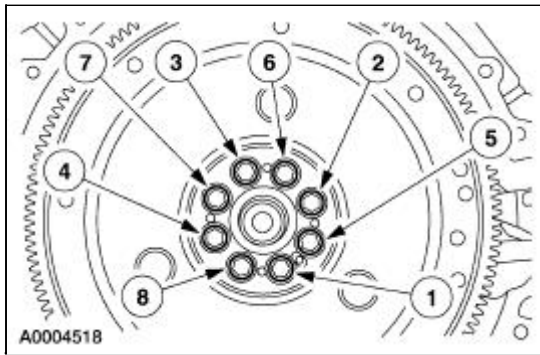


86. Remove the oil pump screen cover and tube and seal.

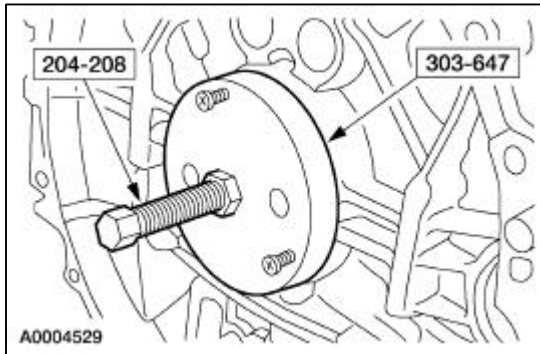


87. Remove the flexplate.

- Remove the bolts in the sequence shown.
- Remove the flexplate.

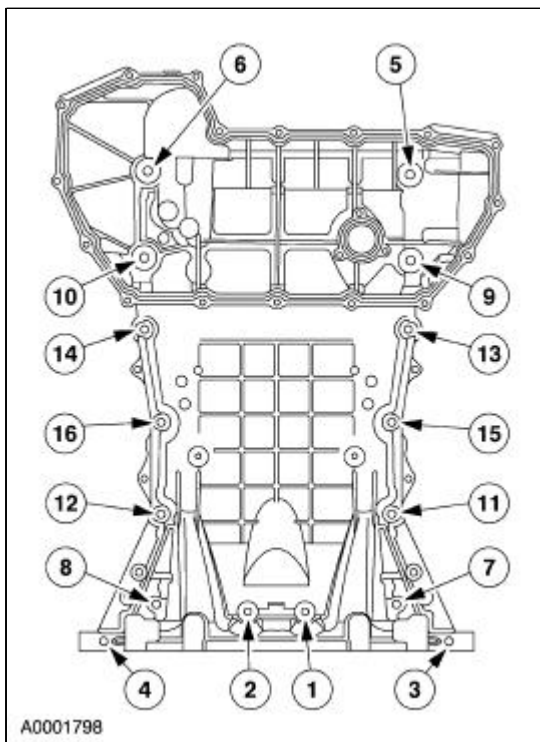


88. Using the special tool, remove the rear main seal.
- Discard the seal.



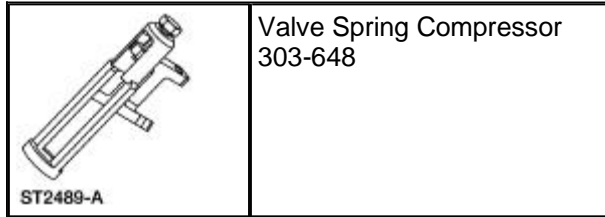
89. **⚠ CAUTION:** Do not use metal scrapers, wire brushes, power abrasive discs or other abrasive means to clean the sealing surfaces. These tools cause scratches and gouges, which make leak paths. Use a plastic scraping tool to remove all traces of the sealant.

Remove the bolts in the sequence shown and remove the sump body.



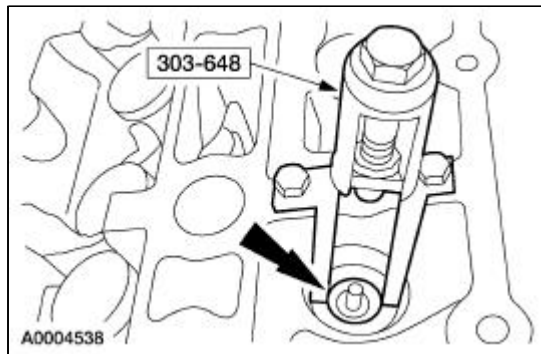
Cylinder Head

Special Tool(s)

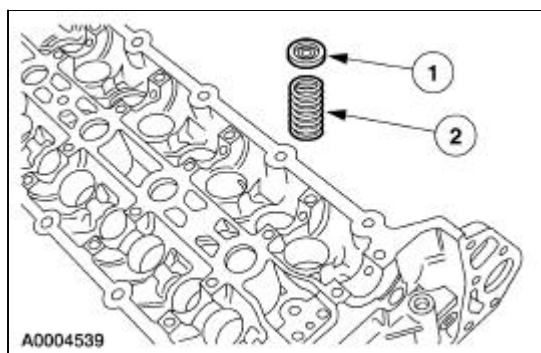


Disassembly

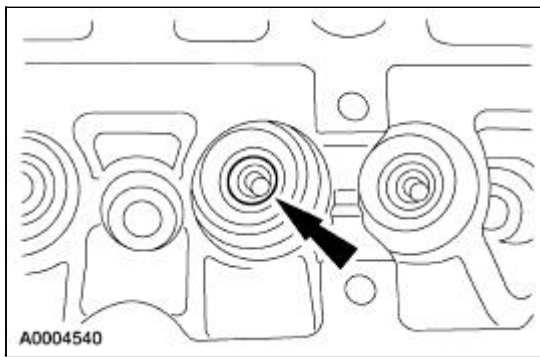
1. Using the special tool, remove the valve spring retainer keys.



2. Remove the valve spring assemblies.
 1. Remove the valve spring retainers.
 2. Remove the valve springs.
 - For component tests for the valve spring refer to [Section 303-00](#).

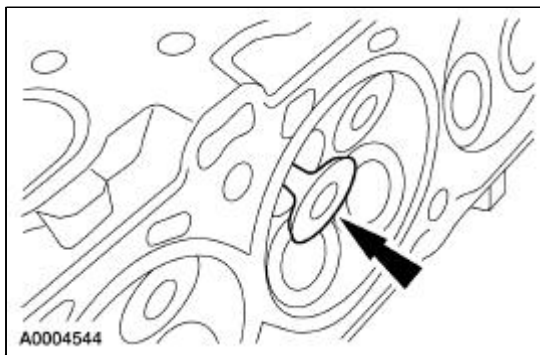


3. Remove the valve stem seal.



4. Remove the valve.

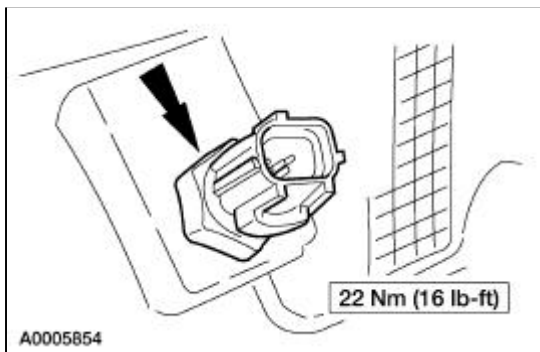
- For component tests for the valve, refer to [Section 303-00](#).
- For component tests for the cylinder head, refer to [Section 303-00](#).



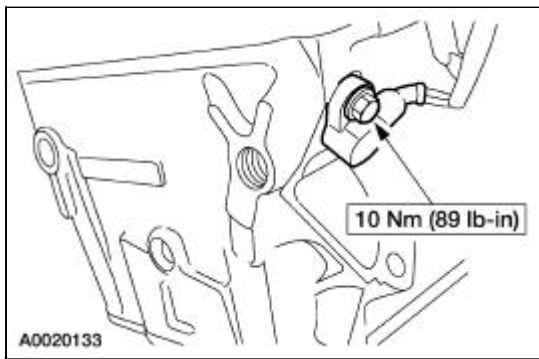
5. Repeat the procedure until all of the valves are removed from the cylinder head.

6. Remove the spark plugs. For additional information, refer to [Section 303-07B](#).

7. Remove the cylinder head temperature sensor (CHT) sensor.



8. Remove the camshaft position (CMP) sensor.





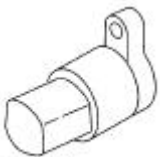




Assembly

1. To assemble, reverse the disassembly procedure.
 - Lubricate the valve stem and the valve stem seal with Super Premium SAE 5W-30 Motor Oil XO-5W30-QSP or equivalent meeting Ford specification WSS-M2C153-G.
-

Engine

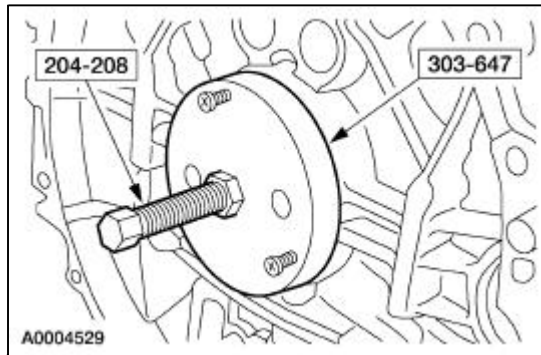
Special Tool(s)


 ST2423-A	Front Crankshaft Seal Installer 303-646
 ST1287-A	Crankshaft Damper Replacer 303-102 (T74P-6316-B)
 ST2398-B	Camshaft Position Tool 303-530
 ST2399-A	Timing Chain Tensioning Tool 303-532
 ST2401-A	Crankshaft Position Tool 303-645
 ST2495-B	Crankshaft Rear Seal Remover/Installer 303-647
 ST2441-A	Screw 204-208 (T95T-5310-AR2)

1. **NOTE:** Lubricate the outer lips and the inner seal on the crankshaft rear oil seal with Super Premium SAE 5W-30 Motor Oil XO-5W30-QSP or equivalent meeting Ford specification WSS-

M2C153-G.

Using the special tool, install the rear main seal.

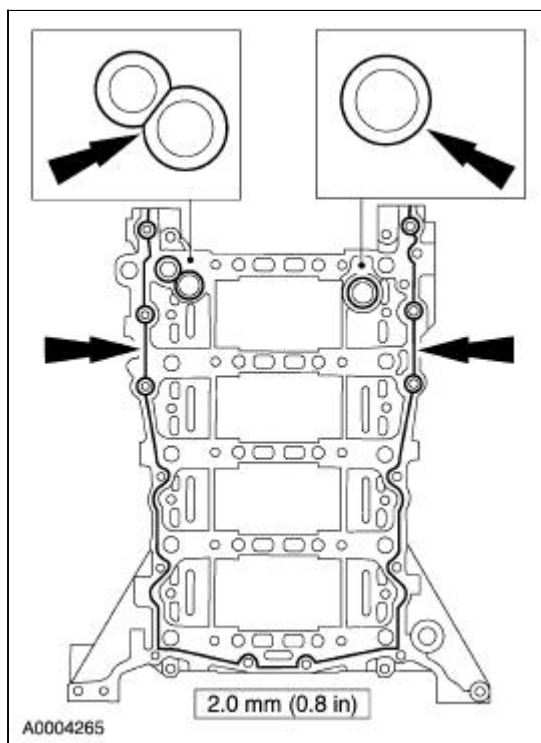


2.  **CAUTION: Do not use metal scrapers, wire brushes, power abrasive discs, or other abrasive means to clean the sealing surfaces. These tools cause scratches and gouges which make leak paths. Use a plastic scraping tool to remove all traces of old sealant.**

NOTE: If the sump is not secured within 20 minutes of sealant application the sealant must be removed and the sealing area cleaned with Metal Surface Cleaner F4AZ-19A536-RA or equivalent meeting Ford specification WSE-M5B392-A. Allow to dry until there is no sign of wetness, or four minutes, whichever is longer. Failure to follow this procedure can cause future oil leakage.

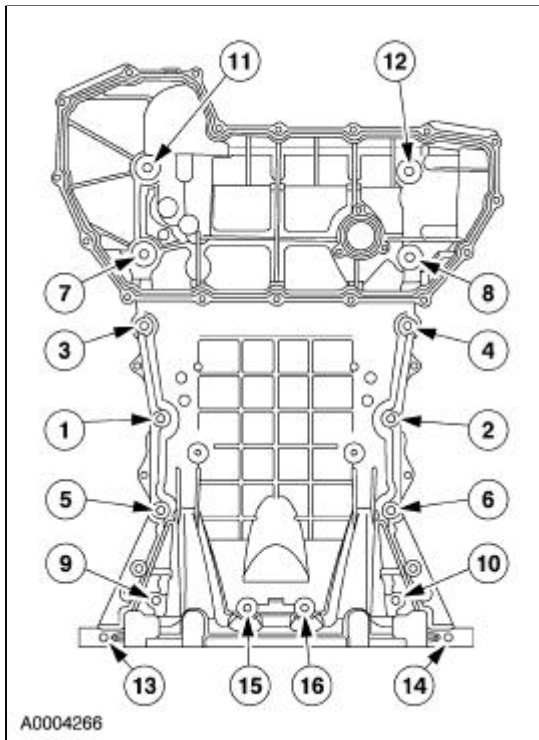
Apply three continuous beads of sealer.

- Use Silicone Gasket and Sealant F7AZ-19554-EA or equivalent meeting Ford specification WSE-M4G323-A4.

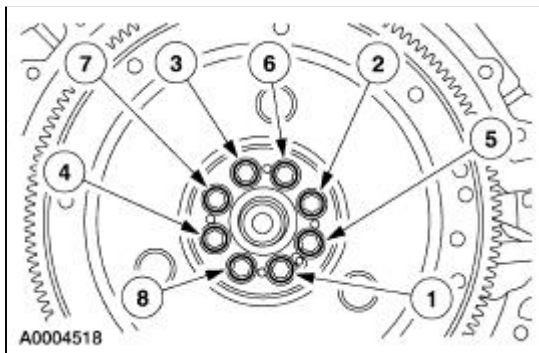


3. Install the oil sump. Using a straightedge, align the sump to the lower cylinder block. Tighten the bolts in sequence in two stages.
- Tighten the bolts to 15 Nm (11 lb-ft).

- Tighten the bolts to 25 Nm (18 lb-ft).



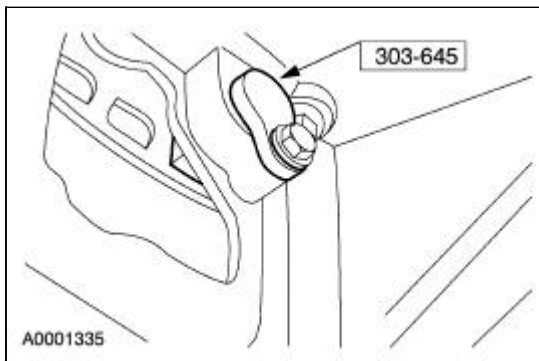
4. Install the flexplate and tighten the bolts in two stages in the sequence shown.
 - Stage 1: Tighten to 15 Nm (11 lb-ft).
 - Stage 2: Tighten to 110 Nm (81 lb-ft).



5. **NOTE:** There is one window on the ignition pulse wheel that is unique to accept the special tool.

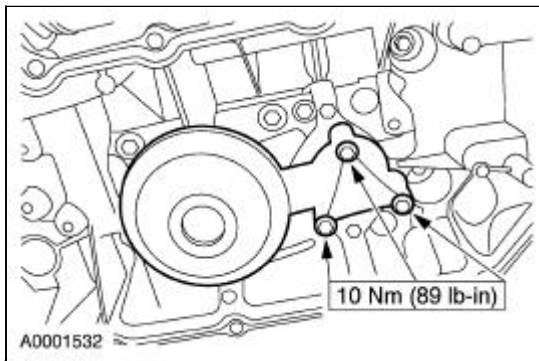
Install the special tool.

- Turn the crankshaft to 45 degrees ATDC. The crankshaft keyway will be in the 6 o'clock position.
- Install the special tool.



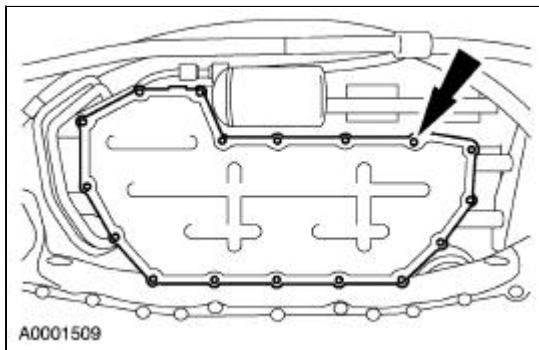
6. **NOTE:** Inspect the seal. Install a new seal if necessary.

Install the oil pump screen cover and tube.

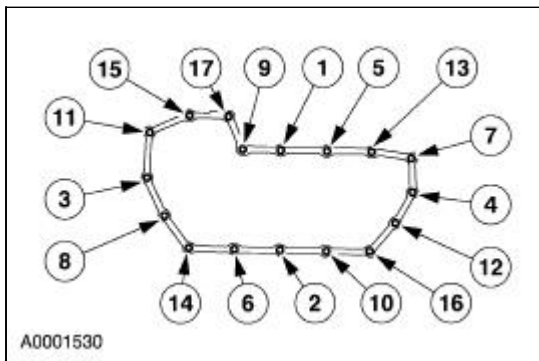


7. **NOTE:** Inspect and install a new oil pan gasket if necessary.

Install the oil pan.

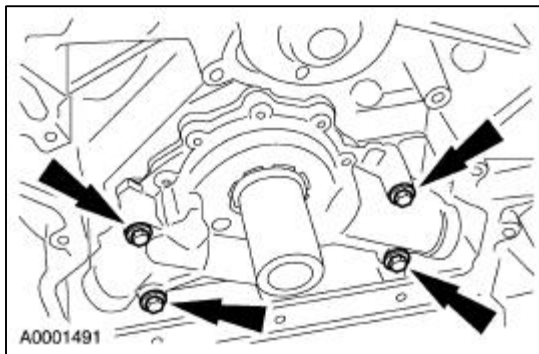


8. Tighten the bolts in the sequence shown in two stages.
- Stage 1: Tighten to 5 Nm (44 lb-in).
 - Stage 2: Tighten to 12 Nm (9 lb-ft).

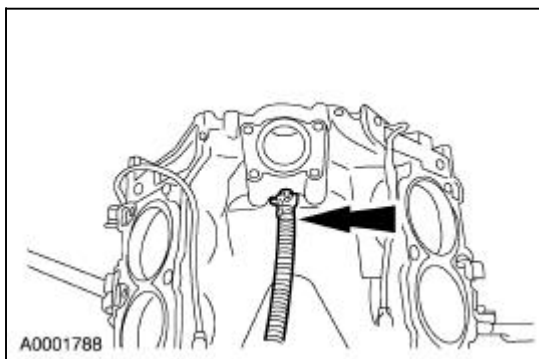


9. Install a new gasket, the oil pump and tighten the bolts in two stages.

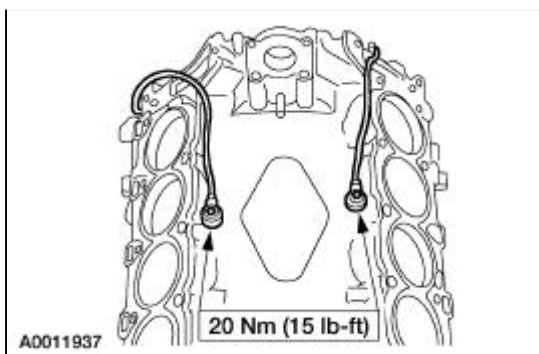
- Stage 1: Tighten to 6 Nm (53 lb-in).
- Stage 2: Tighten an additional 90 degrees.



10. Install the throttle body heater return hose.

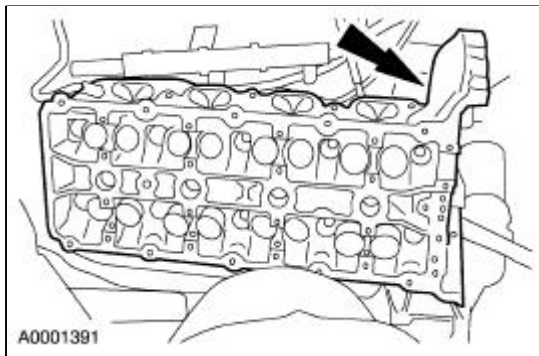


11. Install the knock sensors.



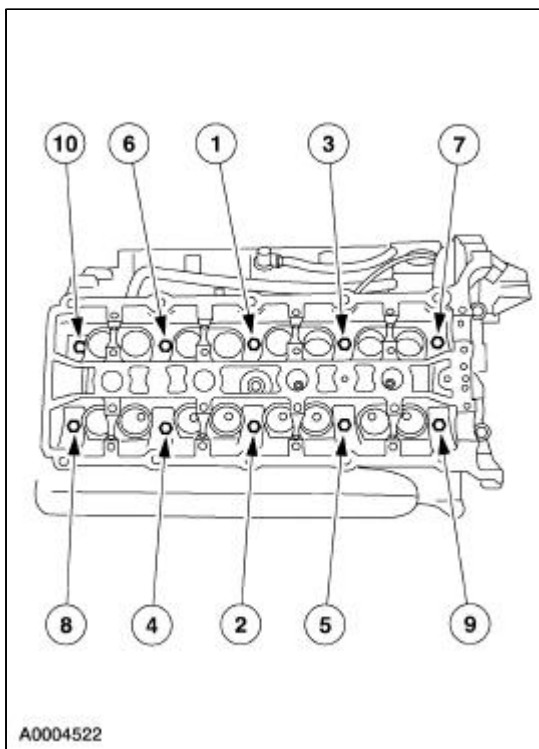
12. Position the cylinder heads.

- Install new gaskets.

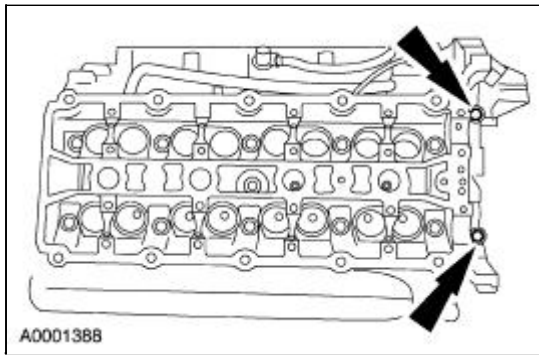


13. Install and tighten the RH head bolts in six stages in the sequence shown.

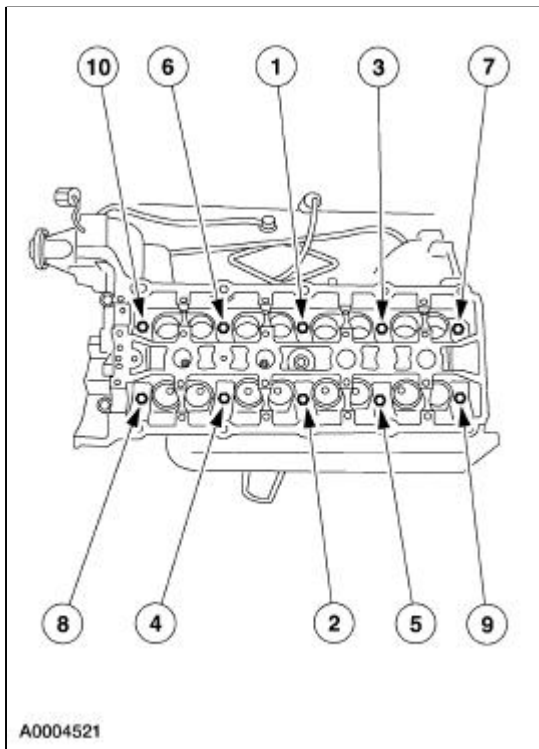
- Stage 1: Tighten bolts 1–10 to 20 Nm (15 lb-ft).
- Stage 2: Tighten bolts 1–10 to 35 Nm (26 lb-ft).
- Stage 3: Tighten bolts 1-10 to 45 Nm (33 lb-ft) and an additional 90 degrees.
- Stage 4: Tighten bolts 1-10 an additional 90 degrees.
- Stage 5: Tighten bolts 11 and 12 to 20 Nm (15 lb-ft).
- Stage 6: Tighten bolts 11 and 12 an additional 90 degrees.



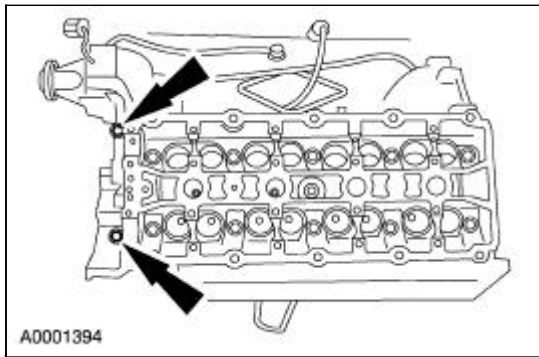
14. Install and tighten the bolts in two stages.
1. Tighten to 20 Nm (15 lb-ft).
2. Tighten an additional 90 degrees.



15. Install and tighten the LH head bolts in six stages in the sequence shown.
- Stage 1: Tighten bolts 1–10 to 20 Nm (15 lb-ft).
 - Stage 2: Tighten bolts 1–10 to 35 Nm (26 lb-ft).
 - Stage 3: Tighten bolts 1–10 to 45 Nm (33 lb-ft) and an additional 90 degrees.
 - Stage 4: Tighten bolts 1–10 an additional 90 degrees.
 - Stage 5: Tighten bolts 11 and 12 to 20 Nm (15 lb-ft).
 - Stage 6: Tighten bolts 11 and 12 an additional 90 degrees.



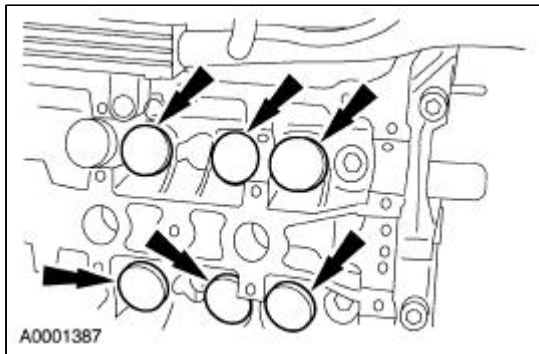
16. Install and tighten the bolts in two stages.
1. Tighten to 20 Nm (15 lb-ft).
 2. Tighten an additional 90 degrees.



17. **CAUTION:** The shim and tappets are location-specific. They must be installed in their original locations or shims will have to be reselected during installation.

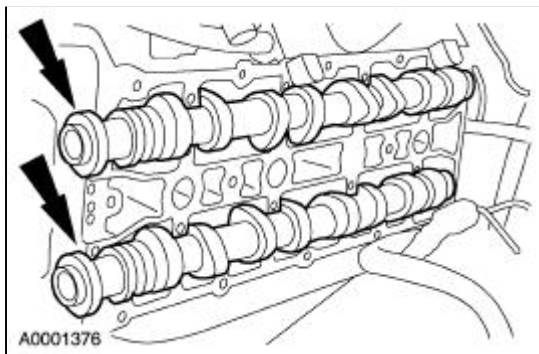
CAUTION: Do not use any means of marking the shims other than a permanent type marker. Any scratches or paint on the shims may result in incorrect lash adjustments and severe engine damage.

If removed, install the tappets and shims. If new tappets and shims are to be installed or if they cannot be identified, refer to [Valve —Clearance Adjust](#) in this section.



18. **NOTE:** Apply Super Premium SAE 5W-30 Motor Oil XO-5W30-QSP or equivalent meeting Ford specification WSS-M2C153-G to the camshaft journals, the camshaft caps and the camshaft lobes prior to installing the camshafts.

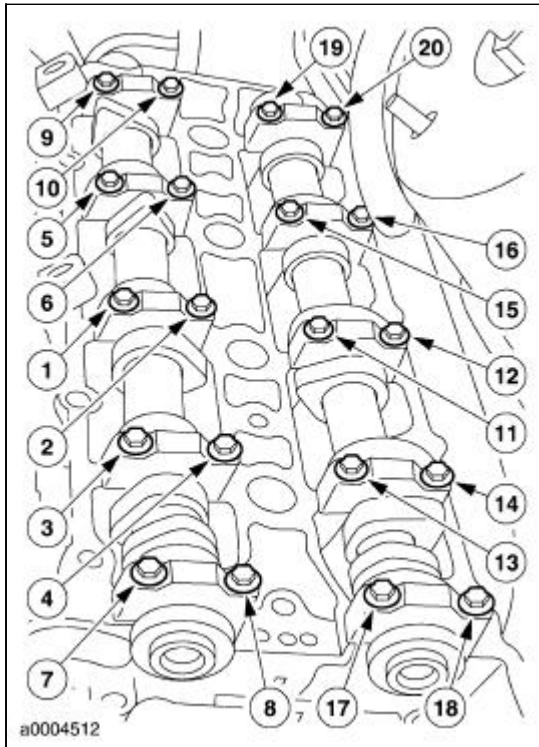
Position the LH camshafts on the camshaft journals.



19. **CAUTION:** Install the camshaft bearing cap locations. The camshaft bearing caps are positional and must be installed in their original locations and orientation or engine damage may occur.

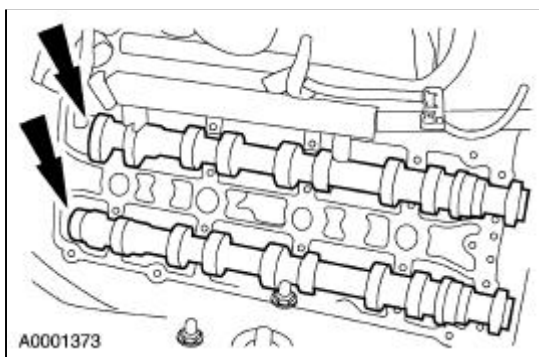
Install the LH camshaft bearing caps.


- Position the bearing caps.
- Install the bolts. Tighten the bolts in three stages in the sequence shown.
 - Stage 1: Hand-tighten.
 - Stage 2: Tighten to 6 Nm (53 lb-in).
 - Stage 3: Tighten an additional 90 degrees.



20. **NOTE:** Apply Super Premium SAE 5W-30 Motor Oil XO-5W30-QSP or equivalent meeting Ford specification WSS-M2C153-G to the camshaft journals, the camshaft caps and the camshaft lobes prior to installing the camshafts.

Position the RH camshafts on the camshaft journals.

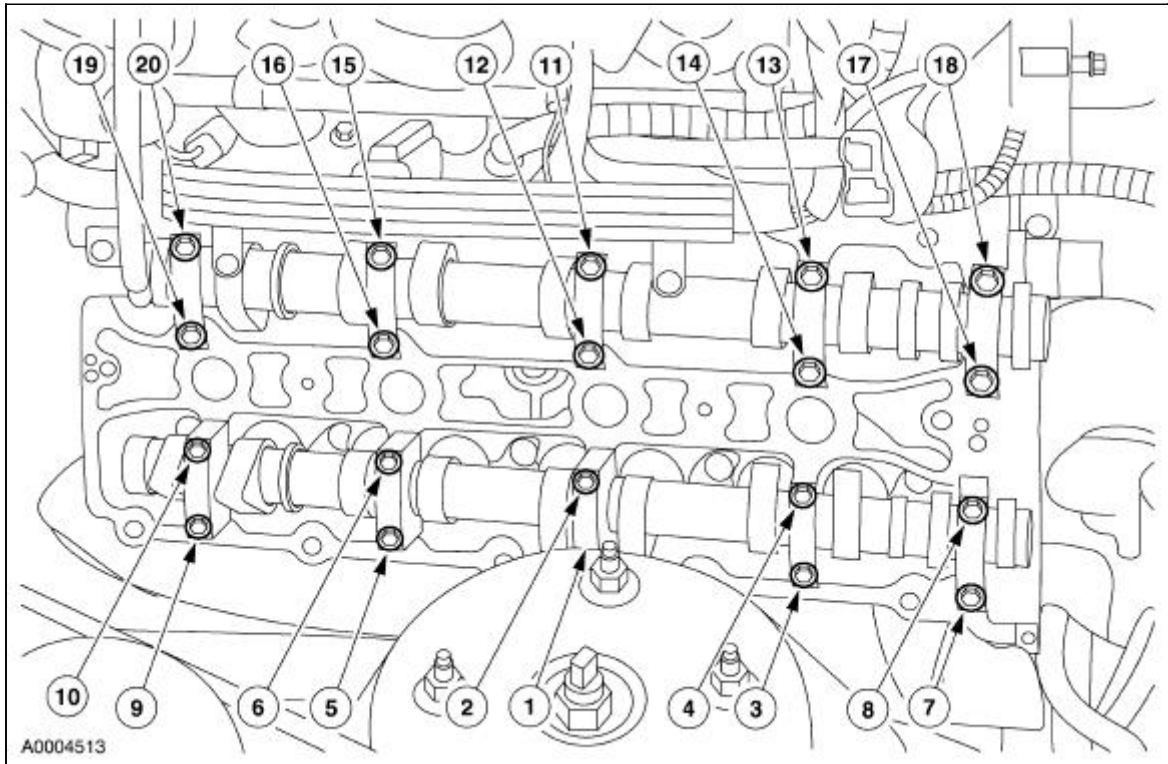


21.  **CAUTION:** Install the camshaft bearing caps in their original locations. The camshaft bearing caps are positional and must be installed in their original locations and orientations or engine damage may occur.

Install the RH camshaft bearing caps.

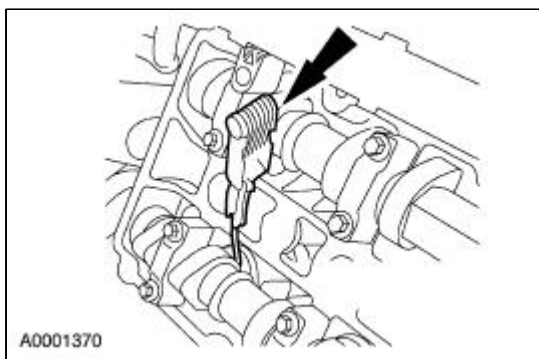
- Position the bearing caps.

- Install the bolts. Tighten the bolts in three stages in the sequence shown.
 - Stage 1: Hand-tighten.
 - Stage 2: Tighten to 6 Nm (53 lb-in).
 - Stage 3: Tighten an additional 90 degrees.



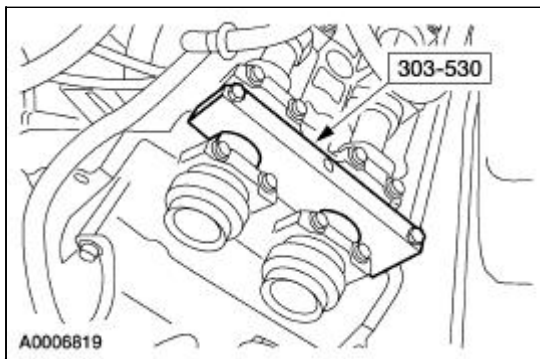
22. **NOTE:** The crankshaft must be at 45 degrees ATDC with crankshaft position tool installed.

Using a feeler gage, confirm that the bucket tappet and shim clearances are within specification.



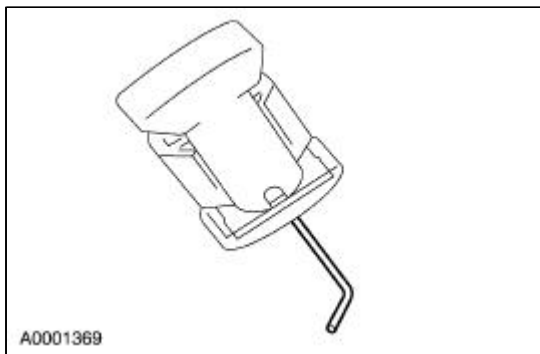
23. **NOTE:** LH shown; RH similar.

Install the special tool on the LH head.

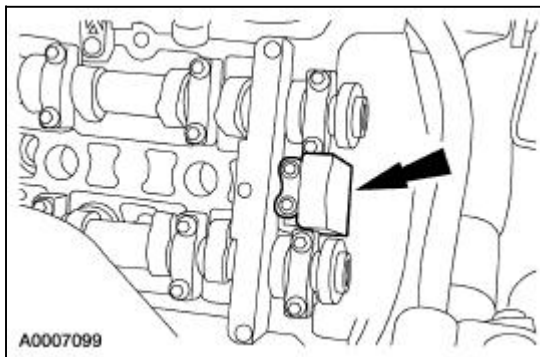


24. Collapse the tensioners.

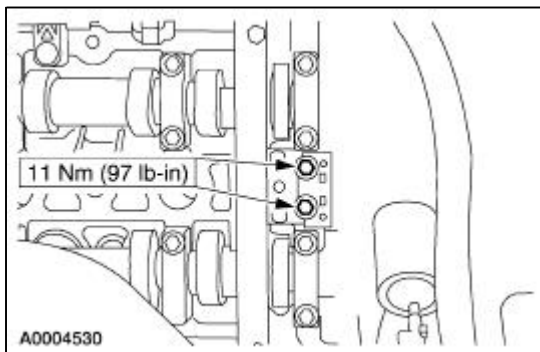
- Insert a thin wire into the check valve.
- Apply hand pressure until the tensioner is fully collapsed.
- Remove the wire.



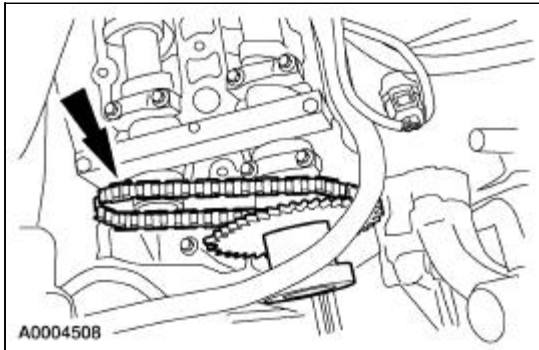
25. Position the tensioner.



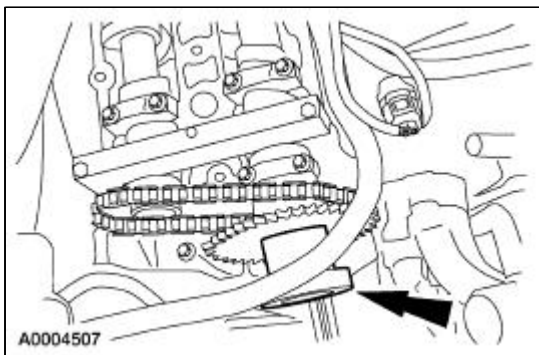
26. Install the secondary timing chain tensioner bolts.



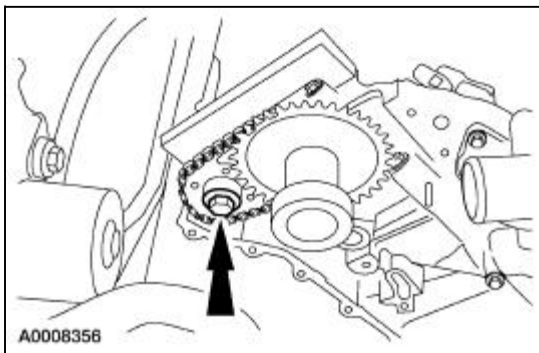
27. Position the intake sprocket, damper, chain and exhaust sprocket on the camshaft as an assembly.



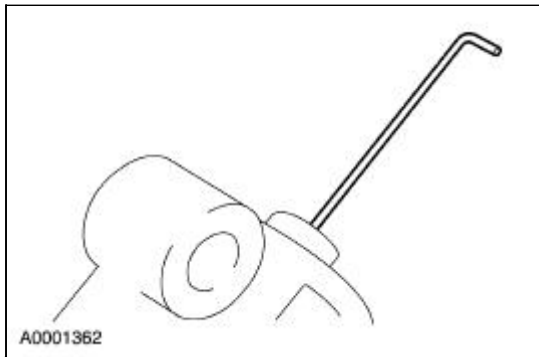
28. Install the intake camshaft sprocket bolt.



29. Install the exhaust camshaft sprocket bolt and washer.



30. Reset the timing chain tensioner.
- Insert a fine wire and dislodge the check ball.
 - Using finger pressure, compress the tensioner.
 - Remove the wire.

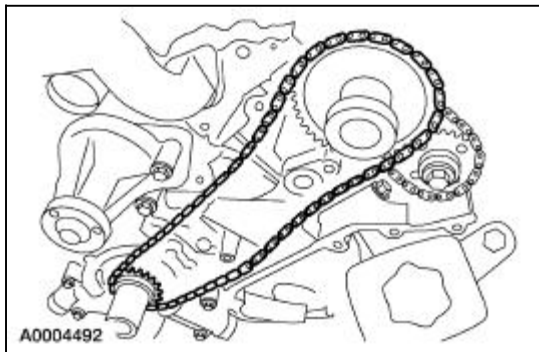


31. **NOTE:** The timing mark on the LH timing chain crankshaft gear faces forward.

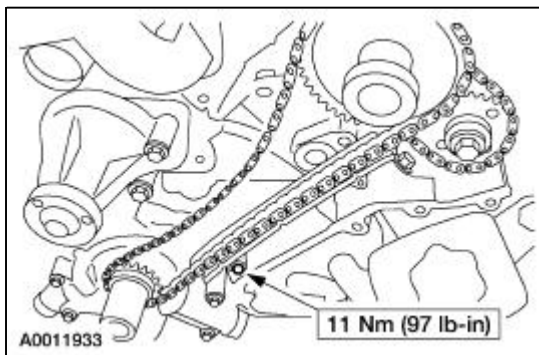
NOTE: The special tool should still be installed on the LH cylinder head.

Position the LH timing chain and crankshaft gear.

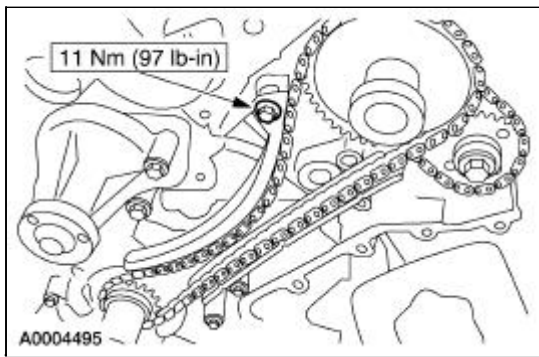
- Position the timing chain over the LH intake camshaft sprocket.
- Position the crankshaft gear in the timing chain.
- Position the timing chain and crankshaft gear over the crankshaft as an assembly.



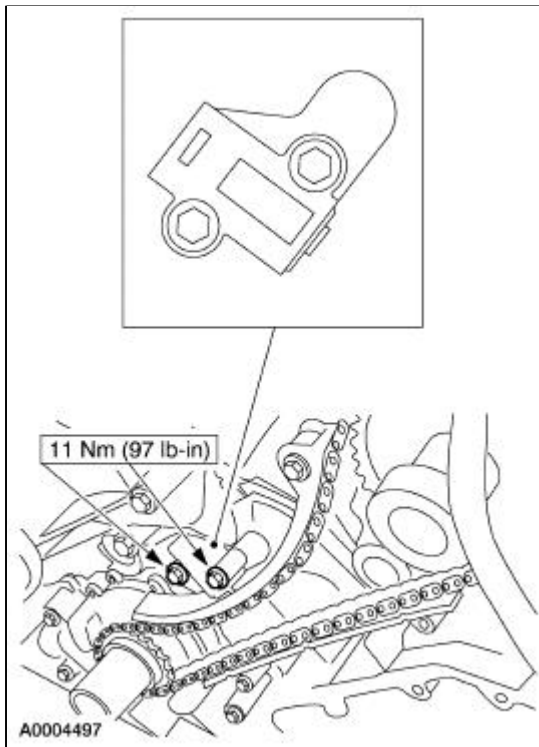
32. Install the LH timing chain guide.



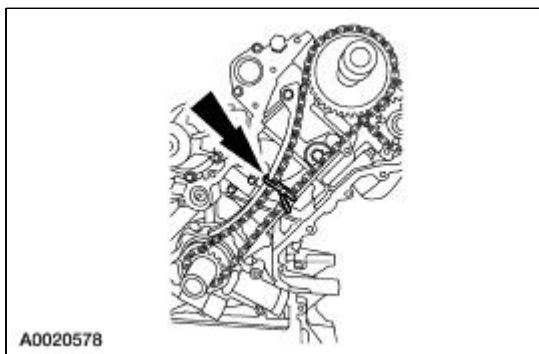
33. Install the LH timing chain tensioner arm.



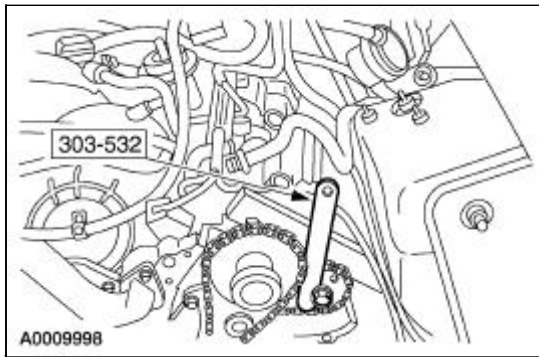
34. Install the LH timing chain tensioner.



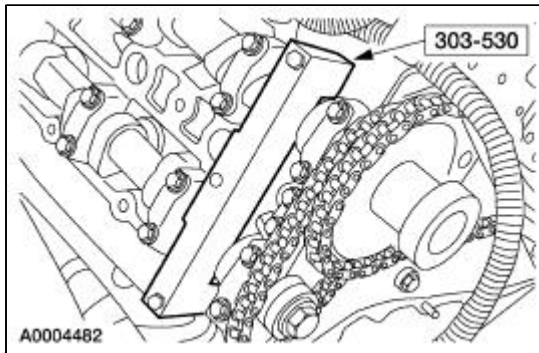
35. Install a tie strap to take up the slack in the timing chain.



36. Using the special tool, apply tension to the LH exhaust camshaft sprocket and tighten the camshaft sprocket bolts in two stages.
- Stage 1: Tighten to 20 Nm (15 lb-ft).
 - Stage 2: Tighten an additional 90 degrees.



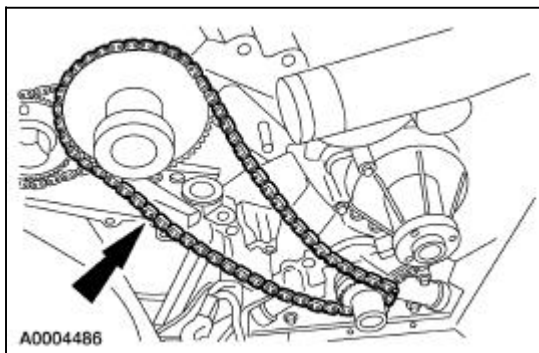
37. Remove the special tool.
38. Install the special tool on the right cylinder head.

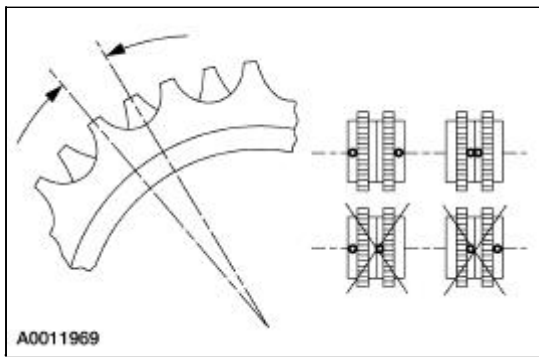


39. **NOTE:** The timing mark on the RH timing chain crankshaft gear faces forward.

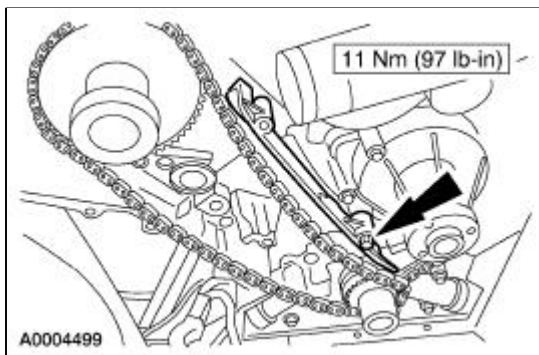
Position the RH timing chain and crankshaft gear.

- Position the timing chain over the RH intake camshaft sprocket.
- Position the crankshaft gear in the timing chain.
- Position the timing chain and crankshaft gear over the crankshaft as an assembly.

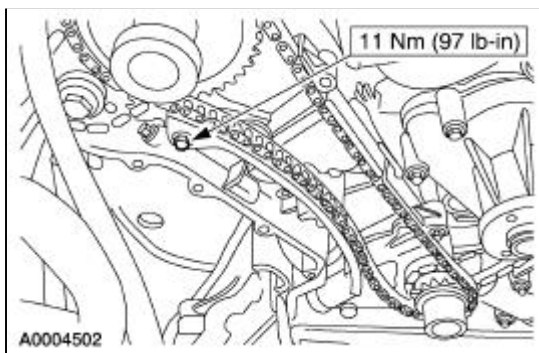




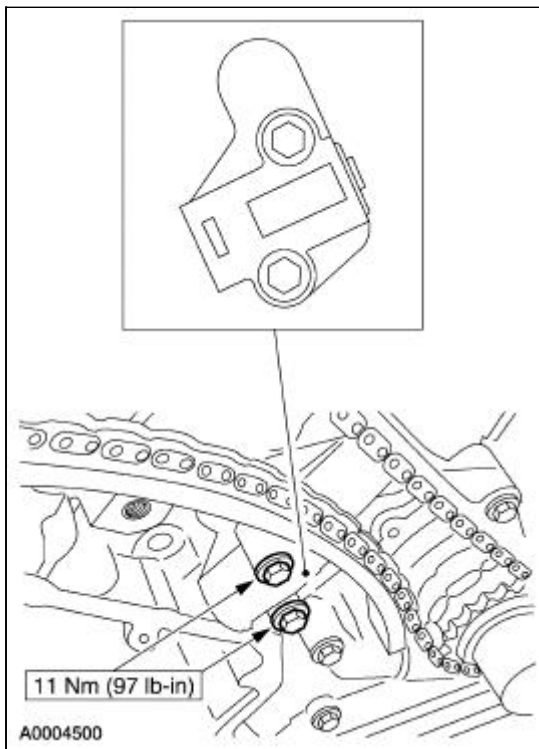
40. Install the RH timing chain guide.



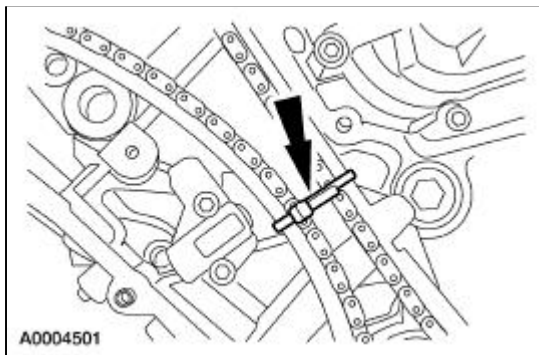
41. Install the RH timing chain tensioner arm .



42. Install the RH timing chain tensioner and blanking plate.

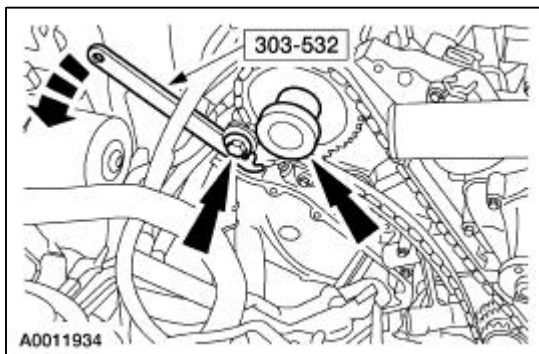


43. Install a tie strap to take up the slack in the timing chain.



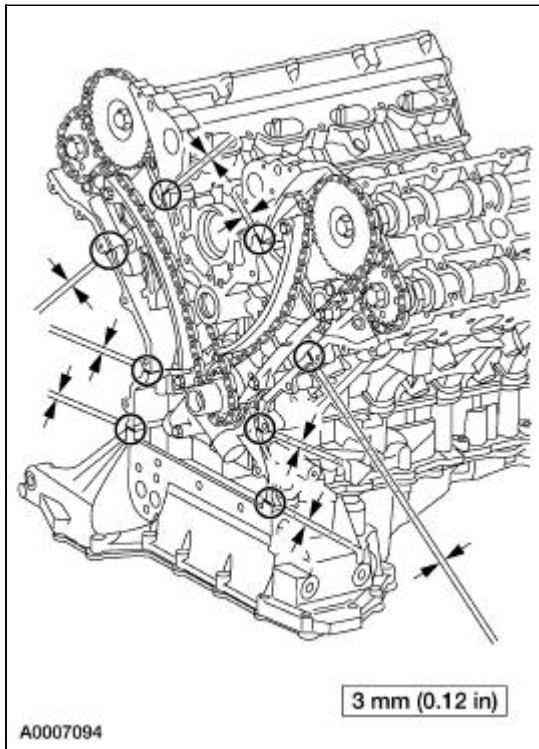
44. Using the special tool, apply tension to the RH camshaft sprockets and tighten the bolts in two stages.

- Stage 1: Tighten to 20 Nm (15 lb-ft).
- Stage 2: Tighten an additional 90 degrees.

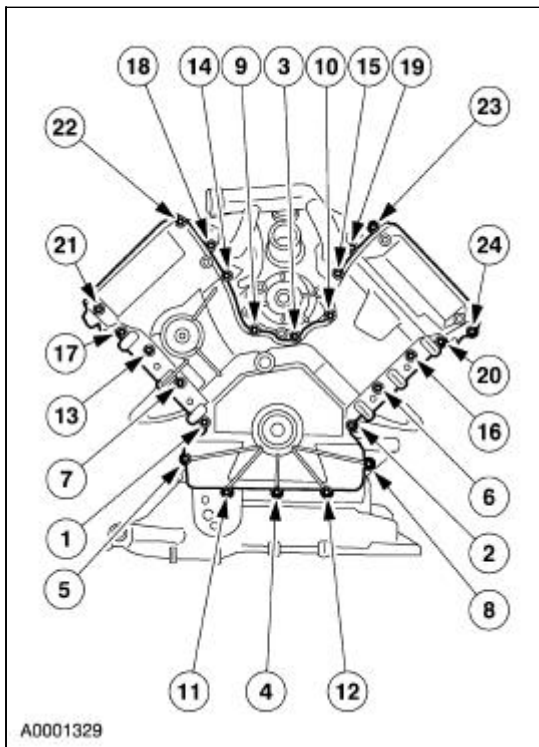


45. Remove the special tool and the two tie straps.

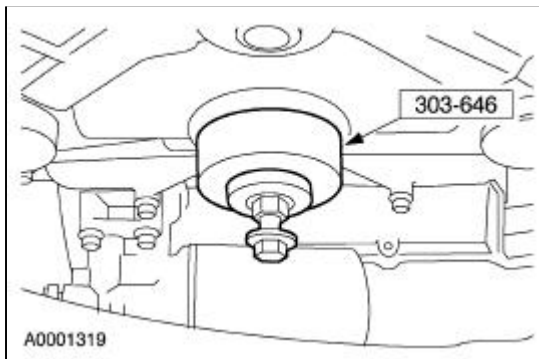
46. Apply Silicone Gasket and Sealant F7AZ-19554-EA or equivalent meeting Ford specification WSE-M4G323-A4 in eight places.



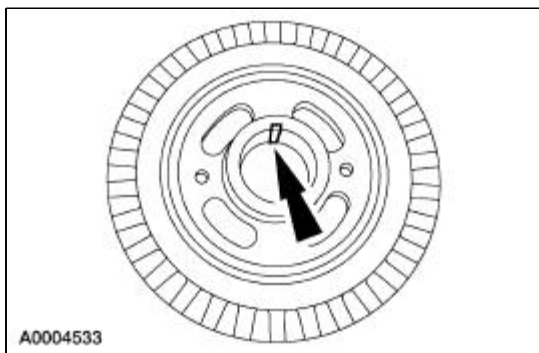
47. Install the engine front cover.
- Install new gaskets.
 - Position the engine front cover on the cylinder block.
 - Loosely install the bolts.
 - Tighten the bolts in two stages in the sequence shown.
 - Stage 1: Tighten to 5 Nm (44 lb-in).
 - Stage 2: Tighten to 10 Nm (89 lb-in).



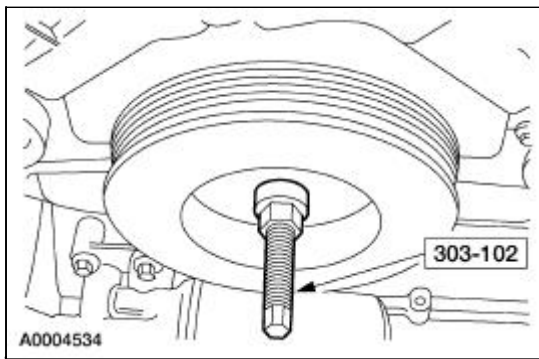
48. Using the special tool, install the front crankshaft seal.



49. Apply Silicone Gasket and Sealant F7AZ-19554-EA or equivalent meeting Ford specification WSE-M4G323-A4 to the crankshaft pulley keyway.

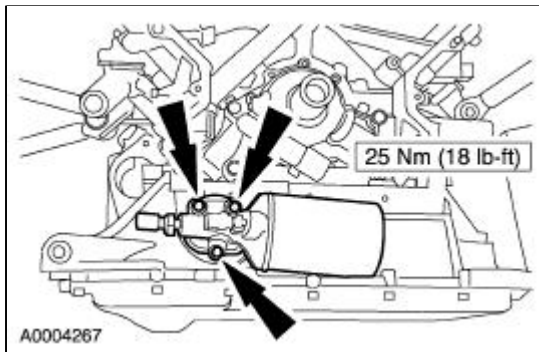


50. Using the special tool, install the crankshaft pulley.

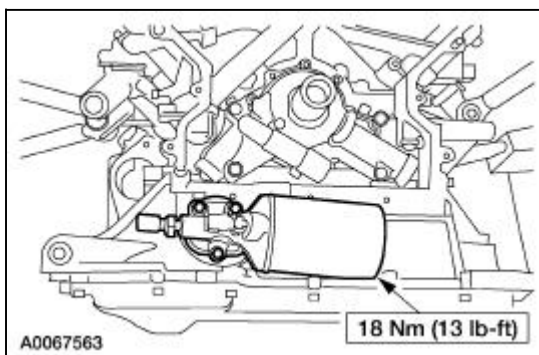


51. Install the washer and a new bolt and tighten in two stages.
 - Stage 1: Tighten to 80 Nm (59 lb-ft).
 - Stage 2: Tighten an additional 80 degrees.
 - Remove the flexplate holding tool.

52. Install a new seal, the oil filter adapter, and the oil cooler (if equipped).



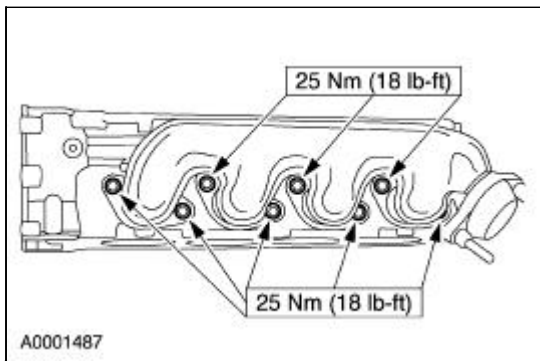
53. Install the oil filter.
 - Install the oil filter until the seal makes contact.
 - Tighten an additional 270 degrees.



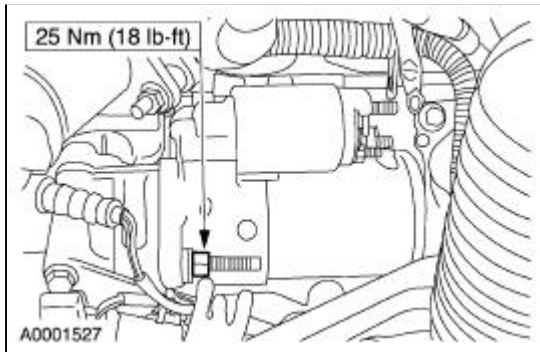
54. **NOTE:** The gaskets are marked top to aid in installation.

NOTE: LH shown; RH similar.

Install the new exhaust manifold gaskets and the exhaust manifolds.



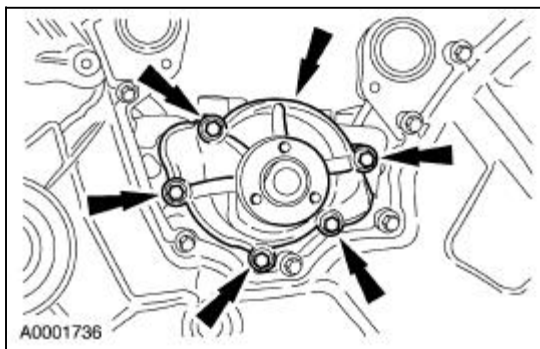
55. Install the starter motor.



56. **NOTE:** Lubricate the water pump O-ring seal with Premium Engine Coolant E2FZ-19549-AA or equivalent meeting Ford specification ESE-M97B44-A.

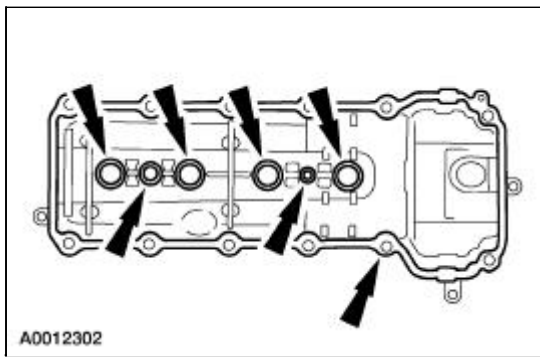
Install the water pump.

- Inspect the O-ring seal and install a new O-ring seal as necessary.
- Position a new water pump gasket.
- Position the water pump.
- Install the bolts and tighten in two stages.
 - Stage 1: Tighten to 8 Nm (72 lb-in).
 - Stage 2: Tighten an additional 90 degrees.



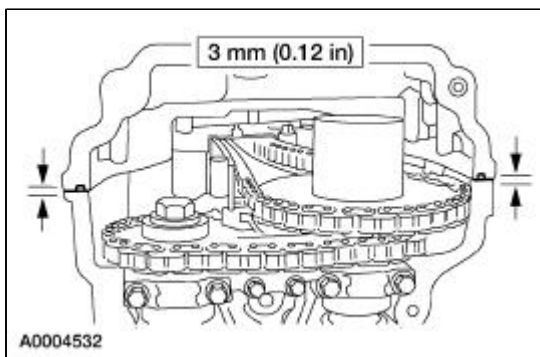
57. **NOTE:** RH shown; LH similar.

Inspect and install new gaskets as necessary.



58. **NOTE:** RH shown; LH similar.

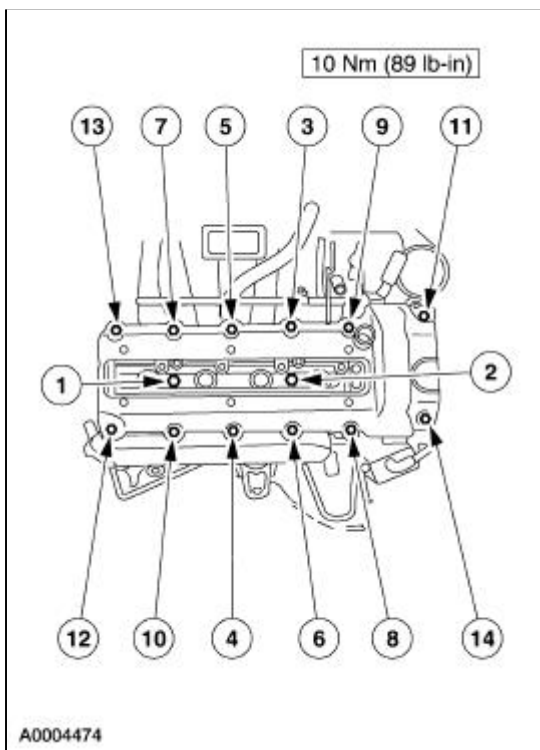
Apply four beads of Silicone Gasket and Sealant F7AZ-19554-EA or equivalent meeting Ford specification WSE-M4G323-A4.



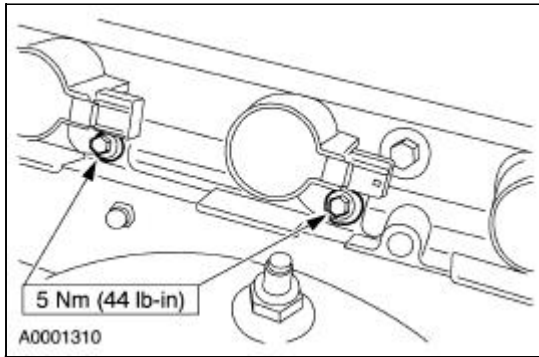
59. **NOTE:** RH shown; LH similar.

Install the valve covers.

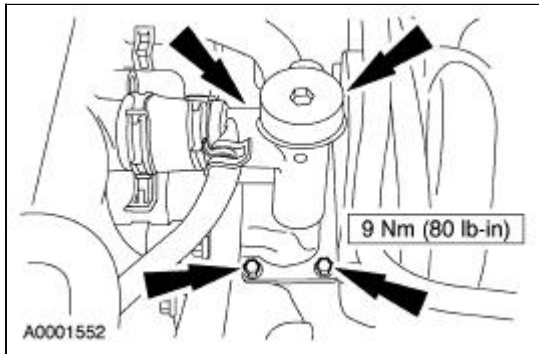
- Tighten the bolts in the sequence shown.



60. Install the eight ignition coils.

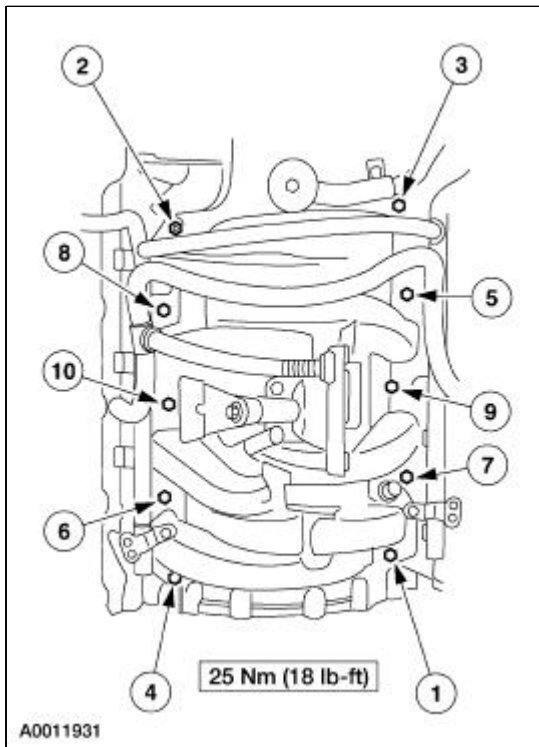


61. Install the four bolts and the thermostat housing.

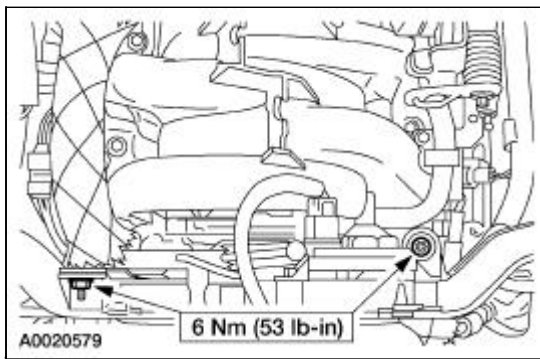


62. Install the intake manifold and tighten the bolts and stud bolt (2) in the sequence shown.

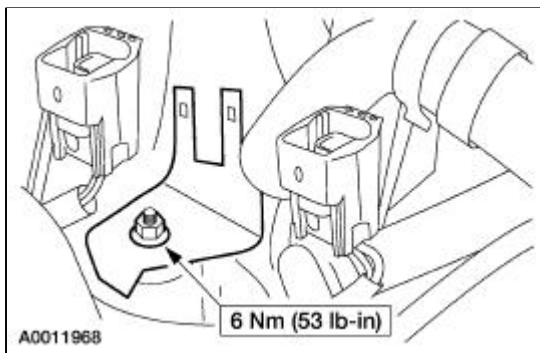
- Inspect and install a new gasket if necessary.



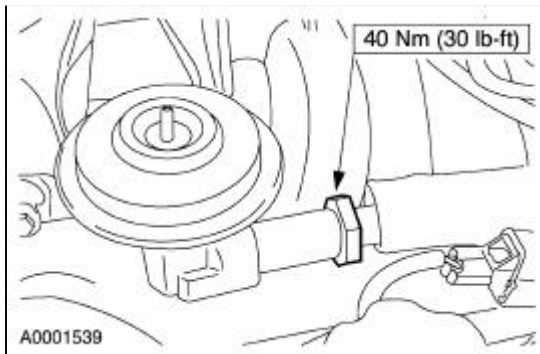
63. Position the wiring harness and install the nuts.



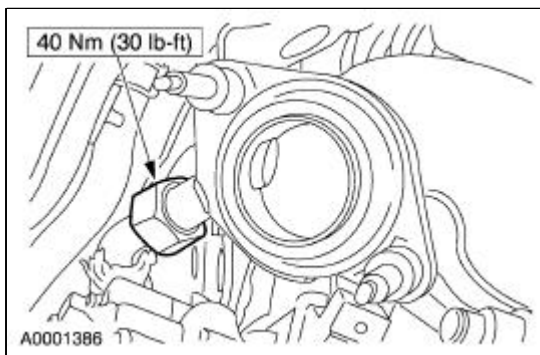
64. Install the bracket.



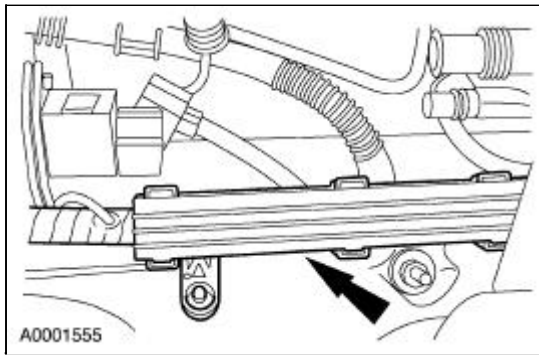
65. Install the EGR valve to exhaust manifold tube. Finger-tighten both fittings. Tighten the upper fitting.



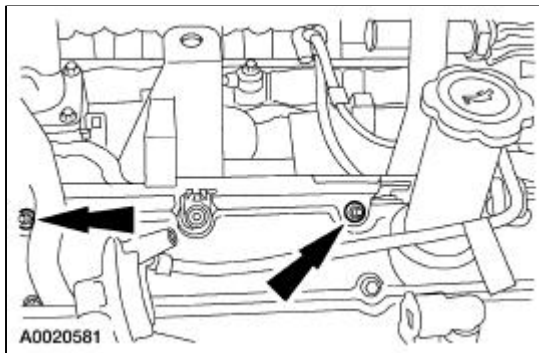
66. Tighten the lower fitting.



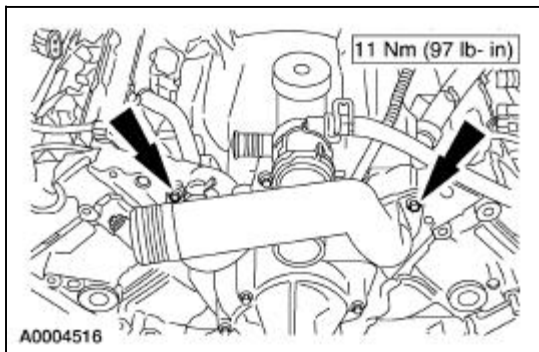
67. Connect the fuel injector connectors and position the engine wiring harness.



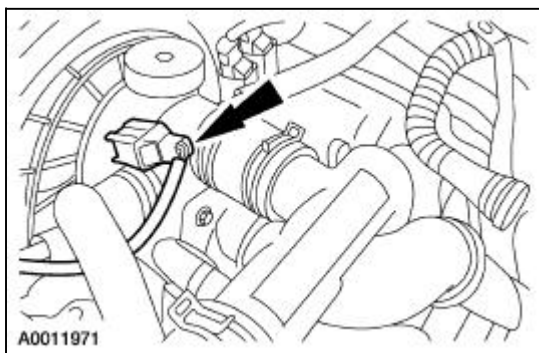
68. Install the bracket and the two nuts.



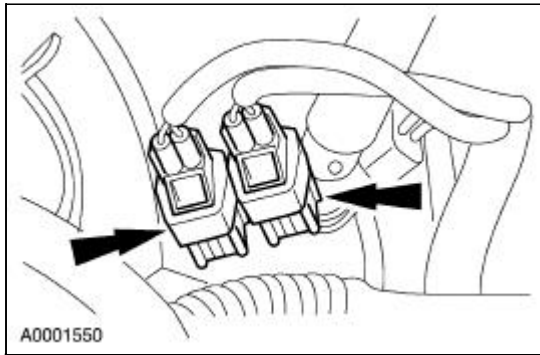
69. Install the water outlet pipe.
- Inspect and install a new gasket if necessary.
 - Install the four bolts.
 - Connect the hoses.



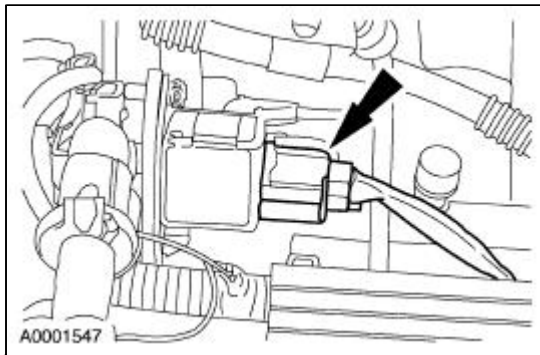
70. Connect the knock sensor connector and install onto the bracket.



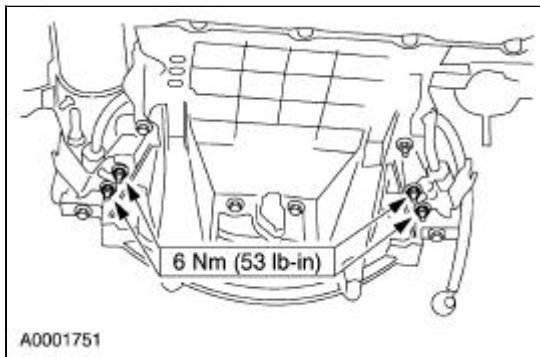
71. Install the CHT sensor and KS electrical connectors on the bracket.



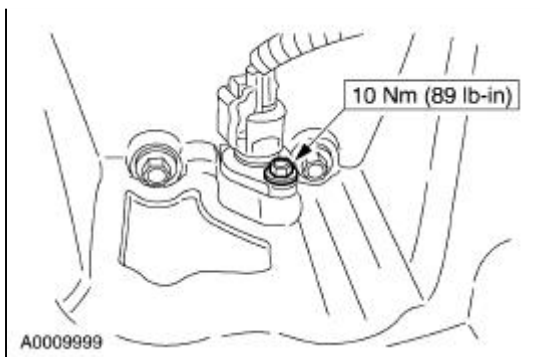
72. Connect the fuel pressure sensor electrical connector.



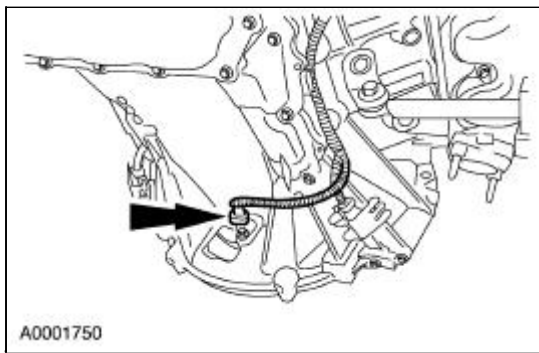
73. Connect the HO2S connectors to the brackets.



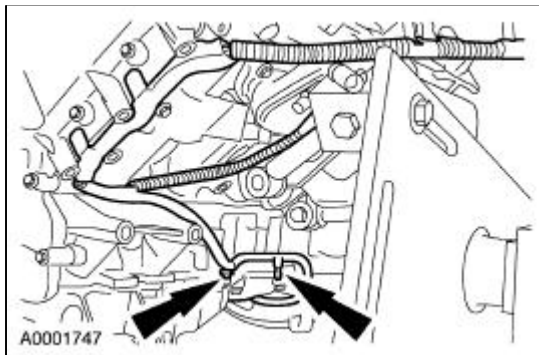
74. Remove the special tool, install the CKP sensor.



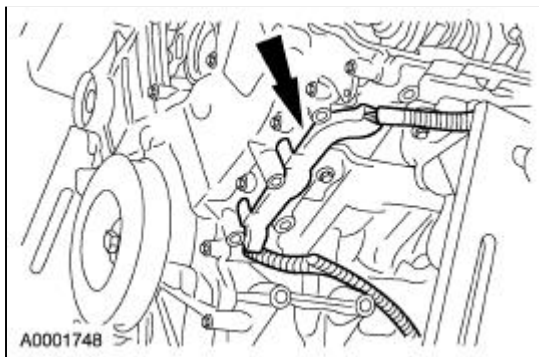
75. Connect the CKP sensor connector.



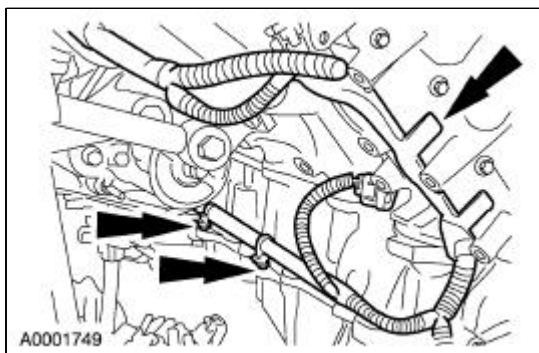
76. Connect the two pin-type retainers.



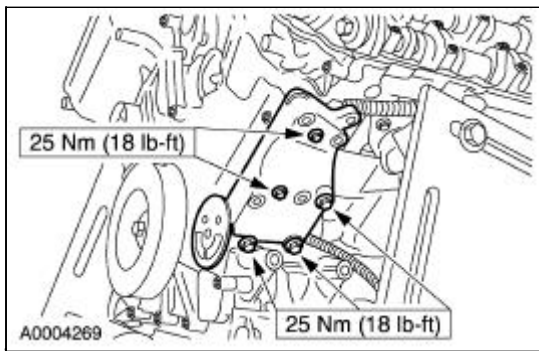
77. Install the wiring harness to the front cover on the LH side.



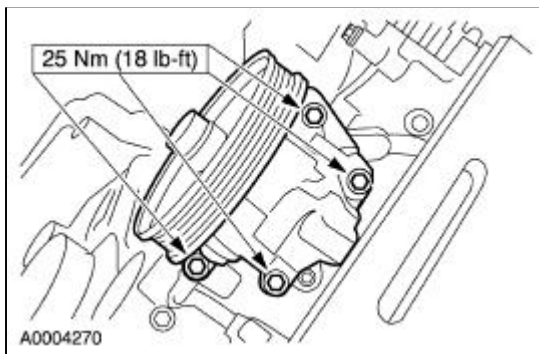
78. Install the wiring harness to the front cover on the RH side.



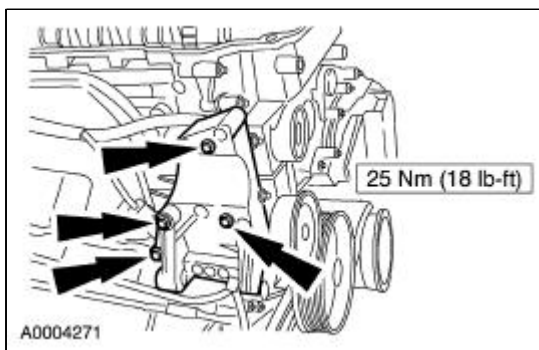
79. Install the power steering pump bracket.



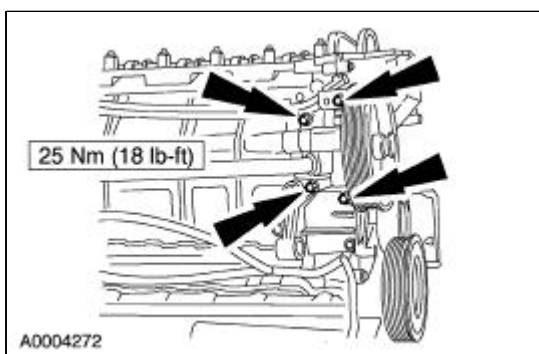
80. Install the power steering pump.



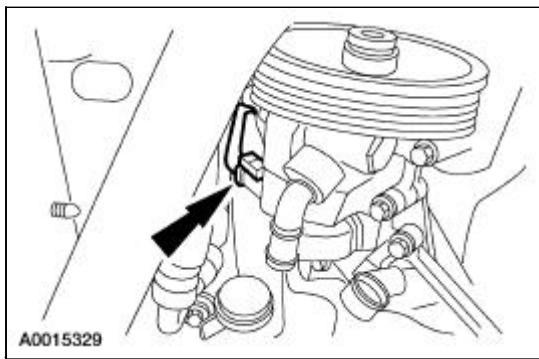
81. Install the hydraulic cooling fan pump bracket.



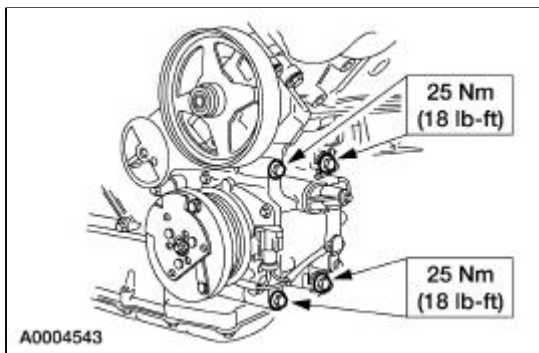
82. Install the hydraulic cooling fan pump.



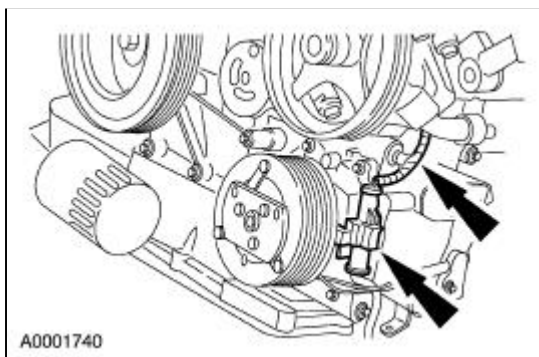
83. Connect the electrical connector.



84. Install the A/C compressor.



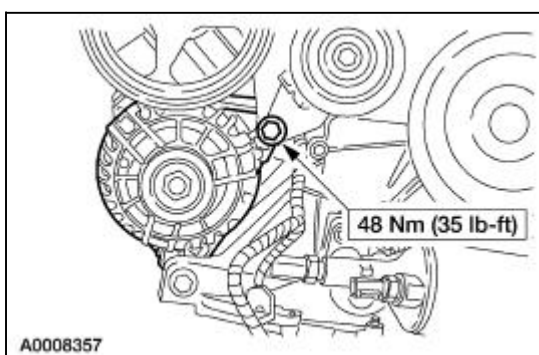
85. Connect the electrical connector and the retaining clip.



86.  **CAUTION:** The generator must be installed in the order shown or damage to the drive belt may occur.

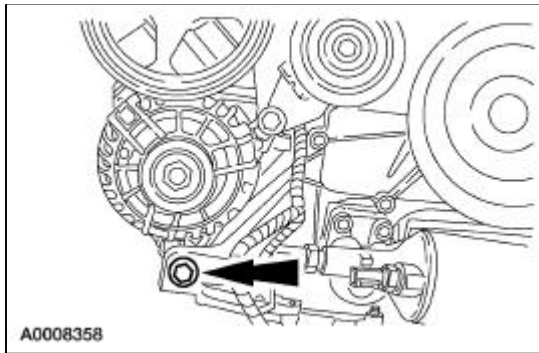
Position the generator and loosely install the bolts and nut.

- Tighten the upper bolt and nut.

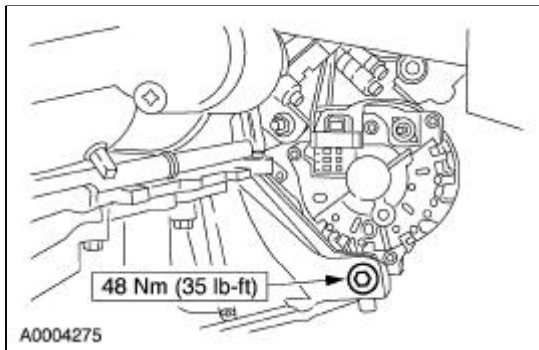


87. Tighten the lower expanding bushing and bolt in two stages.

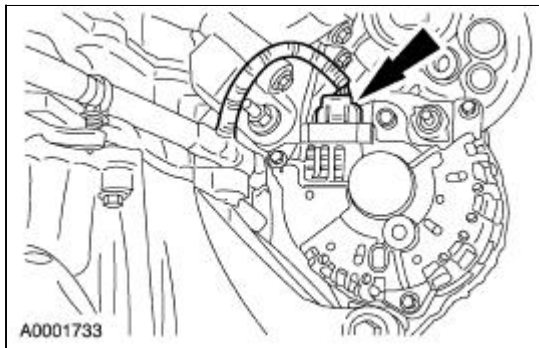
- Stage 1: Tighten to 20 Nm (15 lb-ft).
- Stage 2: Tighten an additional 90 degrees.



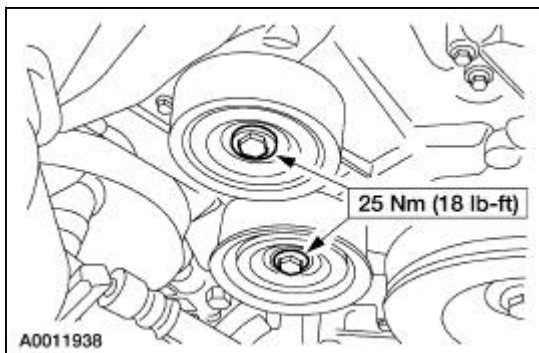
88. Tighten the bolt.



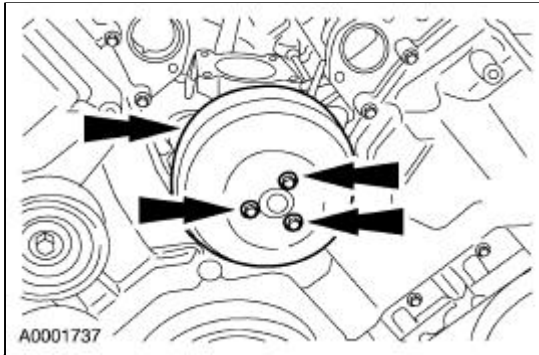
89. Connect the electrical connector.



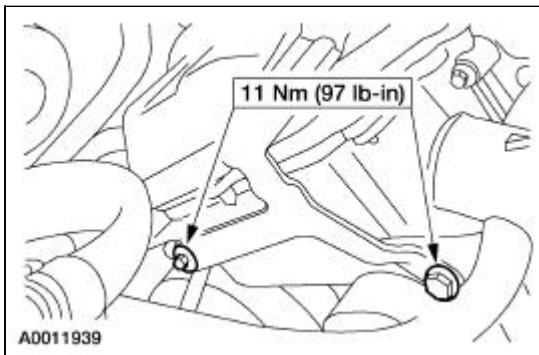
90. Install the two idler pulleys.



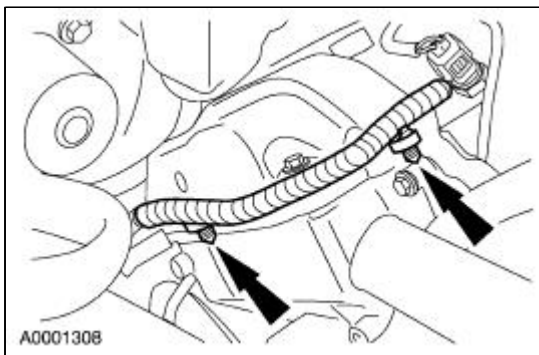
91. Position the water pump pulley and loosely install new bolts.
92. Install the drive belt tensioner. For additional information, refer to [Section 303-05](#).
93. Tighten the water pump pulley bolts in two stages.
 - Stage 1: Tighten to 10 Nm (89 lb-in).
 - Stage 2: Tighten an additional 45 degrees.



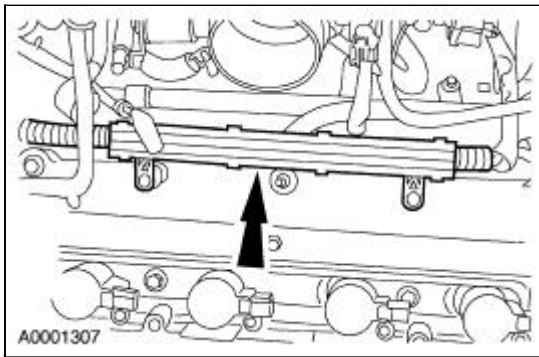
94. Install the inlet tube support bracket.



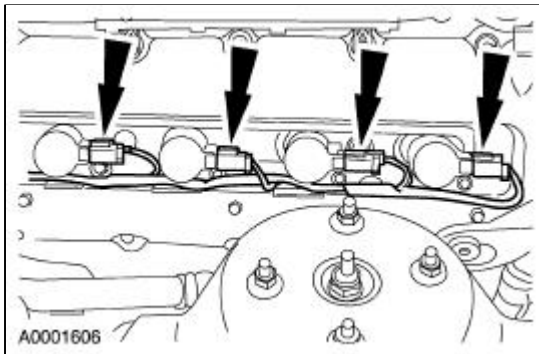
95. Install the eight wiring harness retainers.




96. Connect the fuel injector connectors and position the engine wiring harness.

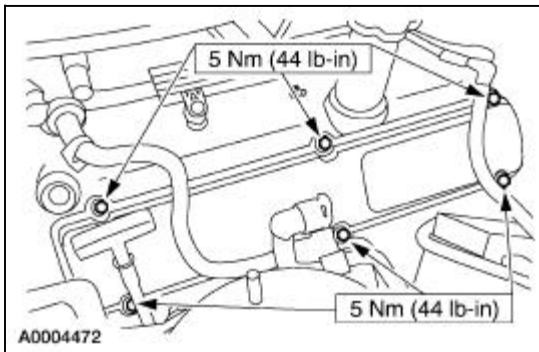


97. Connect the eight ignition coil connectors.



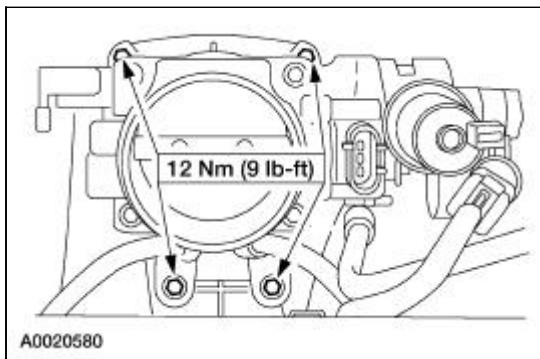
98.  **CAUTION:** Make sure that the wiring harness inlet seals are seated in the valve covers or damage to the wiring harness may occur.

Install the ignition coil covers.

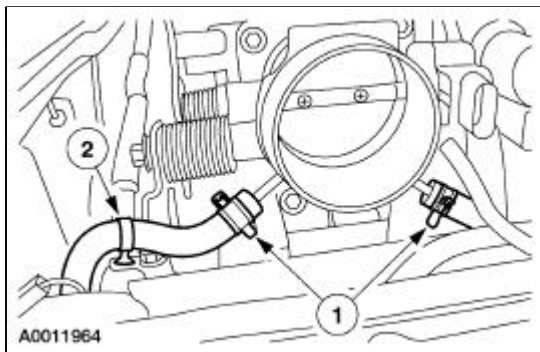


99. **NOTE:** Clean and inspect the gasket. Install a new gasket if necessary.

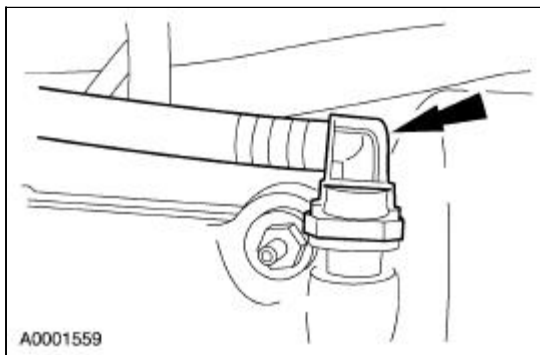
Install the throttle body.



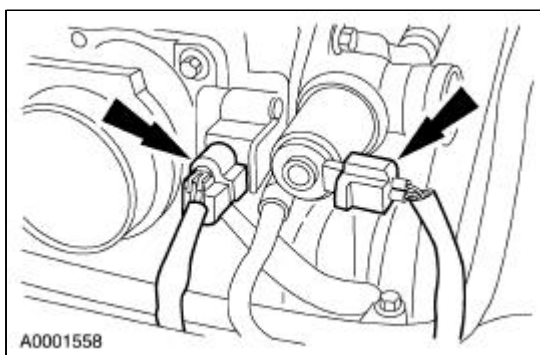
100. Connect the hoses (1) and install the hose in the clip (2).



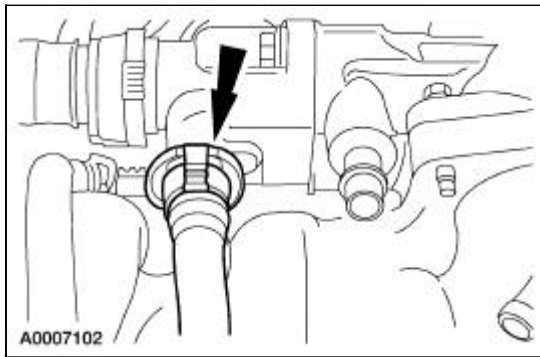
101. Connect the positive crankcase ventilation (PCV) line.



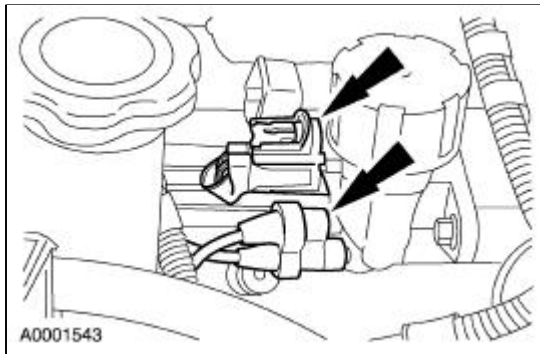
102. Connect the IAC and TPS connectors.



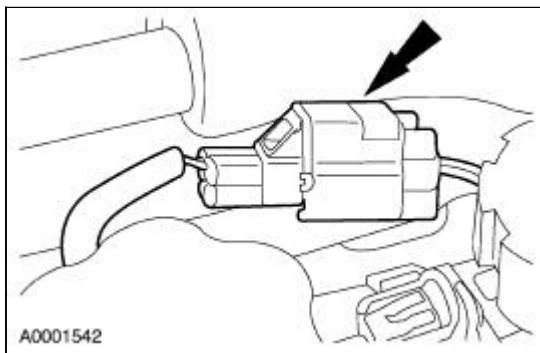
103. Connect the air assist valve hose.



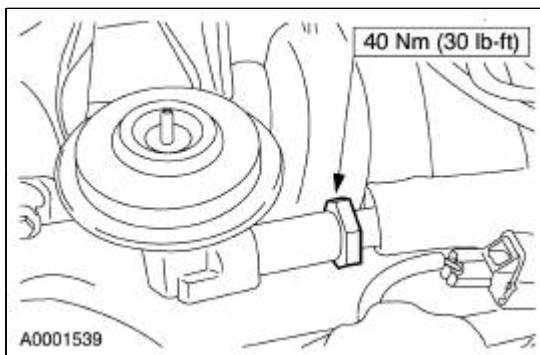
104. Connect the EGR vacuum regulator vacuum and electrical connections.



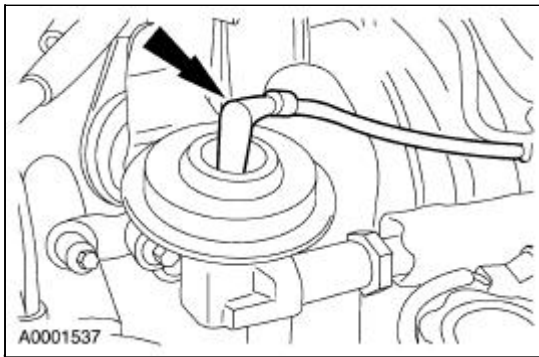
105. Connect the CMP sensor connector and connect the connector locator.



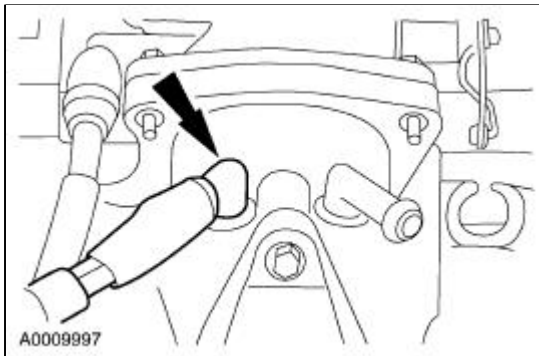
106. Connect the EGR valve to exhaust manifold tube.



107. Connect the vacuum line.


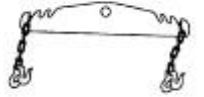


108. Connect the vacuum harness.

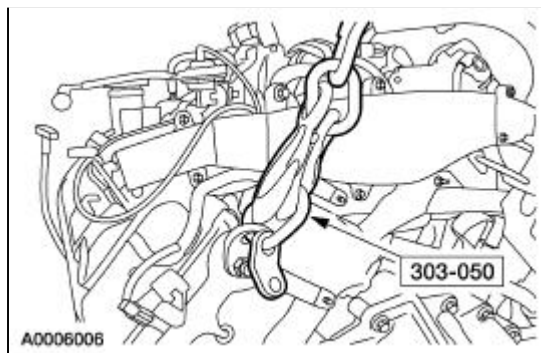


Engine

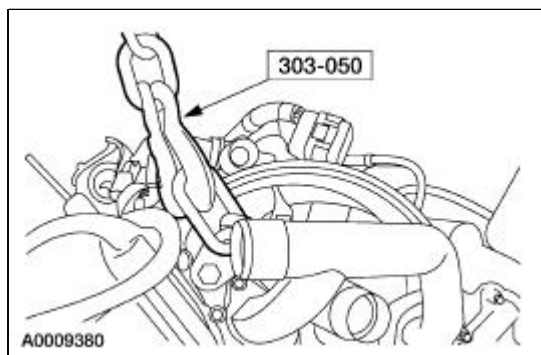
Special Tool(s)

 <p>ST1595-A</p>	Engine Lifting Brackets 303-050 (T70P-6000)
 <p>ST1602-A</p>	Spreader Bar 303-D089 (D93P-6001-A3)

1. Install the special tool.

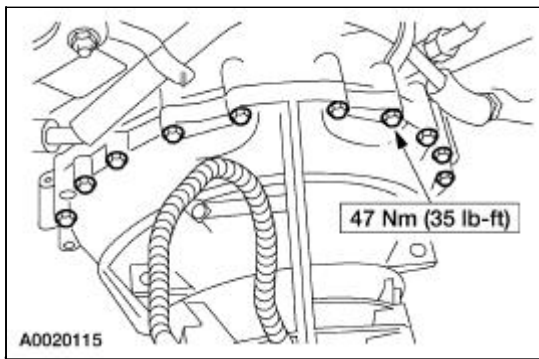


2. Install the special tool.

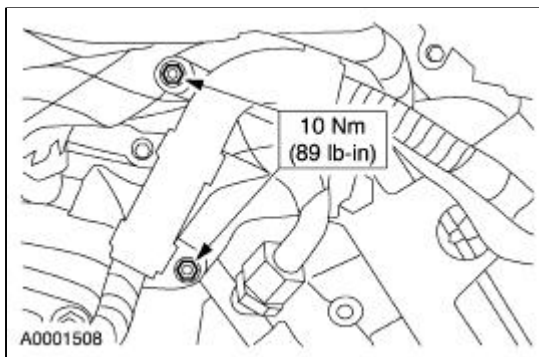


3. Using a floor crane and a spreader bar (303-D089) to support the engine, remove the engine from the engine stand.
4. **NOTE:** Align the flexplate to converter marks made at removal.

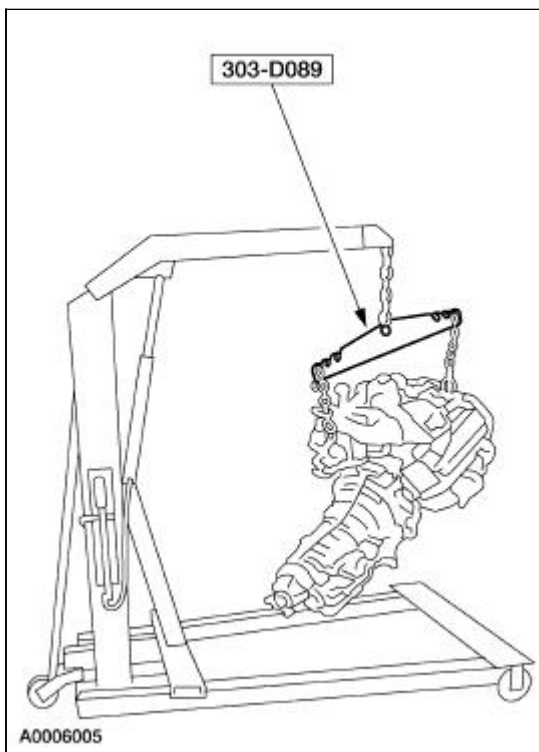
Install the engine to the transmission and install the bolts.



5. Install the wiring harness.

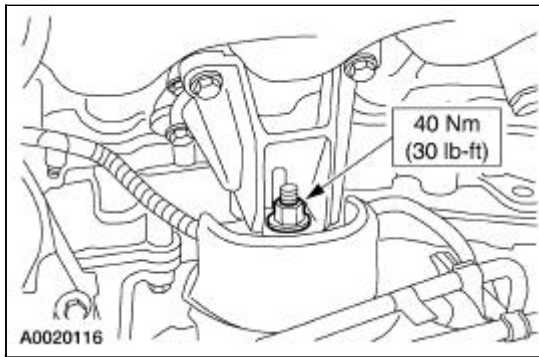


6. Using a floor crane and the special tool,, install the engine onto the sub-frame.



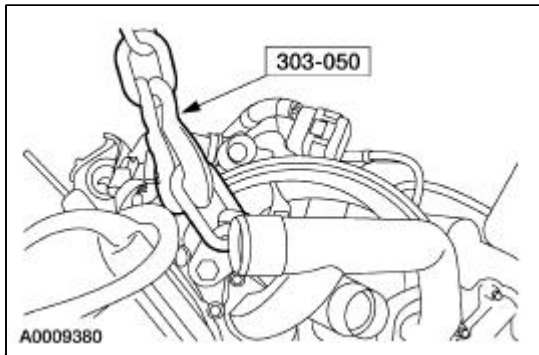
7. **NOTE:** LH shown; RH similar.

Install the LH and the RH upper engine mounts.

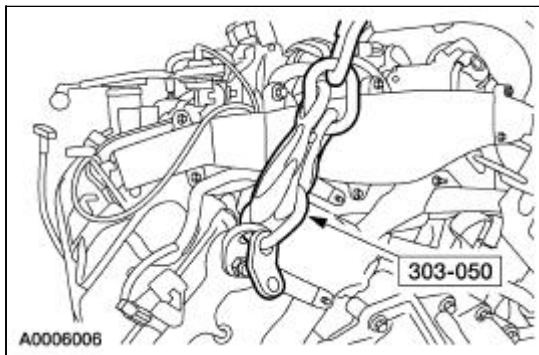


8. Remove the engine lifting equipment.

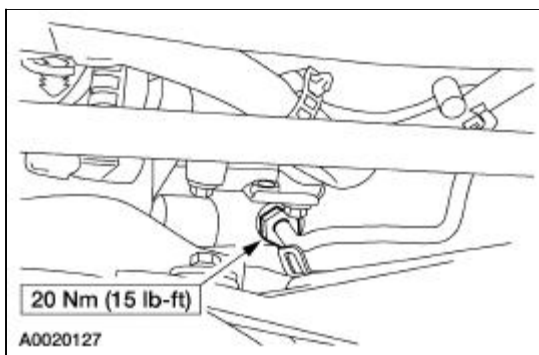
9. Remove the special tool.



10. Remove the special tool.

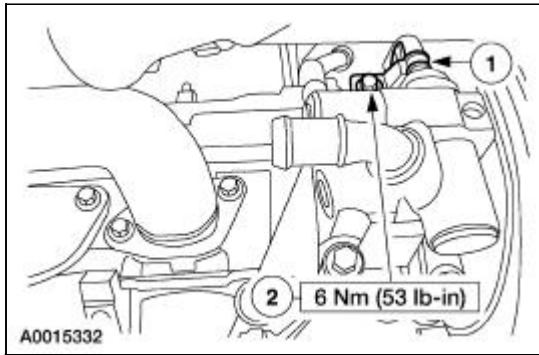


11. Connect the hydraulic fan pump line.

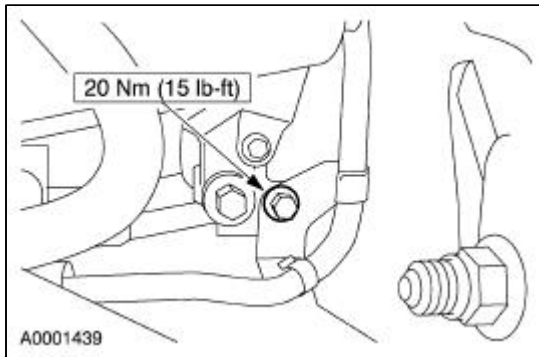


12. Install the hydraulic fan pump line bracket.
1. Install the bracket.

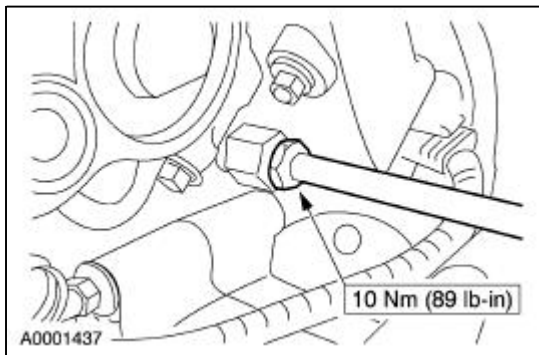
2. Install the bolt.



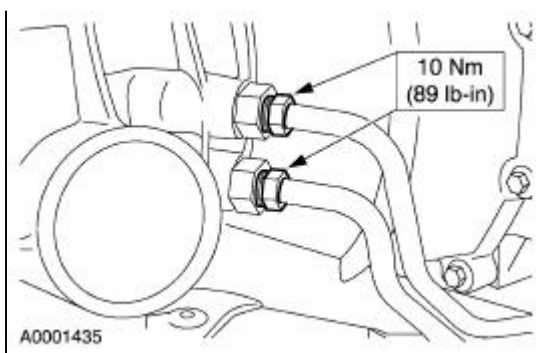
13. Install the power steering line bracket.



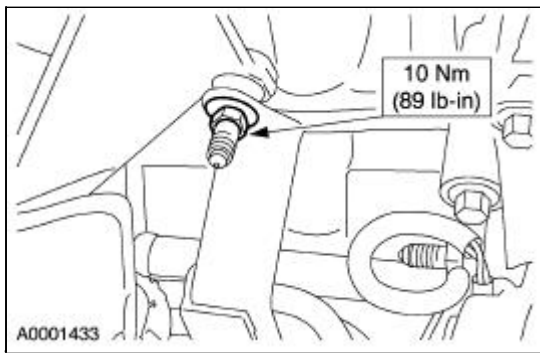
14. Connect the power steering line.



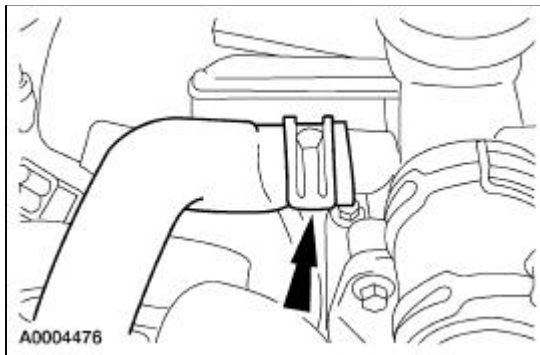
15. Connect the transmission cooler lines.



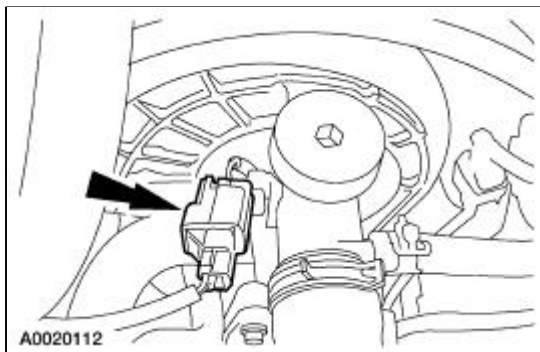
16. Install the transmission cooler line bracket.



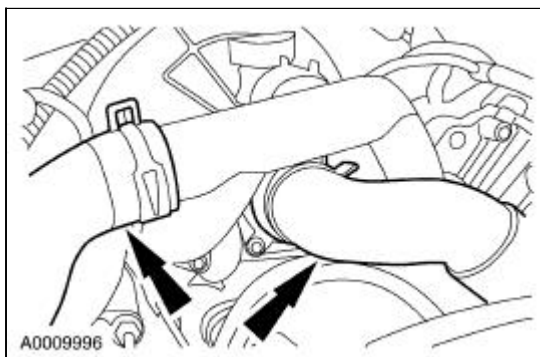
17. Connect heater hose.



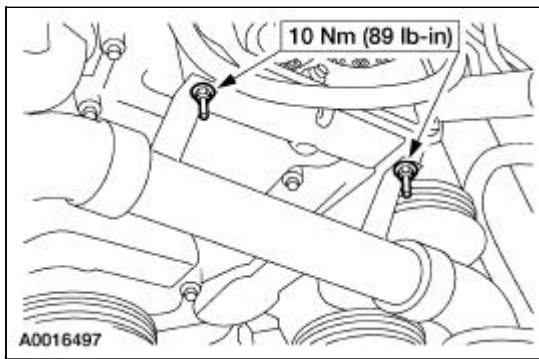
18. Connect the KS electrical connector.



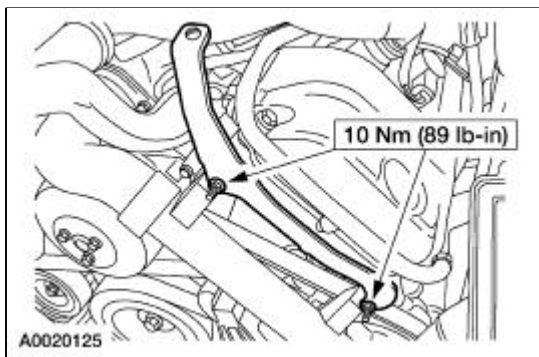
19. Connect the radiator hoses.



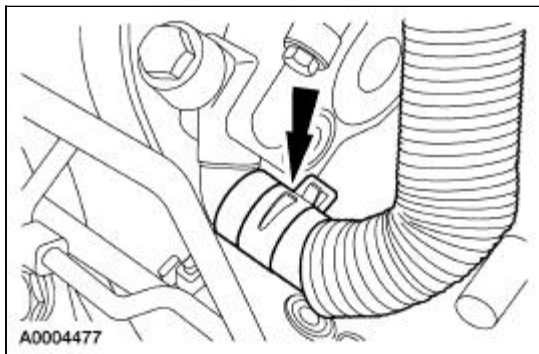
20. Install the lower radiator hose.



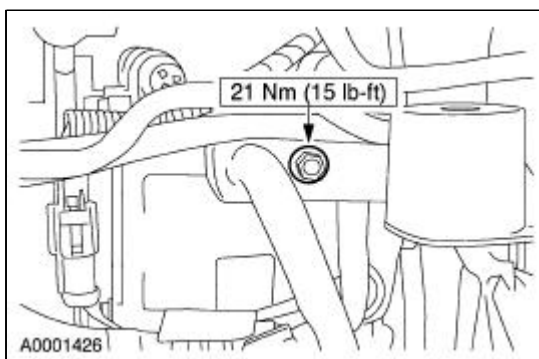
21. Install the bracket.



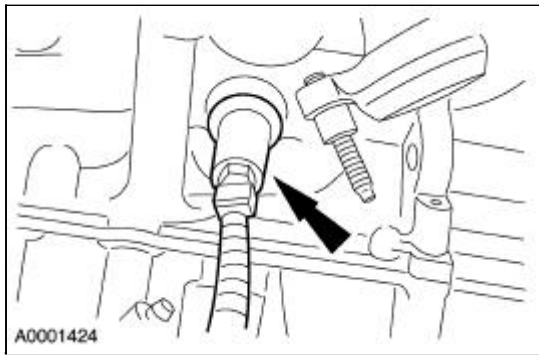
22. Connect the power steering pump and the hydraulic cooling fan pump return hoses.



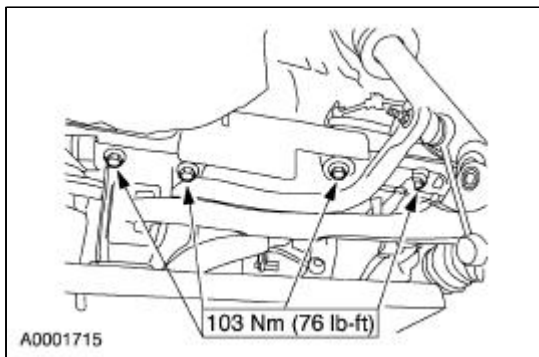
23. Connect the A/C manifold and tube.



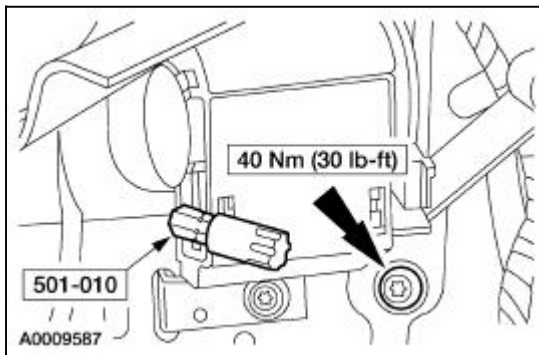
24. Connect the block heater, if equipped.



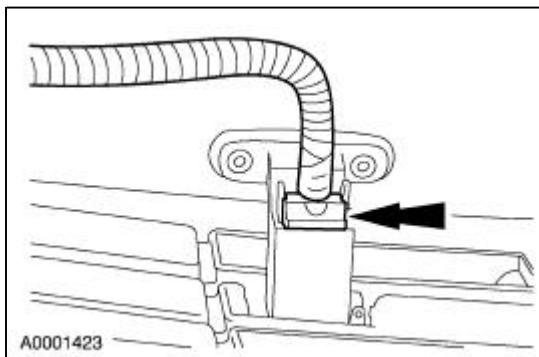
25. Using the powertrain lift and the transmission support bracket, carefully raise the entire assembly into the vehicle.
26. Install the four front and the four center crossmember bolts.



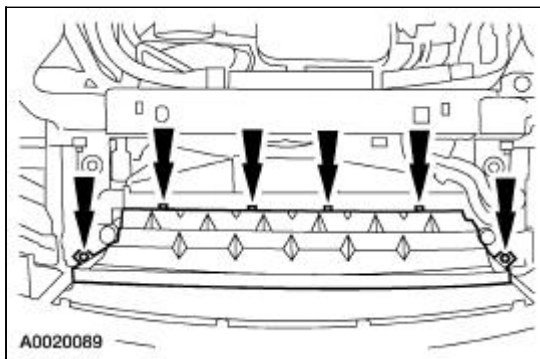
27. Install the transmission crossmember bolts.



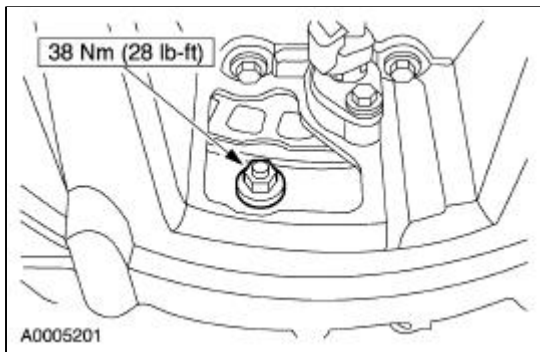
28. Install the engine block heater plug, if equipped.



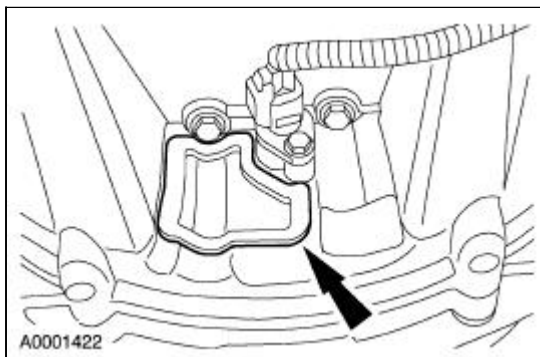
29. Install the inner air deflector.



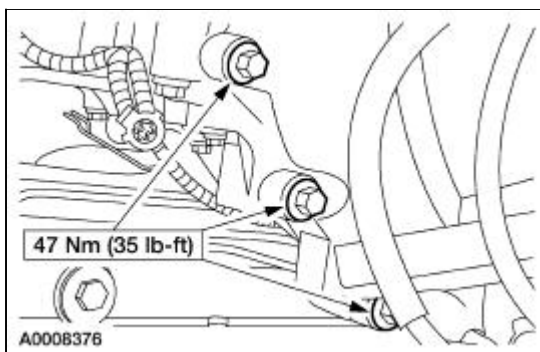
30. Install the eight torque converter nuts.



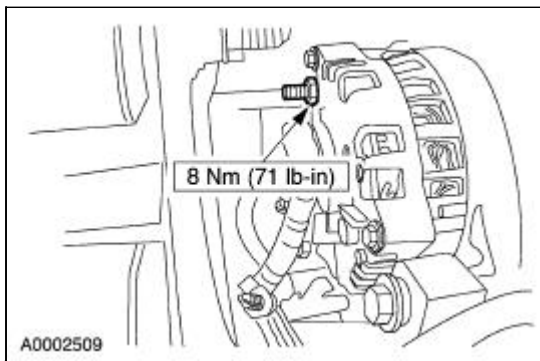
31. Install the cover.



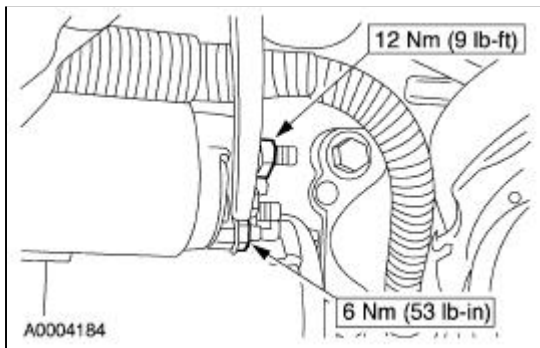
32. Install the six lower transmission to engine bolts.



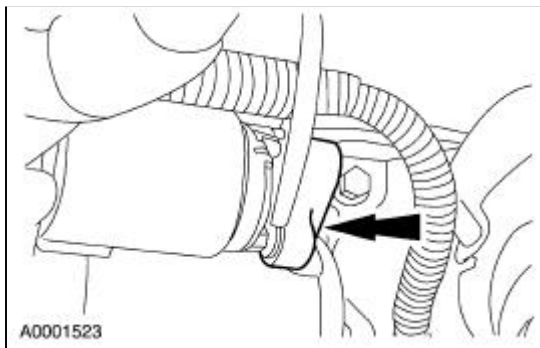
33. Connect the generator electrical connector.



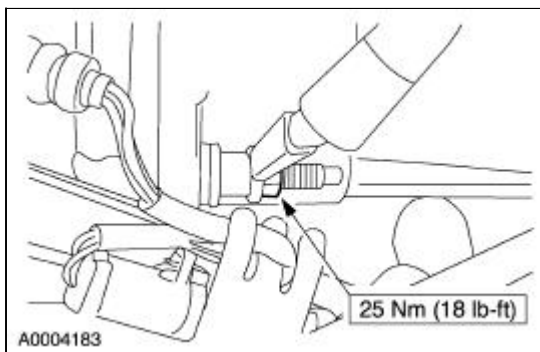
34. Connect the starter motor electrical connectors.



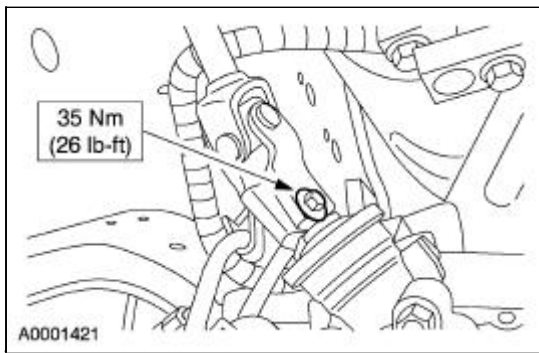
35. Install the cover.



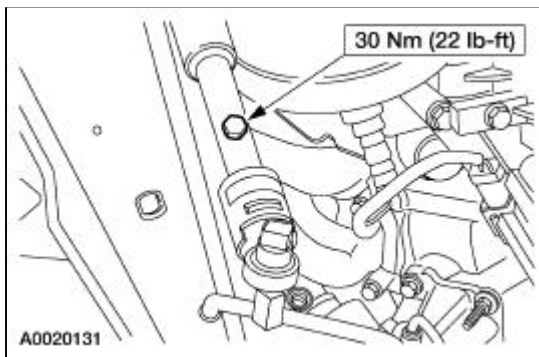
36. Install the starter motor ground cable.



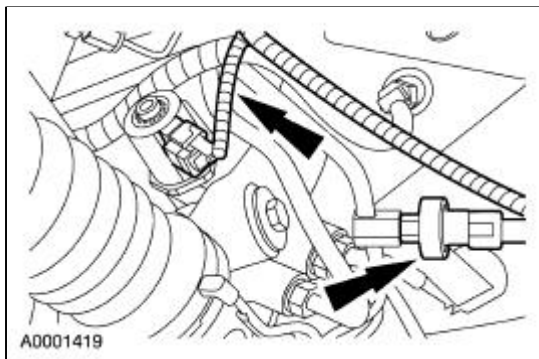
37. Connect the steering coupling.



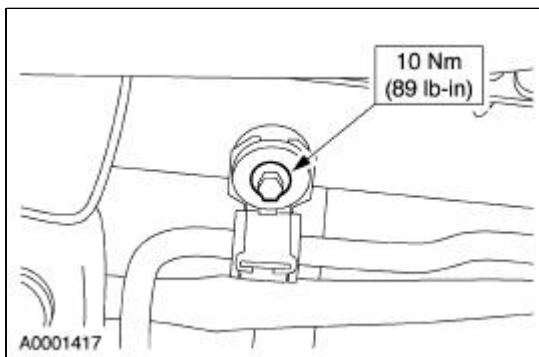
38. Install the steering shaft bolt.



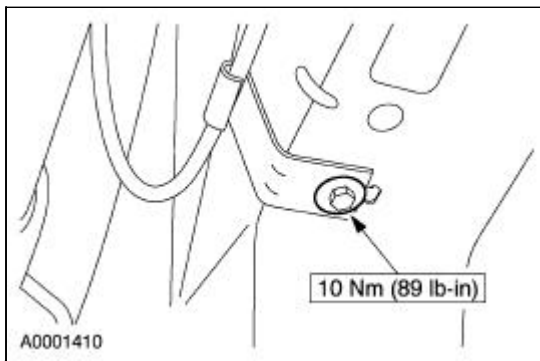
39. Connect the rack and pinion steering unit electrical connectors.



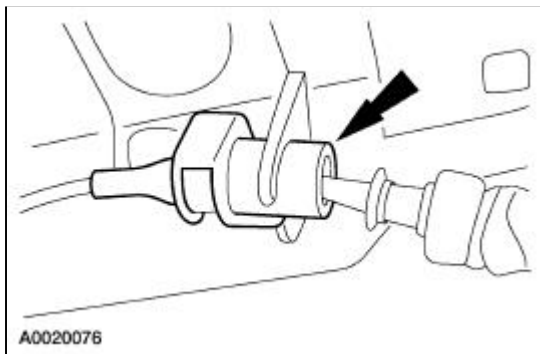
40. Install the hydraulic cooling fan lines to the RH frame rail.



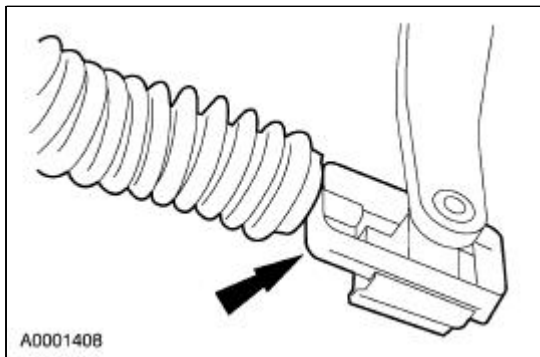
41. Install the shift cable bracket.



42. Reclip the shift cable to the bracket.

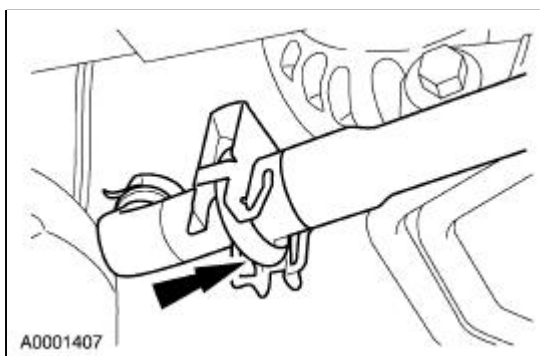


43. Connect the shift cable to the shifter.

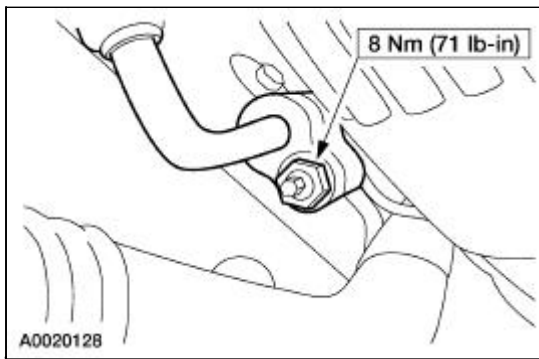


44. Install the driveshaft. For additional information, refer to [Section 205-01](#).

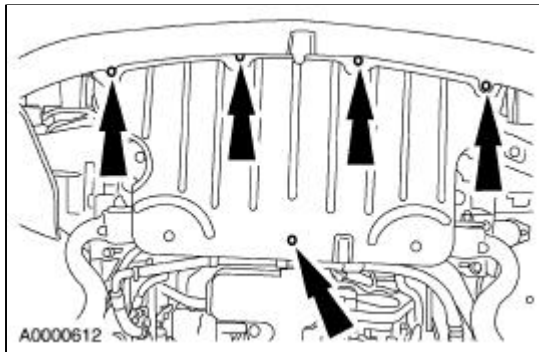
45. Connect the A/C low pressure line.



46. Connect the A/C high pressure line.

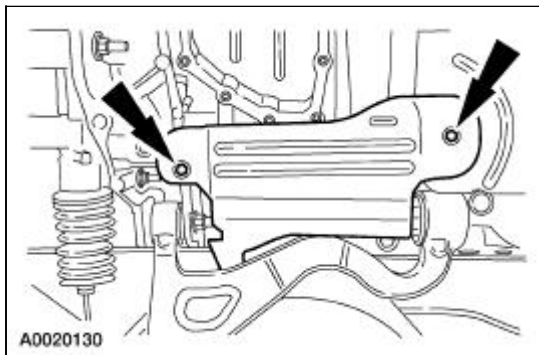


47. Install the center splash shield.



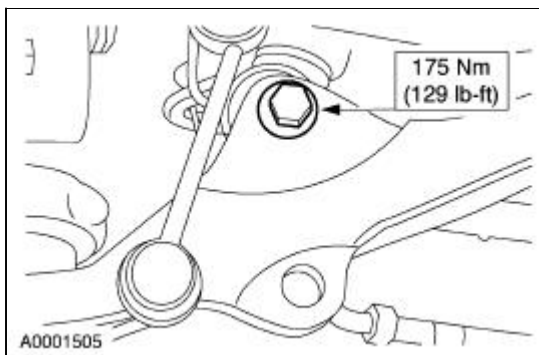
48. **NOTE:** LH shown; RH similar.

Install the LH and the RH splash shields.



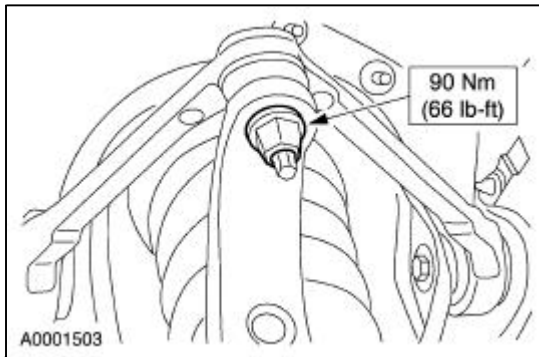
49. **NOTE:** LH shown; RH similar.

Install the LH and the RH lower strut mount bolts.



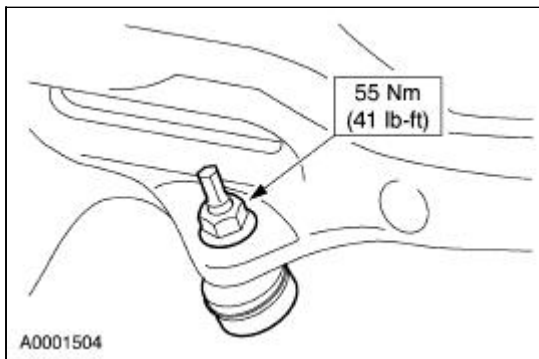
50. **NOTE:** LH shown; RH similar.

Install the LH and the RH ball joints to the spindles and install the nuts.



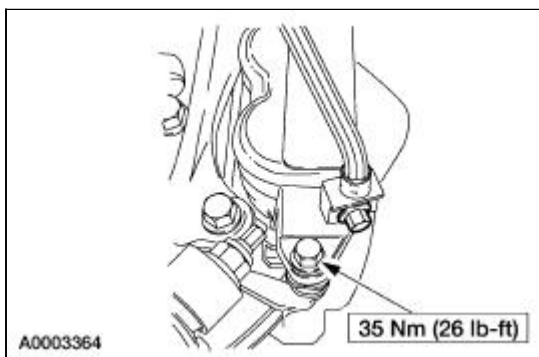
51. **NOTE:** LH shown; RH similar.

Install the LH and the RH sway bar lower nuts.



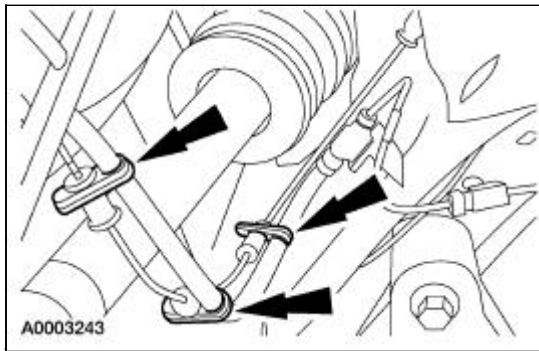
52. **NOTE:** LH shown; RH similar.

Install the LH and the RH brake calipers.



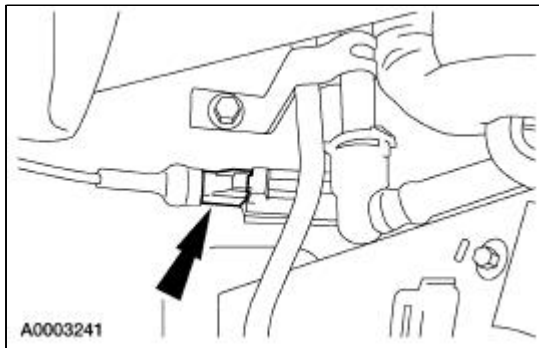
53. **NOTE:** LH shown; RH similar.

Position the LH and the RH anti-lock brake sensor harness and reclip to the brake hoses.



54. **NOTE:** LH shown; RH similar.

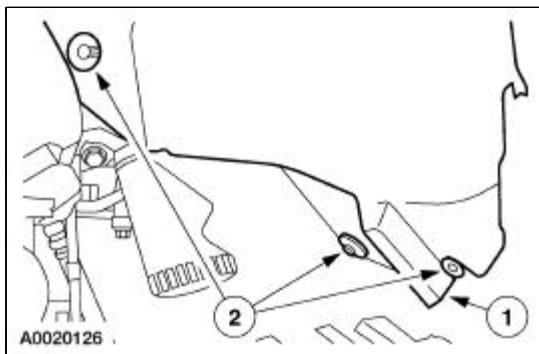
Connect the LH and the RH anti-lock brake sensor electrical connectors.



55. **NOTE:** LH shown; RH similar.

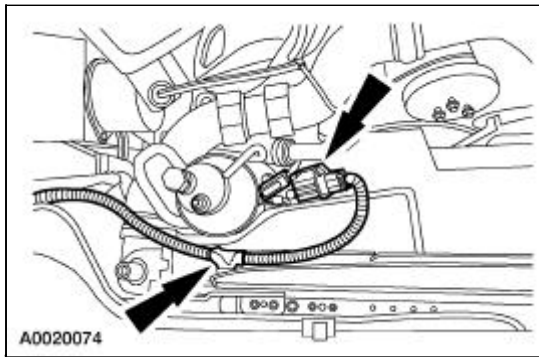
Install the LH and the RH inner splash shields.

1. Position the shield.
2. Install the pin-type retainers.

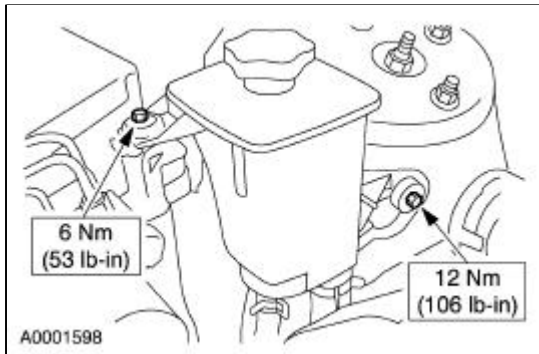


56. Install the front wheels and tires. For additional information, refer to [Section 204-04](#).

57. Clip the harness to the radiator support and connect the water valve electrical connector.

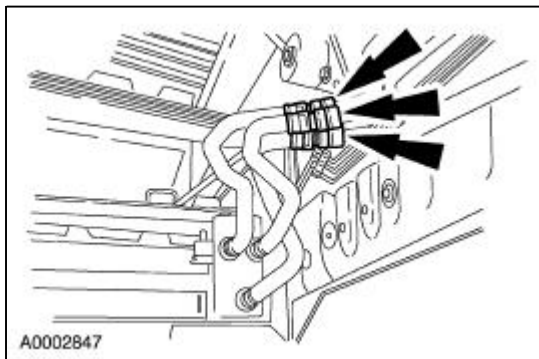


58. Install the hydraulic cooling fan reservoir.

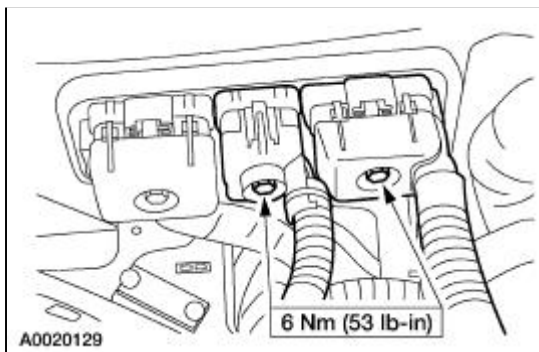


59. **NOTE:** Install the two hoses to the marks made during removal.

Connect the hoses to the water control valve.

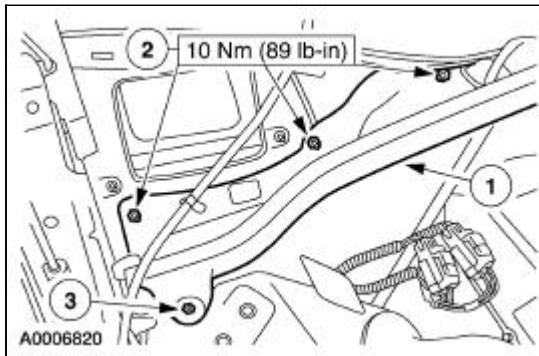


60. Connect the connectors.



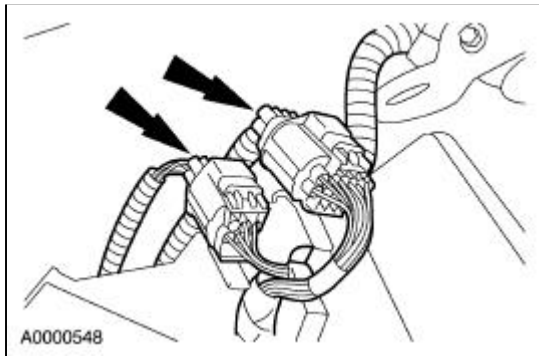
61. Install the fresh air filter panel.
1. Position the panel.

2. Install the nuts.
3. Install the pin-type retainer.

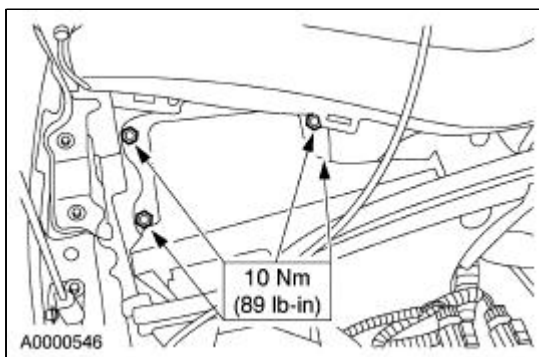


62. **NOTE:** The connectors are located on the backside of the RH strut tower.

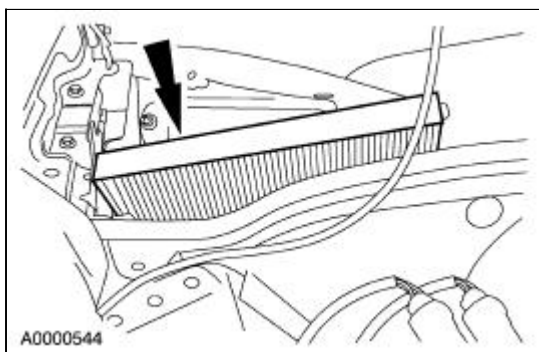
Connect the powertrain bulkhead electrical connectors.



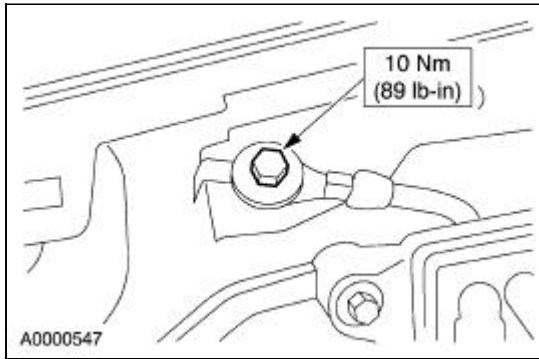
63. Install the fresh air filter housing.



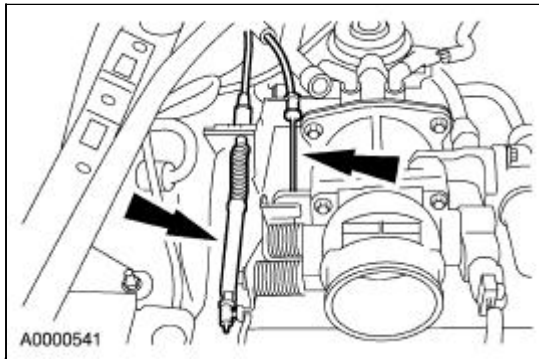
64. Install the fresh air filter.



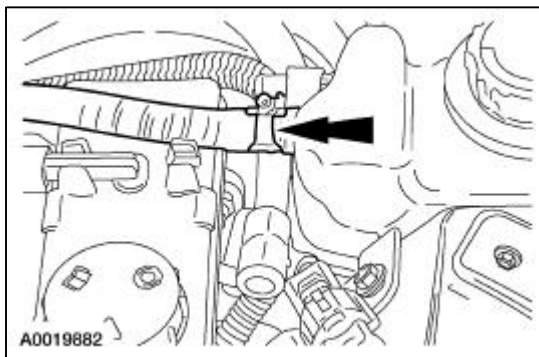
65. Connect the ground strap.



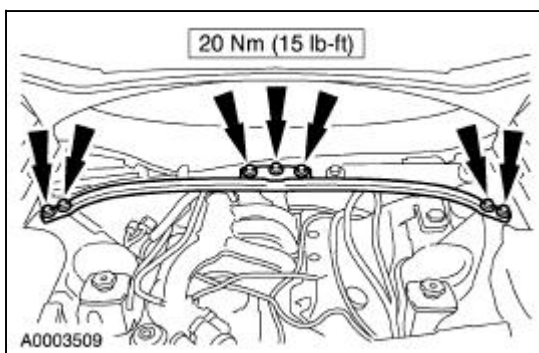
66. Connect the accelerator cable and the speed control cable.



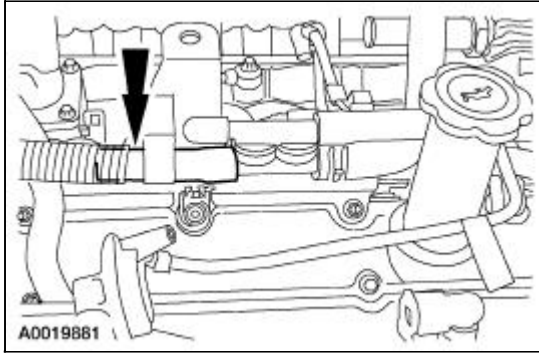
67. Connect the degas bottle hose.



68. Install the bracket.
1. Install the bracket.
 2. Install the seven bolts and one nut.
 3. Install the windshield washer hose.

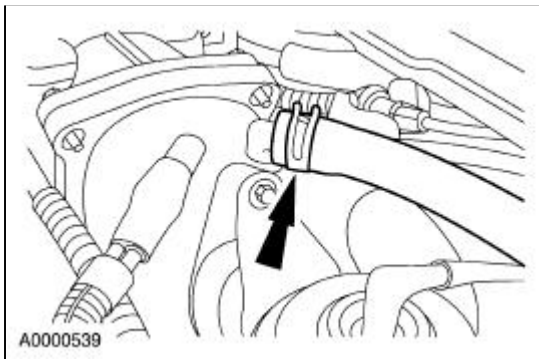


69. Reclip the hose.



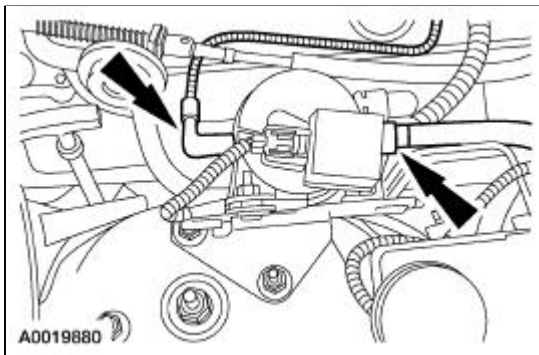
70. Install the cowl vent screen. For additional information, refer to [Section 501-02](#).

71. Connect the main vacuum supply hose.

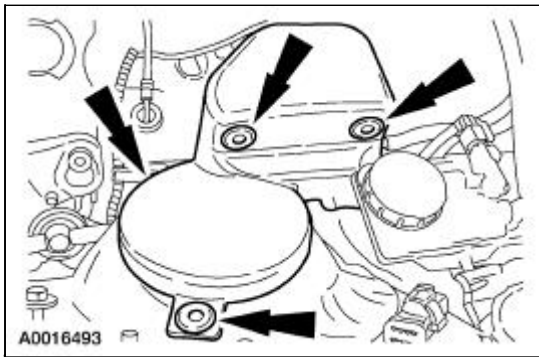


72. Connect the VMV.

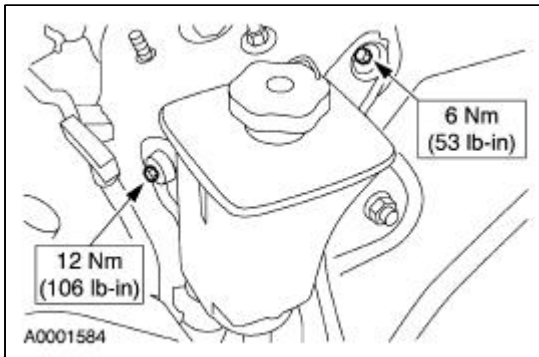
- Vacuum hose.
- Canister purge valve.



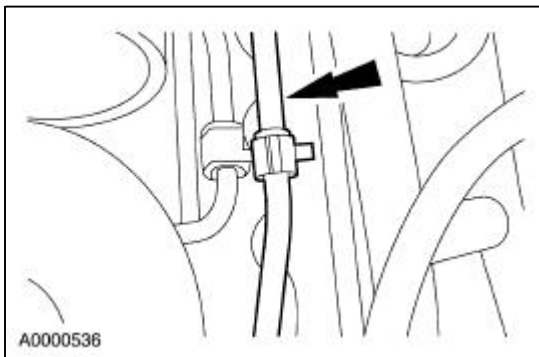
73. Install the VMV cover.



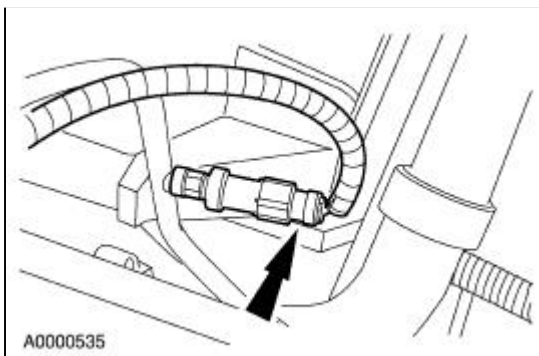
74. Connect the fuel line. For additional information, refer to [Section 310-00](#).
75. Install the power steering pump reservoir.



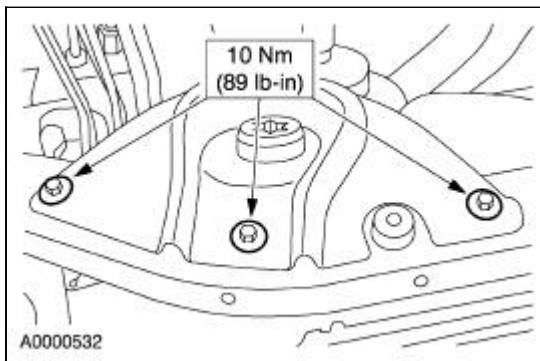
76. Attach the power steering return line to the pressure line.



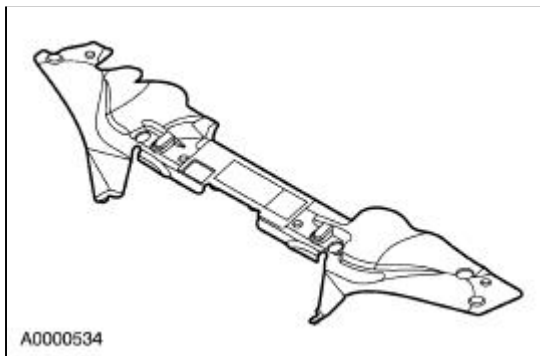
77. Connect the A/C pressure switch electrical connector.




78. Install the two upper radiator support brackets.



79. Install the upper radiator sight shield.



80. Fill the engine with Super Premium SAE 5W-30 Motor Oil XO-5W30-QSP or equivalent meeting Ford specification WSS-M2C153-G.
 81. Connect the battery ground cable. For additional information, refer to [Section 414-01](#).
 82. Install the air cleaner inlet. For additional information, refer to [Section 303-12](#).
 83.  **CAUTION: The cooling system filling and bleeding procedure must be followed exactly or damage to the engine may occur.**

Fill the engine cooling system. For additional information, refer to [Section 303-03](#).
 84. Fill the power steering reservoir to the correct level. For additional information, refer to [Section 211-02](#).
 85. Fill and bleed the hydraulic cooling fan. For additional information, refer to [Section 303-03](#).
 86. Charge the A/C system. For additional information, refer to [Section 412-00](#).
-

General Specifications

Item	Specification
3.9L	11.3
3.0L	10.6
Cooling fan MAX speed	2,300 ± 100 rpm
Cooling fan MAX pressure output	1,200 psi
Cooling fan operating pressure	900 psi
Cooling fan operating flow rate	4.0 ± 0.25 gpm
Coolant mixture with water	50% ^a
Pressure relief cap opening pressure kPa (psi)	110 (16)
Water thermostat start to open temperature	87-93°C (192-199°F)
Water thermostat full open temperature	104° C(219°F)
Lubrication	
Premium Cooling System Flush F1AZ-19A503-A	ESR-M14P7-A
Premium Long Life Grease XG-1-C	ESA-M1C75-B

^a Premium Engine Coolant E2FZ-19549-AA (F5FZ-19549-CC in Oregon), or equivalent meeting Ford specification ESE-M97B44-A.

Torque Specifications

Description	Nm	lb-ft	lb-in
Engine appearance cover bracket	10	—	89
Lower radiator hose	13	10	—
Water outlet adapter 3.9L	11	8	—
Thermostat housing 3.9L	11	8	—
Coolant outlet pipe 3.0L	25	18	—
Coolant outlet pipe	11	8	—
Water pump assembly 3.0L	25	18	—
Water pump 3.9L	^a		
Upper radiator support brackets	10	—	89
Receiver/drier bracket	11	8	—
Auxiliary water pump 3.9L	10	—	89
Hydraulic cooling fan high pressure line	20	15	—
Hydraulic cooling fan high pressure line bracket	8	—	71
Condenser to radiator bolts	10	—	89
Hydraulic cooling fan pump	25	18	—
Hydraulic cooling fan high pressure line support bracket	13	10	—
Cross vehicle support	20	15	—

Degas bottle	6	—	53
Engine fill cap 3.9L	9	—	80
Water pump pulley (3.9L)	a	a	a

^a Refer to the procedure in this section.

Engine Cooling

The cooling system components include the:

- block heater (optional)
- cylinder head temperature sensor
- fan blade, fan motor and fan shroud assembly
- radiator
- pressure relief cap
- degas bottle
- radiator draincock
- water pump
- oil cooler (optional)
- water thermostat

The water thermostat:

- controls the engine coolant temperature.
- allows quicker engine warm-up.

The degas bottle:

- provides a location for system fill.
- contains coolant expansion and system pressurization.
- provides air separation during operation.
- replenishes the engine coolant to the system.

The fan blade draws air through the radiator to help cool the engine coolant.

The fan motor:

- operates only when the engine is running.
- will not operate when the engine is off.

The engine coolant flows:

- from the lower radiator hose to the water pump.
- from the water pump to the engine block and the cylinder heads.

A closed water thermostat returns the engine coolant to the water pump. An open water thermostat allows the engine coolant to flow to the radiator.

Unsatisfactory coolant materials:

- Alcohol-type antifreeze does not provide adequate water pump lubrication.
 - has lower boiling point
 - reduced antifreeze protection
- Alkaline brine solutions will cause serious engine cooling system damage.

The cylinder head temperature sensor provides a signal to the temperature gauge.

- will invoke failsafe cooling.

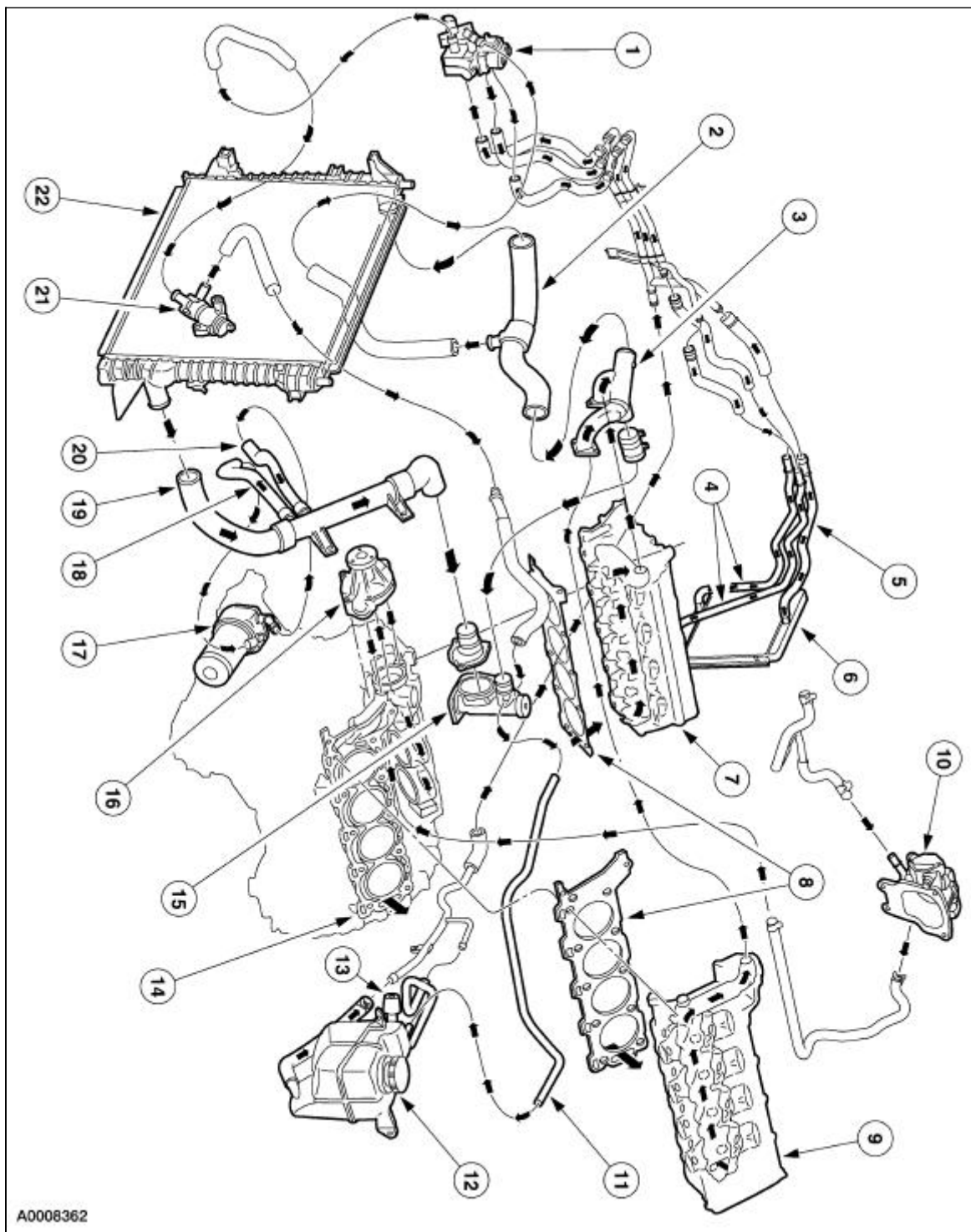
The optional block heater:

- electrical heating element is installed in the block cooling jacket.
 - uses a standard 110V (220V in Europe) electrical supply
- keeps the engine coolant warm during cold weather.

The auxiliary water pump (3.9L only):

- provides heater coolant flow boost.
- has a secondary function of providing engine-off cooling.

Coolant Flow 3.9L

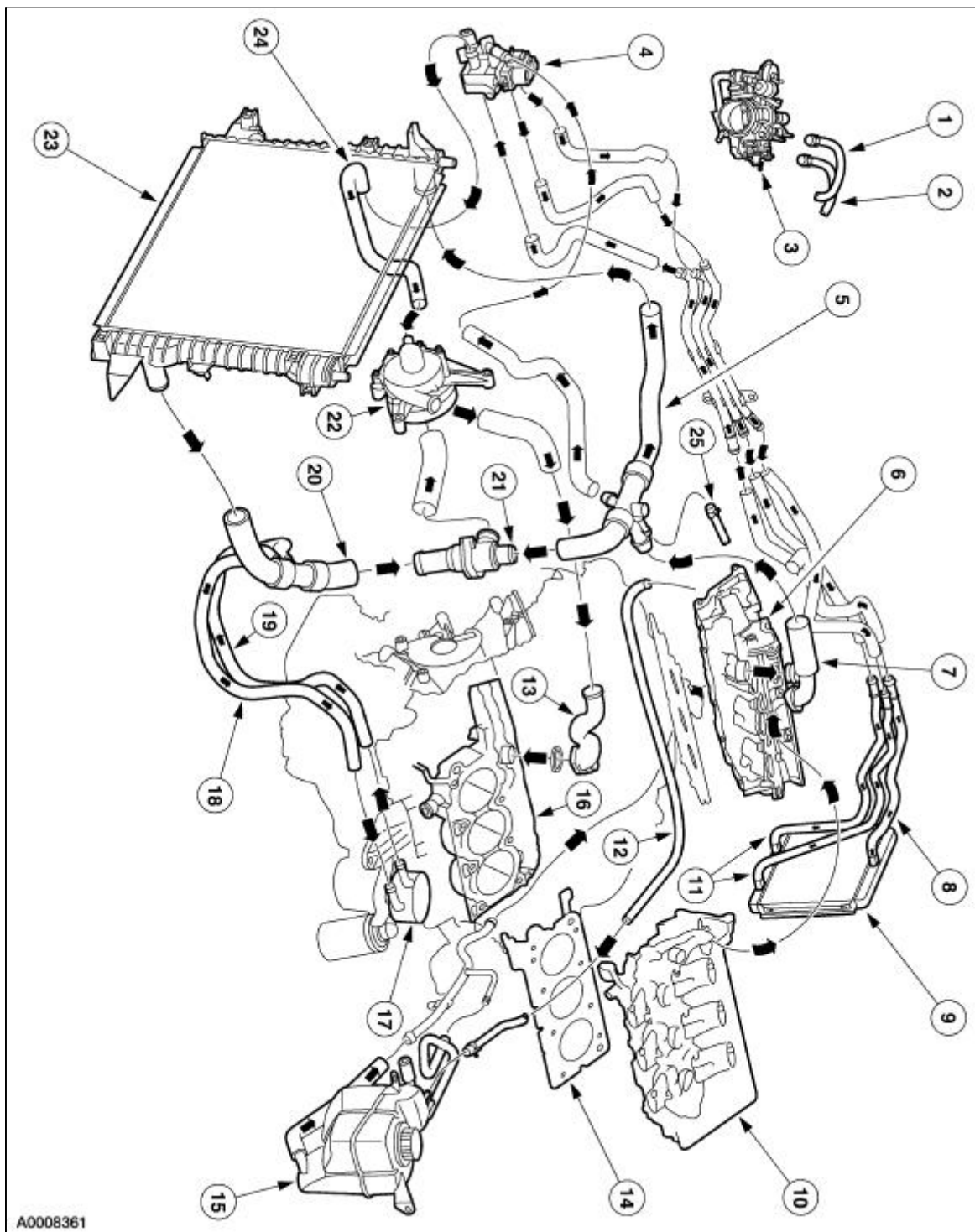


A0008362

Item	Part Number	Description
1	—	Coolant control valve
2	8260	Upper radiator hose
3	8A520	Coolant outlet tube
4	18472	Heater inlet hoses (2 req)
5	18472	Heater outlet hose
6	18476	Heater core
7	6049	Cylinder head RH
8	—	Cylinder head gasket (2 req)

9	6050	Cylinder head LH
10	—	Throttle body adapter
11	—	Engine vent hose
12	—	Degas bottle
13	—	Relief valve
14	6015	Cylinder block
15	8A587	Thermostat housing
16	8501	Water pump
17	6A642	Oil cooler
18	—	Oil cooler inlet hose
19	8286	Lower radiator hose
20	—	Oil cooler outlet hose
21	—	Auxiliary coolant pump
22	8005	Radiator

Coolant Flow 3.0L







A0008361

Item	Part Number	Description
1	—	From degas vent
2	—	From upper radiator inlet
3	9E926	Throttle body
4	—	Coolant control valve
5	—	Upper radiator hose
6	6051	Cylinder head RH
7	8555	Coolant outlet tube
8	18472	Heater outlet hose

9	18476	Heater core
10	6049	Cylinder head LH
11	18472	Heater inlet hoses (2 req)
12	—	Engine vent hose (to throttle body)
13	—	Coolant outlet tube
14	—	Cylinder head gasket (2 req)
15	—	Degas bottle
16	6015	Cylinder block
17	6A642	Oil cooler
18	—	Oil cooler inlet hose
19	—	Oil cooler outlet hose
20	—	Lower radiator hose
21	8A857	Thermostat housing
22	8501	Water pump
23	8005	Radiator
24	—	Water pump inlet hose
25	—	To throttle body
26	—	Vent hose (to throttle body)

Engine Cooling

Special Tool(s)

 <p>ST1474-A</p>	<p>Pressure Test Kit 014-R1072 or equivalent</p>
 <p>ST1217-A</p>	<p>New Generation STAR Tester (NGS) 418-F052 (007-00520) or equivalent</p>
 <p>ST1477-A</p>	<p>Power Steering Analyzer 014-00207 (D79L-33610-A)</p>
 <p>ST1396-A</p>	<p>Dial Thermometer 0-220°F 023-R0007</p>

Inspection and Verification

1. Verify the customer concern by operating the engine to duplicate the condition.
2. Inspect to determine if any of the following mechanical or electrical concerns apply.

Visual Inspection Chart

Mechanical	Electrical
<ul style="list-style-type: none"> ● Leaks ● Restricted airflow through the condensor/radiator ● Damaged hoses ● Loose/damaged hose clamps ● Damaged water gasket ● Damaged head gaskets ● Damaged water pump ● Damaged radiator 	<ul style="list-style-type: none"> ● Damaged cylinder head temperature sensor ● Damaged wiring ● Hydraulic cooling fan pump solenoid/solenoid wiring

<ul style="list-style-type: none"> ● Damaged degas bottle ● Damaged heater core ● Hydraulic cooling fan system <ul style="list-style-type: none"> ■ Fluid level ■ Hydraulic line or joint leaks ■ Kinked hydraulic lines 	
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 **CAUTION: The cylinder head temperature sensor is not reusable after removal on 3.9L engines. For electrical concern testing refer to the Powertrain Control/Emissions Diagnosis (PC/ED) manual.**

3. If the inspection reveals an obvious concern that can be readily identified, repair it as necessary.
4. If the concern remains after the inspection, determine the symptom(s) and go to the Symptom Chart.
5. Verify the cooling system is correctly filled and bled. For additional information, refer to [Cooling System Draining, Filling And Bleeding](#) in this section.

Symptom Chart



Symptom Chart

Condition	Possible Sources	Action
<ul style="list-style-type: none"> ● Loss of engine coolant 	<ul style="list-style-type: none"> ● Radiator. ● Thermostat housing assembly. ● Auxiliary water pump (3.9L only). ● Heater control valve. ● Oil cooler. ● PCV heater system. ● Throttle body adapter heating (3.9L). ● Water pump seal. ● Radiator hoses. ● Heater hoses. ● Heater core. ● Engine gaskets. ● Degas bottle. 	<ul style="list-style-type: none"> ● GO to Pinpoint Test A.
<ul style="list-style-type: none"> ● The engine overheats 	<ul style="list-style-type: none"> ● Water thermostat. ● Airlock in the system. ● Water pump. ● Internal engine coolant leak. ● Radiator. ● Radiator airflow obstruction. 	<ul style="list-style-type: none"> ● GO to Pinpoint Test B.

	<ul style="list-style-type: none"> ● Heater core. ● Cooling fan. ● Pressure relief cap. 	
<ul style="list-style-type: none"> ● The engine does not reach normal operating temperature 	<ul style="list-style-type: none"> ● Water thermostat. 	<ul style="list-style-type: none"> ● GO to Pinpoint Test C.
<ul style="list-style-type: none"> ● The block heater does not operate correctly 	<ul style="list-style-type: none"> ● Block heater power cable. ● Block heater. 	<ul style="list-style-type: none"> ● GO to Pinpoint Test D.
<ul style="list-style-type: none"> ● Noisy cooling fan operation 	<ul style="list-style-type: none"> ● Incorrect fluid level. ● Kinked or leaking line. ● Blocked reservoir screen. ● Hydraulic motor. ● Hydraulic pump. 	<ul style="list-style-type: none"> ● REFILL fluid to specified level. REFER to Hydraulic Cooling Fan System Filling and Bleeding. CHECK for leaks and retest. ● INSTALL a new line. RETEST and CHECK for leaks. ● REFER to Component Tests in this section.

Pinpoint Tests

PINPOINT TEST A: LOSS OF COOLANT

CONDITIONS	DETAILS/RESULTS/ACTIONS
A1 CHECK THE ENGINE COOLANT LEVEL	
NOTE: Allow the engine to cool before checking the engine coolant level.	
<p>1 </p>	<p>2 Visually check the engine coolant level at the degas bottle.</p> <ul style="list-style-type: none"> ● Is the engine coolant level within specification? <p>→ Yes GO to A2.</p> <p>→ No REFILL the engine coolant as necessary. GO to A6.</p>
A2 DEGAS BOTTLE PRESSURE RELIEF CAP	
1	<p> WARNING: Never remove the pressure relief cap under any conditions while the engine is operating. Failure to follow these instructions could result in damage to the cooling system or engine and/or personal injury. To avoid having scalding hot coolant or steam blow out of the cooling system, use extreme care when removing the pressure relief cap from a hot degas bottle. Wait until the engine has</p>

cooled, then wrap a thick cloth around the pressure relief cap and turn it slowly one turn (counterclockwise). Step back while the pressure is released from the cooling system. When certain all the pressure has been released, remove the pressure relief cap (still with a cloth).

Allow the engine to cool.

2 Remove the pressure relief cap.

3 Inspect the pressure relief cap for foreign material between the sealing gasket and the diaphragm.

● Is the pressure relief cap OK?

→ Yes
REFER to Component Tests.

→ No
CLEAN or INSTALL a new pressure relief cap. TEST the system for normal operation. GO to [A1](#).

A3 CHECK THE ENGINE COOLANT FOR INTERNAL LEAK

1



2 Inspect the engine coolant in the degas bottle for signs of engine oil.

● Is oil evident in the coolant?

→ Yes
If engine oil is evident, GO to [Section 303-00](#).

→ No
GO to [A4](#).

A4 CHECK THE ENGINE FOR COOLANT

1 Remove the oil level indicator from the engine.

● Is coolant evident in the oil?

→ Yes
If coolant is in the engine, GO to [Section 303-00](#).

→ No
GO to [A5](#).

A5 PRESSURE TEST THE ENGINE COOLING SYSTEM



1 Pressure test the engine cooling system; refer to the Component Tests in this section.

● Does the engine cooling system leak?

→ Yes
REPAIR or INSTALL new components. TEST the system for normal operation.

	→ No The cooling system is operational. RETURN to the Symptom Chart.
A6 CHECK THE DEGAS BOTTLE	
	<p>1 NOTE: The engine must be cool when coolant is added to the degas bottle.</p> <p>Add coolant to the degas bottle until fluid is between the coolant fill level marks.</p> <ul style="list-style-type: none"> ● Does the degas bottle leak? <p>→ Yes INSTALL a new degas bottle. TEST the system for normal operation.</p> <p>→ No CARRY OUT the cooling system pressure test. REFER to the Component Tests in this section. REPAIR as necessary. TEST the system for normal operation.</p>

PINPOINT TEST B: THE ENGINE OVERHEATS

CONDITIONS	DETAILS/RESULTS/ACTIONS
B1 CHECK THE ENGINE COOLANT LEVEL	
NOTE: If the engine is hot, allow the engine to cool before proceeding.	
<p>1</p> 	<p>1  WARNING: Never remove the pressure relief cap under any conditions while the engine is operating. Failure to follow these instructions could result in damage to the cooling system or engine and/or personal injury. To avoid having scalding hot coolant or steam blow out of the cooling system, use extreme care when removing the pressure relief cap from a hot degas bottle. Wait until the engine has cooled, then wrap a thick cloth around the pressure relief cap and turn it slowly one turn (counterclockwise). Step back while the pressure is released from the cooling system. When certain all the pressure has been released, remove the pressure relief cap (still with a cloth).</p> <p>2 Check the engine coolant level at the degas bottle.</p> <ul style="list-style-type: none"> ● Is the engine coolant OK? <p>→ Yes GO to B2.</p> <p>→ No REFILL the engine coolant at the degas bottle. GO to Pinpoint Test A.</p>
B2 CHECK THE COOLANT CONDITION	
	<p>1 Check the coolant for contaminants such as rust, corrosion, or discoloration.</p> <ul style="list-style-type: none"> ● Is the coolant condition OK? <p>→ Yes GO to B3.</p>

→ **No**
FLUSH the engine cooling system; REFER to [Flushing—Engine and Radiator](#) in this section. TEST the system for normal operation.

B3 CHECK FOR AN AIRFLOW OBSTRUCTION

1 Inspect the A/C condenser core and radiator for obstructions such as leaves or dirt.

● **Is there an obstruction?**

→ **Yes**
REMOVE the obstruction. CLEAN the A/C condenser core and radiator. TEST the system for normal operation.

→ **No**
GO to [B4](#).

B4 CHECK THE HEATER CORE OPERATION

2



1 Install the pressure relief cap.

3 As the engine starts to heat up, feel the inlet and outlet heater water hoses. They should feel approximately the same after three or four minutes.

● **Is the outlet heater water hose approximately the same temperature as the inlet heater water hose?**

→ **Yes**
GO to [B5](#).

→ **No**
TURN the engine off. REPAIR or INSTALL a new heater core. REFER to [Section 412-00](#). TEST the system for normal operation.

B5 CHECK THE WATER THERMOSTAT OPERATION

1



1 Start the engine and allow the engine to run for 10 minutes.


2





3 Feel the upper and lower radiator hoses.

● **Are the upper and lower radiator hoses cold?**

→ **Yes**
INSTALL a new water thermostat. TEST the system for normal operation.

	→ No GO to B6 .
B6 CHECK THE COOLING FAN OPERATION	
1 	1 Carry out the cooling fan component tests; refer to the Component Tests in this section. <ul style="list-style-type: none"> ● Is the cooling fan operation OK? → Yes GO to Section 303-00 for diagnosis and testing of the engine. → No INSTALL a new fan component as necessary. TEST the system for normal operation.

PINPOINT TEST C: THE ENGINE DOES NOT REACH NORMAL OPERATING TEMPERATURE

CONDITIONS	DETAILS/RESULTS/ACTIONS
C1 CHECK THE ENGINE TEMPERATURE	
1 	1 Start the engine and allow the engine to idle for 10 minutes.
2 	2 Feel the upper and lower radiator hoses. <ul style="list-style-type: none"> ● Are the upper and lower radiator hoses cold? → Yes INSTALL a new water thermostat. TEST the system for normal operation. → No GO to Section 413-01 for diagnosis and testing of the engine coolant temperature gauge.

PINPOINT TEST D: THE BLOCK HEATER DOES NOT OPERATE CORRECTLY

CONDITIONS	DETAILS/RESULTS/ACTIONS
D1 CHECK THE POWER CABLE	
1	

2

Block Heater

3

Q4195-A

3 Check the resistance in circuits 1, 2, and 3 of the block heater.


- Are the resistances in circuits 1, 2, and 3 less than 5 ohms?

→ **Yes**
INSTALL a new block heater. TEST the system for normal operation.

→ **No**
INSTALL a new power cable. TEST the system for normal operation.

Component Tests


Pressure Test

1. Turn the engine OFF.
2. Remove the cowl vent screen. For additional information, refer to [Section 501-02](#).
3.  **WARNING:** Never remove the pressure relief cap under any conditions while the engine is operating. Failure to follow these instructions could result in damage to the cooling system or engine and/or personal injury. To avoid having scalding hot coolant or steam blow out of the cooling system, never remove the pressure relief cap from a hot degas bottle. Wait until the engine has cooled, then wrap a thick cloth around the pressure relief cap and turn it slowly one turn (counterclockwise). Step back while the pressure is released from the cooling system. When certain all the pressure has been released, remove the pressure relief cap (still with a cloth).

Check the engine coolant level. For additional information, refer to [Cooling System Draining, Filling And Bleeding](#) in this section.

4. Connect the Radiator/Heater Core Pressure Tester to the degas bottle nipple and overflow hose. Install a pressure test pump to the quick-connect fitting of the test adapter.
5. **NOTE:** If the plunger of the pump is depressed too fast, an erroneous pressure reading will result.

Slowly depress the plunger of the pressure test pump until the pressure gauge reading stops increasing and note the highest pressure reading obtained.

6. If the pressure relief cap does not hold pressure, remove and wash the pressure relief cap in clean water to dislodge all foreign particles from the gaskets. Check the sealing surface in the filler neck.
7. If 8-9 kPa (13 psi) cannot be reached, install a new pressure relief cap. If more than 12 kPa (18 psi) shows on the gauge, install a new pressure relief cap.
8.  **CAUTION: If the pressure drops, check for leaks at the engine to heater core hoses, engine-to-radiator hoses, water valve hose (if applicable), oil cooler return tube gasket, radiator and heater core or other system components and connections. Any leaks which are found must be corrected and the system rechecked.**

Pressurize the engine cooling system as described in Step 4 (using a pressure relief cap that operates within the specified upper and lower pressure limits). Observe the gauge reading for approximately two minutes; refer to General Specifications. Pressure should not drop during this time.

9. Release the system pressure by loosening the pressure relief cap. Check the engine coolant level and replenish, if necessary, with the correct engine coolant mixture. For additional information, refer to [Cooling System Draining, Filling And Bleeding](#) in this section.

Cap



WARNING: Never remove the pressure relief cap under any conditions while the engine is operating. Failure to follow these instructions could result in damage to the cooling system or engine and/or personal injury. To avoid having scalding hot coolant or steam blow out of the cooling system, use extreme care when removing the pressure relief cap from a hot degas bottle. Wait until the engine has cooled, then wrap a thick cloth around the pressure relief cap and turn it slowly one turn (counterclockwise). Step back while the pressure is released from the cooling system. When certain all the pressure has been released, remove pressure relief cap (still with a cloth).

1. Remove the pressure relief cap from the degas bottle.
2. Immerse the pressure relief cap in water and install it on the shallow filler neck of Radiator/Heater Core Pressure Tester and Radiator Cap Adapter, part of the Radiator/Heater Core Pressure Tester.
3. Immerse the filler neck seal in water and install it in the filler neck adapter.
4. Install the filler neck adapter with the filler neck seal to the Radiator Cap Adapter.
5. Connect the female quick-connect fitting of the pressure test pump to the male quick-connect fitting of the filler neck adapter.
6. **NOTE:** If the plunger of the pump is depressed too fast, an erroneous pressure reading will result.

Slowly depress the plunger of the pressure test pump until the pressure gauge reading stops increasing and note the highest pressure reading obtained.

7. Release the pressure by turning the relief screw counterclockwise. Then tighten the pressure relief screw and repeat Step 6 (at least twice) to make sure the reading is repeatable within the specifications of the pressure relief cap.
8. If the pressure test gauge readings are not within specifications, install a new pressure relief cap. If the pressure test gauge readings are within specifications, carry out the cooling system Pressure Test.

Thermostat—Water

A new water thermostat should be installed only after the following electrical and mechanical tests have been carried out.

Thermostat—Electrical Test

NOTE: The electrical thermostat test is most accurate if carried out indoors at less than 37.8°C (100°F) ambient air. This test may be carried out with or without the hood open and with the engine warm or cold.

1. Check the engine coolant level. Fill as needed.
2. With the ignition OFF, attach the Rotunda 73 Digital Multimeter. It may be used to monitor sensor voltage values between 0-5 volts.
New Generation STAR (NGS) Tester or the Service Bay Diagnostic System (SBDS) may be used to monitor the CHT on vehicles equipped with data link connector (DLC). The SBDS sequence to use for the screen is: Toolbox-Electronic Engine Control and DCL-Item.
3. **NOTE:** Running this test with the vehicle in gear or with the A/C compressor clutch engaged (running) will cause incorrect diagnosis.

Place the transmission in PARK (P) or NEUTRAL (N).

4. Start the engine and allow the engine to idle throughout this test. Allow the engine to run for two minutes, then record the CHT voltage. Record the CHT voltage every 60 seconds. When the CHT voltage trend changes direction or only changes slightly (0.03 volt or less) from the previous reading, record this as the thermostat opening voltage. Use the voltage and corresponding coolant temperature chart listed below.

Coolant Temp °C (°F)	CHT Min (Volts)	CHT Nom (Volts)	CHT Max (Volts)
0 (32)	4.7714	4.8032	4.8723
25 (77)	4.3428	4.4148	4.4727
50 (122)	3.5354	3.6495	3.7473
80 (176)	2.3049	2.4201	2.5260
110 (230)	1.3021	1.3808	1.4562
140 (284)	0.6960	0.7414	0.7857
170 (338)	0.3784	0.4024	0.4261

5. If the thermostat opening voltage is less than 2.3049 volts and less than 80°C (176°F), install a new water thermostat.

6. If the thermostat opening voltage is greater than 2.3049 volts 82°C (180°F), the water thermostat is good and a new water thermostat should not be installed. Refer to the Symptom Chart for further instructions.

Thermostat—Mechanical Test

1. Remove the water thermostat.
2. Check the water thermostat for seating. Hold the water thermostat up to a lighted background. Leakage of light around the thermostat valve at room temperature indicates a new water thermostat should be installed. Some water thermostats have a small leakage notch at one location on the perimeter of the thermostat valve, which is considered normal.
3. Immerse the water thermostat in a boiling antifreeze and water mixture.
4. See the General Specifications chart for water thermostat opening temperatures.

Radiator Leak Test, Removed From the Vehicle



CAUTION: Never leak test an aluminum radiator in the same water that copper/brass radiators are tested in. Flux and caustic cleaners may be present in the cleaning tank and they will damage aluminum radiators.

NOTE: Always install plugs in the oil cooler fittings before leak testing or cleaning any radiator.

NOTE: Clean the radiator before leak testing to avoid contamination of tank.

1. Leak test the radiator in clean water with 138 kPa (20 psi) air pressure.

Hydraulic Cooling Fan Reservoir

1. Reduce the fluid in the reservoir by half.
2. Attach the New Generation STAR (NGS) Tester to the vehicle.
3. Start the engine and command MAX fan.
4. Maintain 2,500 rpm. Fluid should be observed through the reservoir returning. The internal return also functions as a relief valve; fluid must be observed through the sides of the return. If the fluid is not returning through the sides the screen is plugged. If no or little return is observed or the fluid is returning through the pressure relief, install a new reservoir.

Hydraulic Cooling Fan Motor

1. Inspect the fan blade and shroud for any foreign materials. Clear the obstruction and continue the test procedure.
2. Rotate the fan to see if any contact between the shroud and blade exists. If contact is observed install a new fan shroud assembly.

3. Rotate the fan by hand; the fan should rotate freely (no resistance should be felt, the fan will free wheel with minimum effort). If any resistance is present install a new fan assembly.
4. Attempt to move the fan blade and shaft in and out and side to side; if any movement is detected install a new fan assembly.

Hydraulic Cooling Fan Pump




WARNING: Do not touch the flowmeter during the test procedure or severe burns and serious injury may occur.

1.  **CAUTION:** Make sure that the connection point will not interfere with any of the engine accessory drive components or drive belts.

NOTE: On some vehicles the port may not be easily accessible. The power steering analyzer should then be hooked up at the hydraulic cooling fan motor or at a point in the high pressure line between the motor and the hydraulic cooling fan pump.

Install the power steering analyzer at the high pressure port of the hydraulic cooling fan pump. Make sure the power steering analyzer gate is fully open.

2.  **CAUTION:** A noisy fan system must be bled and refilled before proceeding with any of the test procedures. For additional information, refer to [Hydraulic Cooling Fan System Filling and Bleeding](#) in this section.

Check the cooling fan hydraulic fluid level. If necessary, add fluid.


- Use MERCON® Multi-Purpose (ATF) Transmission Fluid XT-2-QDX meeting Ford specification MERCON® or equivalent.
3. Remove the reservoir screen and place the dial thermometer in the hydraulic cooling fan reservoir.
 4. Start the engine and allow the engine to warm up until the fan turns on.
 5. Allow fluid temperature to reach 74-80°C (165-175°F).
 6. Record the flow rate and pressure readings.
 7. **NOTE:** The pressure relief valve will open at 1,050 ± 100 psi (7,240 kPa ± 689.5 kPa). If the pressure is above 1,200 psi (8,275 kPa), a new pump pressure relief valve must be installed.


Turn the A/C on MAX, and record the flow and pressure readings. The flow and pressure readings should increase.


- If the flow and pressure readings do not increase, install a new hydraulic cooling fan pump.
8. Partially close the gate valve to achieve 300 psi (2,068.5 kPa). The flow rate should be 1.65 ±.25 gpm.
 - If the flow rate is less than specified, install a new hydraulic cooling fan pump.
-

Cooling System Inspection

Special Tool(s)

 ST1720-A	Fluid Tester 014-R1060 or equivalent
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-  **WARNING:** Never remove the pressure relief cap while the engine is operating or when the cooling system is hot. Failure to follow these instructions can result in damage to the cooling system or engine or personal injury. To avoid having scalding hot coolant or steam blow out of the degas bottle when removing the pressure relief cap, wait until the engine has cooled, then wrap a thick cloth around the pressure relief cap and turn it slowly. Step back while the pressure is released from the cooling system. When you are sure all the pressure has been released, (still with a cloth) turn and remove the pressure relief cap.

 **CAUTION:** If there is engine coolant in the engine oil, the cause must be corrected and the oil changed or engine damage may occur.

NOTE: If vehicle has not been allowed to reach normal operating temperature, check the engine coolant in the degas bottle. This will make sure sufficient engine coolant exchange has occurred.

Allow the engine to cool. Once pressure is released, remove the pressure relief cap.

- Inspect the coolant in the degas bottle for coolant color:
 - If Premium Engine Coolant E2FZ-19549-AA or equivalent meeting Ford specification ESE-M97B44-A has a clear, light green or blue color, this indicates higher water content than necessary.
 - Dark brown indicates unauthorized stop leak may have been used.
 - A light or reddish-brown color indicates rust in the cooling system. Flush the system and refill with the correct mixture of water and Premium Engine Coolant E2FZ-19549-AA (in Oregon F5FZ-19549-CC) or equivalent meeting Ford specification ESE-M97B44-A.
 - An iridescent sheen on top of the coolant indicates a trace of oil is entering the cooling system.
 - A milky brown color may indicate that engine oil is entering the cooling system.
 - Or if engine coolant is present in the engine oil, the causes of the leak might be:
 - a blown head gasket.
 - a cracked or warped cylinder head.
 - a crack in the engine oil gallery and cooling passageways.
 - an internal leak in the engine oil cooler.
- If the engine coolant appearance is good, test the engine coolant range with the Fluid Tester:

- maximum range is 60/40
- minimum range is 45/55

4. Check the engine coolant system conditions:

- If the engine cooling fluid is low, add the specified coolant mixture only.
 - If the engine coolant fluid tests weak, add straight engine coolant until the readings are within acceptable levels.
 - If the engine coolant tests strong, remove some of the engine coolant and add water until readings are within acceptable levels.
-

Cooling System Draining, Filling And Bleeding

Draining

⚠ WARNING: Never remove the pressure relief cap while the engine is operating or when the cooling system is hot. Failure to follow these instructions can result in damage to the cooling system or engine or personal injury. To avoid having scalding hot coolant or steam blow out of the degas bottle when removing the pressure relief cap, wait until the engine has cooled, then wrap a thick cloth around the pressure relief cap and turn it slowly. Step back while the pressure is released from the cooling system. When you are sure all the pressure has been released, (still with a cloth) turn and remove the pressure relief cap.

⚠ CAUTION: The coolant must be recovered in a suitable, clean container for reuse. If the coolant is contaminated it must be recycled or disposed of correctly.

⚠ CAUTION: Care must be taken to ensure the accessory drive belt does not become contaminated with engine coolant.

1. Release the pressure in the cooling system by slowly turning the pressure relief cap one half turn counterclockwise. When the pressure is released, remove the pressure relief cap.
2. **NOTE:** Approximately four liters will drain from the radiator.

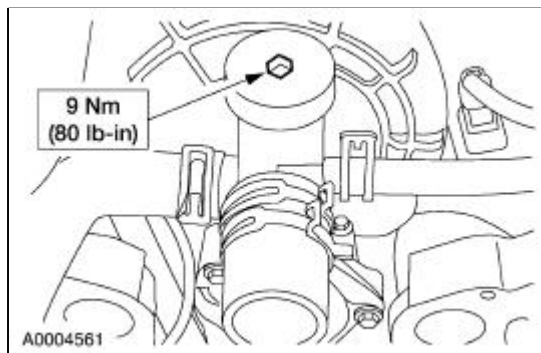
Place a suitable container below the radiator draincock. If equipped, disconnect the coolant return hose at the oil cooler.

- Close the radiator draincock when finished.

Filling—Bleeding

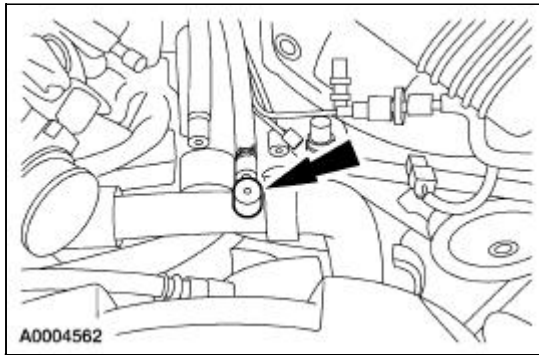
On 3.9L engines

1. Remove the engine fill cap.



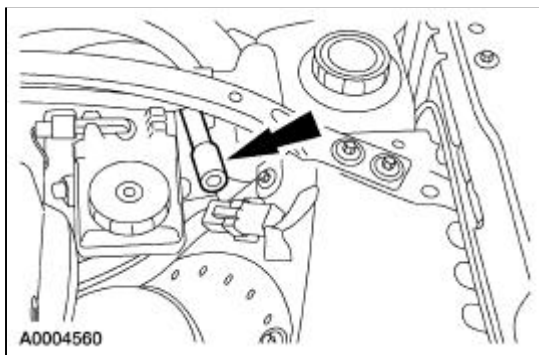
On 3.0L engines

2. Open the engine air bleed.



On all engines

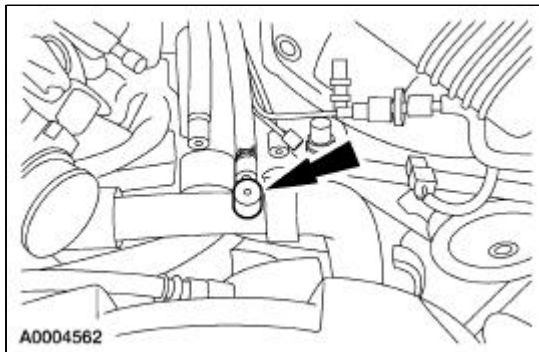
3. Open the heater air bleed.



4. Add coolant to the degas bottle allowing the system to equalize until no more coolant can be added.

On 3.0L engines


5. Close the engine air bleed when coolant begins to escape.



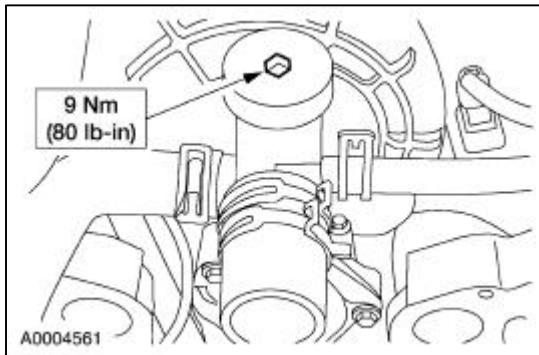
On all engines

6. Replace the degas bottle cap.

On 3.9L engines

 **CAUTION:** Care must be taken to ensure the accessory drive belt does not become contaminated with engine coolant.

7. Add as much coolant as possible to the engine fill. The heater air bleed will remain open.
8. Replace the engine fill cap.

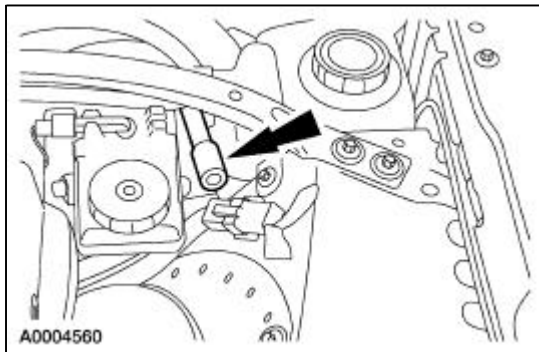


On all engines

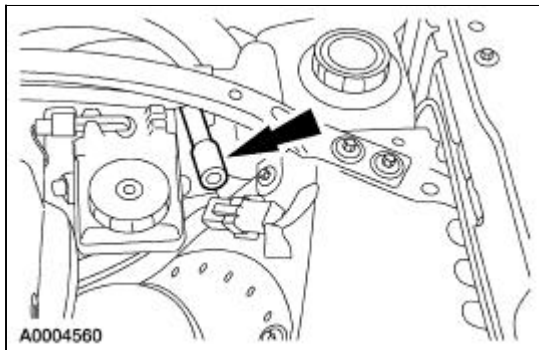
9. **NOTE:** The heater air bleed remains open.

Start the engine and turn the heater to MAX position.

10. Close the heater air bleed when a steady stream of coolant comes from it, during engine idle.



11. Allow the engine to idle for five minutes, add coolant to the degas bottle as needed to maintain the cold fill MAX mark.
12. Reopen the heater air bleed to release any entrapped air and close again.



On 3.9L engines

13. Maintain engine speed of 2,000 rpm for 3-5 minutes or until hot air comes from the heater.
14. Return to idle and verify hot air is still coming from the heater.

On 3.0L engines

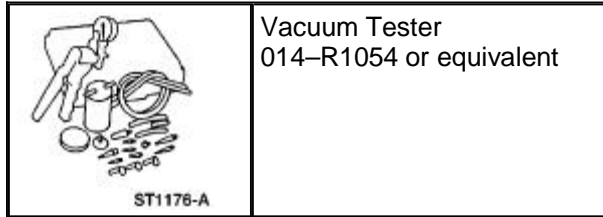
15. Maintain engine speed of 1,500 rpm for 3-5 minutes or until hot air comes from the heater.
16. Return to idle and verify hot air is still coming from the heater.

On all engines

17. Set the heater temperature setting to 24° C (75° F) and allow the vehicle to idle for two minutes.
 18. Shut the engine off and allow to cool.
 19. After the engine has cooled, add coolant to the degas bottle to bring the level to the cold fill MAX mark.
-

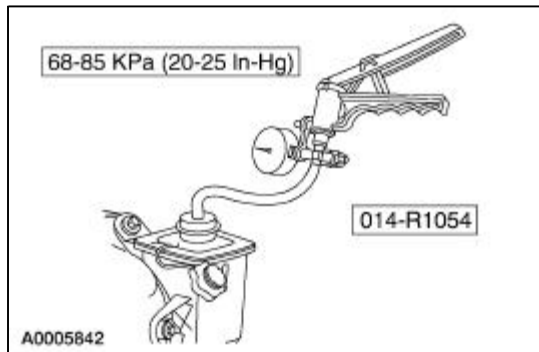
Hydraulic Cooling Fan System Filling and Bleeding

Special Tool(s)



NOTE: It is not uncommon to repeat this procedure three times.




1. Fill the hydraulic cooling fan reservoir to the MAX level.
 - Use Motorcraft MERCON® Multi-Purpose (ATF) Transmission Fluid XT-2-QDX meeting Ford specification MERCON® or equivalent.
2. Apply vacuum for two to three minutes.
 - Remove the vacuum pump.




3. Start the engine and turn the A/C on MAX. This will run the hydraulic fan. If a whining noise is heard, repeat the procedure.

Flushing —Engine and Radiator

Special Tool(s)

 ST1168-A	Coolant Flush Kit 164-R3658 or equivalent
 ST1167-A	Drain Kit 164-R3662 or equivalent
 ST2421-A	Coolant Flush and Fill 023-00154 or equivalent

-  **WARNING:** Never remove the pressure relief cap while the engine is operating or when the cooling system is hot. Failure to follow these instructions can result in damage to the cooling system or engine or personal injury. To avoid having scalding hot coolant or steam blow out of the degas bottle when removing the pressure relief cap, wait until the engine has cooled, then wrap a thick cloth around the pressure relief cap and turn it slowly. Step back while the pressure is released from the cooling system. When you are sure all the pressure has been released, (still with a cloth) turn and remove the pressure relief cap.

Once pressure is released, remove the pressure relief cap.

- Drain the cooling system. For additional information, refer to [Cooling System Draining, Filling And Bleeding](#).
- Remove the water thermostat. For additional information, refer to [Thermostat—Housing, 3.0L](#), or [Thermostat—Housing, 3.9L](#) in this section.
- Install the water hose connection without the water thermostat.
- NOTE:** Refer to the cooling system Flush-All operating instructions for specific vehicle hook-up.

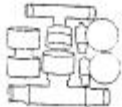

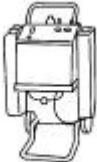
Use cooling system Flush-All, Coolant Flush Kit and Drain Kit to flush the engine and radiator. Use Premium Cooling System Flush F1AZ-19A503-A meeting Ford specification ESR-M14P7-A for vehicles filled with Premium Engine Coolant E2FZ-19549-AA or equivalent meeting Ford specification ESE-M971B44-A (green color).


- Install the water thermostat.

7. Backflush the heater core if necessary. For additional information, refer to [Backflushing—Heater Core](#).
 8. Fill the cooling system. For additional information, refer to [Cooling System Draining, Filling And Bleeding](#) in this section.
-

Backflushing —Heater Core

Special Tool(s)

 ST1168-A	Coolant Flush Kit 164-R3658 or equivalent
 ST1167-A	Drain Kit 164-R3662 or equivalent
 ST2421-A	Coolant Flush and Fill 023-00154 or equivalent

-  **WARNING:** Never remove the pressure relief cap while the engine is operating or when the cooling system is hot. Failure to follow these instructions can result in damage to the cooling system or engine or personal injury. To avoid having scalding hot coolant or steam blow out of the degas bottle when removing the pressure relief cap, wait until the engine has cooled, then wrap a thick cloth around the pressure relief cap and turn it slowly. Step back while the pressure is released from the cooling system. When you are sure all the pressure has been released, (still with a cloth) turn and remove the pressure relief cap.

Once pressure is released, remove the pressure relief cap.

- Partially drain the cooling system. For additional information, refer to [Cooling System Draining, Filling And Bleeding](#) in this section.
- NOTE:** Refer to the cooling system Flush-All operating instructions for particular vehicle hook-up.

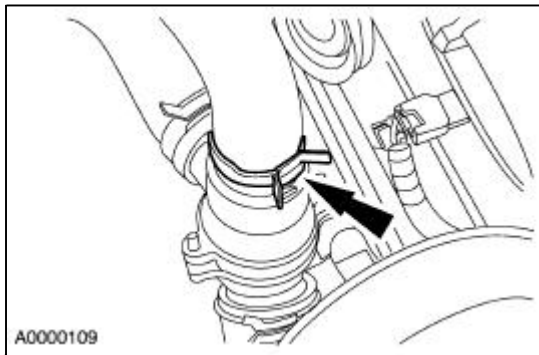
Use cooling system Flush-All, Coolant Flush Kit and Drain Kit to backflush the heater core. Use Premium Cooling System Flush F1AZ-19A503-A meeting Ford specification ESR-M14P7A for vehicles filled with Premium Engine Coolant E2FZ-19549-AA or equivalent meeting Ford specification ESE-M97B44-A (green color).

- Fill the cooling system. For additional information, refer to [Cooling System Draining, Filling And Bleeding](#) in this section.

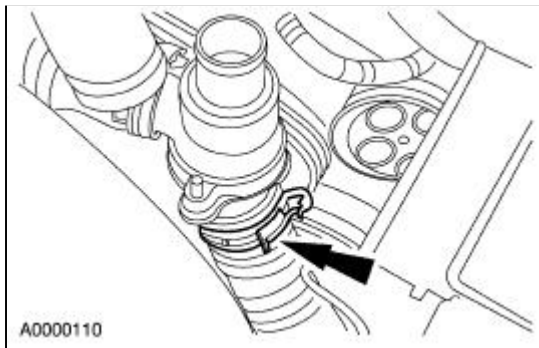
Thermostat —Housing, 3.0L

Removal

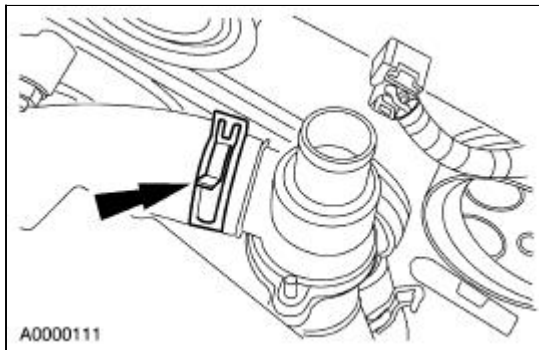
1. Drain the engine cooling system. For additional information, refer to [Cooling System Draining, Filling And Bleeding](#) in this section.
2. Remove the air cleaner outlet tube. For additional information, refer to [Section 303-12](#).
3. Disconnect the hose.



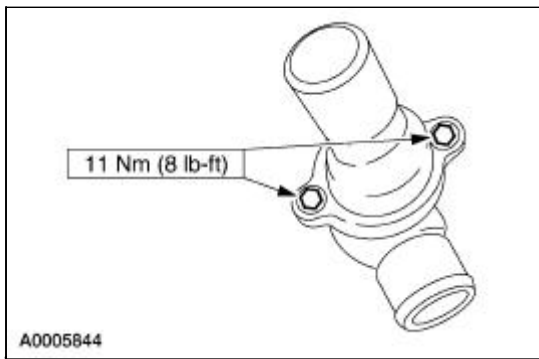
4. Disconnect the hose.



5. Disconnect the hose and remove the thermostat housing assembly.



6. Remove the bolts, separate the housing and remove the thermostat and seal.



Installation

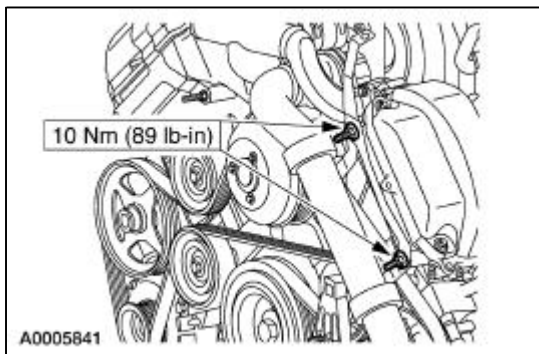
1. **NOTE:** Clean all the sealing surfaces and inspect the O-ring seals thoroughly.

To install, reverse the removal procedure.

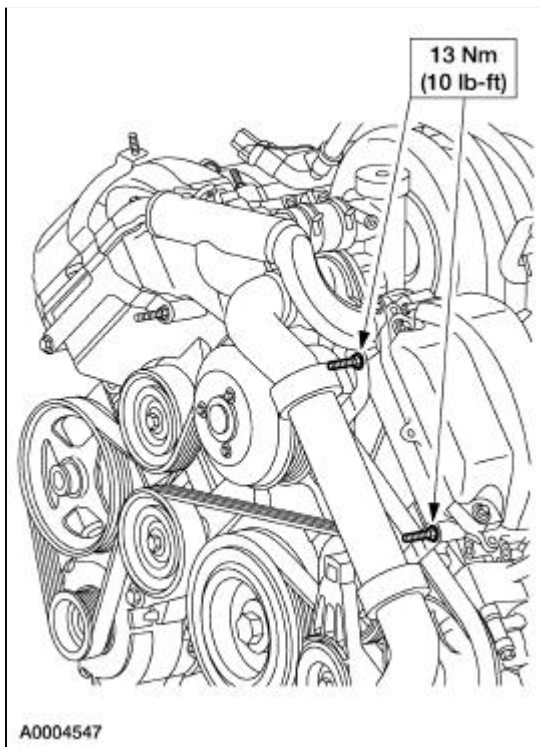
Thermostat —Housing, 3.9L

Removal

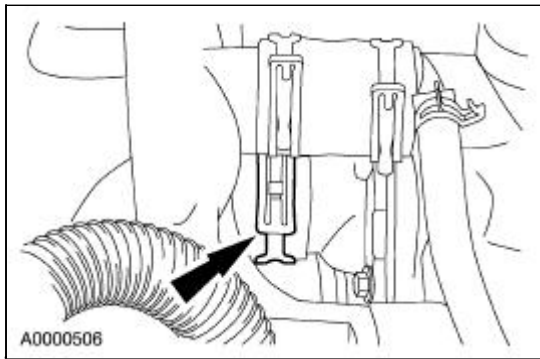
1. Drain the engine cooling system. For additional information, refer to [Cooling System Draining, Filling And Bleeding](#) in this section.
2. Remove the intake manifold. For additional information, refer to [Section 303-01B](#).
3. Remove the nuts and remove the bracket.



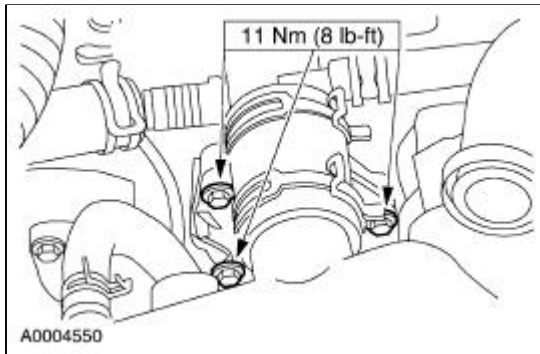
4. Remove the studbolts.



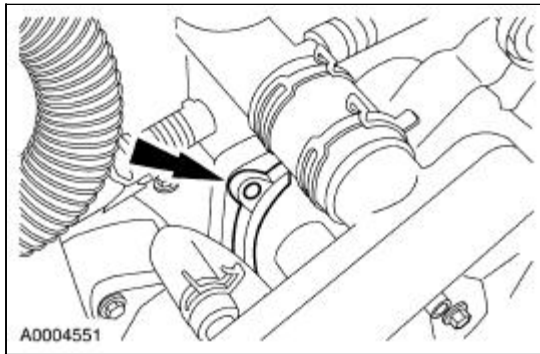
5. Disconnect the lower radiator hose from the thermostat housing.



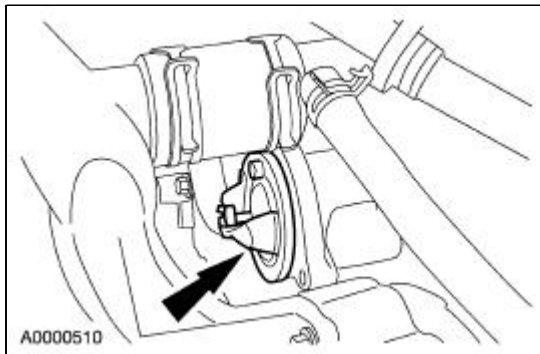
6. Remove the bolts.



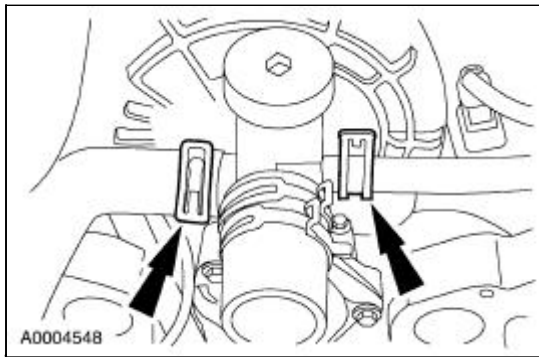
7. Remove the thermostat housing cover.



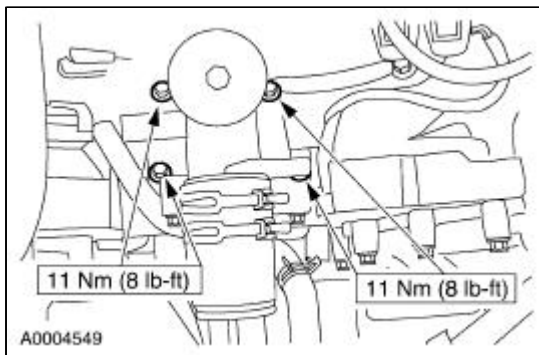
8. Remove the water thermostat.



9. Disconnect the hoses.



10. Remove the coolant outlet pipe. For additional information, refer to [Coolant Outlet Pipe—3.9L](#) in this section.
11. Remove the four bolts and the thermostat housing.



Installation

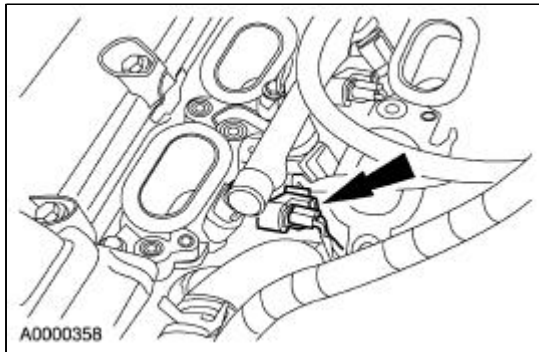
1. **NOTE:** Clean all the sealing surfaces, and inspect the O-ring seals thoroughly.

To install, reverse the removal procedure.

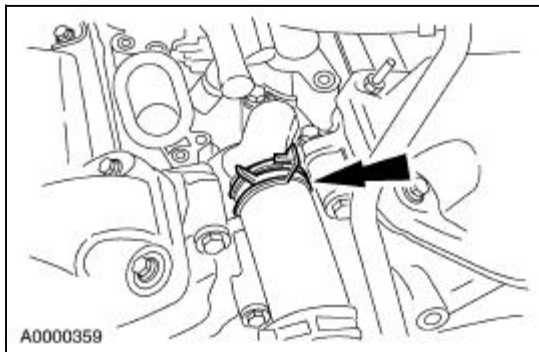
Coolant Outlet Pipe —3.0L

Removal

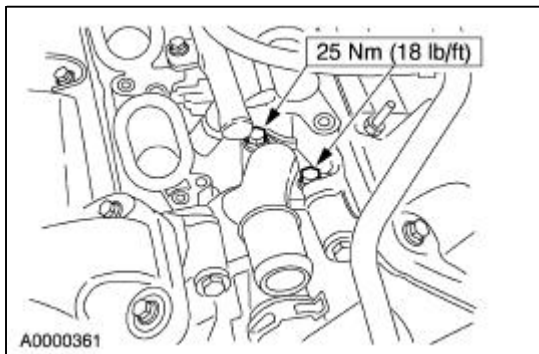
1. Remove the upper intake manifold. For additional information, refer to [Section 303-01A](#).
2. Disconnect the fuel injector electrical connector.



3. Disconnect the hose.



4. Remove the bolts and the coolant outlet pipe.



Installation

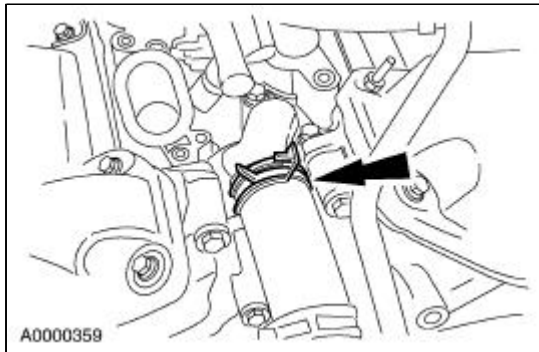
1. **NOTE:** Clean all the sealing surfaces and inspect the O-ring seals thoroughly.

To install, reverse the removal procedure.

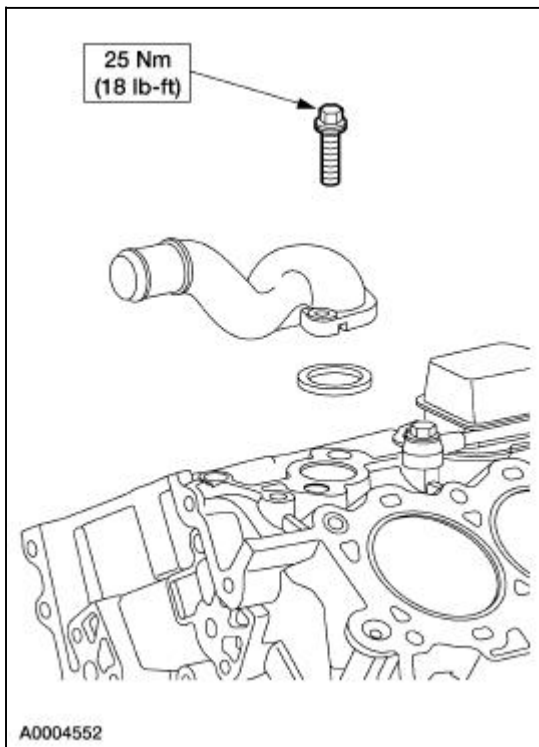
Coolant Inlet Pipe —3.0L

Removal

1. Remove the lower intake manifold. For additional information, refer to [Section 303-01A](#).
2. Disconnect the hose.



3. Remove the bolts and the coolant inlet pipe.



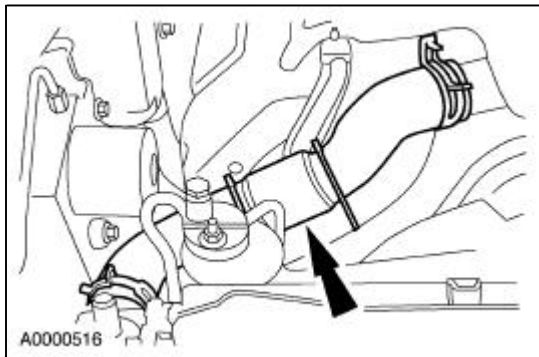
Installation

1. **NOTE:** Clean all the sealing surfaces and inspect the O-ring seals thoroughly.
To install, reverse the removal procedure.

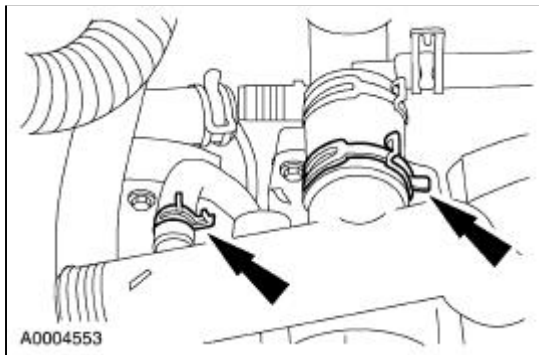
Coolant Outlet Pipe —3.9L

Removal

1. Drain the engine cooling system. For additional information, refer to [Cooling System Draining, Filling And Bleeding](#) in this section.
2. Remove the air cleaner outlet tube. For additional information, refer to [Section 303-12](#).
3. Remove the upper radiator hose.

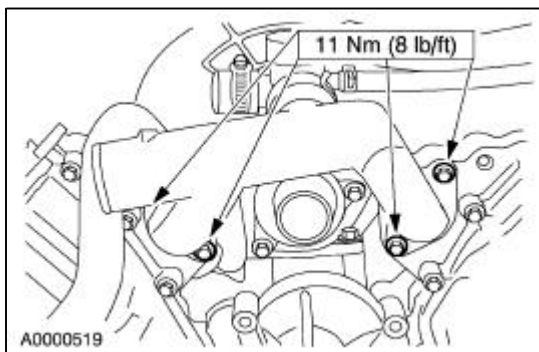


4. Disconnect the hoses.

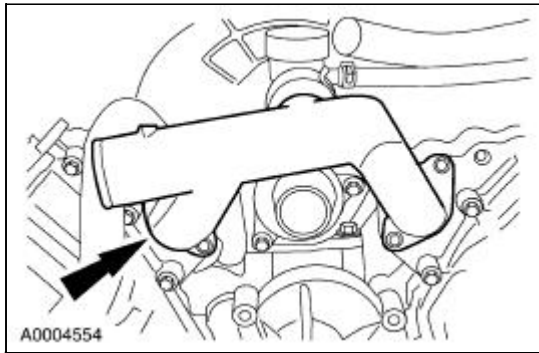


5. **NOTE:** Lower radiator hose not shown for illustration purposes.

Remove the four bolts.

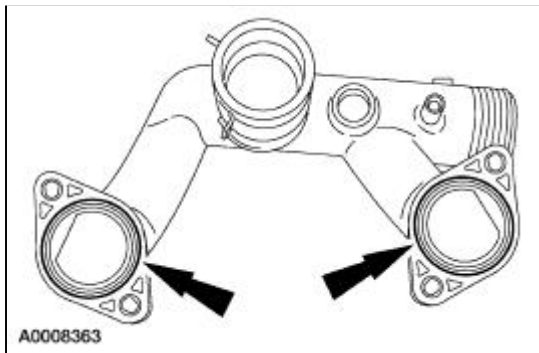


6. Remove the coolant outlet pipe.



7. **NOTE:** Lower radiator hose not shown for illustration purposes.

Remove the O-ring seals, inspect and clean the sealing surfaces.



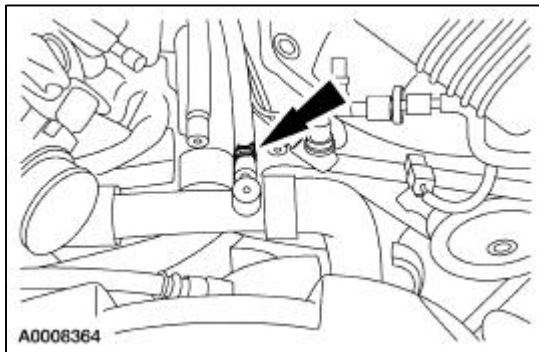
Installation

1. To install, reverse the removal procedure.
-

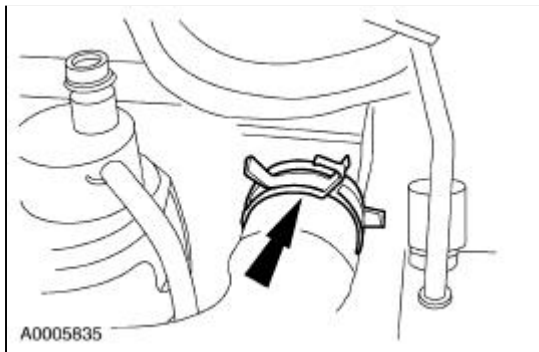
Water Pump —3.0L

Removal

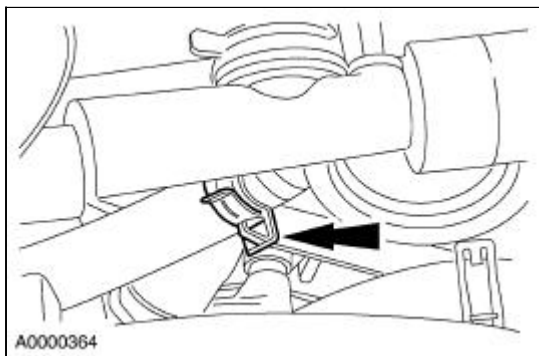
1. Drain the engine cooling system. For additional information, refer to [Cooling System Draining, Filling And Bleeding](#) in this section.
2. Remove the air cleaner outlet tube. For additional information, refer to [Section 303-12](#).
3. Disconnect the engine vent hose.



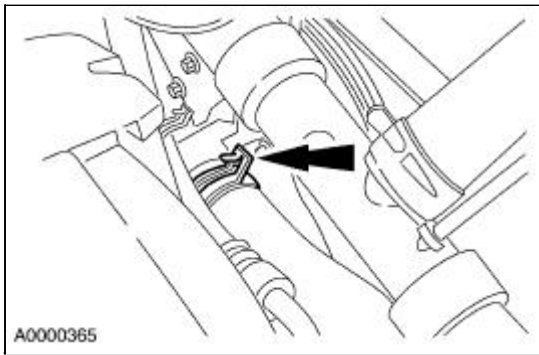
4. Disconnect the upper radiator hose.



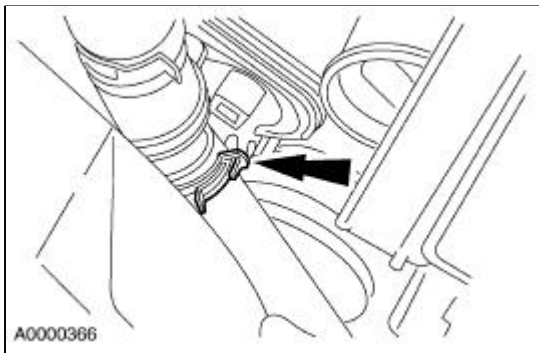
5. Disconnect the heater supply hose.



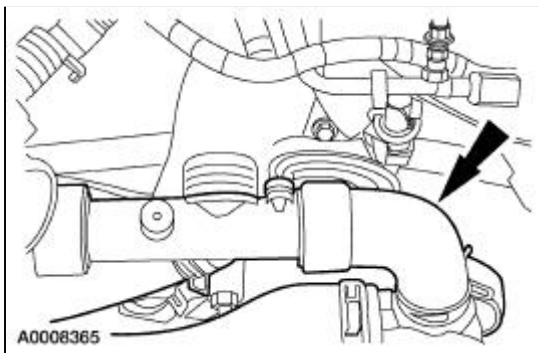
6. Disconnect the water pump hose.



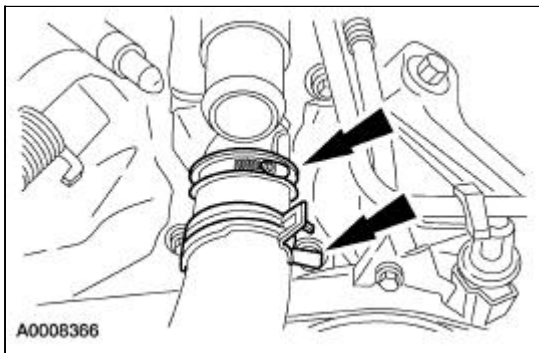
7. Disconnect the lower radiator hose from the thermostat housing.



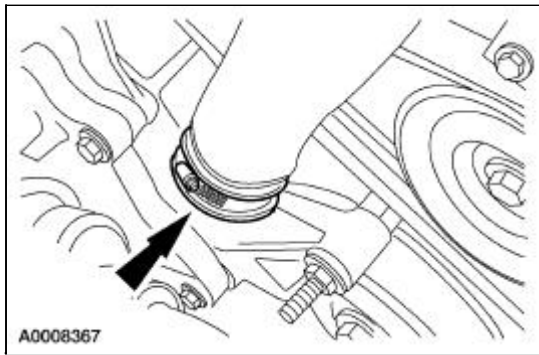
8. Remove the water crossover assembly.



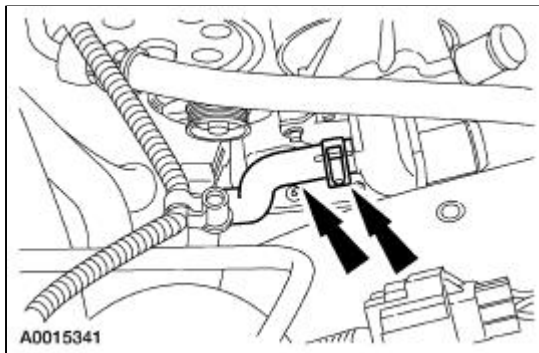
9. Disconnect the water inlet hose from the coolant outlet pipe.



10. Disconnect and remove the water inlet hose from the pump.

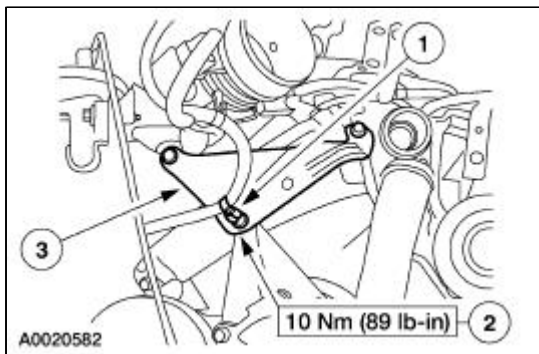


11. Disconnect the heater water hose from the water pump.

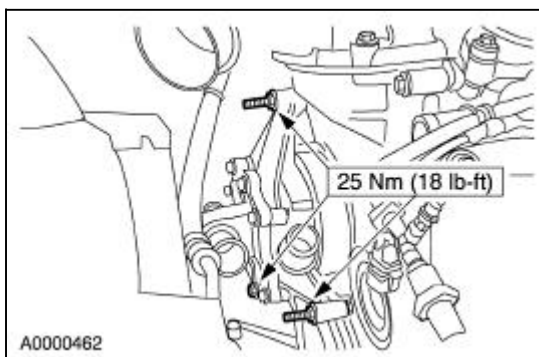


12. Remove the belt idler pulley. For additional information, refer to [Section 303-05](#).

13. Remove the bracket.
 1. Unclip the wiring harness.
 2. Remove the two studbolts and the bolt.
 3. Remove the bracket.



14. Remove the bolt and the studs. Remove the water pump assembly.



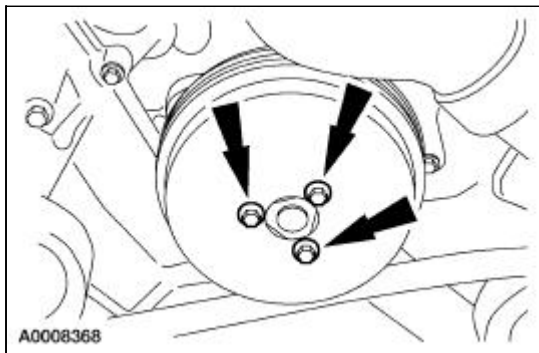
Installation

1. To install, reverse the removal procedure.
-

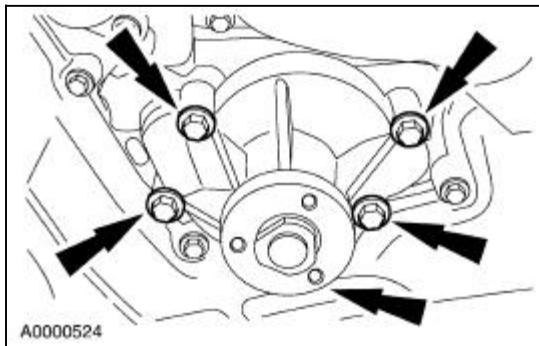
Water Pump —3.9L

Removal

1. Drain the engine cooling system. For additional information, refer to [Cooling System Draining, Filling And Bleeding](#) in this section.
2. Loosen the water pump pulley bolts.



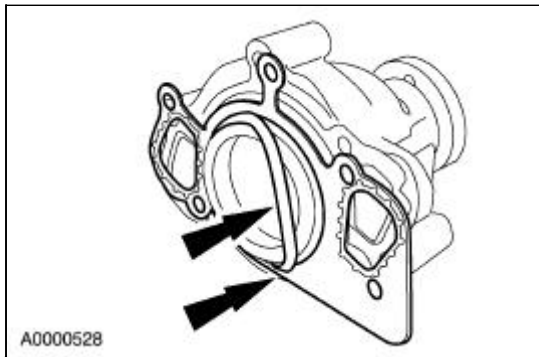
3. Remove the accessory drive belt. For additional information, refer to [Section 303-05](#).
4. Remove the water pump pulley bolts and the pulley.
5. Remove the five bolts and the water pump.



6. **NOTE:** Clean and inspect the sealing surfaces.

Remove the gasket and discard.

- Inspect the O-ring seal. Install a new O-ring seal as necessary.
- Visually inspect the rotors in the water pump.



Installation

1. **NOTE:** Lubricate the water pump O-ring using Premium Engine Coolant E2FZ-19549-AA (F5FZ-19549-CC in Oregon), or equivalent meeting Ford specification ESE-M97B44-A.

Install the water pump and tighten the bolts in two stages:

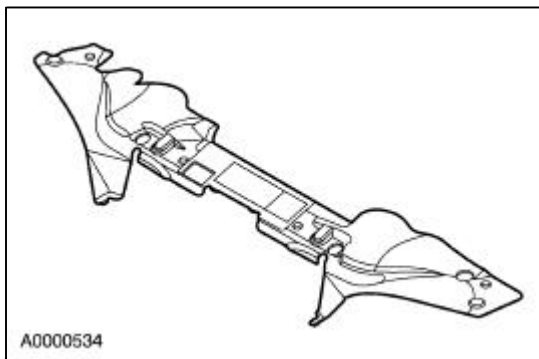
- Stage 1: Tighten to 8 Nm (71 lb-in).
 - Stage 2: Tighten an additional 90 degrees.
2. Install and tighten the water pump pulley in two stages:
 - Stage 1: Tighten to 10 Nm (89 lb-in).
 - Stage 2: Tighten an additional 45 degrees.
 3. Install the accessory drive belt. For additional information, refer to [Section 303-05](#) .
 4. Refill the engine cooling system. For additional information, refer to [Cooling System Draining, Filling And Bleeding](#) in this section.
-

Radiator —Fan Motor and Shroud

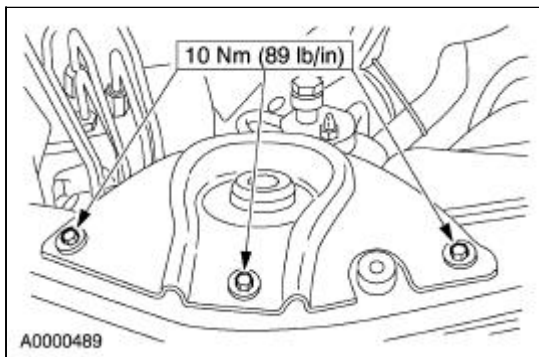
Removal

On all engines

1. Drain the engine cooling system. For additional information, refer to [Cooling System Draining, Filling And Bleeding](#) in this section.
2. Remove the upper radiator sight shield.

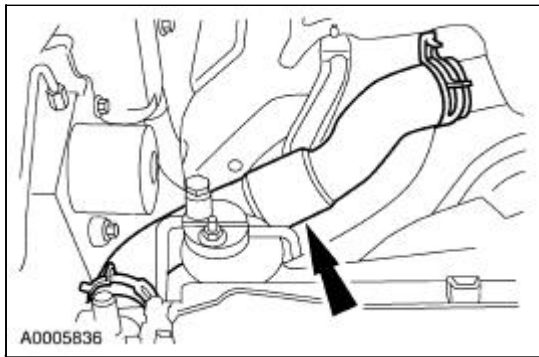


3. Remove the air cleaner outlet tube. For additional information, refer to [Section 303-12](#).
4. Remove the six bolts and the two radiator upper support brackets.

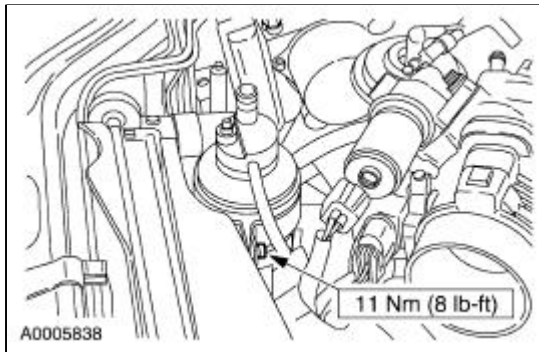


5. **NOTE:** 3.9L shown; 3.0L similar.

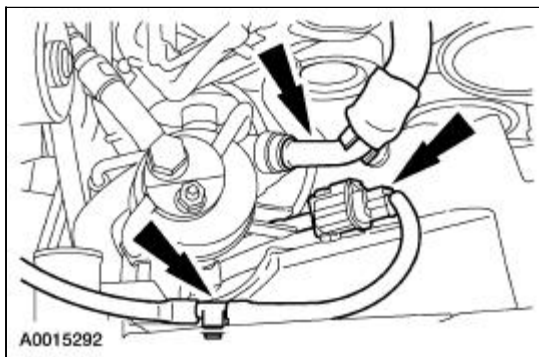
Remove the upper radiator hose.



6. Remove the bolt and position the receiver drier aside.

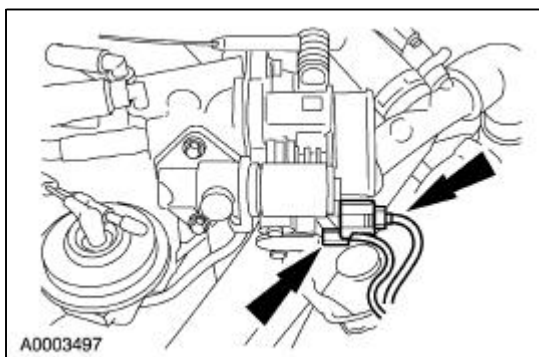


7. Disconnect the dual flow coolant valve electrical connector and the A/C line from the fan shroud.



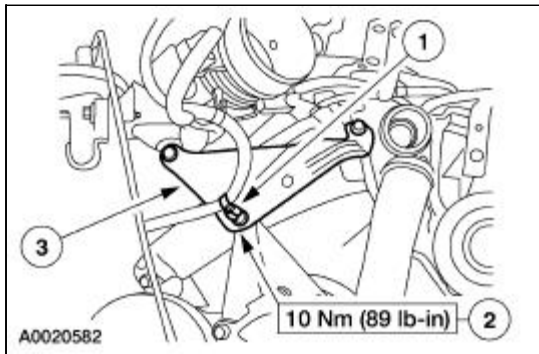
On 3.0L engines

8. Disconnect the throttle position (TP) sensor and the idle air control (IAC) valve electrical connectors.



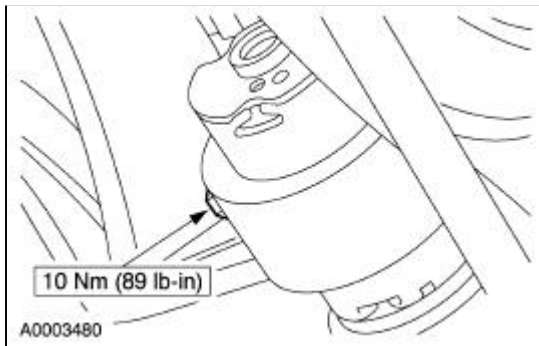
9. Remove the bracket.

1. Remove the bolts.
2. Remove the bracket.



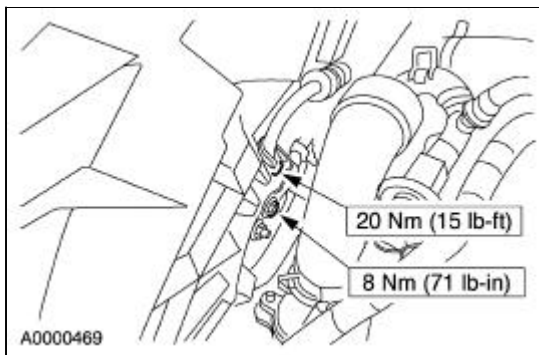
On 3.9L engines

10. Remove the bolt and position the electric water pump aside.

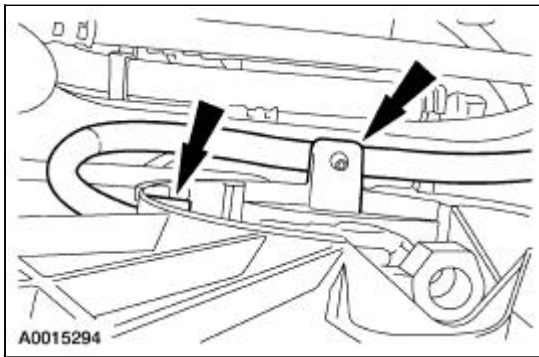


On all engines

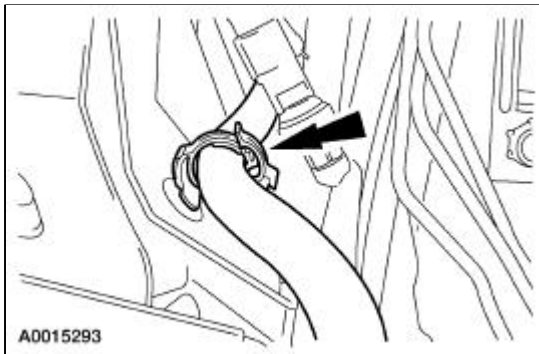
11. Disconnect the high pressure cooling fan bracket and line.
 - Inspect the seal and install a new seal if necessary. For additional information, refer to [Section 211-02](#).



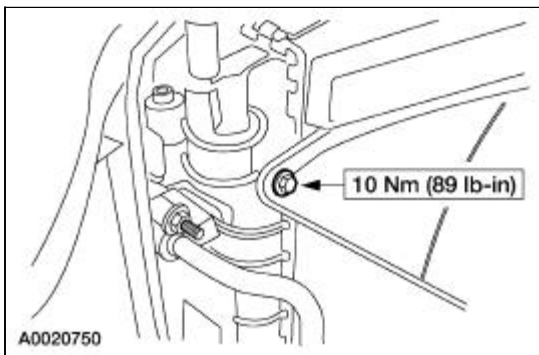
12. Disconnect the return hose from the cooling fan and shroud.



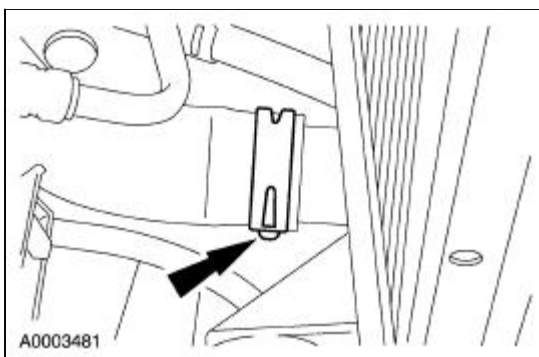
13. Separate the return hose from the fan shroud and position aside.



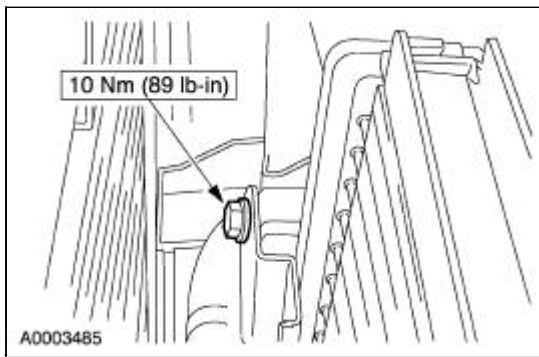
14. Remove the two bolts and the fan shroud assembly.



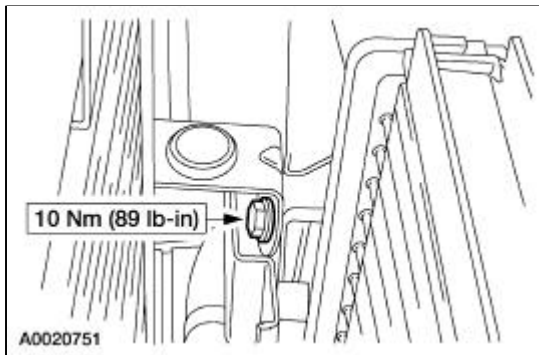
15. Remove the A/C condensor. For additional information, refer to [Section 412-03](#).
16. Disconnect the lower radiator hose.



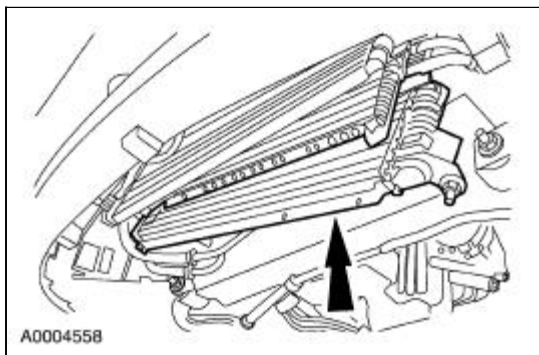
17. Remove the two bolts and position the multi-cooler assembly aside.



18. Remove the bolts and the condenser support brackets.



19. Remove the radiator.



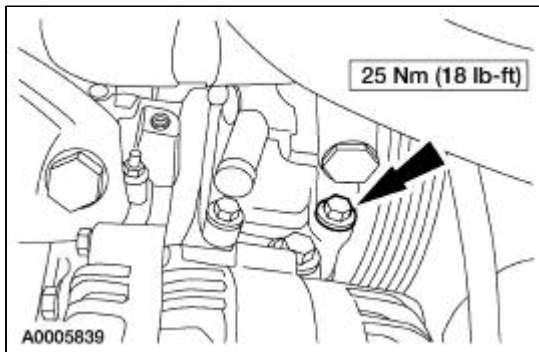
Installation

1. To install, reverse the removal procedure.
-

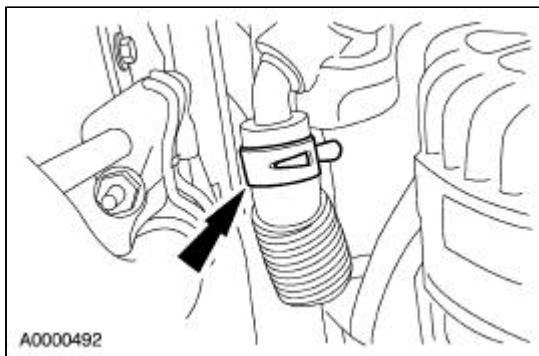
Fan — Pump, 3.0L

Removal and Installation

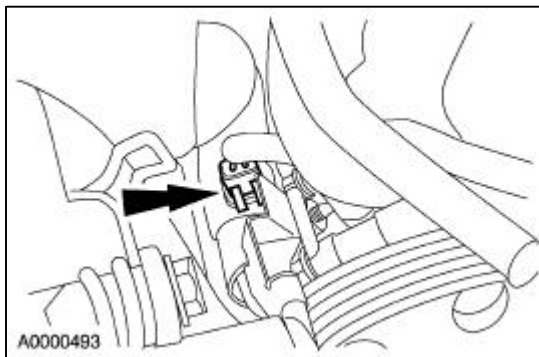
1. Remove the accessory drive belt. For additional information, refer to [Section 303-05](#).
2. Remove the lower bolt.



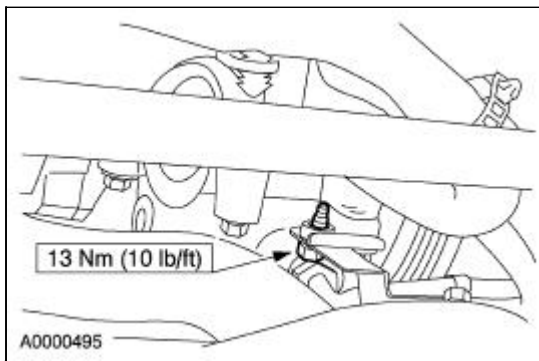
3. Disconnect the hose and allow to drain.



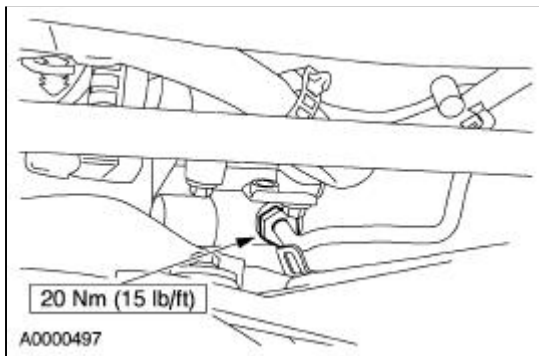
4. Disconnect the electrical connector.



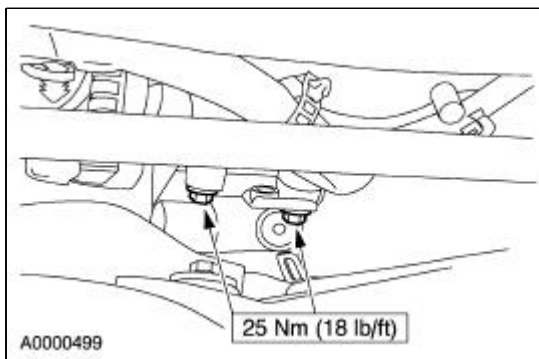
5. Remove the bolt and the high pressure line bracket.



6. Disconnect the high pressure line.



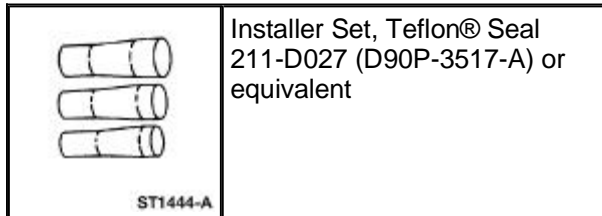
7. Remove the two upper bolts and the cooling fan pump.



8. To install, reverse the removal procedure.
-

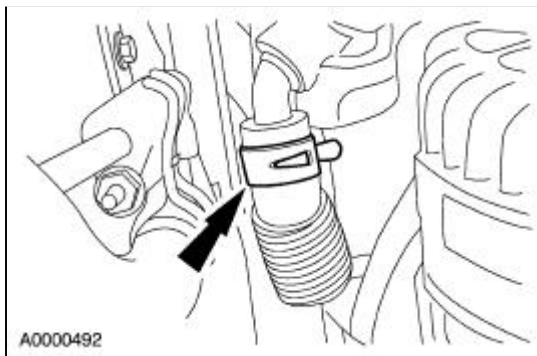
Fan — Pump, 3.9L

Special Tool(s)

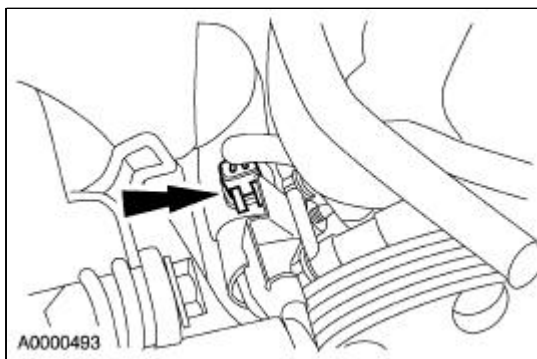


Removal and Installation

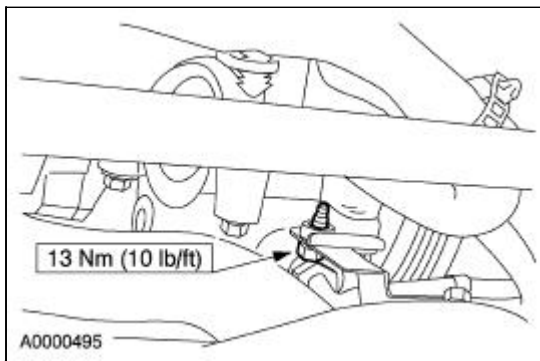
1. Remove the generator. For additional information, refer to [Section 414-02](#).
2. Disconnect the hose and allow to drain.



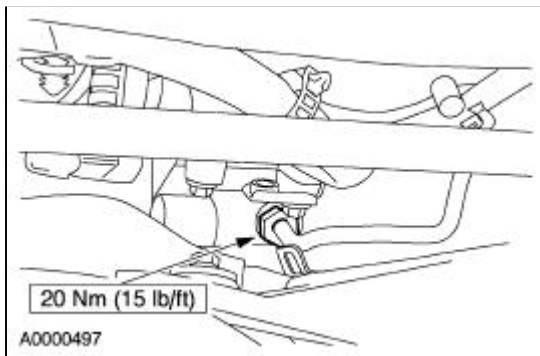
3. Disconnect the electrical connector.



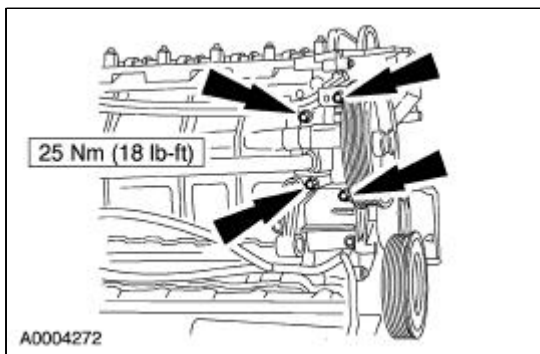
4. Remove the bolt and the high pressure line bracket.



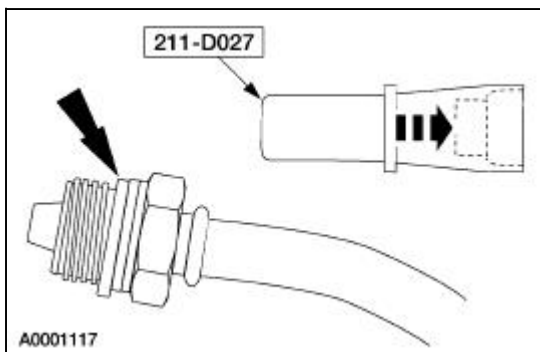
5. Disconnect the high pressure line.



6. Remove the bolts and the cooling fan pump.



7. To install, reverse the removal procedure.
8. Using the appropriate special tool, install a new O-ring on the hydraulic cooling fan pressure hose fitting.



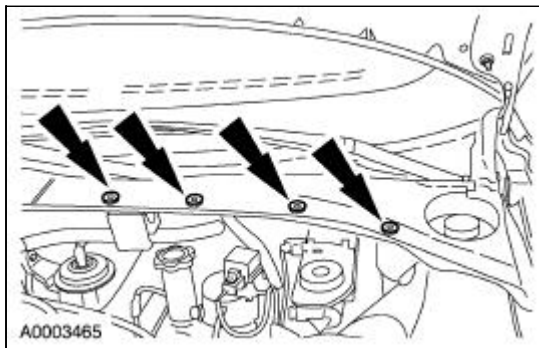
9. Fill and bleed the hydraulic cooling fan system. For additional information, refer to [Section 303-](#)



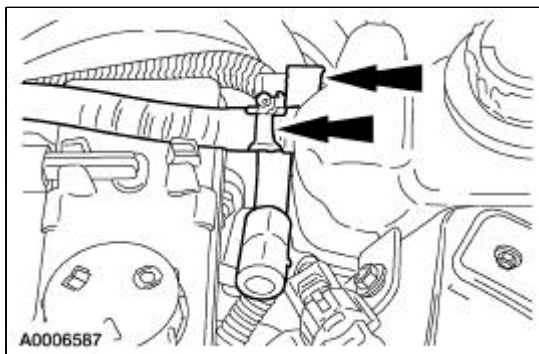
Degas Bottle

Removal and Installation

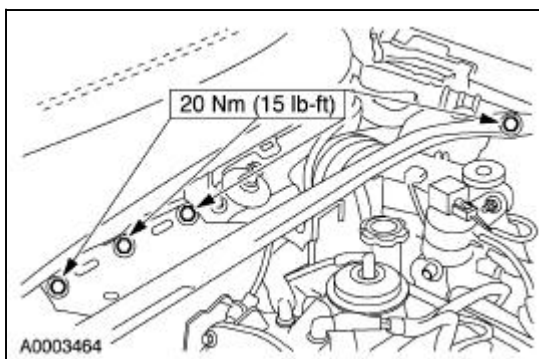
1. Drain the engine cooling system. For additional information, refer to [Cooling System Draining, Filling And Bleeding](#) in this section.
2. Remove the cowl vent screen. For additional information, refer to [Section 501-02](#).



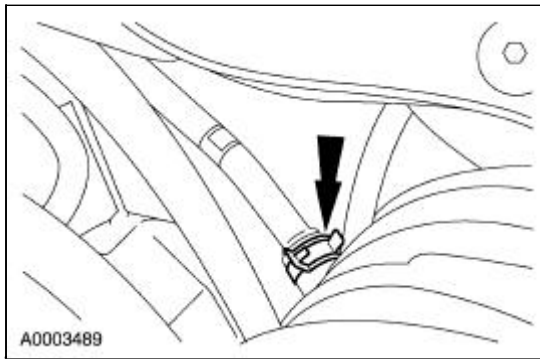
3. Disconnect the engine vent hose, and separate the air bleed hose from the degas bottle.



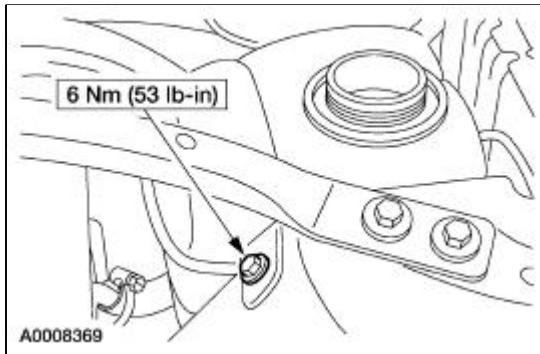
4. Remove the seven bolts and reposition the cross vehicle support.



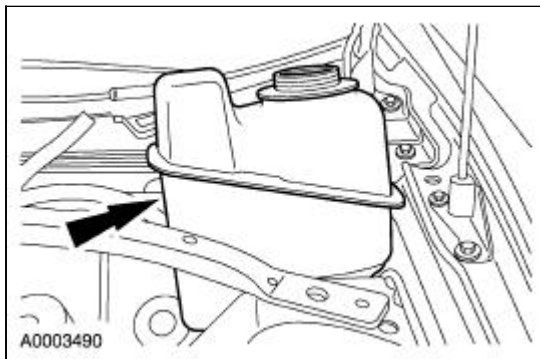
5. Disconnect the degas return hose from the degas return tube.



6. Remove the two bolts.



7. Remove the degas bottle from the vehicle.



8. To install, reverse the removal procedure.

Sensor —Cylinder Head Temperature (CHT)

Removal and Installation

For additional information, refer to [Section 303-14](#) .

General Specifications

Item	Specification
Super Premium SAE 5W30 Motor Oil XO-5W30-QSP	WSS-M2C153-G

Torque Specifications

Description	Nm	lb-ft	lb-in
Fuel injection supply manifold bolts	10	—	89
Fuel pressure relief valve	7	—	62
Fuel pressure sensor shield bolt	10	—	89
Fuel pressure sensor shield nut	6	—	53
Fuel rail bolts	10	—	89
Throttle body bolts	10	—	89

Fuel Charging and Controls

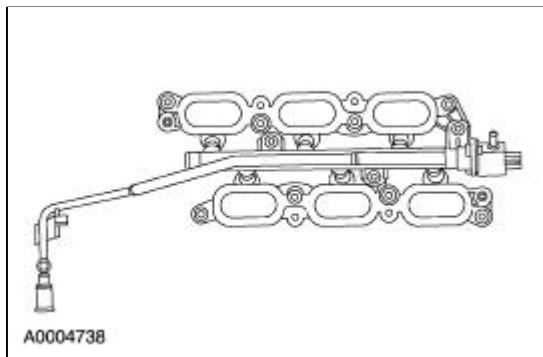
The fuel charging and controls system consists of the:

- throttle body
- fuel injectors
- fuel charging wiring
- fuel supply manifold
- fuel pressure relief (Schrader) valve

The fuel charging and controls system is:

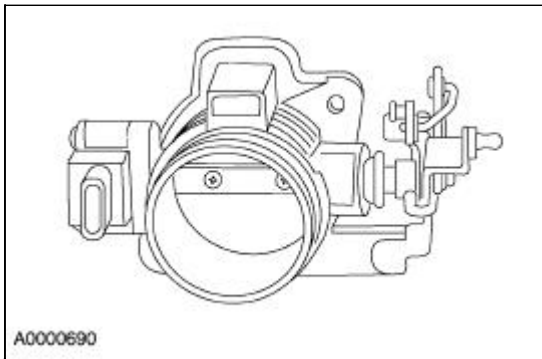
- a sequential multiport fuel injection (SFI) system.
- pulse width modulated.
- mass airflow-controlled.

The powertrain control module (PCM) controls the fuel injection system. Injector pulse-width is varied to control the amount of fuel flow. Varying fuel pump output controls fuel pressure. The PCM commands the fuel pump driver module, which directly controls the fuel pump. At low speeds, the idle air control (IAC) valve controls the bypass air around the throttle plate.



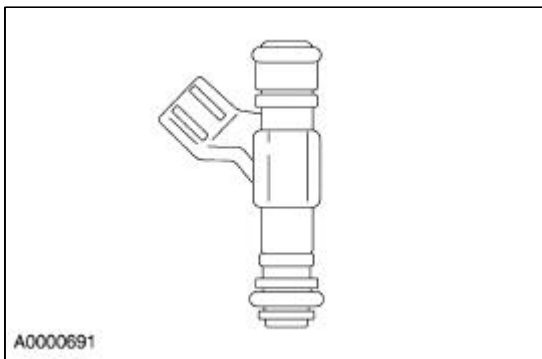
The fuel supply manifold:

- delivers fuel to the individual fuel injectors.
- receives fuel from the fuel supply line.



The throttle body:

- controls air supply to the upper intake manifold by positioning the throttle plate.
- connects the accelerator cable and the speed control actuator cable to the throttle plate.
- is not adjustable.
- must not be cleaned.
- has a different linkage ratio depending on the type of transmission (automatic or manual).

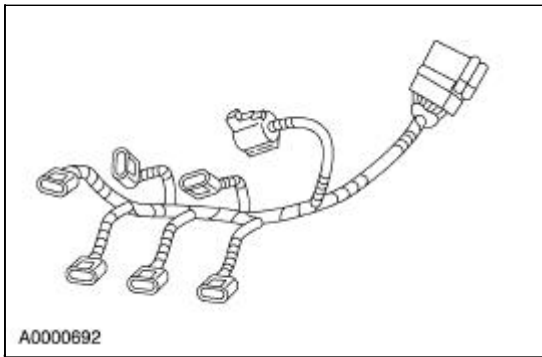


The fuel injectors:

- use new O-ring seals.
- are electrically operated by the powertrain control module (PCM).
- each have an internal solenoid that opens a needle valve to inject fuel into the lower intake manifold.
- atomize the fuel as the fuel is delivered.
- are deposit-resistant.
 - Do not clean the fuel injectors.

The fuel pressure relief valve:

- is used as a test port and to relieve fuel pressure.



The fuel charging wiring:

- connects the fuel injectors and fuel pressure sensor to the engine wiring harness and the powertrain control module.
 - Connectors on the right side fuel injectors are gray.
 - Connectors on the left side fuel injectors are black.
 - receives signals from the powertrain control module and transfers the signals to the fuel injectors.
-

Fuel Charging and Controls

Refer to the Powertrain Control/Emissions Diagnosis (PC/ED) manual.

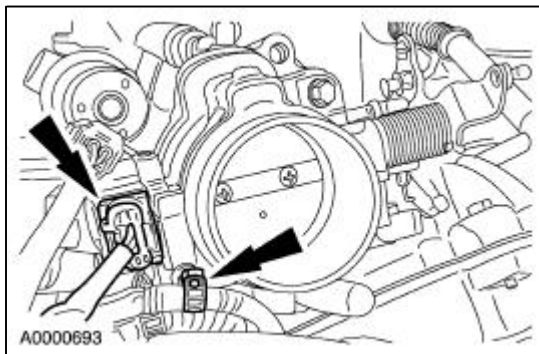
Throttle Body

Removal and Installation

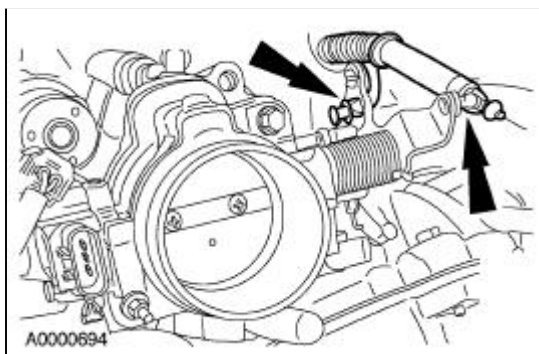
⚠ WARNING: Do not smoke or carry lighted tobacco or open flame of any type when working on or near any fuel-related components. Highly flammable mixtures are always present and may be ignited. Failure to follow these instructions may result in personal injury.

⚠ CAUTION: The throttle body bore and plate area have a special coating and cannot be cleaned.

1. Remove the air cleaner outlet tube from the throttle body. For additional information, refer to [Section 303-12](#).
2. Disconnect the throttle position sensor electrical connector and the wiring harness retainer.

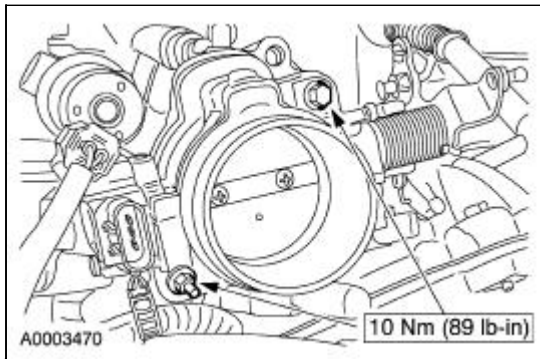


3. Disconnect the accelerator cable and the speed control actuator cable from the throttle body.



4. **NOTE:** The throttle body (TB) gasket is reusable.

Remove the bolts and the throttle body.



5. To install, reverse the removal procedure.
-

Fuel Injectors

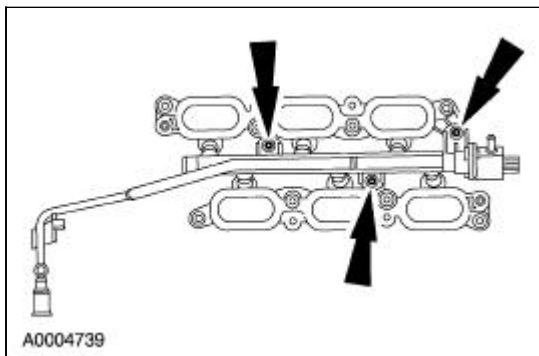
Removal

⚠ WARNING: Do not smoke or carry lighted tobacco or open flame of any type when working on or near any fuel-related components. Highly flammable mixtures are always present and may be ignited. Failure to follow these instructions may result in personal injury.

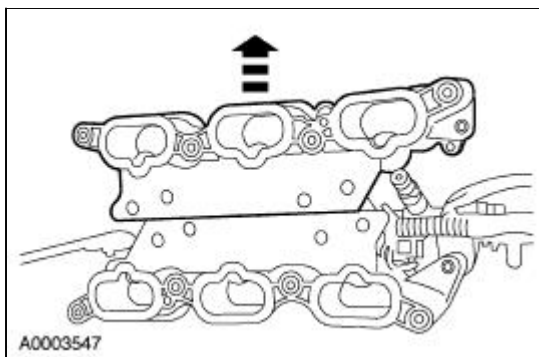
⚠ CAUTION: To remove the fuel injectors the lower intake manifold assembly must be removed.

⚠ CAUTION: The fuel injectors must be removed from the fuel supply manifold in the correct sequence. Failure to follow this procedure could result in damage to the fuel supply manifold.

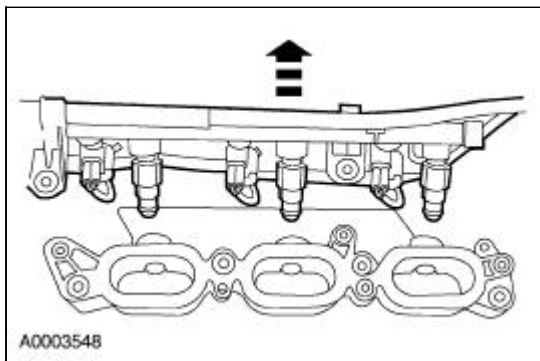
1. Remove the fuel supply manifold assembly. Refer to [Supply Manifold—Assembly](#).
2. Remove the fuel rail attachment bolts.



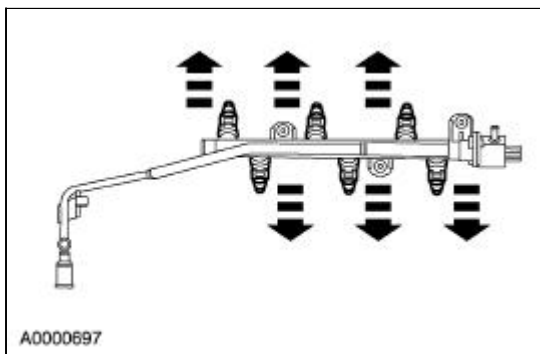
3. Turn the assembly over. Separate the two halves of the intake manifold and pull the left bank of the lower intake manifold from the supply manifold assembly and the fuel injectors.



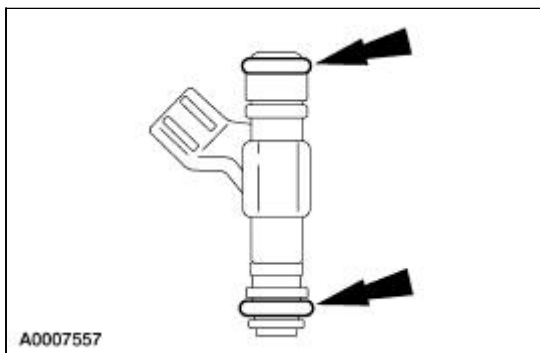
4. Remove the supply manifold and fuel injectors from the right bank of the lower intake manifold.



5. Disconnect the electrical connector from each fuel injector. For additional information, refer to Wiring Harness in this section.
6. Remove the fuel injectors from the fuel rail.



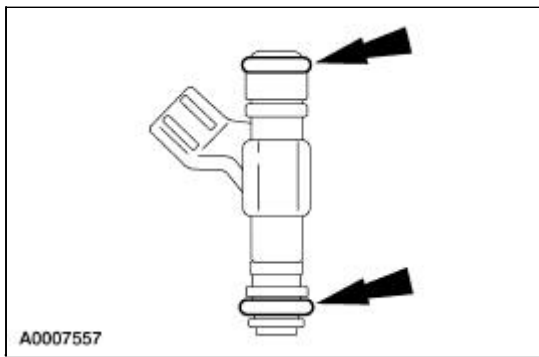
7. Remove and discard the O-ring seals from each fuel injector.



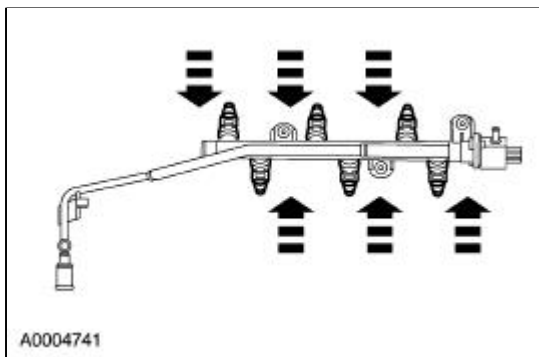
Installation

1. **NOTE:** Install new fuel injector O-ring seals.

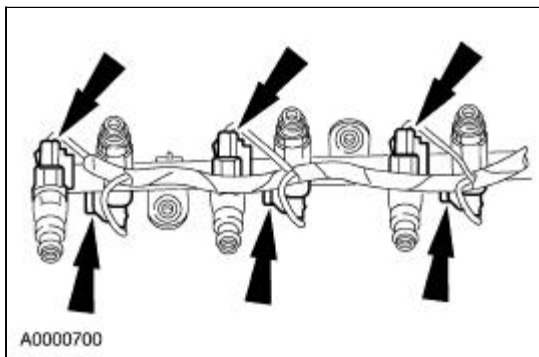
Lubricate the new fuel injector O-ring seals with Super Premium SAE 5W30 Motor Oil XO-5W30-QSP or equivalent meeting Ford specification WSS-M2C153-G.




2. Install the fuel injectors into the fuel rail.

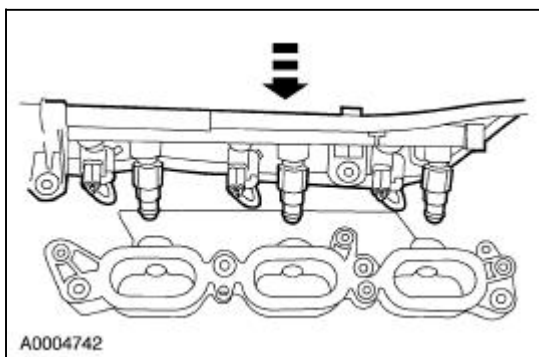


3. Connect the electrical connectors to each fuel injector.

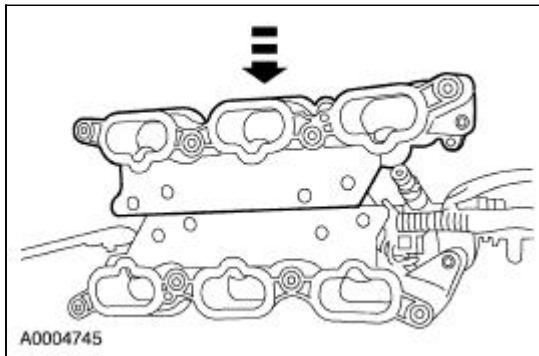


4.  **CAUTION:** The fuel injectors must be installed into the fuel supply manifold in the correct sequence. Failure to follow the procedure could result in damage to the fuel supply manifold.

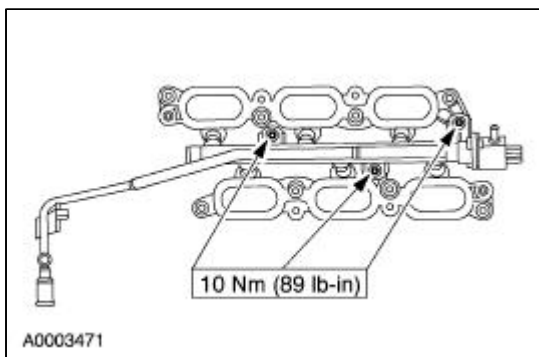
Install the supply manifold and fuel injectors into the right half of the intake manifold.



5. Turn the assembly over. Assemble the two halves of the lower intake manifold as the fuel injectors are installed into the left half of the lower intake manifold.



6. Install the fuel rail attachment bolts.



7. Install the fuel supply manifold. For additional information, refer to [Supply Manifold—Assembly](#) in this section.
-

Wiring Harness

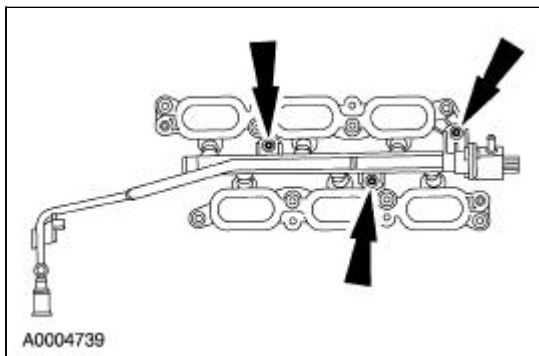
Removal

⚠ WARNING: Do not smoke or carry lighted tobacco or open flame of any type when working on or near any fuel-related components. Highly flammable mixtures are always present and may be ignited. Failure to follow these instructions may result in personal injury.

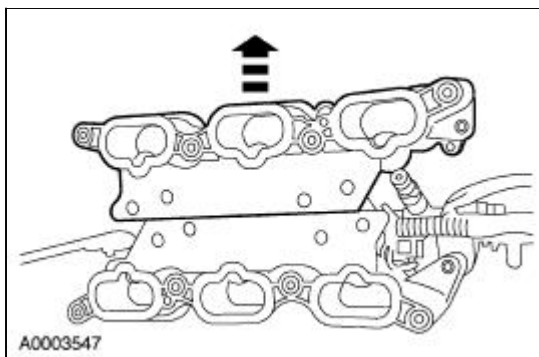
⚠ CAUTION: To remove the wiring harness the lower intake manifold must be removed.

⚠ CAUTION: The wiring harness must be removed from the fuel supply manifold in the correct sequence. Failure to follow this procedure could result in damage to the fuel supply manifold.

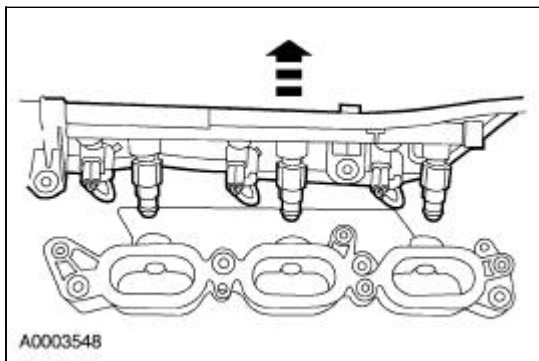
1. Remove the fuel injection supply manifold assembly. Refer to [Supply Manifold—Assembly](#).
2. Remove the fuel rail attachment bolts.



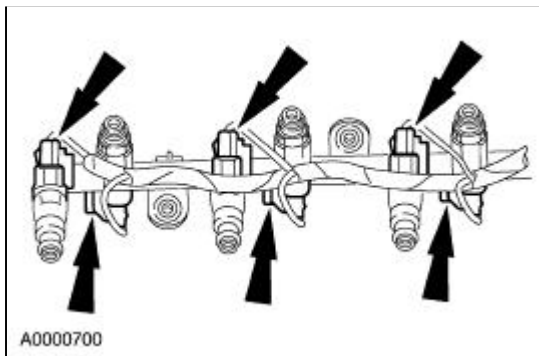
3. Turn the assembly over. Separate the two halves of the intake manifold and pull the left half away from the supply manifold and the fuel injectors.



4. Remove the supply manifold and fuel injectors from the right half of the intake manifold.

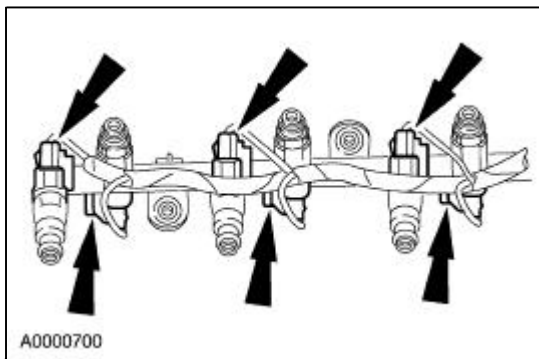


5. Disconnect the fuel injector electrical connectors.

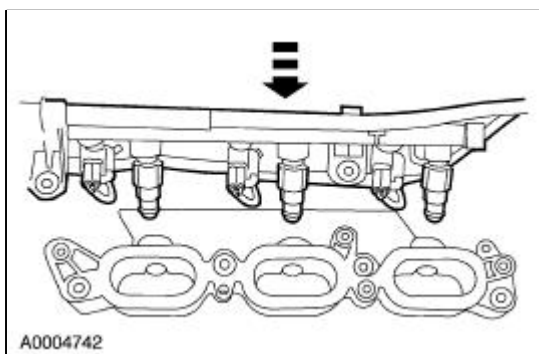


Installation

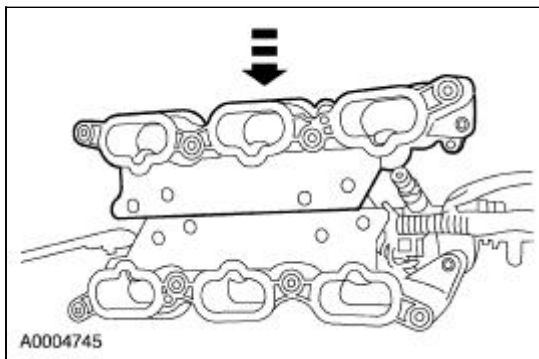
1. Connect the fuel injector electrical connectors.



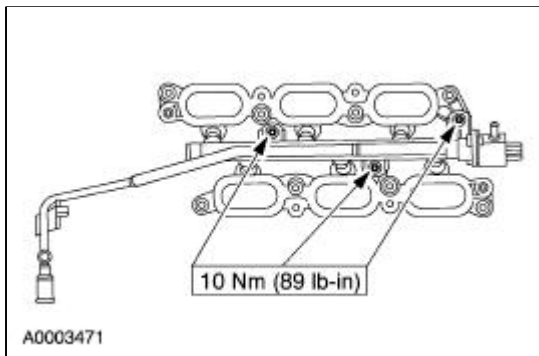
2. Install the supply manifold and fuel injectors into the right half of the intake manifold.



3. Assemble the two halves of the lower intake manifold as the fuel injectors are installed into the left half of the lower intake manifold.




4. Install the fuel rail attachment bolts.




5. Install the fuel supply manifold. For additional information, refer to [Supply Manifold—Assembly](#) in this section.
-

Supply Manifold —Assembly

Removal

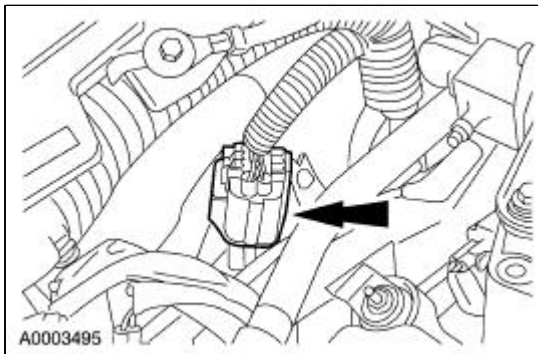
 **WARNING:** Do not smoke or carry lighted tobacco or open flame of any type when working on or near any fuel injection components. Highly flammable mixtures are always present and may be ignited. Failure to follow these instructions may result in personal injury.

 **WARNING:** Fuel in the fuel system remains under high pressure even when the engine is not running. Use care when working on the fuel system or personal injury may occur.

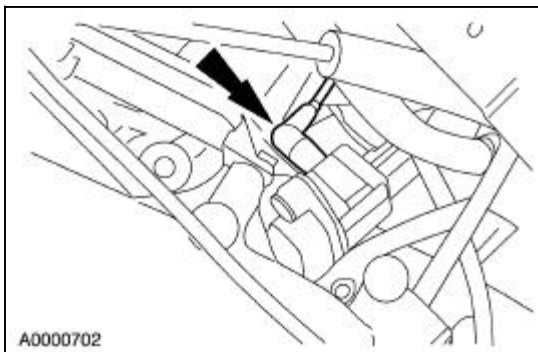
 **WARNING:** Before working on or disconnecting any of the fuel lines or fuel system components, the fuel system pressure must be relieved to prevent possible personal injury.

1. Remove the upper intake manifold. For additional information, refer to [Section 303-01A](#) .
2. Relieve the fuel system pressure. For additional information, refer to [Section 310-00](#) .
3. **NOTE:** The fuel charging wiring to engine control sensor wiring harness connector is located behind the lower intake manifold on the rear side of the wiring shield.

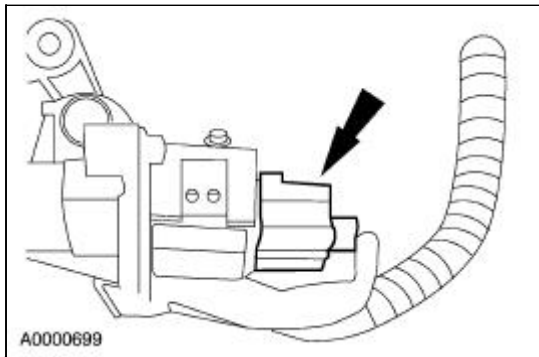
Disconnect the fuel charging wiring connector from the engine control sensor electrical connector.




4. Disconnect the fuel pressure sensor vacuum hose.



5. Disconnect the fuel pressure sensor electrical connector.

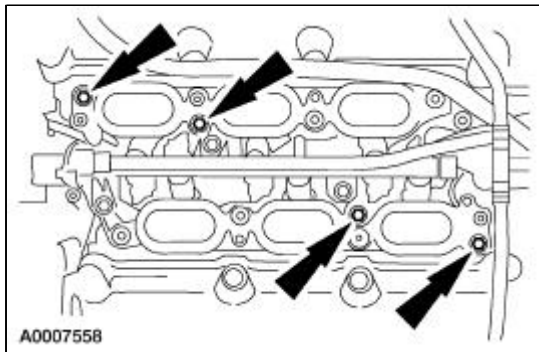


6.  **CAUTION:** After disconnecting, plug the fuel line to prevent leakage.

Disconnect the fuel line. Refer to [Section 310-00](#).

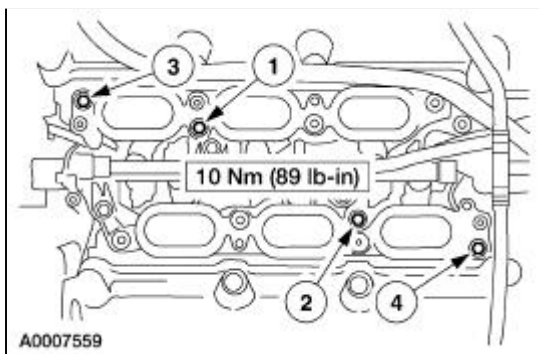
7.  **CAUTION:** The lower intake manifold assembly must be removed from the engine.

Remove the four bolts and the fuel supply manifold assembly.

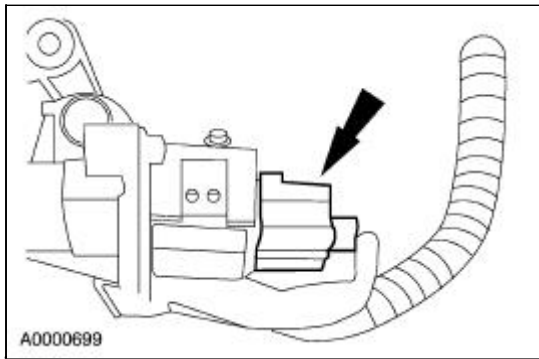


Installation

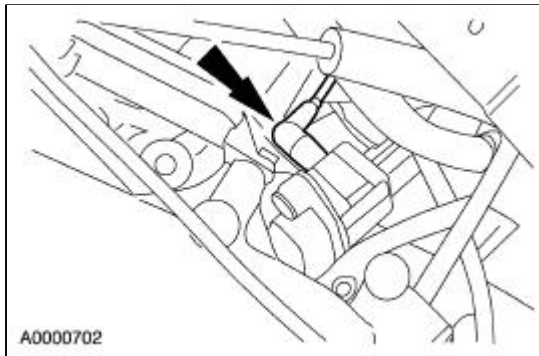
1. Position the fuel supply manifold assembly and tighten the four bolts using the sequence shown.



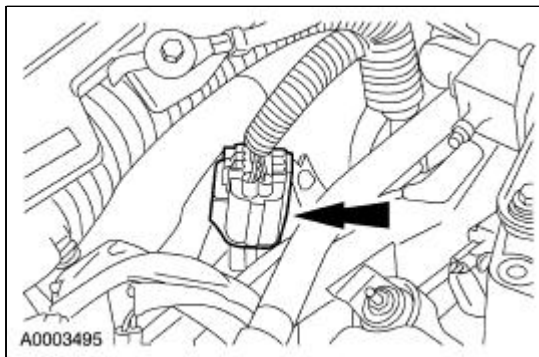
2. Connect the fuel line. For additional information, refer to [Section 310-00](#).
3. Connect the fuel pressure sensor electrical connector.



4. Connect the fuel pressure sensor vacuum hose.



5. Connect the fuel charging wiring connector from the engine control sensor electrical connector.



6. Test the fuel system pressure. For additional, information, refer to the Powertrain Control/Emissions Diagnosis (PC/ED) manual.
-

Pressure Relief Valve

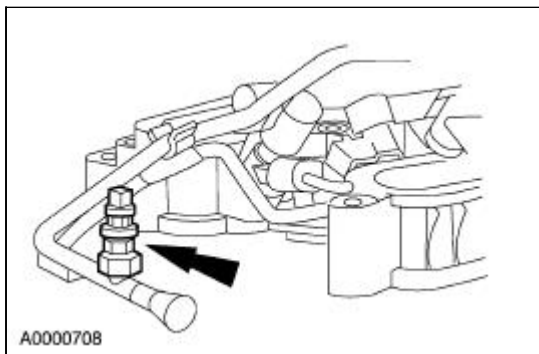
Removal and Installation

⚠ WARNING: Do not smoke or carry lighted tobacco or open flame of any type when working on or near any fuel-related components. Highly flammable mixtures are always present and may be ignited. Failure to follow these instructions may result in personal injury.

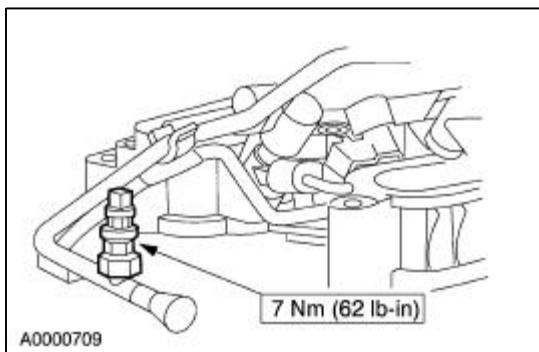
⚠ WARNING: Fuel in the system remains under high pressure even when the engine is not running. Use care when working on the fuel system or personal injury may occur.

⚠ WARNING: Before working on or disconnecting any of the fuel lines or fuel system components, the fuel system pressure must be relieved to prevent possible personal injury.

1. Relieve the fuel system pressure. For additional information, refer to [Section 310-00](#).
2. Remove the fuel pressure relief valve cap and the fuel pressure relief valve.



3. To install, reverse the removal procedure.



General Specifications

Item	Specification
Super Premium SAE 5W-30 Motor Oil XO-5W30-QSP	WSS-M2C153-G

Torque Specifications

Description	Nm	lb-ft	lb-in
Engine appearance cover bracket nuts	6	—	53
Fuel injection supply manifold bolts	13	10	—
Throttle body bolts	12	9	—

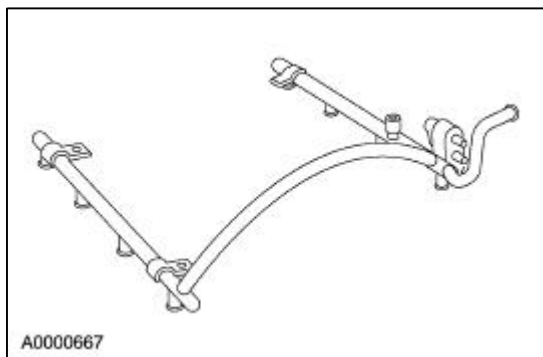
Fuel Charging and Controls

The fuel charging and controls system consists of the:

- throttle body (9E926)
- fuel injectors (9F593)
- engine wiring harness (12B637)
- fuel injection supply manifold (9F792)
- fuel pressure relief valve (9H321)

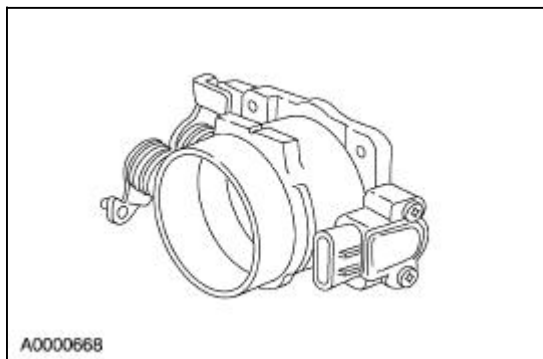
The fuel charging and controls system is:

- a sequential multiport fuel injection (SFI) system.
- pulse width modulated.
- mass airflow controlled.



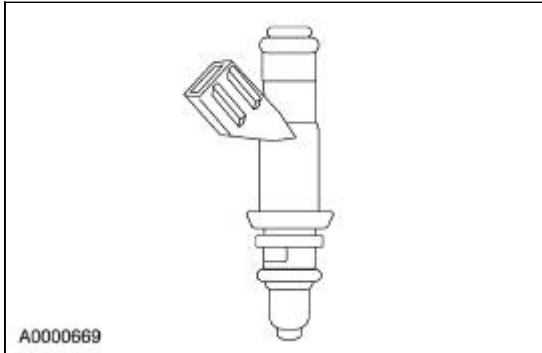
The fuel injection supply manifold:

- delivers fuel to the individual fuel injectors.
- receives fuel from the fuel supply line.



The throttle body:

- controls air supply to the intake manifold (9C633) by positioning the throttle plate.
- connects the accelerator cable (9A758) and the speed control actuator cable (9A825) to the throttle plate.
- is not adjustable.
- must not be cleaned.



The fuel injectors:

- are electrically operated by the powertrain control module (PCM) (12A650).
- have an air assist feature to aid in atomization of the fuel.
- each have an internal solenoid which opens a needle valve to inject fuel into the lower intake manifold.
- atomize the fuel as the fuel is delivered.
- are deposit-resistant.
- do not need cleaning.

The fuel pressure relief valve:

- is used to relieve fuel pressure.

The engine wiring harness:

- connects the fuel injectors and other electronic engine controls, such as the throttle position (TP) sensor (9B989), to the powertrain control module.
 - receives fuel injector signals from the powertrain control module and transfers the signals to the fuel injectors.
-

Fuel Charging and Controls

Refer to the Powertrain Control/Emissions Diagnosis (PC/ED) manual.

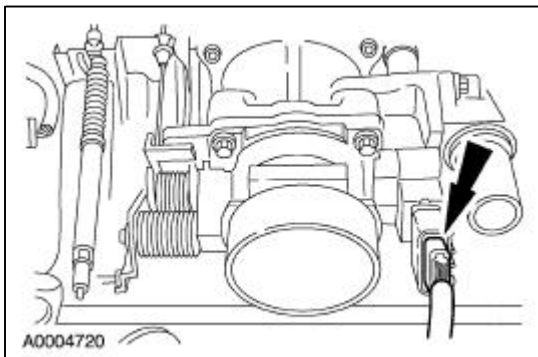
Throttle Body

Removal

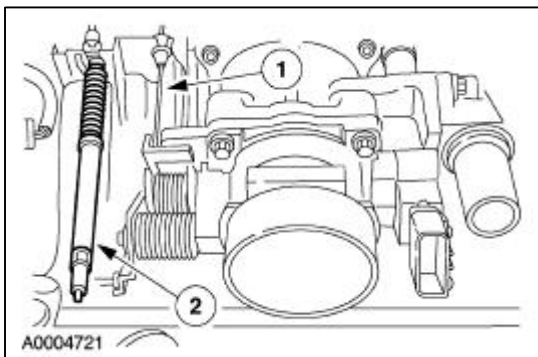
⚠ WARNING: Do not smoke or carry lighted tobacco or open flame of any type when working on or near any fuel-related components. Highly flammable mixtures are always present and may be ignited. Failure to follow these instructions may result in personal injury.

⚠ CAUTION: Throttle body bore and plate area have a special coating and cannot be cleaned.

1. Remove the air cleaner outlet tube from the throttle body. For additional information, refer to [Section 303-12](#).
2. Disconnect the throttle position (TP) sensor electrical connector.



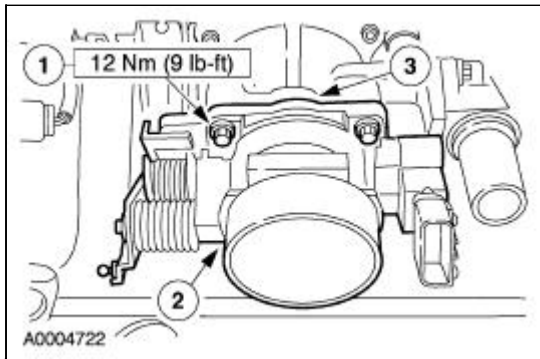
3. Disconnect the throttle body linkages.
 1. Disconnect the speed control actuator cable.
 2. Disconnect the accelerator cable.



4. **NOTE:** Discard the throttle body (TB) gasket.

Remove the throttle body.

1. Remove the four bolts.
2. Remove the throttle body.
3. Remove the throttle body gasket.



Installation

1. **NOTE:** Use a new throttle body gasket.

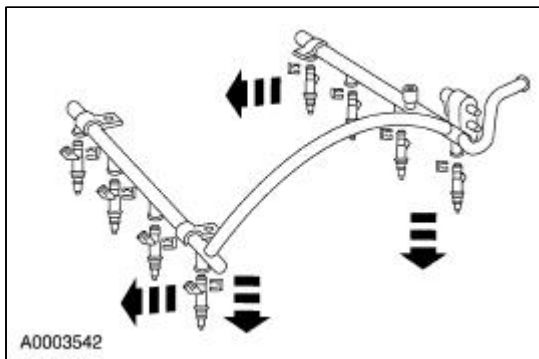
To install, reverse the removal procedure.

Fuel Injectors

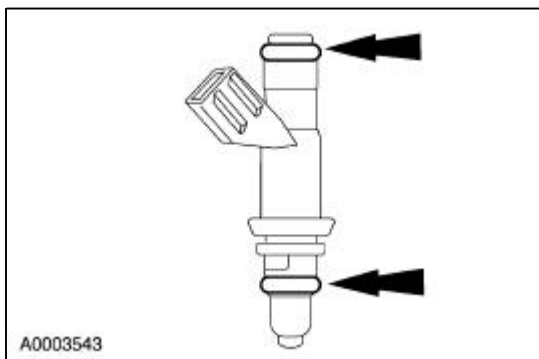
Removal

⚠ WARNING: Do not smoke or carry lighted tobacco or open flame of any type when working on or near any fuel-related components. Highly flammable mixtures are always present and may be ignited. Failure to follow these instructions may result in personal injury.

1. Remove the fuel injection supply manifold. For additional information, refer to [Supply Manifold—Fuel Injection](#) in this section.
2. Remove the retaining clip and the fuel injectors from the fuel injection supply manifold.



3. Remove and discard the two O-ring seals from each fuel injector.



Installation


1. **⚠ CAUTION:** Install new O-ring seals.


NOTE: Lubricate new fuel injector O-ring seals with Super Premium SAE 5W30 Motor Oil XO-5W30-QSP or equivalent meeting Ford specification WSS-M2C153-G.


To install, reverse the removal procedure.

Supply Manifold —Fuel Injection

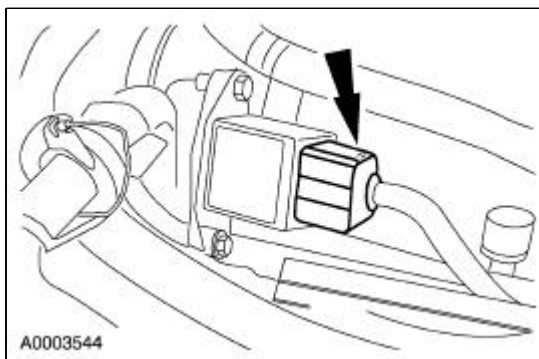
Removal

 **WARNING:** Do not smoke or carry lighted tobacco or open flame of any type when working on or near any fuel-related components. Highly flammable mixtures are always present and may be ignited. Failure to follow these instructions may result in personal injury.

 **WARNING:** Fuel in the fuel system remains under high pressure even when the engine is not running. Use care when working on the fuel system or personal injury may occur.

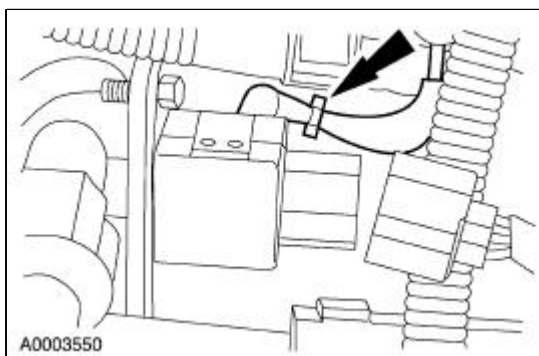
 **WARNING:** Before working on or disconnecting any of the fuel lines or fuel system components, the fuel system pressure must be relieved to prevent possible personal injury.

1. Remove the engine appearance cover.
2. Relieve the fuel pressure. For additional information, refer to [Section 310-00](#).
3. Remove the air cleaner outlet tube from the throttle body. For additional information, refer to [Section 303-12](#).
4. Disconnect the electrical connector from the fuel pressure sensor.

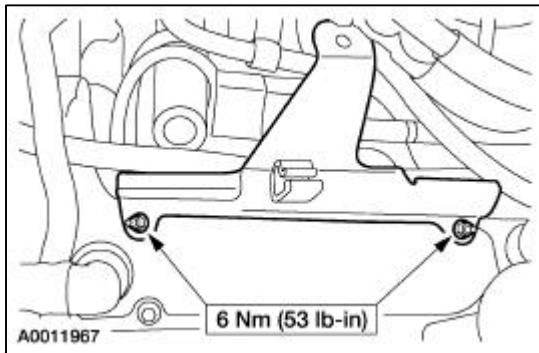


5. **NOTE:** The fuel pressure sensor vacuum hose must be disconnected at the jumper connection, not at the sensor.

Disconnect the fuel pressure sensor vacuum hose.

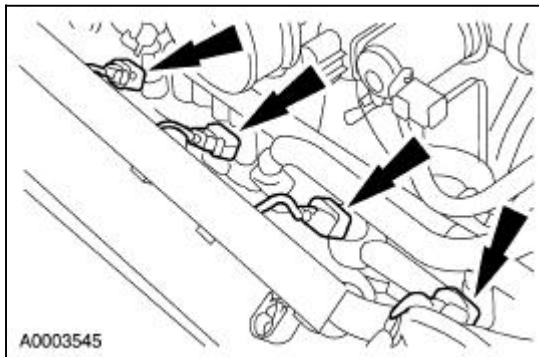


6. Disconnect the fuel line. For additional information, refer to [Section 310-00](#).
7. Remove the nuts and the engine appearance cover bracket.

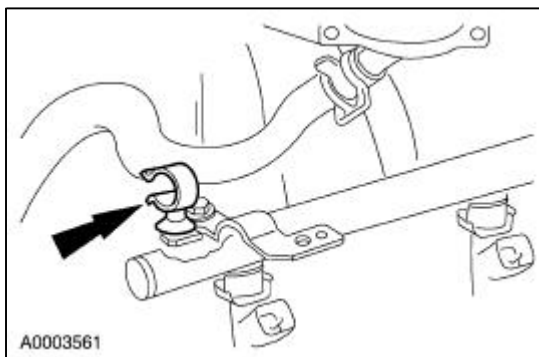


8. **NOTE:** RH side shown; LH side similar.

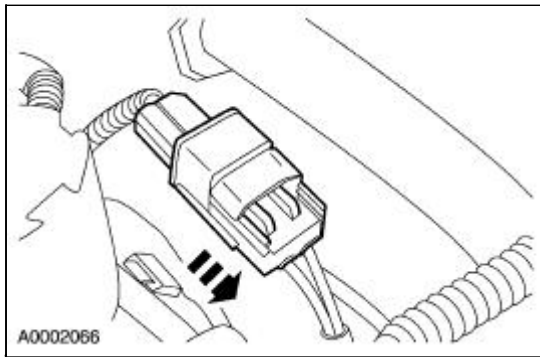
Disconnect the eight fuel injector electrical connectors.



9. Remove the throttle body heater return hose from the retaining clip.

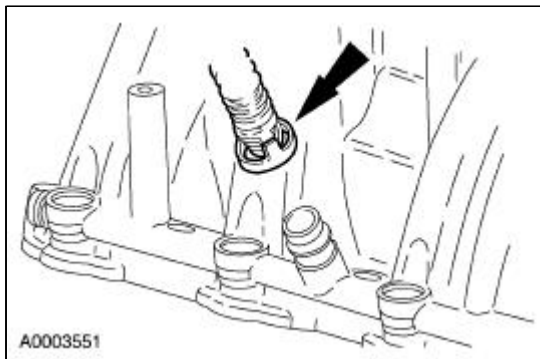


10. Disconnect the camshaft position (CMP) sensor.

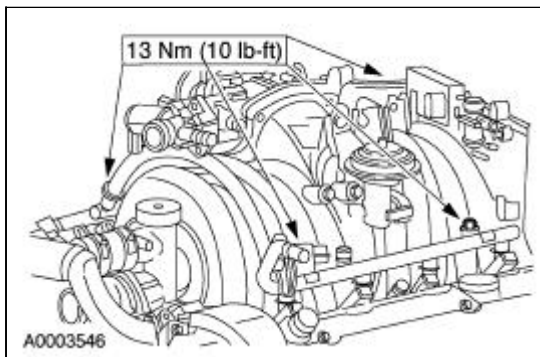


11. **NOTE:** Do not use tools to remove the air assist hose fittings. Squeeze the fitting by hand to disconnect the air assist hose.

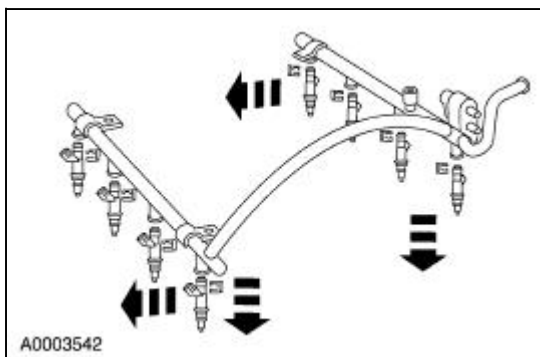
Remove the air assist hose from both sides of the intake manifold and the idle air control (IAC) valve.



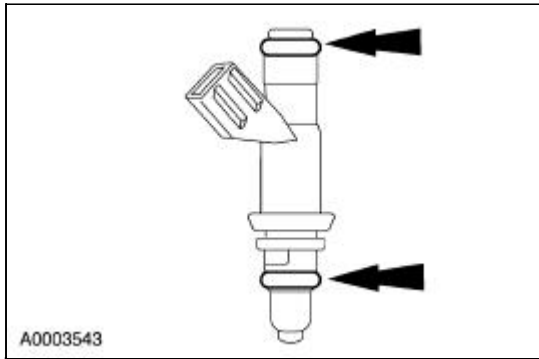
12. Remove the four bolts and the fuel injection supply manifold.



13. Remove the retaining clip and the fuel injectors from the fuel injection supply manifold.



14. Remove and discard the two O-ring seals from each fuel injector.



Installation

1.  **CAUTION: Install new O-ring seals.**

NOTE: Lubricate new fuel injector O-ring seals with Super Premium SAE 5W-30 Motor Oil XO-5W30-QSP or equivalent meeting Ford specification WSS-M2C153-G.

To install, reverse the removal procedure.

General Specifications

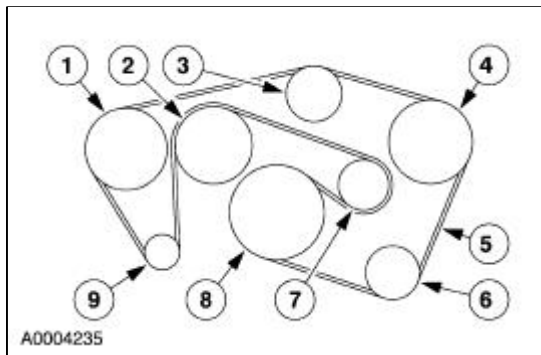
Item	Specification
Drive belt	Non neoprene 6K poly v belt
Press-on pulleys power steering pump and hydraulic cooling fan	Flush to end of shaft \pm 0.25 mm (0.0010 inch)

Torque Specifications

Description	Nm	lb-ft
Belt idler pulley bolt	25	18
Drive belt tensioner bolt	50	37

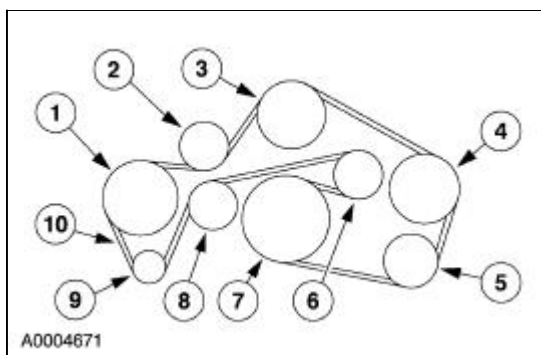
Accessory Drive

Component Locations —3.0L



Item	Part Number	Description
1	8C647	Hydraulic fan pump pulley
2	8A528	Water pump pulley
3	6C348	Belt idler pulley
4	3D673	Power steering pump pulley
5	8620	Drive belt
6	19D784	A/C clutch pulley
7	6B209	Drive belt tensioner
8	6316	Crankshaft vibration damper
9	10A352	Generator pulley

Component Locations —3.9L



Item	Part Number	Description
1	8C647	Hydraulic fan pump pulley
2	19A216	Belt idler pulley—unflanged
3	8509	Water pump pulley
4	3D673	Power steering pump pulley
5	19D748	A/C clutch pulley
6	6B209	Drive belt tensioner

7	6316	Crankshaft vibration damper
8	19A216	Belt idler pulley—flanged
9	10A352	Generator pulley
10	8620	Drive belt

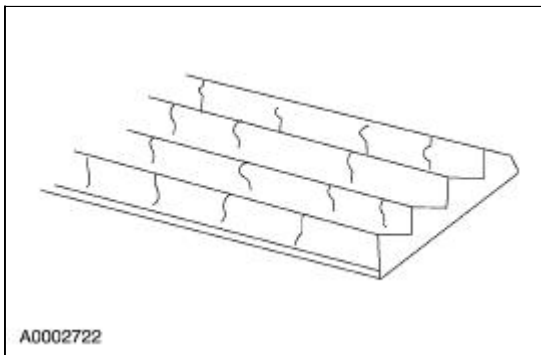
Accessory Drive

Inspection and Verification

1. Verify customer concern by running the engine.
2. Inspect the drive belt for chunking, fraying, wear, and pilling.
3. Check the drive belt for correct routing.

Drive Belt Cracking/Chunking/Wear

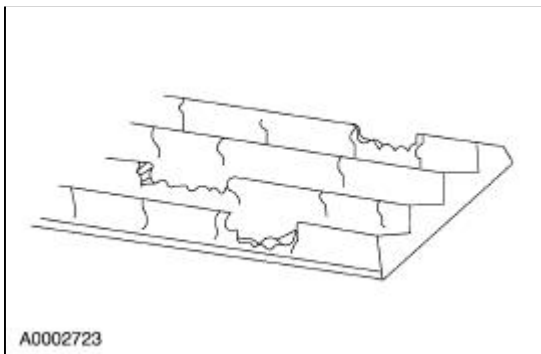
V Ribbed Serpentine Drive Belt With Cracks Across Ribs



The accessory drive:

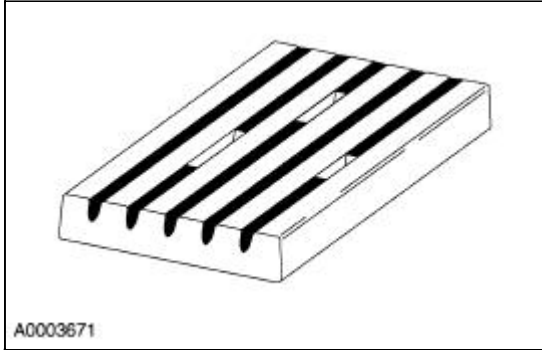
- has a single serpentine drive belt.
- has an automatic drive belt tensioner.
- does not require adjustment.

V Ribbed Belt With Chunks of Rib Missing



V Ribbed Belt With Pilling

NOTE: Pilling is an excessive build up in the V grooves of the belt.



Symptom Chart

Symptom Chart

Condition	Possible Sources	Action
<ul style="list-style-type: none"> ● Drive belt noise, chirping, flutter 	<ul style="list-style-type: none"> ● Defective/worn drive belt. ● Misaligned pulley. ● Pulley runout. ● Damaged accessories. ● Fluid contamination of drive belt. ● Damaged or worn drive belt tensioner. 	<ul style="list-style-type: none"> ● REFER to Component Tests, Drive Belt, Noise/Flutter in this section. ● REFER to Component Tests, Belt Tensioner, Automatic in this section.
<ul style="list-style-type: none"> ● Premature drive belt wear 	<ul style="list-style-type: none"> ● Defective drive belt. ● Misaligned pulley. ● Pulley runout. ● Damaged accessories. ● Incorrectly installed drive belt. ● Fluid contamination. 	<ul style="list-style-type: none"> ● REFER to Component Tests, Drive Belt Noise/Flutter and Drive Belt Misalignment diagnosis in this section.

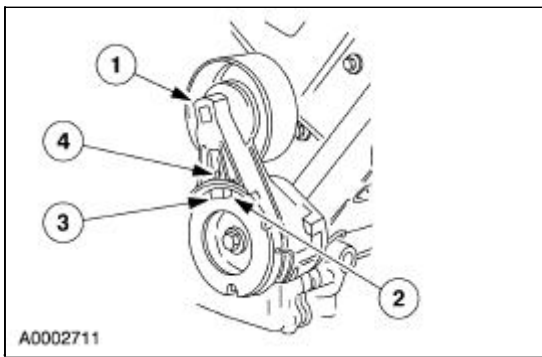
Component Tests

Drive Belt Noise/Flutter

NOTE: Tensioner is shown in free-state position against arm travel stops.

Drive Belt Tensioner/Belt Length Indicator

NOTE: The 3.0L and the 3.9L drive belt tensioners are the same.



Item	Part Number	Description
1	—	Belt tension relief point
2	—	Unacceptable belt wear range
3	—	Acceptable belt installation and wear range
4	—	Belt length indicator

Drive belt chirp occurs due to pulley misalignment or excessive pulley runout. It can be the result of a damaged pulley or an incorrectly aligned pulley.

To correct, determine the area where the noise comes from. Check each of the pulleys in that area with a straightedge to the crankshaft pulley. Look for accessory pulleys out of position in the fore/aft direction or at an angle to the straightedge.

NOTE: Do not apply any fluids or belt dressing to the belt or pulleys.

Drive belt squeal is an intermittent noise that occurs when the drive belt slips on a pulley during certain conditions, such as: engine start up, rapid engine acceleration, A/C clutch engagement, 1-2 shift and power steering loading.

Drive belt squeal can occur under certain conditions:

- if the A/C discharge pressure goes above specifications:
 - the A/C system is overcharged.
 - the A/C condenser core airflow is blocked.
- if the A/C OFF equalized pressure (the common discharged and suction pressure that occurs after several minutes) exceeds specifications.
- if any of the accessories are damaged, have a worn or damaged bearing, or internal torsional resistance above normal. All accessories should be rotatable by hand in the unloaded condition. If not, inspect the accessory.
- if fluid gets on the drive belt. This includes power steering fluid, engine coolant, engine oil or air conditioning system lubricant. If excessive fluid does get on the drive belt during repair, install a new drive belt.
- if the drive belt is too long. A drive belt that is too long will allow the drive belt tensioner arm to go all the way to the arm travel stop under certain load conditions, which will release tension to the drive belt. If the drive belt tensioner indicator is outside the normal installation wear range window, install a new drive belt.
- **NOTE:** The drive belt tensioner arm should rotate freely without binding.

Install a new drive belt tensioner if the drive belt tensioner is worn or damaged.

Belt Tension

NOTE: Drive belt tension is not adjustable.

The drive belt tensioner automatically adjusts drive belt tension.

Belt Tensioner, Automatic

Check the automatic drive belt tensioner:

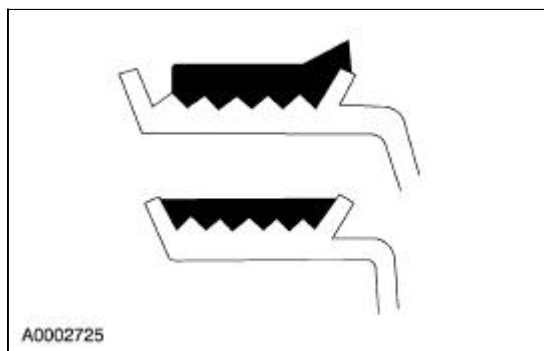
1. With the engine off, check for correct drive belt routing. For additional information, refer to [Belt—3.0L](#) or [Belt—3.9L](#) in this section. Repair as necessary.
2. Rotate the drive belt tensioner and check for a binding or frozen condition. Install new components as necessary.

Drive Belt Misalignment



CAUTION: Incorrect drive belt installation will cause excessive drive belt wear and may cause the drive belt to come off the drive pulleys.

Non-standard drive belts may track differently or incorrectly. If a drive belt tracks incorrectly, install a new drive belt to avoid performance failure or loss of the drive belt.



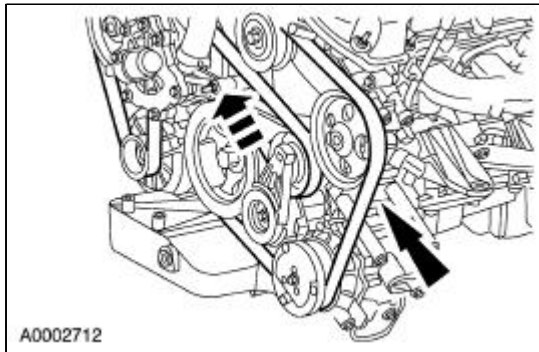
With the engine running, check drive belt tracking. If the edge of the drive belt rides beyond the edge of the pulleys, noise and premature wear may occur. Make sure the drive belt rides correctly on the pulley. If a drive belt tracking condition exists, proceed with the following:

- Visually check the drive belt tensioner for damage, especially the mounting pad surface. If the drive belt tensioner is not installed correctly, the mounting surface pad will be out of position. This will result in chirp and squeal noises.
 - With the engine running, visually observe the grooves in the pulleys (not the pulley flanges or the pulley forward faces) for excessive wobble. Install new components as necessary.
 - Check all accessories, mounting brackets and the drive belt tensioner for any interference that would prevent the component from mounting correctly. Correct any interference condition and recheck the drive belt tracking.
 - Tighten all accessories, mounting brackets, and drive belt tensioner retaining hardware to specification. Recheck the drive belt tracking.
-

Belt —3.0L

Removal

1. Remove the air cleaner outlet tube. For additional information, refer to [Section 303-12](#).
2. Rotate the tensioner counterclockwise and remove the drive belt.



Installation

1.  **CAUTION: Incorrect drive belt installation will cause premature drive belt failure.**

NOTE: Make sure the drive belt (8620) is correctly installed on each pulley.

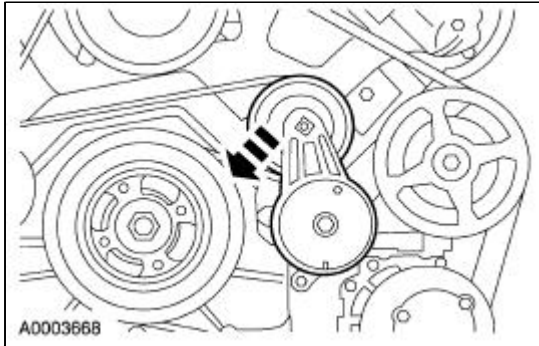
To install, reverse the removal procedure.

- Refer to component locations —3.0L for correct drive belt routing.
-

Belt —3.9L

Removal

1. Remove the air cleaner outlet tube. For additional information, refer to [Section 303-12](#).
2. Rotate the tensioner counterclockwise and remove the drive belt from the pulley.



3. Remove the belt tensioner. For additional information, refer to [Belt Tensioner](#) in this section.

Installation

1.  **CAUTION: Incorrect drive belt installation will cause premature drive belt failure.**

NOTE: Make sure the drive belt (8620) is correctly installed on each pulley.

To install, reverse the removal procedure.

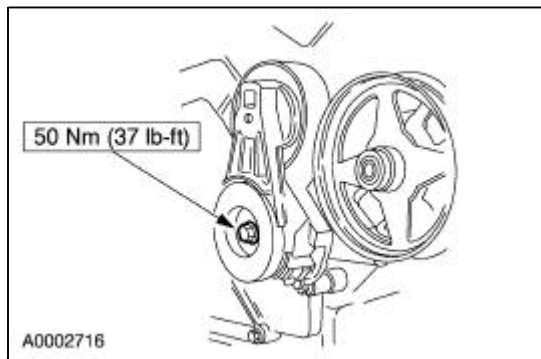
- Refer to component locations —3.9L for correct drive belt routing.
-

Belt Tensioner

Removal

1. Position the drive belt out of the way. For additional information, refer to [Belt—3.0L](#) or [Belt—3.9L](#) in this section.
2. **NOTE:** The 3.9L is shown, and the 3.0L is similar.

Remove the bolt and the drive belt tensioner.



Installation

1. **NOTE:** Make sure locating pins are aligned with the holes in the front cover, and the belt is installed around the belt tensioner pulley.

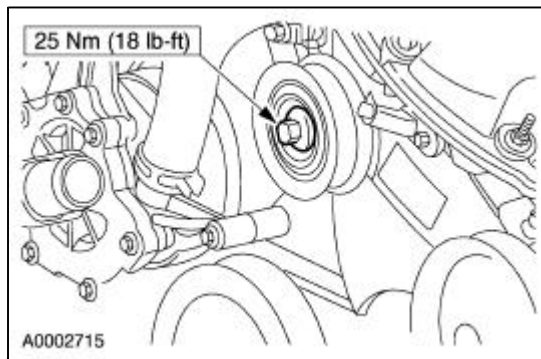
To install, reverse the removal procedure.

Belt Idler Pulley

Removal

1. Position the drive belt out of the way. For additional information, refer to [Belt—3.0L](#) or [Belt—3.9L](#) in this section.
2. **NOTE:** The 3.0L belt idler pulley is shown, and the 3.9L is similar.

Remove the bolt and the belt idler pulley.



Installation

1. To install, reverse the removal procedure.
-

General Specifications

Item	Specification
Starter motor normal load current draw (amperes)	130-220
Starting circuit maximum voltage drop (volts)	0.5

Torque Specifications

Description	Nm	lb-ft	lb-in
Starter motor bolts	25	18	—
Starter motor ground cable nut	25	18	—
Starter solenoid terminal nut (S-terminal)	6	—	53
Starter solenoid terminal nut (B-terminal)	12	9	—

Starting System


The starting system consists of the following components:

- starter motor (11002)
 - ignition switch
 - digital transmission range (TR) sensor (7F293)
 - starter relay
-

Starting System

Refer to Wiring Diagrams Section [303-06](#), Starting System for schematic and connector information.

Special Tool(s)

 ST1137-A	73III Automotive Meter 105-R0057 or equivalent
---	---

Principles of Operation

Anti-Theft Intervention

The starting system is electronically controlled by the passive anti-theft system (PATS). The PATS recognizes the correct electronically coded ignition key and signals the instrument cluster to provide a ground for the starter relay. The energized relay provides voltage to the starter solenoid, thereby allowing the starter motor to activate.

Insection and Verification



WARNING: When carrying out underhood work in the vicinity of the starter motor, be aware that the heavy gauge battery input lead at the starter solenoid is "electrically hot" at all times. A protective cap or boot is provided over the terminal of this lead and must be installed after the repair procedure is completed. Failure to follow these instructions may result in personal injury.



WARNING: When working in area of the starter motor, be careful to avoid touching hot exhaust components. Failure to follow these instructions may result in personal injury.

NOTE: When working on the starter system, make sure the anti-theft system is deactivated.

1. Verify the customer concern by operating the system.
2. Visually inspect for obvious signs of mechanical or electrical damage.

Visual Inspection Chart

Mechanical	Electrical
<ul style="list-style-type: none">● Starter motor● Brackets	<ul style="list-style-type: none">● Battery● Auxiliary junction box (AJB) fuse F121 (30A)● Battery junction box (BJB) fuse F22 (20A)

- Central junction box (CJB) fuse F201 (5A)
- Starter relay
- Loose or corroded connectors
- Damaged wiring

3. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
4. If the concern remains after the inspection, determine the symptom(s) and go to the Symptom Chart.

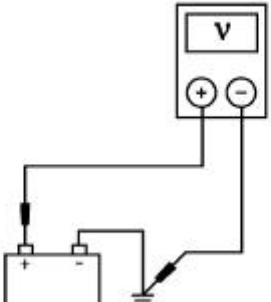
Symptom Chart

Symptom Chart

Condition	Possible Sources	Action
<ul style="list-style-type: none"> ● The engine cranks slowly 	<ul style="list-style-type: none"> ● Battery. ● Ignition switch. ● Starter motor. ● Circuitry. 	<ul style="list-style-type: none"> ● CARRY OUT the starter motor-motor feed circuit and/or the starter motor-ground circuit test. REFER to Component Tests in this section.
<ul style="list-style-type: none"> ● The engine does not crank 	<ul style="list-style-type: none"> ● Battery. ● Central junction box (CJB) fuse F201 (5A). ● Auxiliary junction box (AJB) fuse F121 (30A). ● Battery junction box (BJB) fuse F422 (20A). ● Ignition switch. ● Starter relay. ● Anti-theft system. ● Circuitry. 	<ul style="list-style-type: none"> ● GO to Pinpoint Test A.
<ul style="list-style-type: none"> ● Unusual starter noise 	<ul style="list-style-type: none"> ● Starter motor. ● Starter motor mounting. ● Incorrect starter motor drive engagements. 	<ul style="list-style-type: none"> ● GO to Pinpoint Test B.
<ul style="list-style-type: none"> ● The starter spins but the engine does not crank 	<ul style="list-style-type: none"> ● Starter motor. ● Broken flywheel/ring gear teeth. 	<ul style="list-style-type: none"> ● INSPECT the starter motor mounting and engagement. ● INSPECT the flywheel/ring gear for broke, missing or worn teeth. REPAIR as necessary.
<ul style="list-style-type: none"> ● Engine cranks with clutch pedal not applied (manual transmission) 	<ul style="list-style-type: none"> ● Starter clutch pedal position (CPP) switch. 	<ul style="list-style-type: none"> ● INSTALL a new clutch pedal position (CPP) switch.

Pinpoint Tests

PINPOINT TEST A: THE ENGINE DOES NOT CRANK

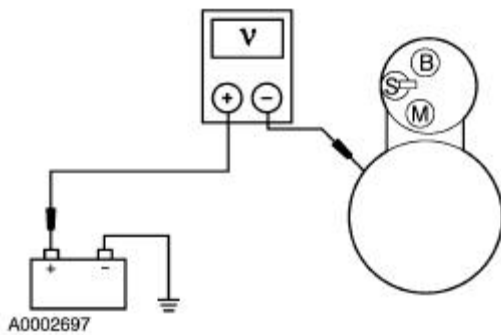
CONDITIONS	DETAILS/RESULTS/ACTIONS
A1 CHECK FOR INSTRUMENT CLUSTER DIAGNOSTIC TEST CODES	
	<p>1 NOTE: The instrument cluster PATS DTCs are the only DTCs of concern in this step. Only repair retrieved non-PATS DTCs if a customer concern is reported.</p> <p>Carry out the instrument cluster self-test. Refer to Section 413-01.</p> <ul style="list-style-type: none"> ● Were any PATS DTCs retrieved from the instrument cluster? <p>→ Yes GO to Section 419-01B to diagnose the PATS DTCs.</p> <p>→ No GO to A2.</p>
A2 CHECK THE BATTERY	
	<p>1 Check the battery condition and charge. For additional information, refer to Section 414-00.</p> <ul style="list-style-type: none"> ● Is the battery OK? <p>→ Yes GO to A3.</p> <p>→ No CHARGE or INSTALL a new battery as necessary. For additional information, refer to Section 414-00. TEST the system for normal operation.</p>
A3 CHECK THE BATTERY GROUND CABLE	
<p>1</p>  <p>A0002696</p>	<p>1 Measure the voltage between the positive battery post and the battery ground cable connection on the engine.</p> <ul style="list-style-type: none"> ● Is the voltage greater than 10 volts?

→ **Yes**
GO to [A4](#).

→ **No**
INSTALL a new battery ground cable.
REFER to [Section 414-01](#). TEST the
system for normal operation.

A4 CHECK THE STARTER MOTOR GROUND

1



1 Measure the voltage between the battery
positive post and the starter motor case.

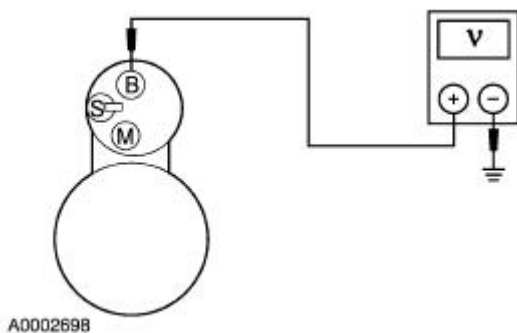
● Is the voltage greater than 10 volts?

→ **Yes**
GO to [A5](#).

→ **No**
CLEAN the starter motor mounting flange
and make sure the starter motor is
correctly mounted. TEST the system for
normal operation.

A5 CHECK THE POWER SUPPLY TO THE STARTER MOTOR

1



1 Measure the voltage between starter
motor B-terminal and ground.

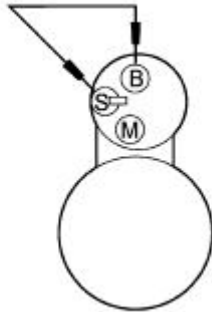
● Is the voltage greater than 10 volts?

→ **Yes**
GO to [A6](#).

→ **No**
REPAIR circuit 30-BB10 (RD). TEST the
system for normal operation.

A6 CHECK THE STARTER MOTOR B-TERMINAL

1



A0002699

1

Connect a fused jumper wire to the B-terminal of the starter motor. Momentarily connect the other lead of the jumper wire to the starter motor S-terminal.

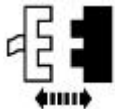
- **Did the starter motor engage and the engine crank?**

→ **Yes**
GO to [A7](#).

→ **No**
INSTALL a new starter motor; REFER to [Starter Motor—3.0L](#) or [Starter Motor—3.9L](#) in this section. TEST the system for normal operation.

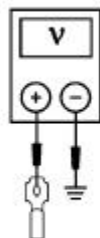
A7 CHECK THE START INPUT TO THE STARTER MOTOR

1



Starter motor C197

2



A0002700

3



2

Measure the voltage between starter motor C197, circuit 50-BB12 (GY/BK), harness side and ground while holding the ignition switch in the START position.

- **Is the voltage greater than 10 volts in START?**

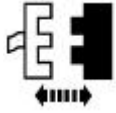
→ **Yes**
CLEAN the starter motor S-terminal and connector. CHECK the wiring and the starter motor for a loose or intermittent connection. TEST the system for normal

operation.

→ **No**
GO to [A8](#).

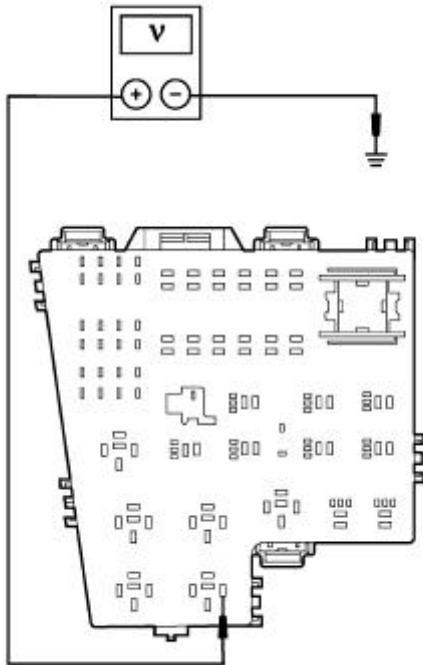
A8 CHECK THE START INPUT TO THE STARTER RELAY

1



Starter relay

5



A0003577

- 2 For manual transmissions, depress the clutch pedal position (CPP) switch.
- 3 Make sure the vehicle is in PARK or NEUTRAL.
- 4 Turn the ignition switch to START and hold.
- 5 Measure the voltage between starter relay pin 86, circuit 50–SBB12 (GY), harness side and ground.

● Is the voltage greater than 10 volts?

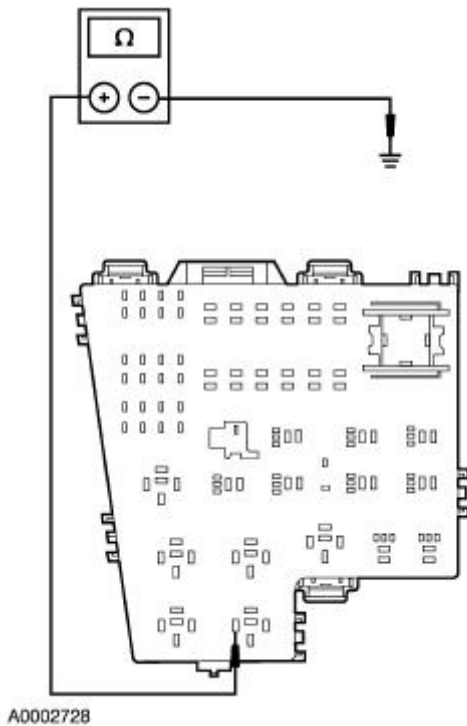
→ **Yes**
GO to [A9](#).

→ **No**
GO to [A17](#).

A9 CHECK THE GROUND SUPPLY TO THE STARTER RELAY

- 1 For manual transmissions, depress the clutch pedal position (CPP) switch.
- 2 Make sure the vehicle is in PARK or NEUTRAL.

4



3 Turn the ignition switch to START and hold.

4 Measure the resistance between the starter relay pin 85, circuit 31-SBB12 (BK/YE), harness side and ground.

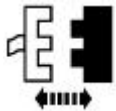
● Is the resistance less than 5 ohms?

→ **Yes**
GO to [A14](#).

→ **No**
If automatic transmission, GO to [A10](#). If manual transmission, GO to [A11](#).

A10 CHECK THE CIRCUIT 31S-BB12 FOR AN OPEN

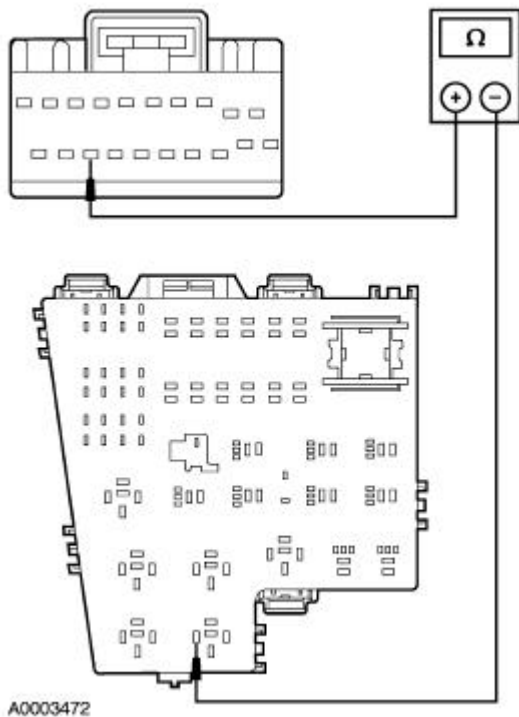
1



Instrument cluster C220b

2

2 Measure the resistance between the starter relay pin 85, circuit 31S-BB12 (BK/YE), harness side and the instrument cluster C220B pin 18, circuit 31S-BB12, harness side.

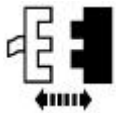


● Is the resistance less than 5 ohms?

- **Yes**
INSTALL a new instrument cluster;
REFER to [Section 413-01](#) .
- **No**
REPAIR the circuit. TEST the system for
normal operation.

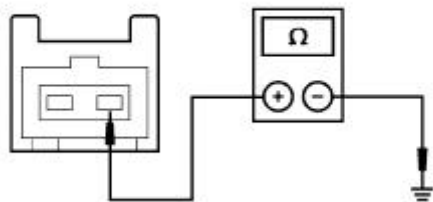
A11 CHECK THE GROUND SUPPLY TO THE CLUTCH PEDAL POSITION (CPP) SWITCH

1



CPP switch C257

3



A0002086

- 2 Turn the ignition switch to START and hold.
- 3 Measure the resistance between clutch pedal position (CPP) switch C257 pin 2, circuit 31S-BB6 (BK/YE), harness side and ground.

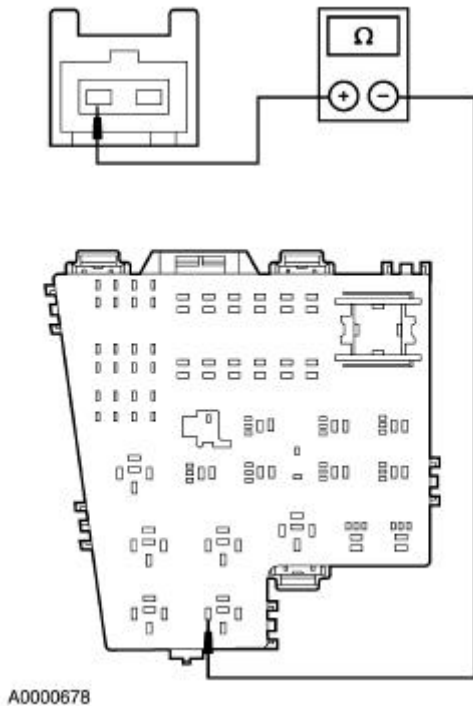
● Is the resistance less than 5 ohms?

→ **Yes**
GO to [A12](#).

→ **No**
GO to [A13](#).

A12 CHECK CIRCUIT 31S-BB12 FOR AN OPEN

1



1

Measure the resistance between clutch pedal position (CPP) switch C257 pin 1, circuit 31S-BB12 (BK/YE), harness side and the starter relay pin 85, circuit 31S-BB12 (BK/YE), harness side.

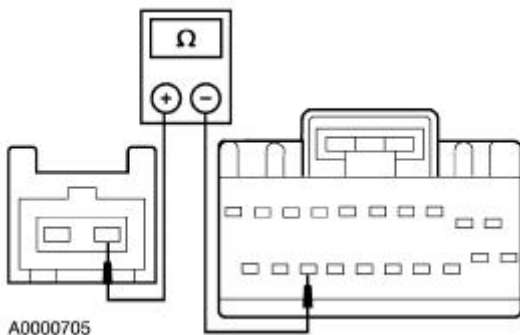
● **Is the resistance less than 5 ohms?**

→ **Yes**
INSTALL a new clutch pedal position switch (CPP); REFER to [Section 303-14](#).

→ **No**
REPAIR the circuit. TEST the system for normal operation.

A13 CHECK CIRCUIT(S) 31S-BB12 AND 31S-BB6 FOR AN OPEN

1



1

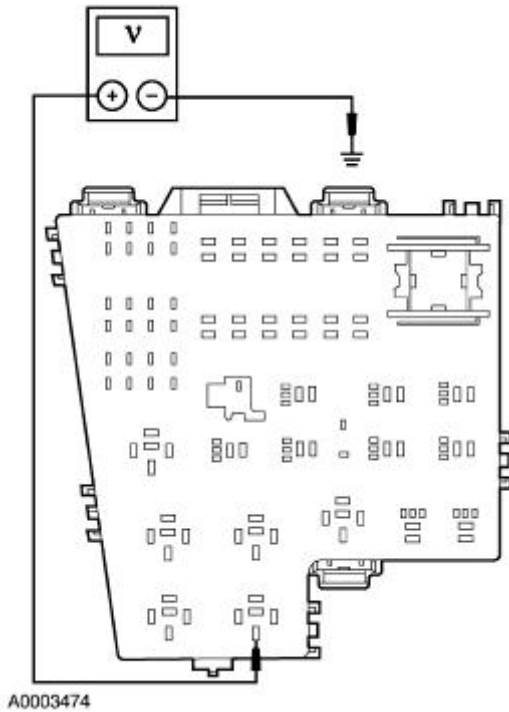
Measure the resistance between instrument cluster C220b pin 18, circuit 31S-BB12 (BK/YE), harness side and clutch pedal position (CPP) switch C257 pin 2, circuit 31S-BB6 (BK/YE), harness side.

● **Is the resistance less than 5 ohms?**

- **Yes**
INSTALL a new instrument cluster;
REFER to [Section 413-01](#). TEST the
system for normal operation.
- **No**
REPAIR the circuit(s). TEST the system
for normal operation.

A14 CHECK THE BATTERY SUPPLY TO THE STARTER RELAY

1



- 1 Measure the voltage between the starter relay pin 30, circuit 30-BB13 (RD), harness side and ground.

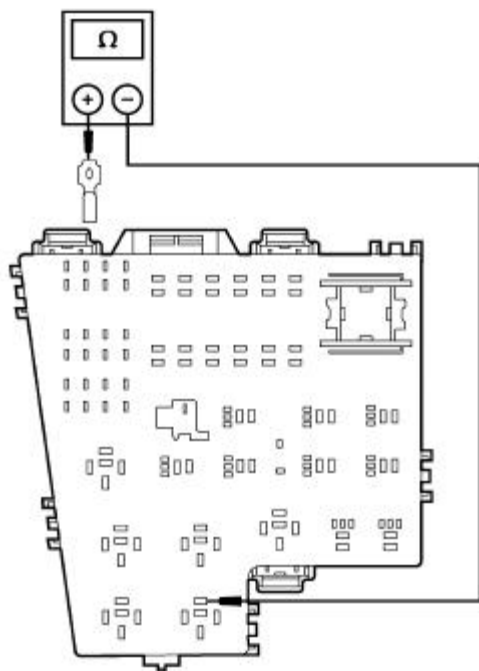
● Is the voltage greater than 10 volts?

- **Yes**
GO to [A15](#).
- **No**
REPAIR the circuit. TEST the system for normal operation.

A15 CHECK CIRCUIT 50-BB10 AND 50-BB12 FOR AN OPEN

2

- 1 Disconnect the eyelet from the starter S-terminal.
- 2 Measure the resistance between the starter relay pin 87, circuit 50-BB10 (GY/BK), harness side and the S-terminal eyelet C197, circuit 50-BB12 (GY/BK), harness side.



A0000706

● Is the resistance less than 5 ohms?

→ **Yes**

GO to [A16](#).

→ **No**

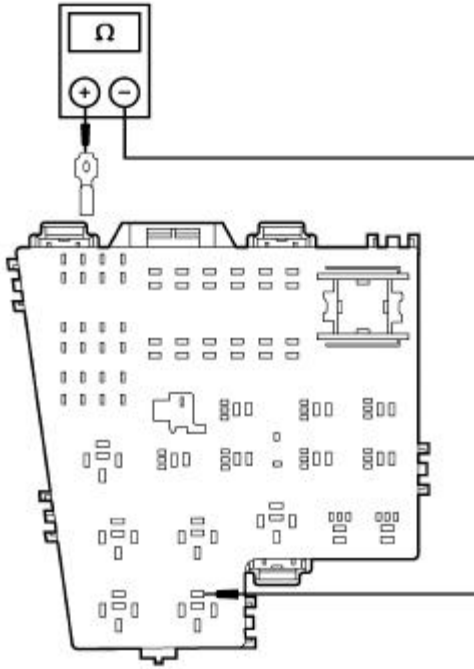
REPAIR the circuit(s). TEST the system for normal operation.

A16 CHECK CIRCUIT 50-BB10 AND 50-BB12 FOR A SHORT TO GROUND

1

1

Measure the resistance between the starter relay pin 87, circuit 50-BB10 (GY/BK), harness side and the S-terminal eyelet C197, circuit 50-BB12 (GY/BK), harness side.



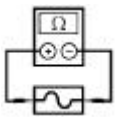
A0000706

- Is the resistance greater than 10,000 ohms?

- **Yes**
INSTALL a new starter relay. TEST the system for normal operation.
- **No**
REPAIR the circuit. TEST the system for normal operation.

A17 CHECK FUSE 1 (5A)

1



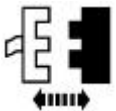
CJB Fuse F201 (5A)

- Is CJB fuse F201 (5A) open?

- **Yes**
GO to [A24](#).
- **No**
GO to [A18](#).

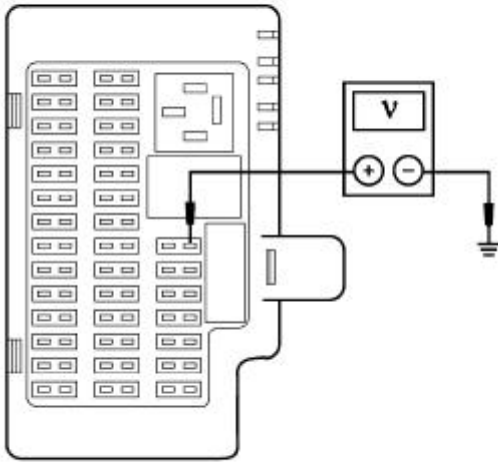
A18 CHECK THE START INPUT TO FUSE 1

1



CJB Fuse F201 (5A)

3



A0000670

- 2 Turn the ignition switch to the START position and hold.
- 3 Measure the voltage between CJB fuse F201 (5A) input terminal and ground.

● Is the voltage greater than 10 volts?

→ **Yes**
GO to [A22](#).

→ **No**
GO to [A19](#).

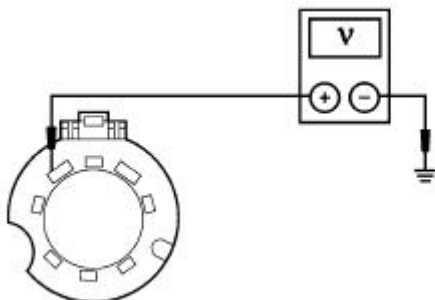
A19 CHECK THE BATTERY INPUT TO THE IGNITION SWITCH

1



Ignition switch C250

2



A0000685

- 2 Measure the voltage between ignition switch C250 pin 1, circuit 30-BB9 (RD), harness side and ground.

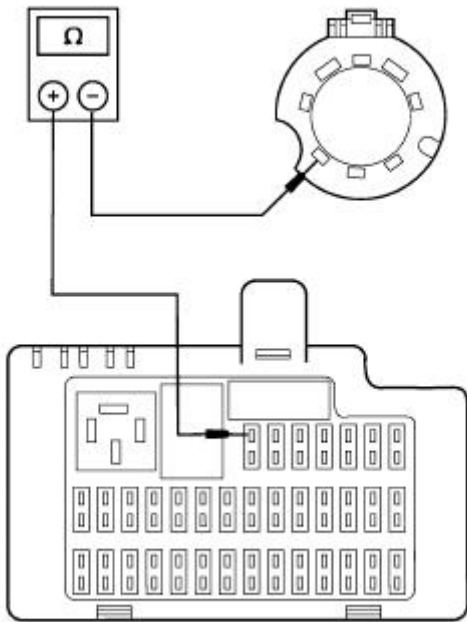
● Is the voltage greater than 10 volts?

→ **Yes**
GO to [A20](#).

→ **No**
REPAIR the circuit. TEST the system for normal operation.

A20 CHECK CIRCUIT 50-DD5 FOR AN OPEN

1



A0004195

1 Measure the resistance between the ignition switch C250 pin 3, circuit 50-DD5 (GY/BK), harness side and the CJB fuse F201 (5A) input terminal, circuit 50-DD5, harness side.

● **Is the resistance less than 5 ohms?**

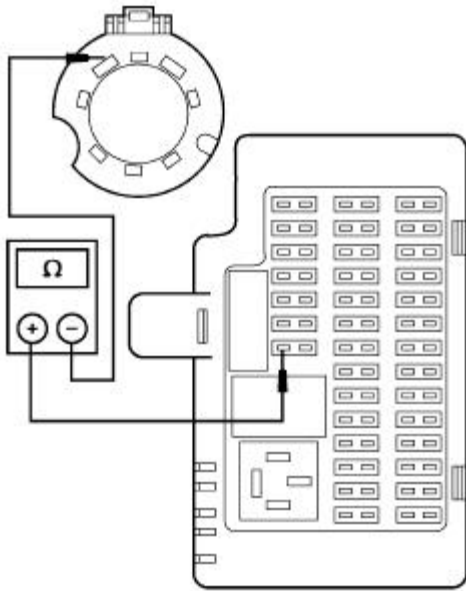
→ **Yes**
GO to [A21](#).

→ **No**
REPAIR the circuit. TEST the system for normal operation.

A21 CHECK CIRCUIT 50-DD5 FOR A SHORT TO GROUND

1

1 Measure the resistance between ignition switch C250 pin 3, circuit 50-DD5 (GY/BK), harness side and the CJB fuse F201 (5A) input terminal, circuit 50-DD5, harness side.



A0002692

- Is the resistance greater than 10,000 ohms?

- **Yes**
INSTALL a new ignition switch; [Section 211-05](#). TEST the system for normal operation.
- **No**
REPAIR the circuit. TEST the system for normal operation.

A22 CHECK CIRCUIT 50-BB15 FOR AN OPEN

1



CJB Fuse F201 (5A)

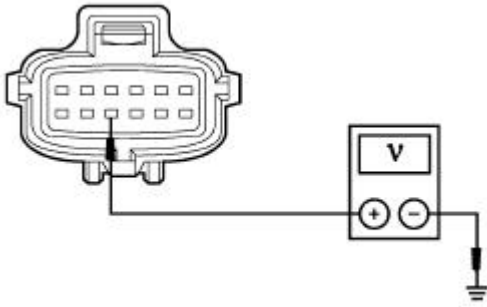
2



Digital TR sensor C167

4

- 3 Turn the ignition switch to the START position and hold.
- 4 Measure the voltage between digital TR sensor C167 pin 10, circuit 50-BB15 (GY/OG), harness side and ground.



A0002693

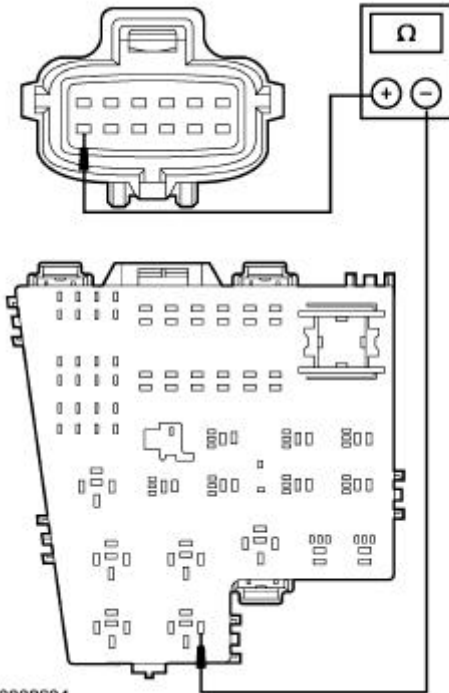
- Is the voltage greater than 10 volts?

→ **Yes**
GO to [A23](#) .

→ **No**
REPAIR the circuit. TEST the system for normal operation.

A23 CHECK CIRCUIT 50S-BB12 FOR AN OPEN

1



A0002694

1

Measure the resistance between the digital TR sensor C167 pin 12, circuit 50S-BB12 (GY), harness side and the starter relay pin 86, circuit 50S-BB12, harness side.

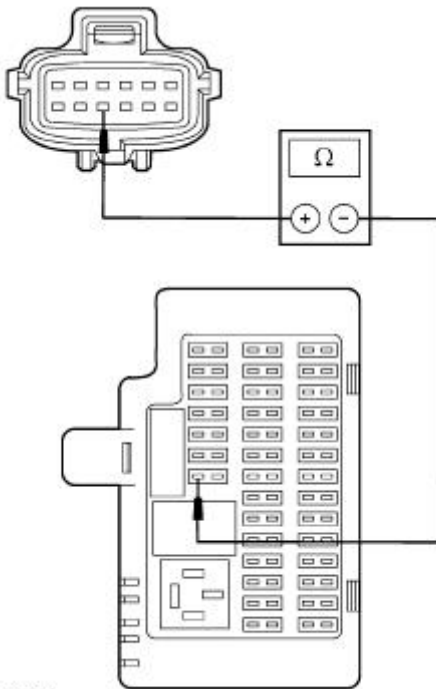
- Is the resistance less than 5 ohms?

→ **Yes**
ADJUST the digital TR sensor. For additional information, REFER to [Section 307-05](#) .

→ **No**
REPAIR the circuit. TEST the system for normal operation.

A24 CHECK CIRCUIT 50-BB15 FOR A SHORT TO GROUND

1



A0009036

1

Measure the resistance between digital TR sensor C167 pin 10, circuit 50S-BB15 (GY/OR), harness side and CJB fuse F201 (5A) output terminal C270b pin 3, circuit 50S-BB15 (GY/OR), harness side.

- Is the resistance greater than 10,000 ohms?

→ **Yes**
GO to [A25](#).

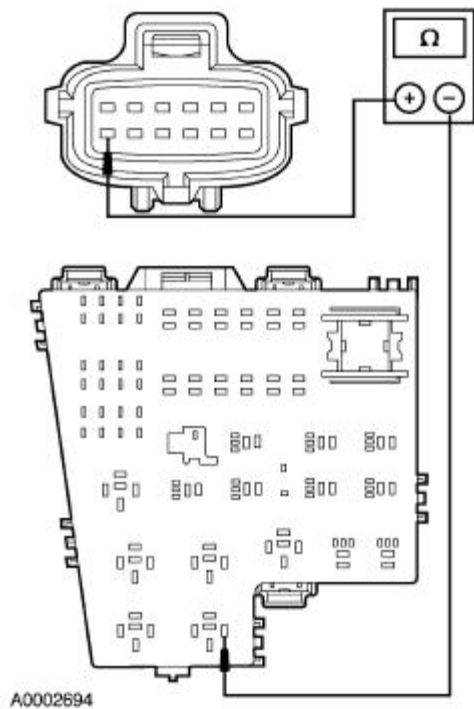
→ **No**
REPAIR the circuit. TEST the system for normal operation.

A25 CHECK CIRCUIT 50S-BB12 FOR A SHORT TO GROUND

1

1

Measure the resistance between the digital TR sensor switch C167 pin 12, circuit 50S-BB12 (GY), harness side and the starter relay pin 86, circuit 50S-BB12 (GY), harness side.



- Is the resistance greater than 10,000 ohms?

→ **Yes**
GO to [A26](#).

→ **No**
REPAIR the circuit. TEST the system for normal operation.

A26 INSTALL A NEW FUSE 1 (5A)

1



Digital TR sensor switch C167

2 Install a new CJB fuse F201 (5A). Retest the system.

- Does the fuse open?

→ **Yes**
ADJUST the digital TR sensor. For additional information, REFER to [Section 307-05](#).

→ **No**
RETEST for normal operation. VERIFY the symptom.

PINPOINT TEST B: UNUSUAL STARTER NOISE

CONDITIONS	DETAILS/RESULTS/ACTIONS
B1 CHECK THE STARTER MOUNTING	
	<p>1 Inspect the starter motor mounting bolts and brackets for looseness.</p> <ul style="list-style-type: none"> ● Is the starter motor mounted correctly? <p>→ Yes GO to B2.</p> <p>→ No INSTALL the starter motor correctly. For additional information, REFER to Starter Motor—3.0L or Starter Motor—3.9L in this section. TEST the system for normal operation.</p>
B2 CHECK FOR ENGINE NOISE	
	<p>1 Turn the ignition switch to the OFF position.</p> <p>2 Connect a fused jumper wire from the B-terminal to the S-terminal of the starter motor. Engage the starter motor and verify the noise is due to the starter operation.</p> <ul style="list-style-type: none"> ● Is the noise due to the starter motor engagement? <p>→ Yes GO to B3.</p> <p>→ No REFER to Section 303-01A or Section 303-01B to continue the diagnosis.</p>
B3 CHECK FOR UNUSUAL WEAR	
	<p>1 Remove the starter motor. For additional information, refer to Starter Motor—3.0L or Starter Motor—3.9L in this section.</p> <p>2 Inspect the ring gear for damaged or worn teeth.</p> <ul style="list-style-type: none"> ● Is the noise due to flywheel ring gear tooth damage? <p>→ Yes INSTALL a new flywheel ring gear. EXAMINE the starter pinion teeth. If damaged, INSTALL a new starter motor. For additional information, REFER to Starter Motor—3.0L or Starter Motor—3.9L in this section. TEST the system for normal operation.</p> <p>→ No INSTALL a new starter motor. For additional information, REFER to Starter Motor—3.0L or Starter Motor—3.9L in this section. TEST the system for normal operation.</p>

Component Tests



WARNING: When repairing the starter motor or carrying out other underhood work in the vicinity of the starter motor, be aware that the heavy gauge battery input lead at the starter solenoid is "electrically hot" at all times. Failure to follow these instructions may result in personal injury.

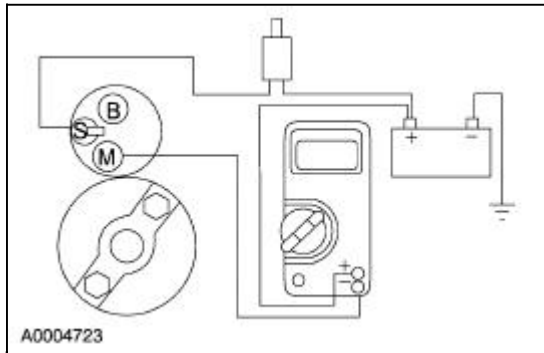


CAUTION: A protective cap or boot is provided over the battery input terminal on all vehicle lines and must be installed after repairing. Be sure to disconnect the battery ground cable before repairing the starter motor.

Connect the 73III Automotive Meter at the component terminal rather than at the wiring end connector. Making a connection at the wiring end connector could result in false readings because the meter will not pick up a high resistance between the wiring connector and the component.

Starter Motor—Motor Feed Circuit

1. Make sure the battery is fully charged. Carry out a battery load test. For additional information, refer to [Section 414-00](#).
2. Disconnect the inertia fuel shutoff (IFS) switch (9341).
3. Connect a remote starter switch between the starter solenoid S-terminal and the battery positive (+) terminal.
4. Connect the 73III Automotive Meter positive lead to the battery positive (+) post. Connect negative lead to the M-terminal.

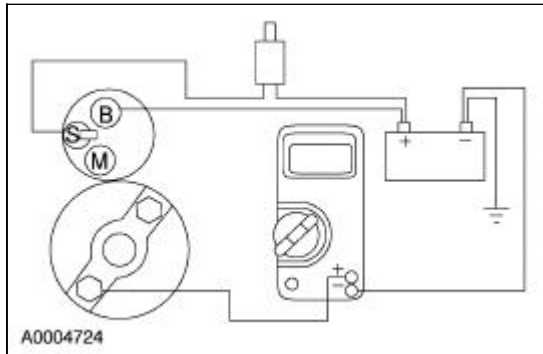


5. Engage the remote starter switch. Read and record the voltage. The voltage reading should be 0.8 volt or less.
6. If the voltage reading is 0.8 volt or less, go to the Starter Motor-Ground Circuit Component Test.
7. If the voltage reading is greater than 0.8 volt, this is an indication of excessive resistance in the connections, the positive battery cable or in the starter solenoid. Move the 73III Automotive Meter negative lead to the starter solenoid B-terminal and repeat the test. If the voltage reading at the B-terminal is lower than 0.8 volt, the concern is either in the connections at the starter solenoid or in the solenoid contacts.
8. Remove the cables from solenoid B-, S- and M-terminals. Clean the cables and connections and reinstall the cables to the correct terminals. Repeat Steps 3 through 6. If the voltage drop reading is still greater than 0.8 volt when checked at the M-terminal or less than 0.8 volt when checked at the B-terminal, the concern is in the solenoid contacts. Install a new starter motor.
9. If the voltage reading taken at the solenoid B-terminal is still greater than 0.8 volt after cleaning the cables and the connections at the solenoid, the concern is either in the positive (+) battery cable connection or in the positive battery cable itself. Clean the positive (+) battery cable connection. If this does not solve the problem, install a new positive battery cable. Refer to [Section 414-01](#).

Starter Motor—Ground Circuit

A slow cranking condition can be caused by resistance in the ground or return portion of the cranking circuit. Check the voltage drop in the ground circuit as follows:

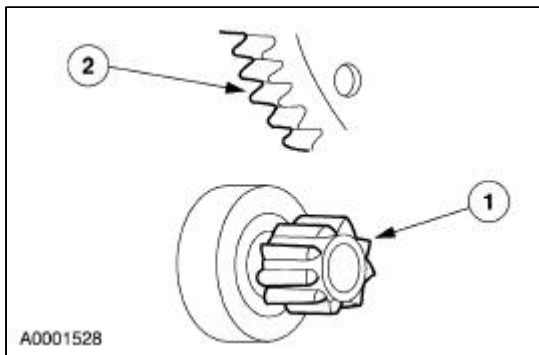
1. Connect the 73III Automotive Meter positive lead to the starter motor housing (the connection must be clean and free of rust or grease). Connect the negative lead to the negative (-) battery terminal.



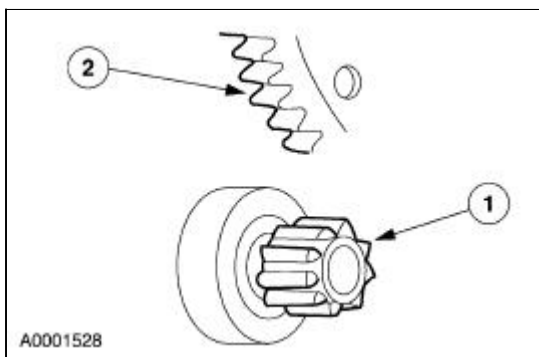
2. Engage the remote starter switch and crank the engine. Read and record the voltage reading. The reading should be 0.5 volt or less.
 3. If the voltage is more than 0.5 volt, clean the negative cable connections at the battery, the body ground connections, and the starter ground connections. Retest.
 4. If the voltage is more than 0.5 volt, install a new cable. If the voltage reading is less than 0.5 volt and the engine still cranks slowly, install a new starter motor.
-

Starter Drive and Flywheel Ring Gear Inspection

1. Remove the starter motor (11002). For additional information, refer to [Starter Motor—3.0L](#) and [Starter Motor—3.9L](#) in this section.
2. Check the wear patterns on the (1) starter drive gear and the (2) flywheel ring gear. If the wear pattern is normal, install the starter motor. For additional information, refer to [Starter Motor—3.0L](#) and [Starter Motor—3.9L](#) in this section.



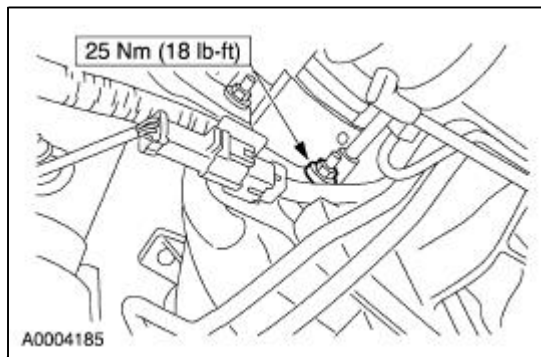
3. If the (1) starter drive gear and the (2) flywheel ring gear are not fully meshing or the gears are milled or damaged, install a new starter motor and, if necessary, a new flywheel gear. For additional information, refer to [Starter Motor—3.0L](#) and [Starter Motor—3.9L](#) in this section or [Section 303-01A](#).



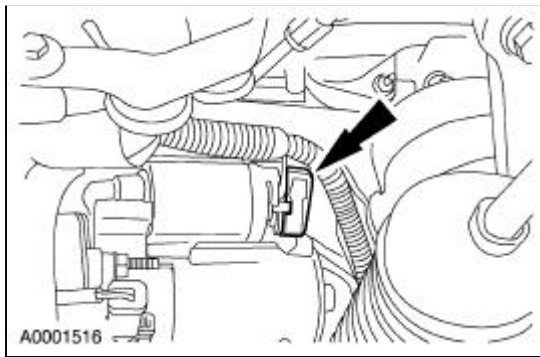
Starter Motor —3.0L

Removal

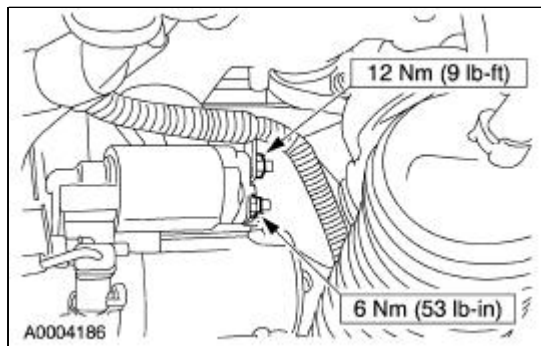
1. Disconnect the battery ground cable (14301). For additional information, refer to [Section 414-01](#).
2. Raise and support the vehicle. For additional information, refer to [Section 100-02](#).
3. Disconnect the ground strap.



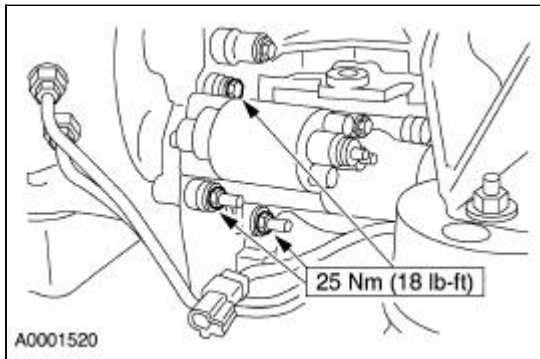
4. Remove the cover.



5. Remove the nuts and position the cables aside.



6. Remove the bolts, two stud bolts and the starter motor (11002).



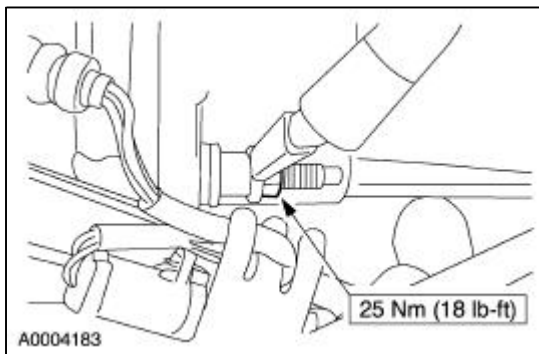
Installation

1. To install, reverse the removal procedure.
-

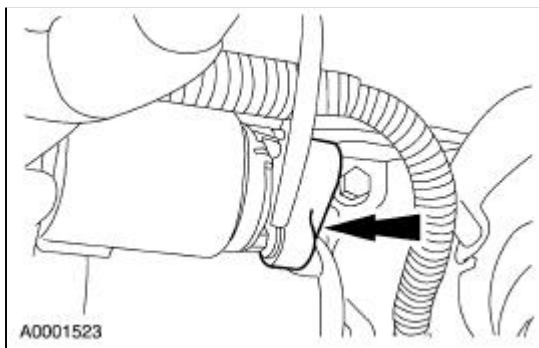
Starter Motor —3.9L

Removal

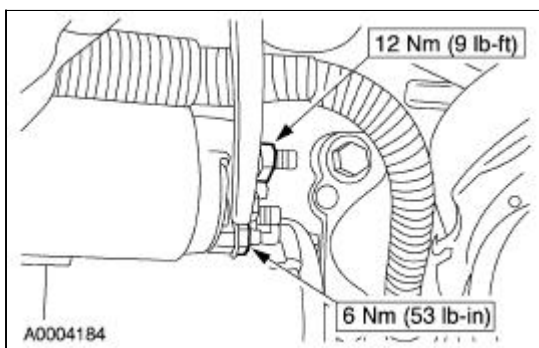
1. Disconnect the battery ground cable (14301). For additional information, refer to [Section 414-01](#).
2. Raise and support the vehicle. For additional information, refer to [Section 100-02](#).
3. Disconnect the ground strap.



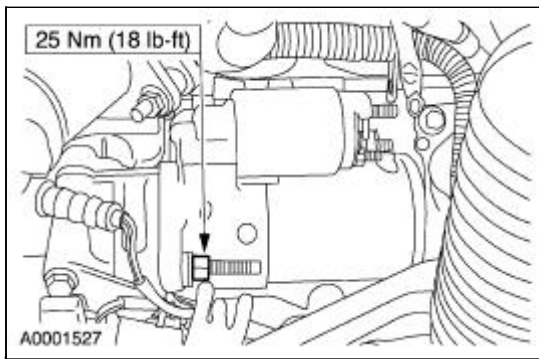
4. Remove the cover.



5. Remove the nuts and position the cables aside.



6. Remove the bolt, stud bolt and the starter motor (11002).



Installation

1. To install, reverse the removal procedure.
-

General Specifications

Item	Specification
Firing order	1-4-2-5-3-6
Spark plug type	AGSF-32FS
Spark plug gap	1.30-1.45 mm (0.051-0.057 inch)

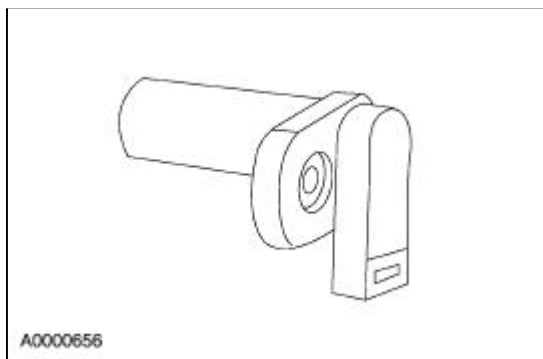
Torque Specifications

Description	Nm	lb-ft	lb-in
Spark plugs	15	11	—
Ignition coil bolts	6	—	53

Engine Ignition

The electronic ignition (EI) system is a coil-on-plug (COP) ignition system. The COP ignition system consists of the following components:

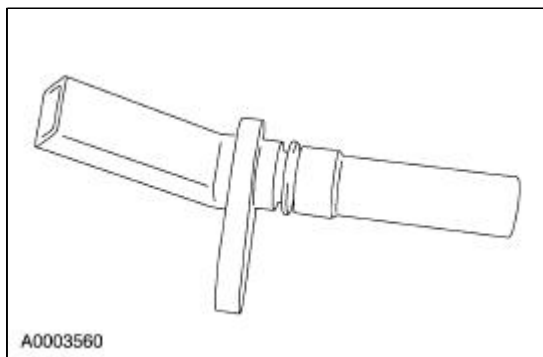
- crankshaft position (CKP) sensor
- camshaft position (CMP) sensor
- ignition coils
- spark plugs



The crankshaft position sensor:

- is a variable reluctance sensor.
- is mounted on the engine front cover.
- is triggered by a 36-minus-1 tooth trigger wheel mounted on the crankshaft.
- provides base timing and crankshaft speed (rpm) to the powertrain control module (PCM).

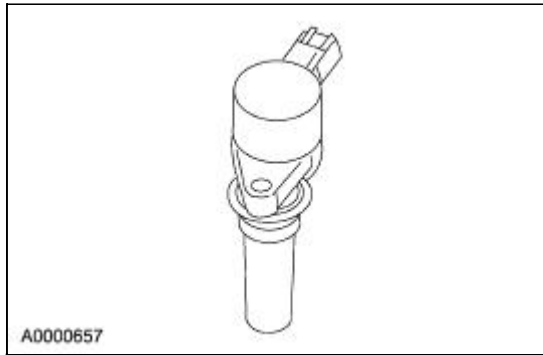
Refer to [Section 303-14](#) for removal and installation of the crankshaft position sensor.



The camshaft position sensor:

- sends the powertrain control module (PCM) a signal indicating camshaft position used for fuel synchronization.

Refer to [Section 303-14](#) for removal and installation of the camshaft position sensor.



The six separate ignition coils:

- convert low voltage signals from the powertrain control module to high voltage pulses.
- produce the high voltage pulses for the spark plugs.
- are connected directly to each spark plug.

The spark plugs:

- convert a high voltage pulse into a spark which ignites the fuel and air mixture.
 - originally installed on the vehicle have a platinum-enhanced active electrode for long life.
-

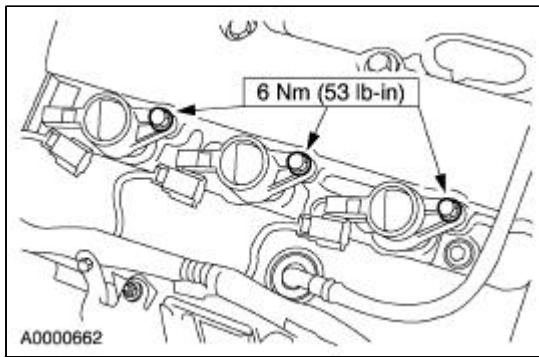
Engine Ignition

Refer to the Powertrain Control/Emissions Diagnosis (PC/ED) manual.

Ignition Coil

Removal

1. Remove the engine appearance cover.
2. To access the RH bank ignition coils, remove the upper intake manifold. For additional information, refer to [Section 303-01A](#).
3. Disconnect the electrical connector from the ignition coils.
4. Remove the bolts.



5. Remove the ignition coils.

Installation

1. **NOTE:** Verify the ignition coils are seated and the boots are not damaged. If the boots are damaged, install a new ignition coil.

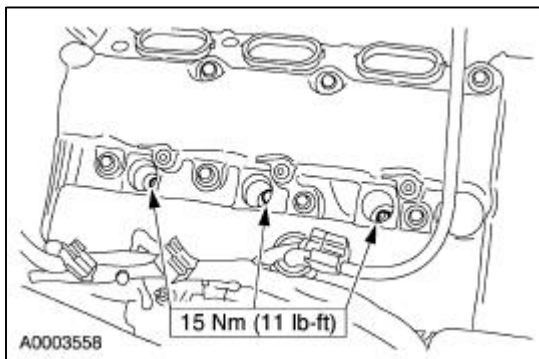
To install, reverse the removal procedure.

Spark Plug

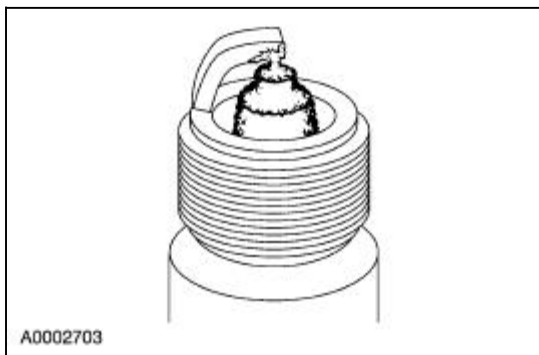
Removal

1. Remove the ignition coil. For additional information, refer to [Ignition Coil](#) in this section.
2. **NOTE:** Use compressed air to remove any foreign material from the spark plug well before removing the spark plugs.

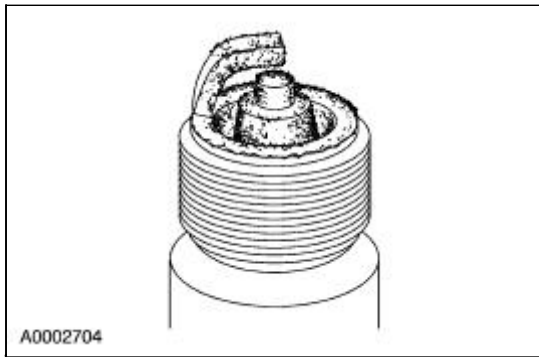
Remove the spark plugs.



3. Inspect for a bridged gap.
 - Check for deposit build-up closing the gap between electrodes. Deposits are caused by oil or carbon fouling.
 - Clean the spark plug.

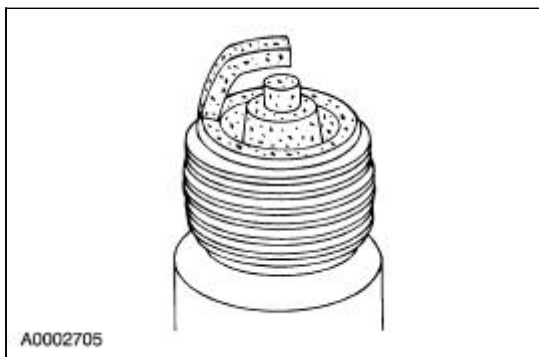


4. Inspect for oil fouling, identified by wet, black deposits on the insulator shell bore electrodes. This is caused by excessive oil entering the combustion chamber through worn rings and pistons, excessive valve-to-guide clearance or worn or loose bearings.
 - Correct the oil leak concern.
 - Install a new spark plug.



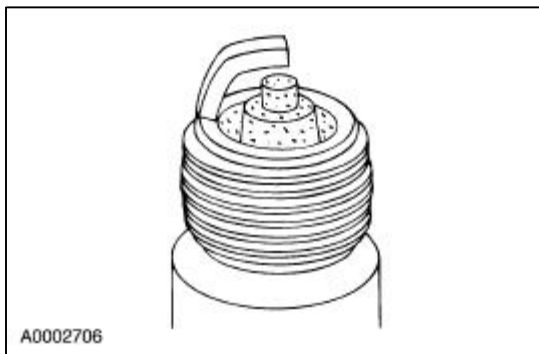
5. Inspect for carbon fouling, identified by black, dry, fluffy carbon deposits on the insulator tips, exposed shell surfaces and electrodes. This is caused by a spark plug with an incorrect heat range, dirty air cleaner, too rich a fuel mixture or excessive idling.

- Clean the spark plug.



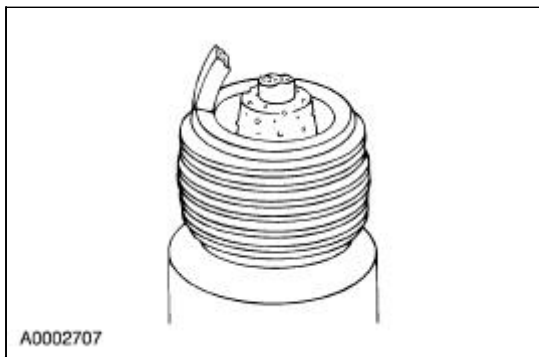
6. Inspect for normal burning.

- Check for light tan or gray deposits on the firing tip.



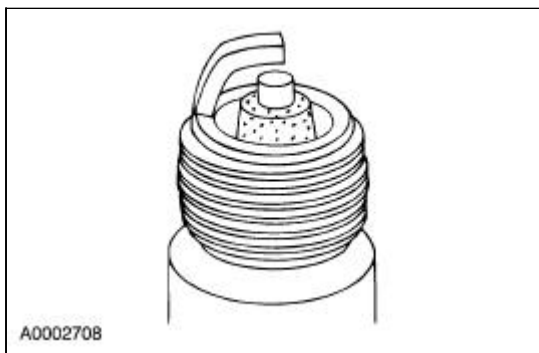
7. Inspect for pre-ignition, identified by melted electrodes and possibly a damaged insulator. Metallic deposits on the insulator indicate engine damage. Pre-ignition may be caused by incorrect ignition timing, wrong type of fuel or the installation of a heli-coil insert in place of the spark plug threads.

- Install a new spark plug.



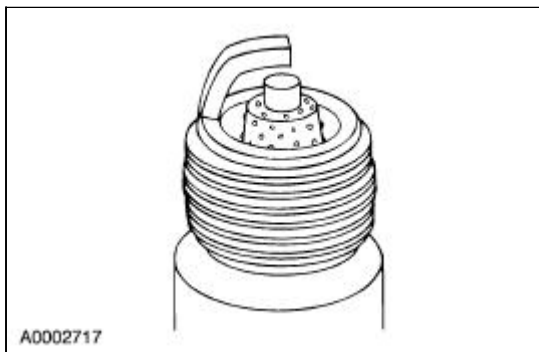
8. Inspect for overheating, identified by a white or light gray insulator with small black or gray-brown spots with bluish-burnt appearance of electrodes. This is caused by engine overheating, wrong type of fuel, loose spark plugs, spark plugs with an incorrect heat range, low fuel pump pressure or incorrect ignition timing.

- Install a new spark plug.

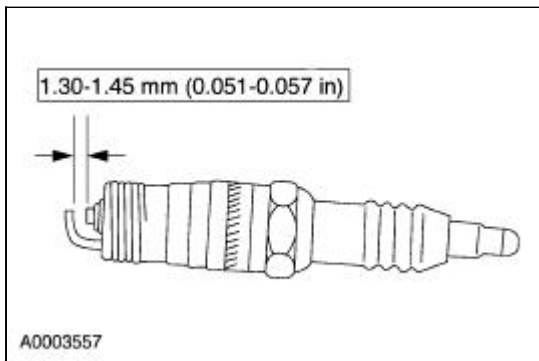


9. Inspect for fused spot deposits, identified by melted or spotty deposits resembling bubbles or blisters. This is caused by sudden acceleration.

- Clean the spark plug.



10. Adjust the spark plug gap as necessary.



Installation

1. To install, reverse the removal procedure.
-

General Specifications

Item	Specification
Firing order	1-5-4-2-6-3-7-8
Spark plug type	AGSP-32F
Spark plug gap	0.99-1.09 mm (0.039-0.043 inch)
Silicone Brake Caliper Grease and Dielectric Compound D7AZ-19A331-A	ESE-M1C171-A

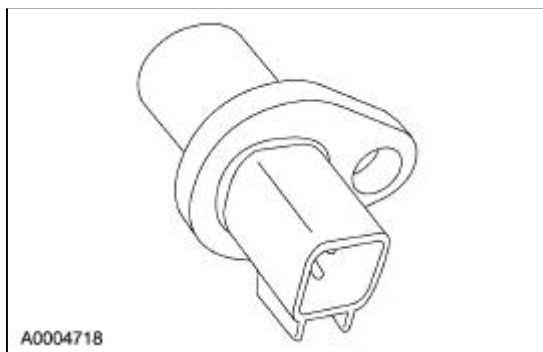
Torque Specifications

Description	Nm	lb-ft	lb-in
Ignition coil cover bolts	5	—	44
Spark plugs	26	19	—
Ignition coil bolts	5	—	44

Engine Ignition

The electronic ignition (EI) system is a coil-on-plug (COP) ignition system. The COP ignition system consists of the following components:

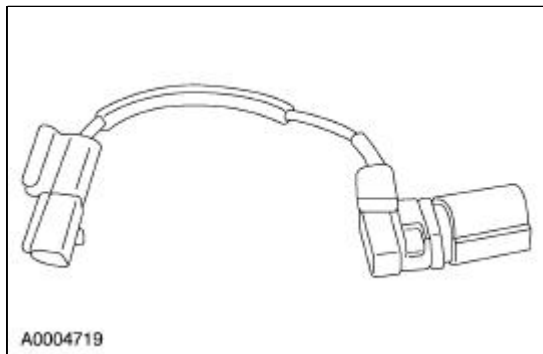
- crankshaft position (CKP) sensor
- camshaft position (CMP) sensor
- ignition coils
- spark plugs



The crankshaft position sensor:

- is a variable reluctance sensor.
- is mounted on the sump body under the engine.
- is triggered by the flywheel.
- provides base timing and crankshaft speed (rpm) to the powertrain control module (PCM).

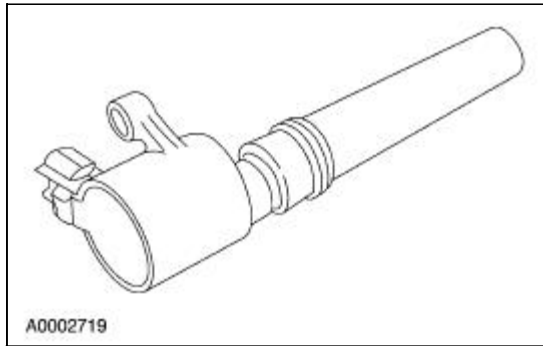
Refer to [Section 303-14](#) for removal and installation of the crankshaft position sensor.



The camshaft position sensor:

- sends the powertrain control module (PCM) a signal indicating camshaft position used for fuel synchronization.
- indicates top dead center.

Refer to [Section 303-14](#) for removal and installation of the camshaft position sensor.



The eight separate ignition coils:

- convert low voltage signals from the powertrain control module to high voltage pulses.
- produce the high voltage pulses for the spark plugs.
- are connected directly to each spark plug.

The spark plugs:

- convert the high voltage pulse into a spark which ignites the fuel and air mixture.
 - originally installed on the vehicle have a platinum-enhanced active electrode for long life.
-

Engine Ignition

Refer to the Powertrain Control/Emissions Diagnosis (PC/ED) manual.

Ignition Coil

Material

Item	Specification
Silicone Brake Caliper Grease and Dielectric Compound D7AZ-19A331-A	ESE-M1C171-A

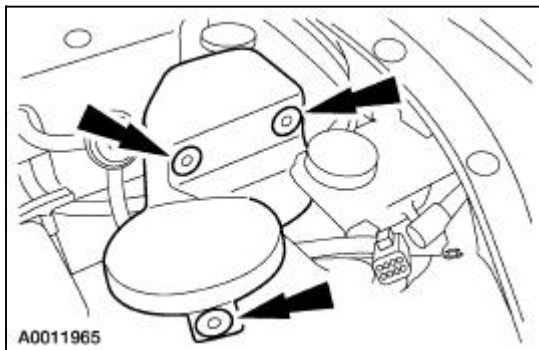
Removal and Installation

Right side ignition coils

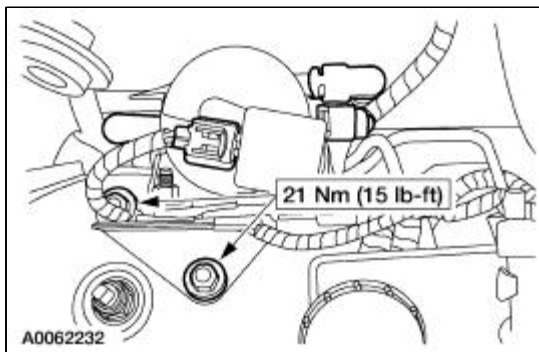
1. Remove the air cleaner outlet tube. For additional information, refer to [Section 303-12](#).

Left side ignition coils

2. Remove the evaporative emission canister purge valve cover.



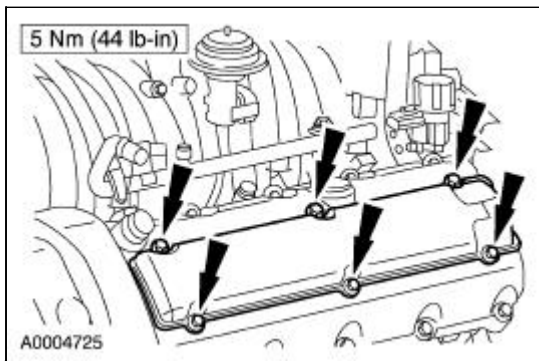
3. Remove the evaporative emission canister purge valve bracket nuts and position aside.



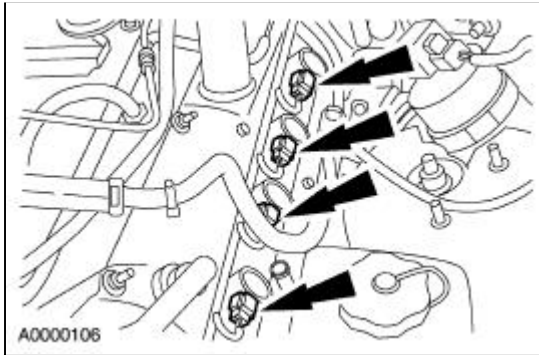
Left and right side ignition coils

4. **NOTE:** Left side shown, right side similar.

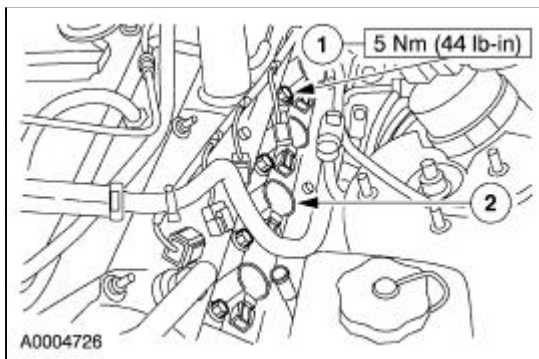
Remove the bolts and the ignition coil cover.



5. Disconnect the electrical connector from each ignition coil.



6. Remove the ignition coils.
 1. Remove the bolts.
 2. Remove the ignition coils.



7. **NOTE:** Apply silicone brake caliper grease and dielectric compound to the inside of ignition coil boots.

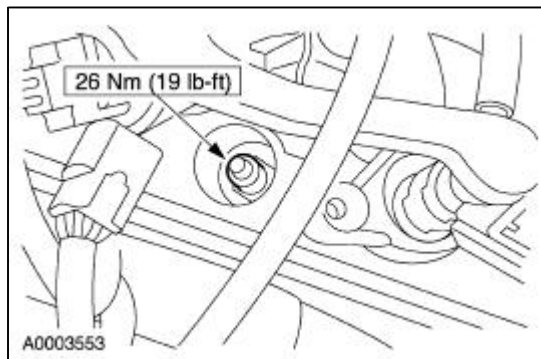
To install, reverse the removal procedure.

Spark Plug

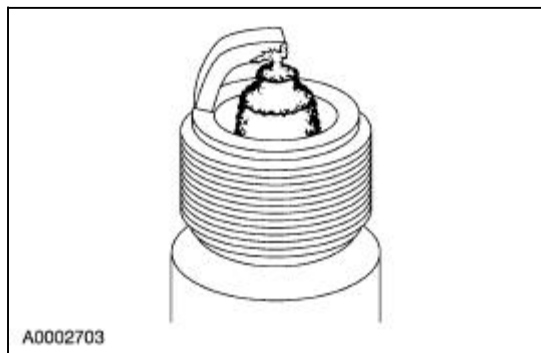
Removal

1. Remove the ignition coil. For additional information, refer to [Ignition Coil](#) in this section.
2. **NOTE:** Use compressed air to remove any foreign material from the spark plug well before removing the spark plugs.

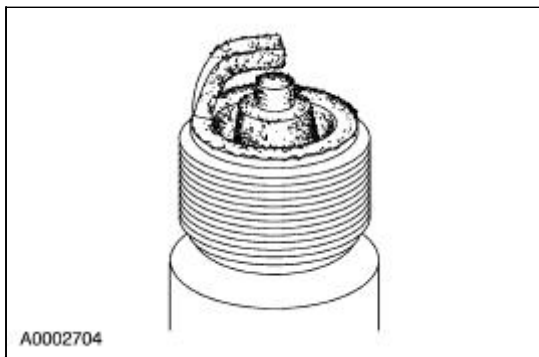
Remove the spark plugs.



3. Inspect for a bridged gap.
 - Check for deposit build-up closing the gap between electrodes. Deposits are caused by oil or carbon fouling.
 - Clean the spark plug.

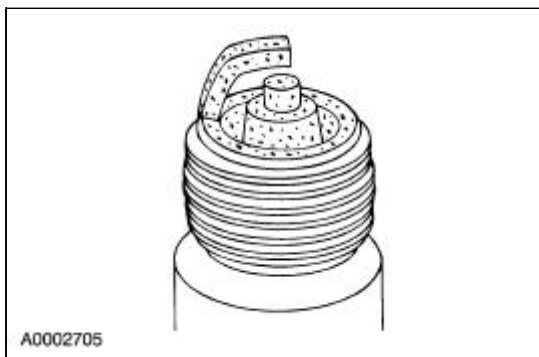


4. Inspect for oil fouling, identified by wet, black deposits on the insulator shell bore electrodes. This is caused by excessive oil entering the combustion chamber through worn rings and pistons, excessive valve-to-guide clearance or worn or loose bearings.
 - Correct the oil leak concern.
 - Install a new spark plug.



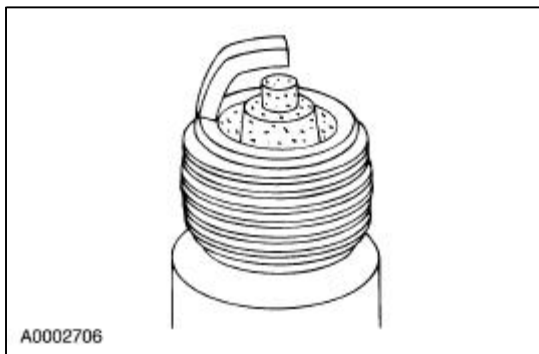
5. Inspect for carbon fouling, identified by black, dry, fluffy carbon deposits on the insulator tips, exposed shell surfaces and electrodes. This is caused by a spark plug with an incorrect heat range, dirty air cleaner, too rich a fuel mixture or excessive idling

- Clean the spark plug.



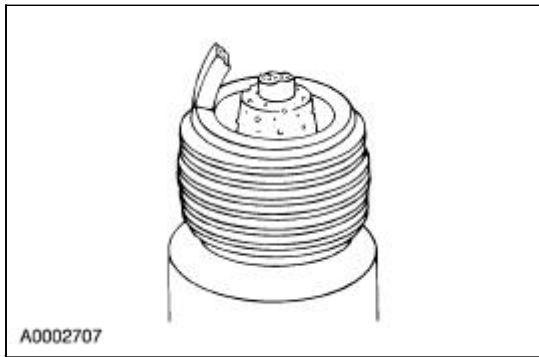
6. Inspect for normal burning.

- Check for light tan or gray deposits on the firing tip.



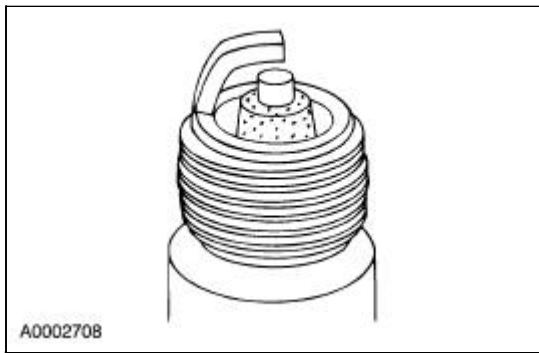
7. Inspect for pre-ignition, identified by melted electrodes and possibly a damaged insulator. Metallic deposits on the insulator indicate engine damage. Pre-ignition may be caused by incorrect ignition timing, wrong type of fuel or the installation of a heli-coil insert in place of the spark plug threads.

- Install a new spark plug.



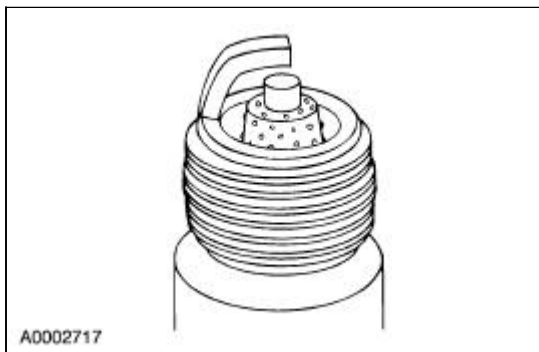
8. Inspect for overheating, identified by a white or light gray insulator with small black or gray-brown spots with bluish-burnt appearance of electrodes. This is caused by engine overheating, wrong type of fuel, loose spark plugs, spark plugs with an incorrect heat range, low fuel pump pressure or incorrect ignition timing.

- Install a new spark plug.



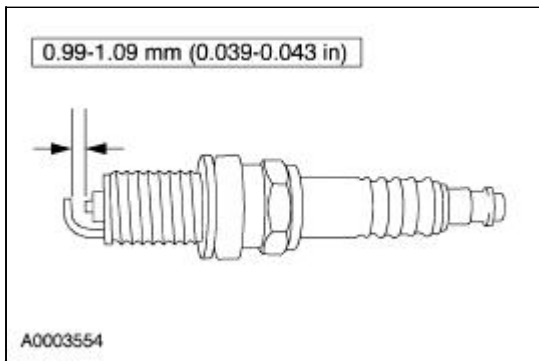
9. Inspect for fused spot deposits, identified by melted or spotty deposits resembling bubbles or blisters. This is caused by sudden acceleration.

- Clean the spark plug.



10. Inspect to make sure the platinum tip is present.

11. Adjust the spark plug gap as necessary.



Installation

1. To install, reverse the removal procedure.
-

Torque Specifications

Description	Nm	lb-ft	lb-in
EGR valve bolts	25	18	—
EGR valve to exhaust manifold tube fittings	^a	—	—
EVR solenoid	5	—	44
Differential pressure feedback EGR	6	—	53
Cross vehicle support	20	15	—
Crankcase vent oil separator	10	—	89
Secondary air tube	38	28	—
Secondary air tube bolt	10	—	89
Secondary air valve	10	—	89
Secondary air pump	10	—	89

^a Refer to the procedure in this section.

Engine Emission Control

⚠ CAUTION: Do not remove any part of the engine emission control system. Operating the engine without the engine emission control system will reduce fuel economy and engine ventilation. This will weaken engine performance and shorten engine life.

The engine emission control consists of the:

- positive crankcase ventilation (PCV) system.
- exhaust gas recirculation (EGR) system.
- secondary air system (3.0L only).

The Vehicle Emission Control Information (VECI) decal shows:

- the components of the emission control system.
- the correct vacuum hose routing.

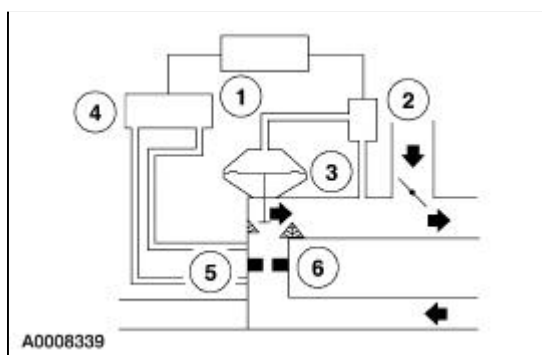
For additional information, refer to [Section 100-01](#).

The PCV system uses intake manifold vacuum to ventilate the crankcase and return the fumes to the intake manifold for combustion.

The PCV valve (3.0L only):

- controls the amount of ventilating air and blow-by gases going to the intake manifold.
- prevents a backfire from reaching the crankcase.

EGR System Components



Item	Part Number	Description
1	12A650	Powertrain control module
2	9J459	EGR vacuum regulator solenoid
3	9D475	EGR valve
4	9J433	Differential pressure feedback EGR
5	—	Metering orifice (part of 9D477)

The EGR system returns a portion of the exhaust gas to the intake manifold to reduce the combustion temperature. This results in lower nitrous oxide formation.

The EGR vacuum regulator solenoid (9J459) uses input from the PCM to change the EGR valve operation.

The EGR valve-to-exhaust manifold tube:

- connects the exhaust manifold (9430) to the EGR valve.
- has two tubes connecting to the differential pressure feedback EGR for EGR flow monitoring.

The differential pressure feedback EGR:

- monitors the EGR flow rate through the EGR valve-to-exhaust manifold tube.
- sends an EGR flow rate signal to the PCM.

The powertrain control module (PCM) (12A650) controls the EGR vacuum regulator solenoid. The EGR vacuum regulator solenoid controls the vacuum to the EGR valve. When the EGR valve opens, exhaust gas flows to the intake manifold. The differential pressure feedback EGR (9J433) measures the flow through the EGR valve from the exhaust manifold tube (9D477) and sends a signal to the PCM. A metering orifice in the EGR valve-to-exhaust manifold tube restricts the flow rate when the EGR valve (9D475) is open.

The secondary air system is used to reduce hydrocarbons (HC) by introducing oxygen into the exhaust gas stream. It operates at startup for the first 90 seconds.

Engine Emission Control

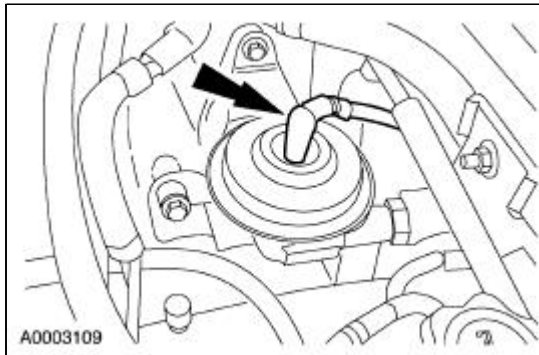
Refer to the Powertrain Control/Emissions Diagnosis (PC/ED) manual.

EGR Valve

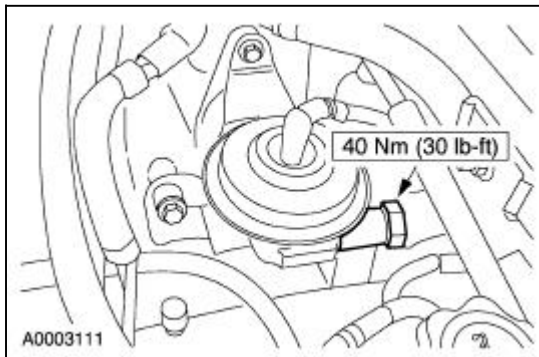
Removal and Installation

NOTE: The 3.9L is shown, the 3.0L is similar.

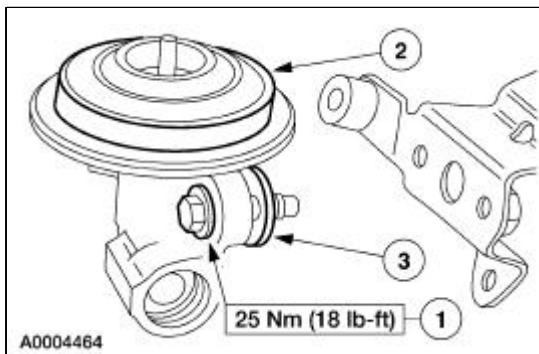
1. Disconnect the vacuum hose.



2. Disconnect the exhaust gas recirculation (EGR) tube from the EGR valve.



3. Remove the EGR valve.
 1. Remove the bolts.
 2. Remove the EGR valve.
 3. Remove and discard the gasket and clean the sealing surfaces.

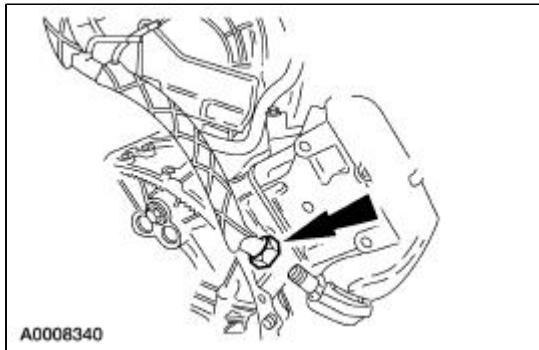


4. To install, reverse the removal procedure.
 - Install a new gasket.

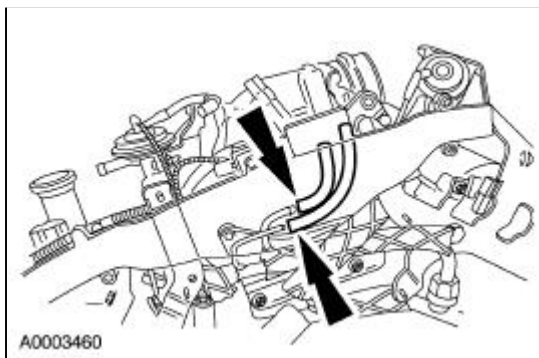
EGR Valve Tube —3.0L

Removal

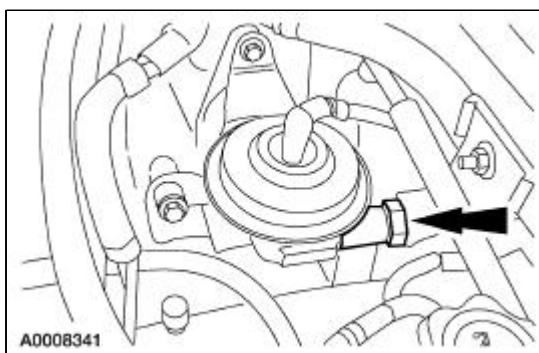
1. Raise and support the vehicle. For additional information, refer to [Section 100-02](#).
2. Disconnect the EGR tube from the exhaust manifold.



3. Lower the vehicle.
4. Disconnect the differential pressure feedback EGR hoses.

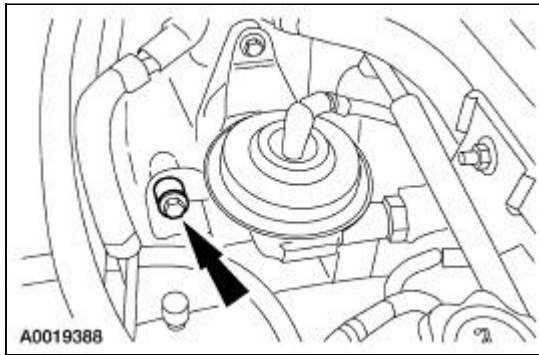


5. Disconnect the EGR tube from the EGR valve.
 - Remove the tube from the vehicle.

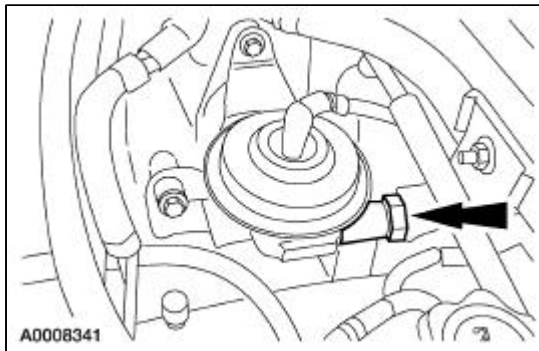


Installation

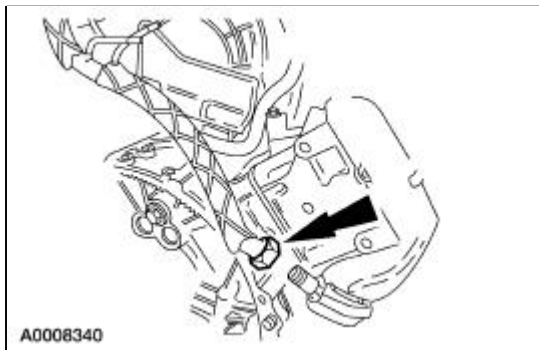
1. Loosen the two EGR valve bolts.



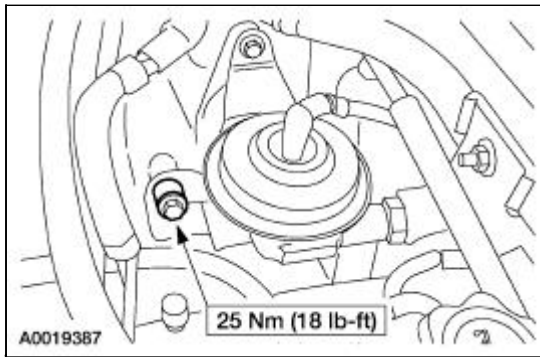
2. Hand-tighten the EGR valve tube to the EGR valve.



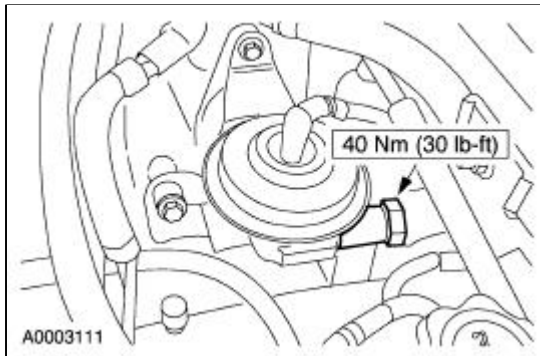
3. Raise and support the vehicle. For additional information, refer to [Section 100-02](#).
4. Tighten the EGR valve tube to the exhaust manifold in two stages:
 - Stage 1: Hand-tighten the EGR valve tube to the exhaust manifold.
 - Stage 2: Tighten the EGR valve tube to 40 Nm (30 lb-ft).



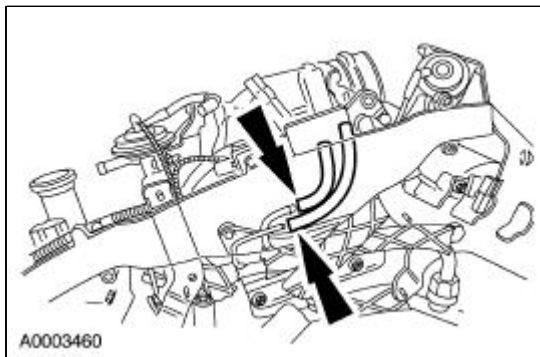
5. Lower the vehicle.
6. Tighten the two EGR valve bolts.



7. Tighten the EGR valve tube to the EGR valve.



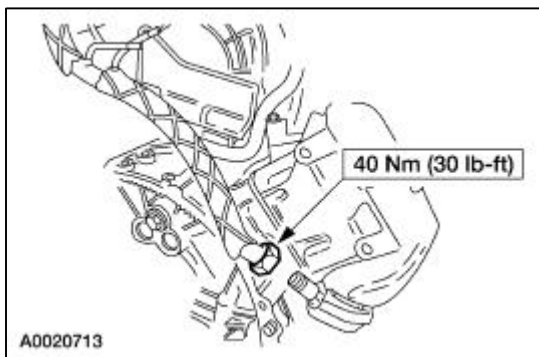
8. Connect the differential pressure feedback EGR hoses.



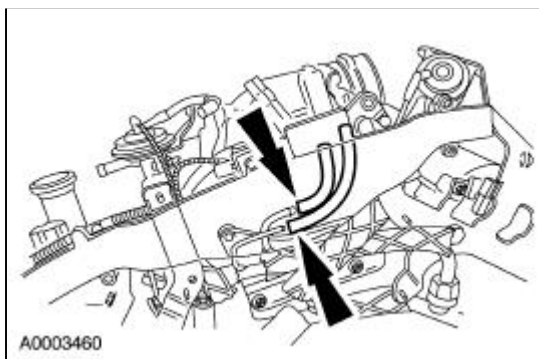
EGR Valve Tube —3.9L

Removal and Installation

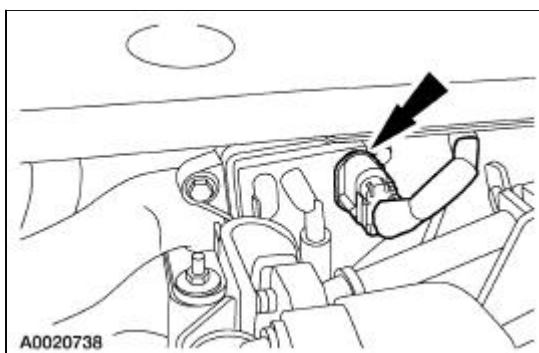
1. Disconnect the battery ground cable. For additional information, refer to [Section 414-01](#).
2. Remove the cabin air filter. For additional information, refer to [Section 412-01](#).
3. Disconnect the exhaust gas recirculation (EGR) tube from the exhaust manifold.
 - Loosen the compression nut.



4. Disconnect the differential pressure feedback EGR (DPFE) hoses.

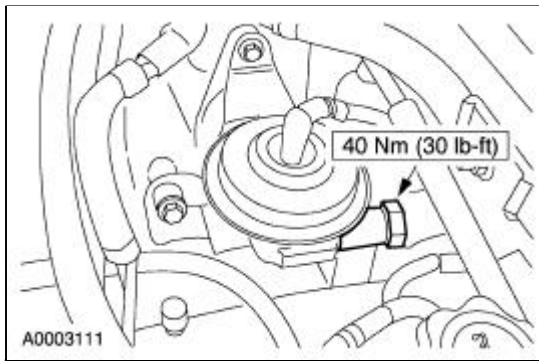


5. Disconnect the DPFE electrical connector.

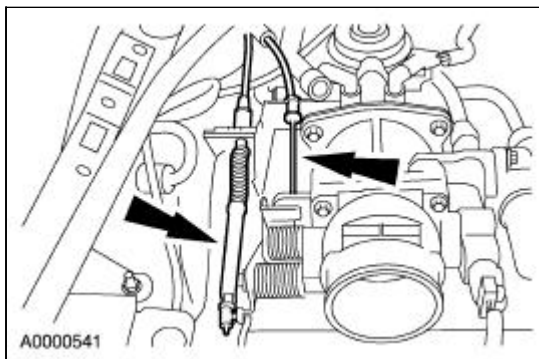


6. Disconnect the EGR tube from the EGR valve.

- Loosen the compression nut.

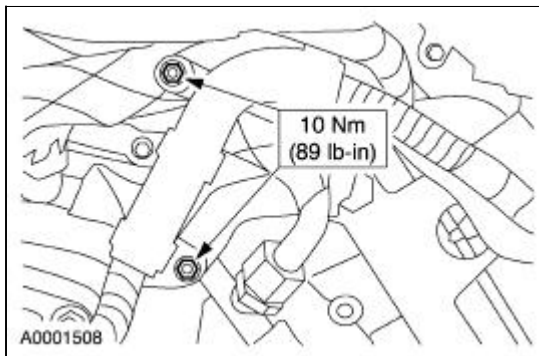


7. Disconnect the accelerator and speed control cables.



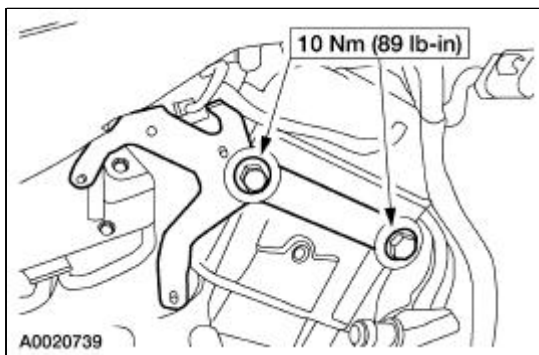
8. Position the wire harness bracket aside.

- Remove the nuts.



9. Position the bracket aside.

- Remove the bolts.

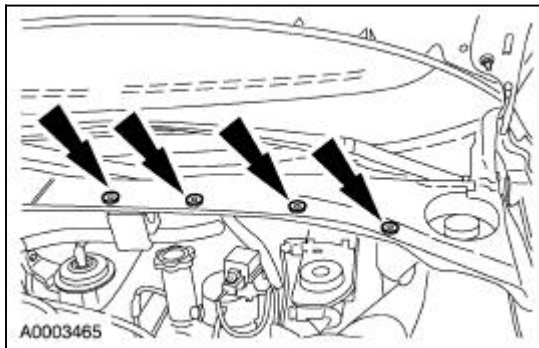


10. Remove the EGR tube from the vehicle.
 11. To install, reverse the removal procedure.
-

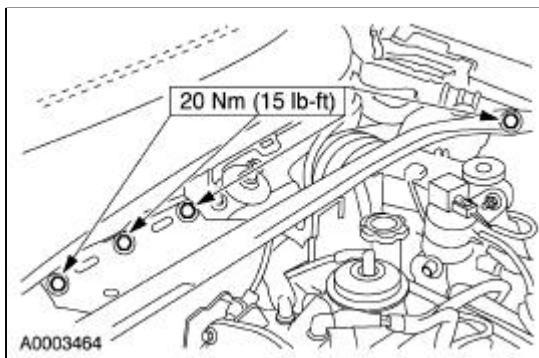
Differential Pressure Feedback EGR —3.0L

Removal and Installation

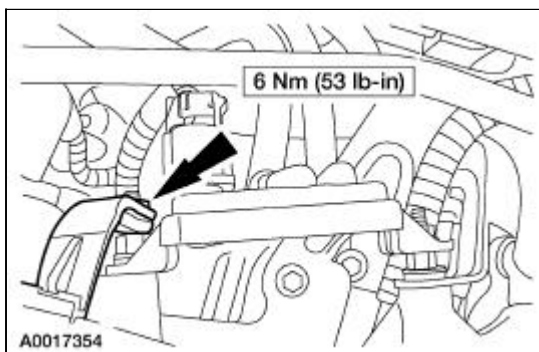
1. Remove the cowl vent screen. For additional information, refer to [Section 501-02](#).



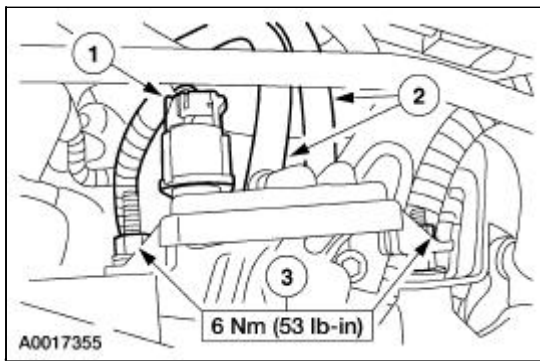
2. Remove the seven bolts and position the cross vehicle support out of the way.



3. Remove the nut and the throttle cable bracket.



4. Remove the differential pressure feedback EGR.
 1. Disconnect the electrical connector.
 2. Disconnect the hoses.
 3. Remove the bolts and the differential pressure feedback EGR.

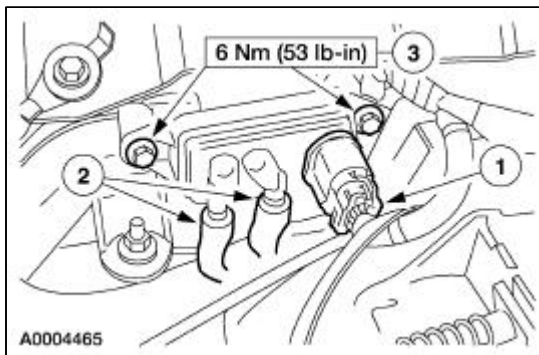


5. To install, reverse the removal procedure.
-

Differential Pressure Feedback EGR —3.9L

Removal and Installation

1. Remove the differential pressure feedback EGR.
 1. Disconnect the electrical connector.
 2. Disconnect the hoses.
 3. Remove the bolts and the differential pressure feedback EGR.

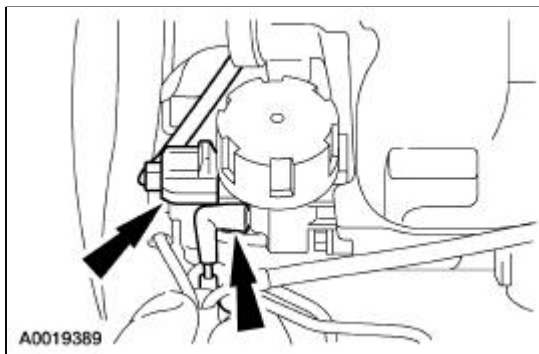


2. To install, reverse the removal procedure.
-

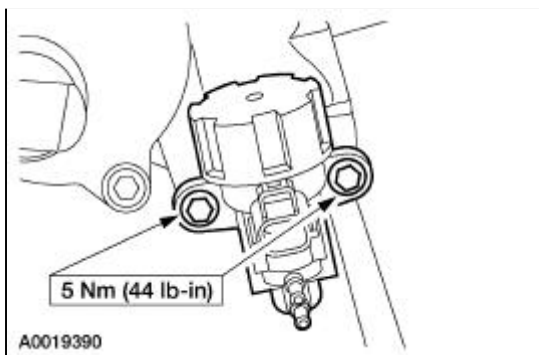
Solenoid —Electric Vacuum Regulator, 3.0L

Removal and Installation

1. Remove the cabin air filter plenum. For additional information, refer to [Section 412-01](#).
2. Disconnect the EGR vacuum regulator (EVR).
 - Disconnect the electrical connector.
 - Disconnect the vacuum hoses.



3. Remove the EVR.
 - Remove the bolts.

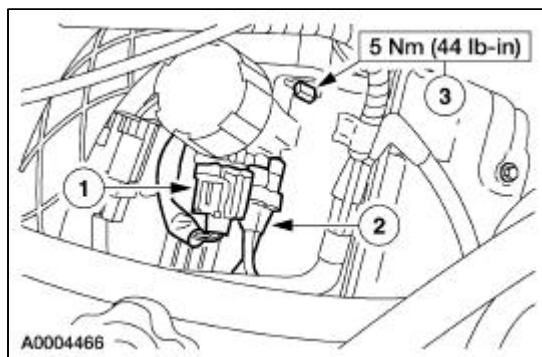


4. To install, reverse the removal procedure.

Solenoid —Electric Vacuum Regulator, 3.9L

Removal and Installation

1. Remove the EGR vacuum regulator (EVR).
 1. Disconnect the electrical connector.
 2. Disconnect the vacuum hoses.
 3. Remove the bolts and EVR.

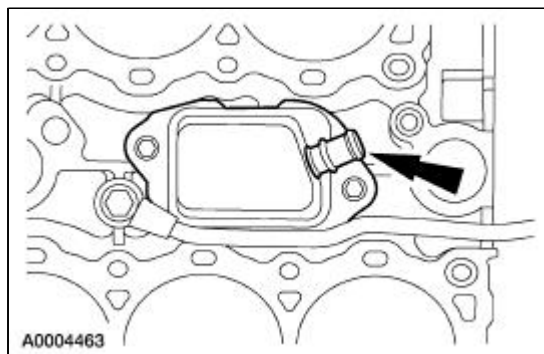


2. To install, reverse the removal procedure.
-

PCV Valve —3.0L

Removal and Installation

1. Remove the lower intake manifold. For additional information, refer to [Section 303-01A](#).
2. Remove the positive crankcase ventilation (PCV) valve from the oil separator.

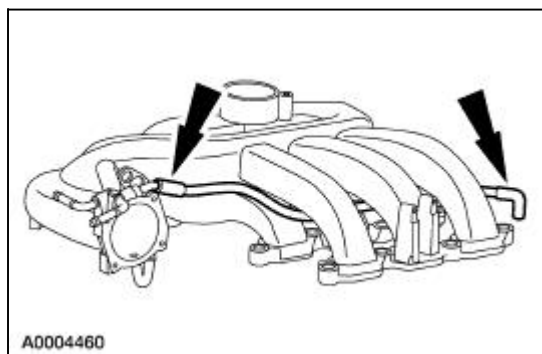


3. To install, reverse the removal procedure.
-

PCV Ventilation Hose —3.0L

Removal and Installation

1. Disconnect and remove the PCV ventilation hose.

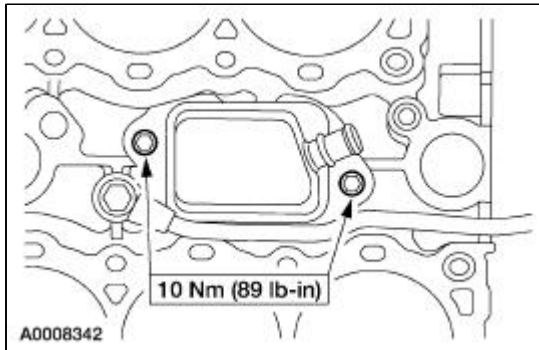


2. To install, reverse the removal procedure.
-

Crankcase Vent Oil Separator —3.0L

Removal and Installation

1. Remove the LH cylinder head. For additional information, refer to [Section 303-01A](#).
2. Remove the bolts and the oil separator. Discard the gasket.

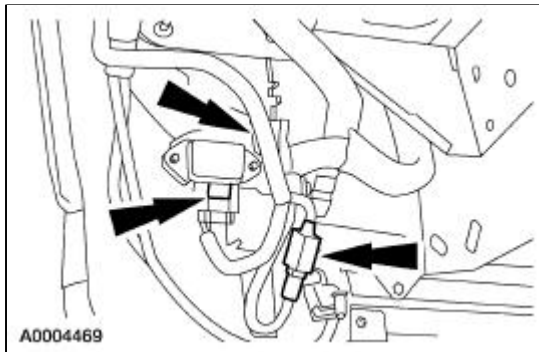


3. To install, reverse the removal procedure.
 - Install a new gasket.
-

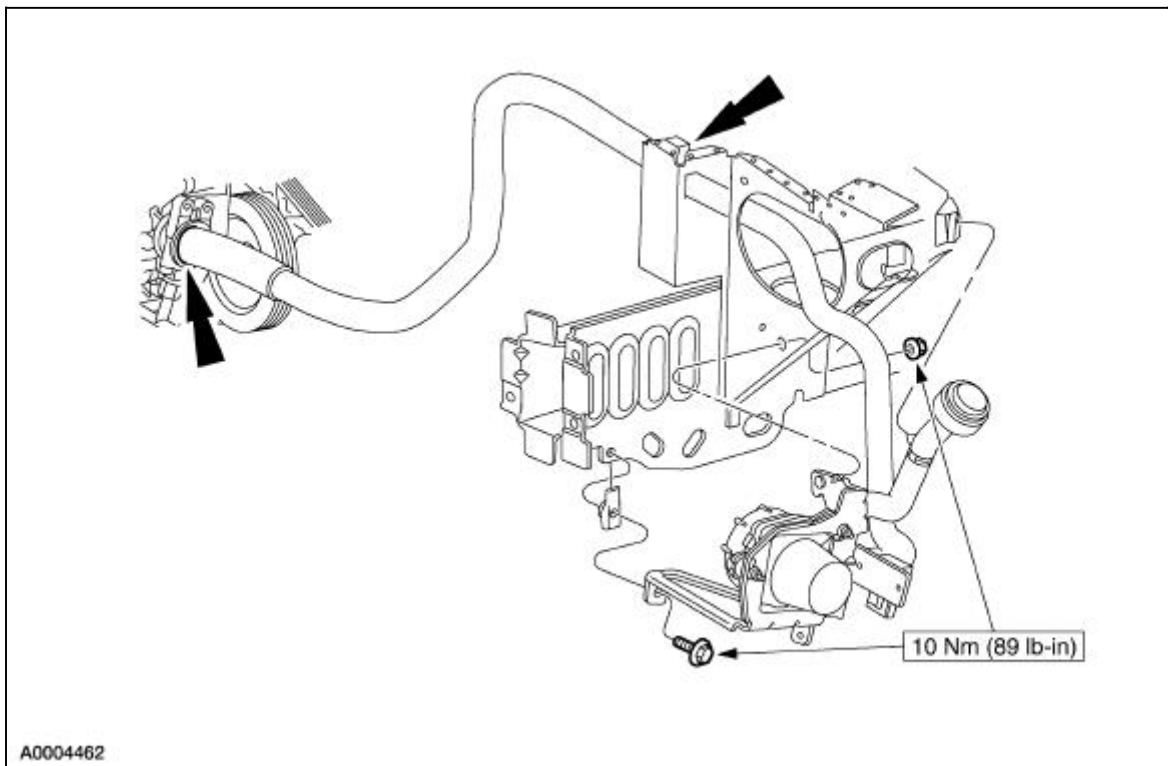
Secondary Air Pump —3.0L

Removal and Installation

1. Raise and support the vehicle. For additional information, refer to [Section 100-02](#).
2. Remove the inner fender splash shield.
3. Disconnect the electrical connectors and separate the wiring from the secondary air pump.



4. Remove the secondary air pump.
 - Disconnect and remove the pump-to-valve air tube.
 - Remove the bolt and nut, remove the secondary air pump.

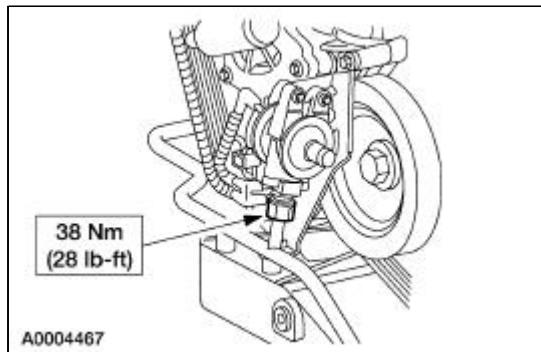


5. To install, reverse the removal procedure.

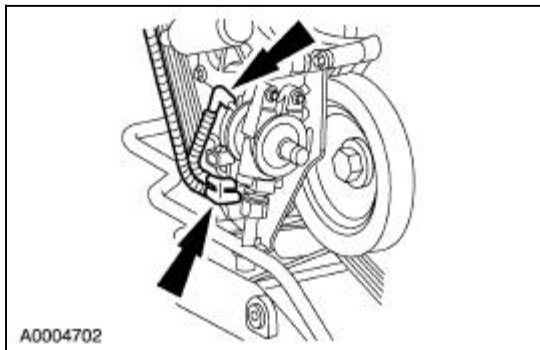
Secondary Air Valve —3.0L

Removal and Installation

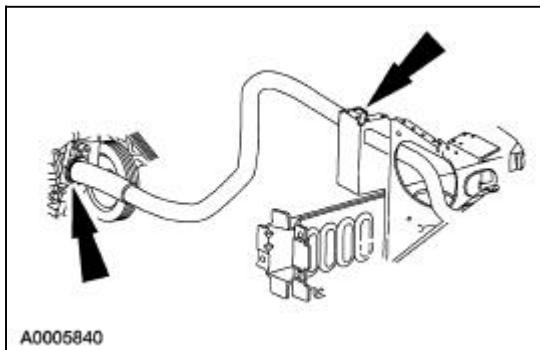
1. Raise and support the vehicle. For additional information, refer to [Section 100-02](#).
2. Disconnect the secondary air tube from the valve.



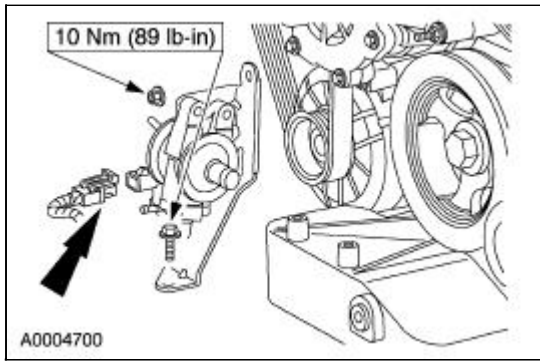
3. Disconnect the vacuum lines from the secondary air valve.



4. Disconnect and remove the pump-to-valve air tube.



5. Disconnect the electrical connector. Remove the nut and bolt. Remove the valve.

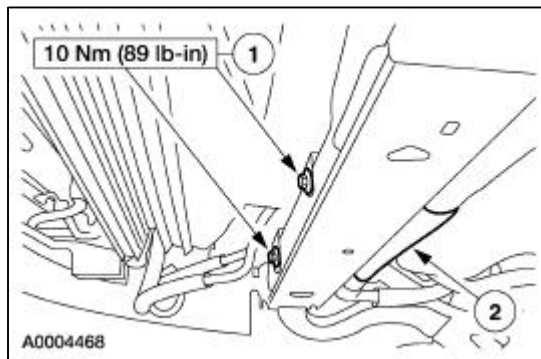


6. To install, reverse the removal procedure.
-

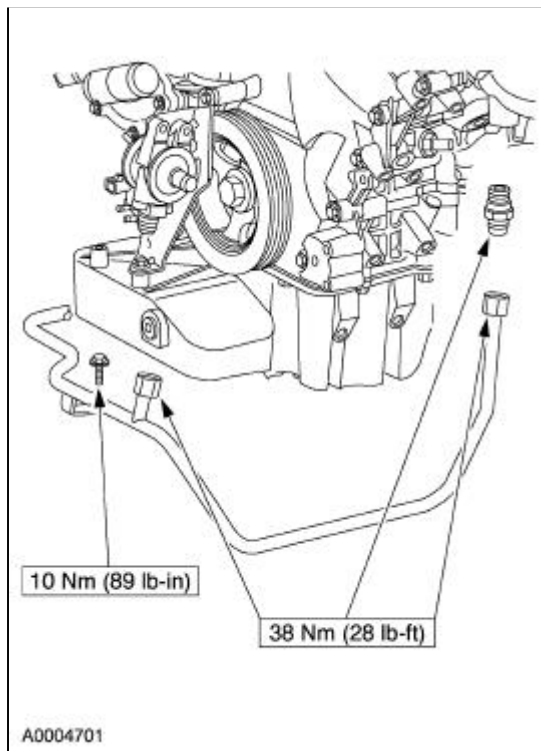
Secondary Air Valve —Tube, 3.0L

Removal and Installation

1. Remove the accessory drive belt from the generator pulley. For additional information, refer to [Section 303-05](#).
2. Raise and support the vehicle. For additional information, refer to [Section 100-02](#).
3. Disconnect the A/C line.



4. Remove the secondary air tube.



5. To install, reverse the removal procedure.

Torque Specifications

Description	Nm	lb-in
ACL outlet tube clamp screws	5	44
ACL outlet tube support nut	4	35

Intake Air Distribution and Filtering

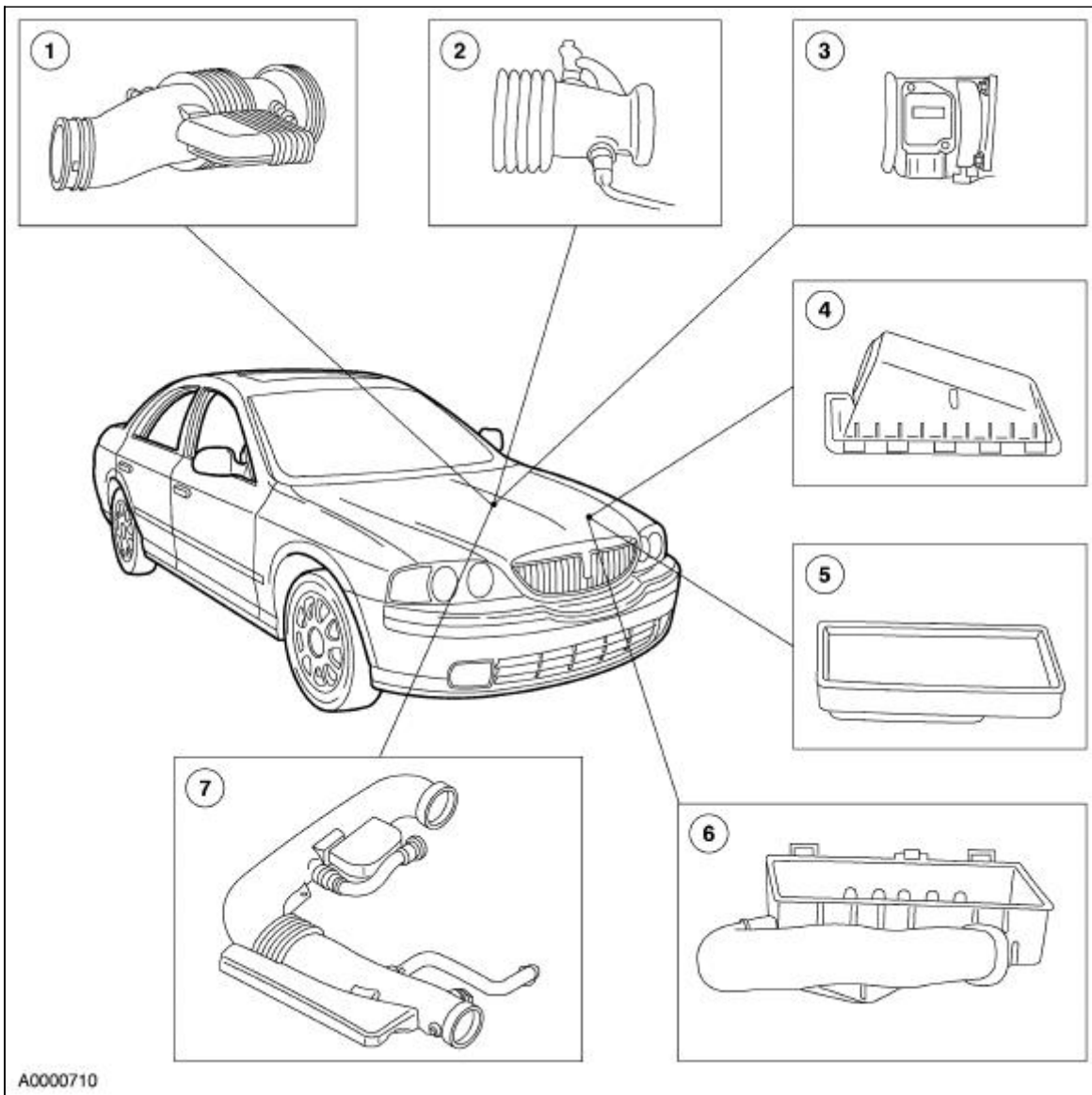
The air intake system consists of the:

- air cleaner (ACL) (inlet and outlet) (9600)
- air cleaner (ACL) element (9601)
- mass airflow (MAF) sensor (12B579)
- intake air temperature (IAT) sensor (12A697)
- air cleaner outlet tube (9F805)

The air intake system:

- cleans intake air with a replaceable air cleaner element.
- measures airflow with the MAF sensor. For additional information, refer to [Section 303-14](#).
- measures air temperature with the IAT.

Component Locations



A0000710

Item	Part Number	Description
1	9B659	Air cleaner outlet tube—3.0L
2	12A697	Intake air temperature sensor
3	12B579	Mass airflow sensor
4	9600	Air cleaner— outlet
5	9601	Air cleaner element
6	9600	Air cleaner— inlet
7	9F805	Air cleaner outlet tube—3.9L

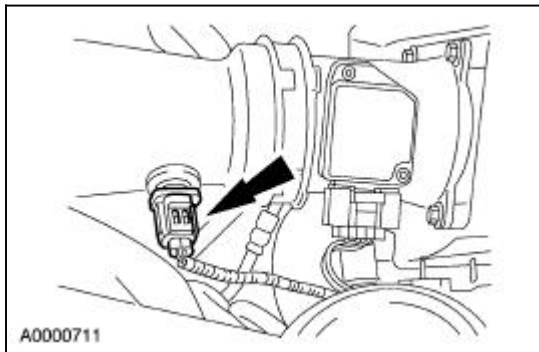
Intake Air Distribution and Filtering

Refer to the Powertrain Control/Emissions Diagnosis (PC/ED) manual.

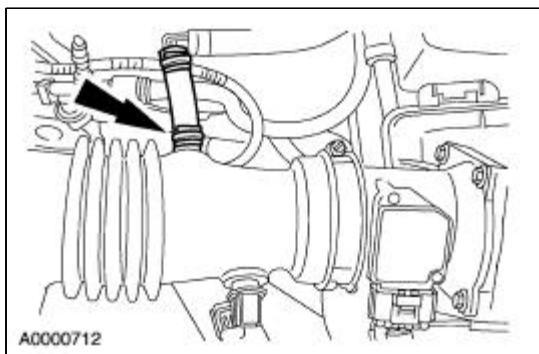
Air Cleaner Outlet Pipe —3.0L

Removal

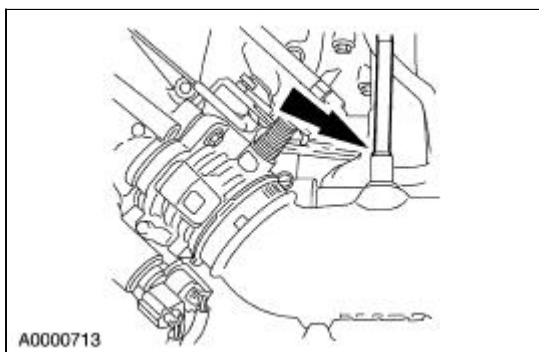
1. Disconnect the intake air temperature (IAT) sensor electrical connector.



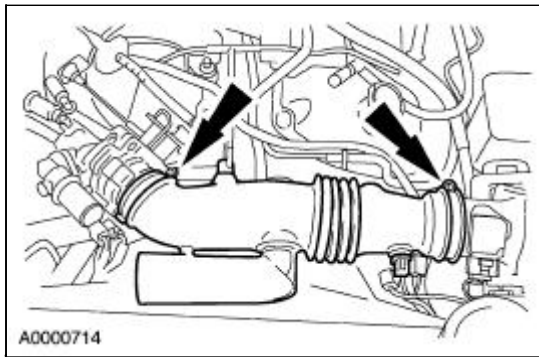
2. Disconnect the aspirator hose from the air cleaner outlet tube (9F805).



3. Disconnect the positive crankcase ventilation hose (6853).



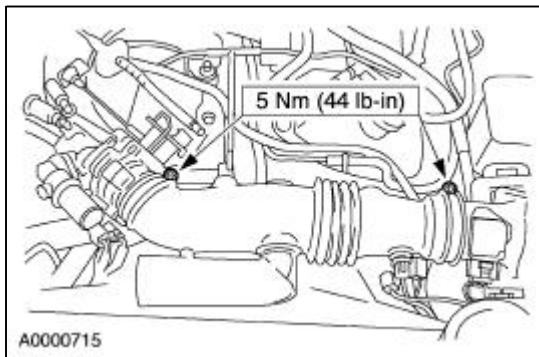
4. Loosen the hose clamp screws and remove the air cleaner outlet tube.



Installation

⚠ CAUTION: The air cleaner outlet tube should be securely sealed to prevent unmeasured air from entering the engine.

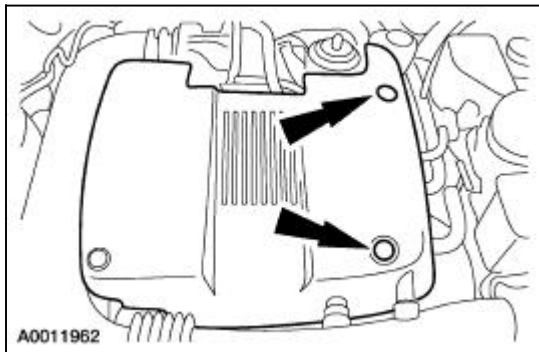
1. To install, reverse the removal procedure.



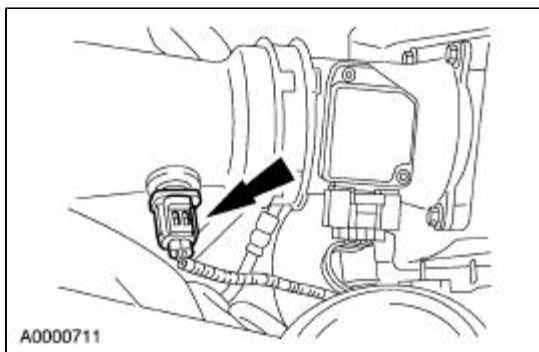
Air Cleaner Outlet Pipe —3.9L

Removal

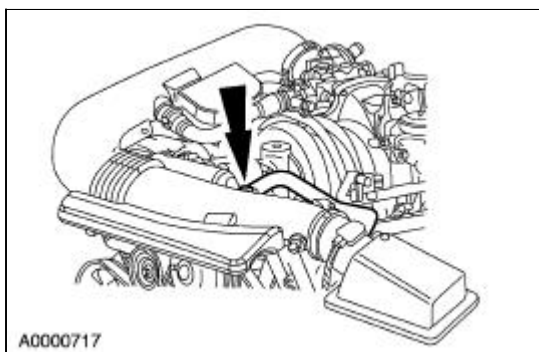
1. Remove the engine appearance cover (6N030).



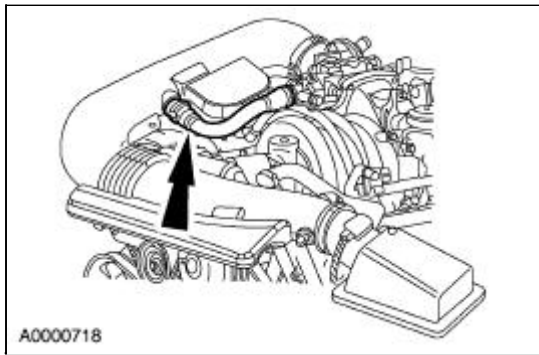
2. Disconnect the intake air temperature (IAT) sensor electrical connector.



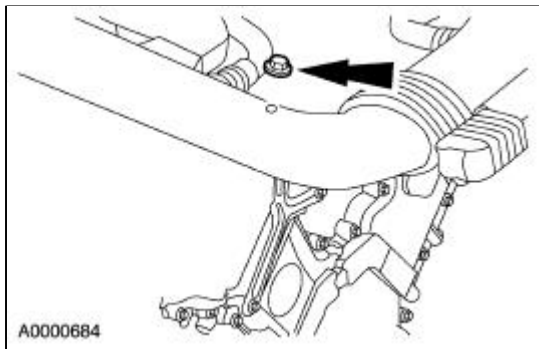
3. Disconnect the full load breather hose (9P903).



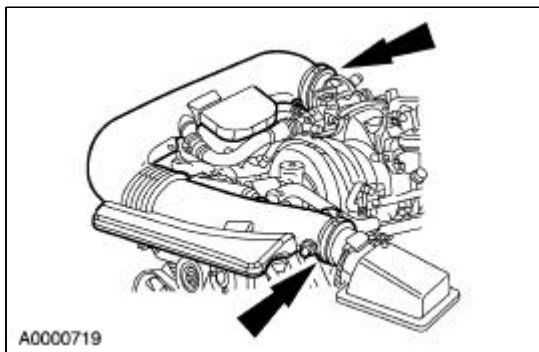
4. Disconnect the idle air control valve inlet tube (9K617).



5. Remove the air cleaner outlet tube support nut and washer.



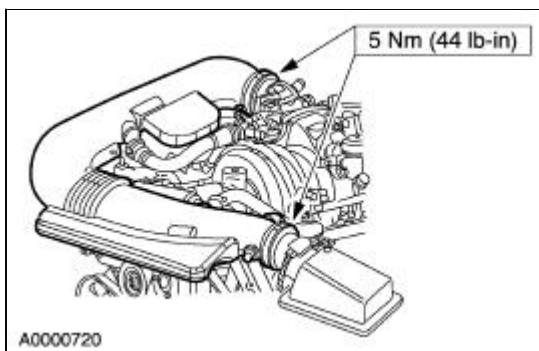
6. Loosen the hose clamp screws and remove the air cleaner outlet tube (9F805).



Installation

⚠ CAUTION: The air cleaner outlet tube should be securely sealed to prevent unmetered air from entering the engine.

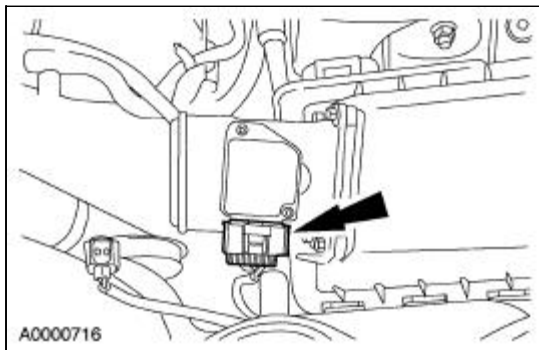
1. To install, reverse the removal procedure.



Air Cleaner —Outlet

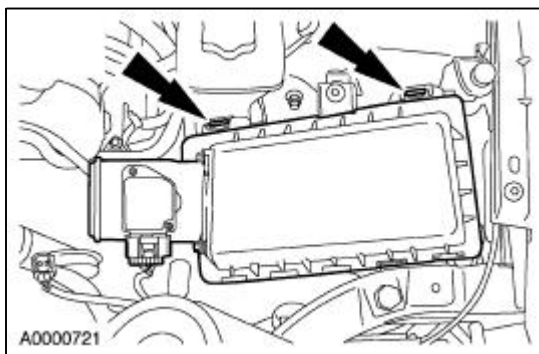
Removal

1. Remove the air cleaner outlet tube (9F805). For additional information, refer to [Air Cleaner Outlet Pipe—3.0L](#) or [Air Cleaner Outlet Pipe—3.9L](#) in this section.
2. Disconnect the electrical connector from the mass airflow (MAF) sensor (12B579).



3. **NOTE:** No tools are needed to remove the air cleaner (ACL) element (9601). The following removal and installation steps should be carried out using hands only.

Open the air cleaner snaps and remove the outlet side of the air cleaner (9600).



4. If necessary, remove the MAF sensor from the outlet side of the air cleaner. For additional information, refer to [Section 303-14](#).

Installation



CAUTION: The grommet used to seal the air cleaner housing must be fully seated. Failure to do so will result in unmetered air entering the engine.

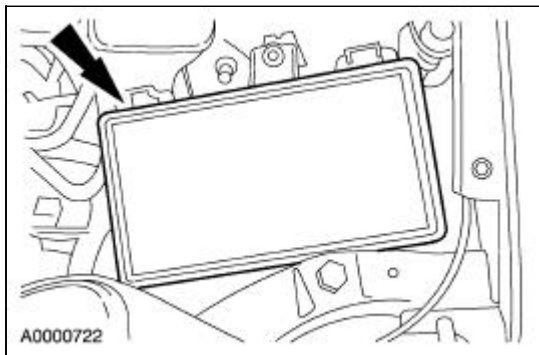
NOTE: Use the alignment notches to correctly align the inlet side and the outlet side of the air cleaner.

1. To install, reverse the removal procedure.

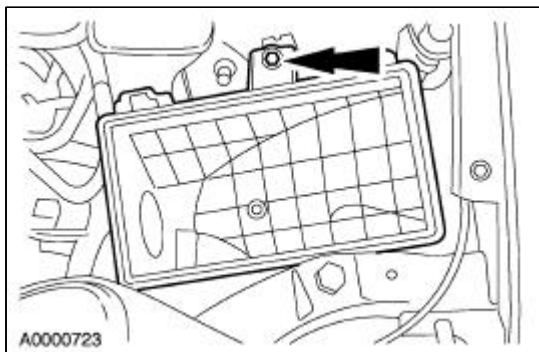
Air Cleaner —Inlet

Removal

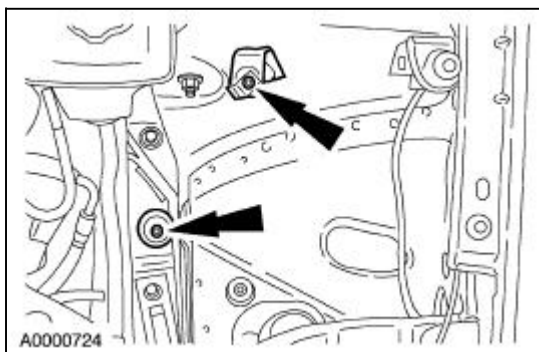
1. Remove the outlet side of the air cleaner (ACL) (9600). For additional information, refer to [Air Cleaner—Outlet](#) in this section.
2. Remove the air cleaner element (9601).



3. Remove the screw and the inlet side of the ACL.



4. If necessary, remove the grommet and bracket.



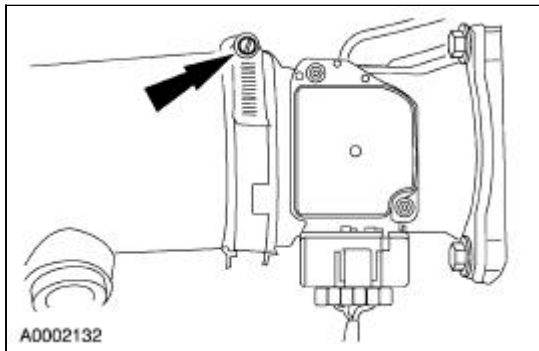
Installation

1. To install, reverse the removal procedure.

Air Cleaner Element

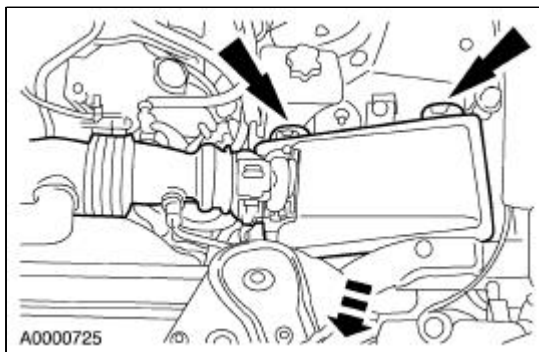
Removal

1. Loosen the clamp on the air cleaner (ACL) outlet tube (9F805) at the mass airflow (MAF) sensor (12B579).

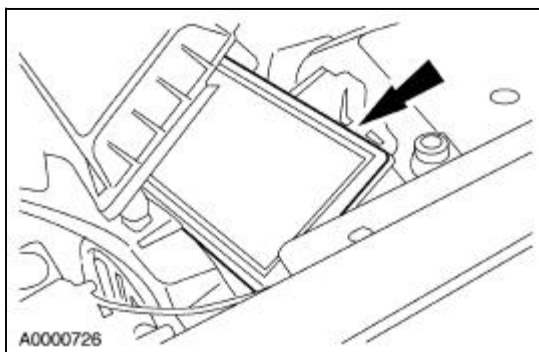


2. **NOTE:** No tools are needed to remove the air cleaner (ACL) element (9601). The following removal and installation steps should be carried out using hands only.

Open the air cleaner snaps and set the outlet side of the air cleaner (ACL) (9600) aside.



3. Remove the air cleaner (ACL) element (9601).



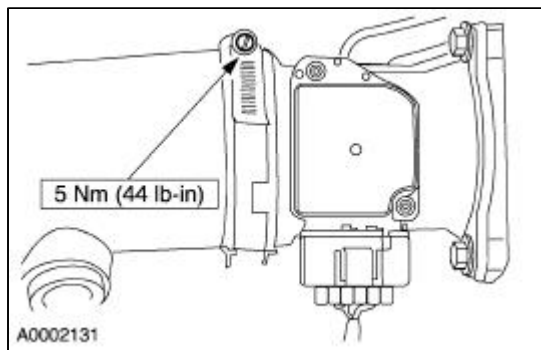
Installation

 **CAUTION:** The grommet used to seal the air cleaner housing must be fully seated. Failure

to do so will result in unmetered air entering the engine.

NOTE: Use the alignment notch to correctly align the inlet side and the outlet side of the air cleaner.

1. To install, reverse the removal procedure.



General Specifications

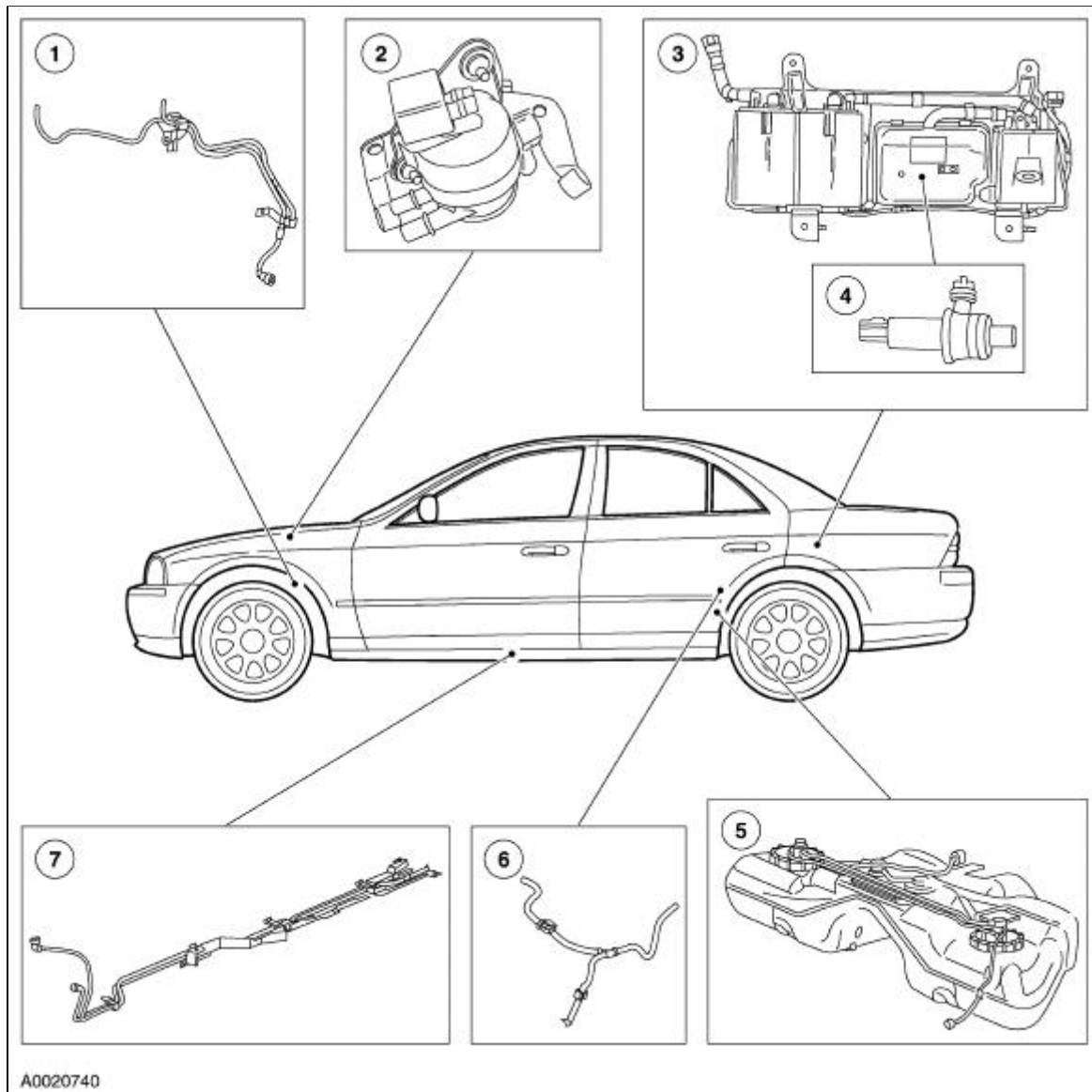
Item	Specification
MERPOL® O-ring Seal Lubricant	ESE-M99B144-B

Torque Specifications

Description	Nm	lb-ft	lb-in
Evaporative emission canister and bracket assembly bolts	10	—	89
Evaporative canister purge valve nuts	8	—	71
Evaporative canister purge valve bracket nuts	10	—	89
Differential bolt	114	84	—

Evaporative Emissions

Component Location



Item	Part Number	Description
1	9J280	Tube assembly —fuel supply and vapor (engine compartment)
2	9C915	EVAP canister purge valve
3	9E857	Evaporative emission (EVAP) canister with bracket assembly
4	9F945	Canister vent solenoid
5	9002	Fuel tank assembly
6	9C047	Fuel vapor control valve tube assembly

7	9S284	Tube assembly—fuel supply and vapor (underbody)
---	-------	---

The evaporative emission (EVAP) system:

- is equipped with an on-board refueling vapor recovery (ORVR) system.
- prevents hydrocarbon emissions from reaching the atmosphere.
- stores fuel vapors in the EVAP canister that are generated during vehicle refueling, vehicle operation or hot soak until they can be consumed by the engine.
- routes the stored fuel vapors to the engine during engine operation.
- is controlled by the powertrain control module (PCM) which uses various sensor inputs to calculate the desired amount of purge flow. The PCM regulates the purge flow, induced by the application of intake manifold vacuum, by varying the duty cycle applied to the EVAP canister purge valve.
- has an EVAP test port for test purposes.

The fuel vapors are routed:

- from the fuel tank through the fuel vapor control valve and fuel vapor vent valve.
- to the EVAP canister through a vapor line.
- to the engine when the EVAP canister purge valve is opened by the PCM.

The fuel tank pressure (FTP) sensor:

- monitors the pressure levels in the fuel tank.
- communicates the pressure reading to the PCM during the OBDII leak test.
- is permanently attached to the fuel vapor control valve tube assembly.

The evaporative emission canister:

- is located above the rear subframe.
- contains activated carbon.
- stores fuel vapors.

The fuel tank filler cap:

- relieves system pressure above 14 kPa (56.21 inches H₂O).
- relieves system vacuum below 3.8 kPa (15.26 inches H₂O).

The canister vent solenoid:

- is normally open.
- seals the EVAP system for the inspection and maintenance (I/M 240) test and OBDII leak and pressure tests.
- is mounted on the EVAP canister bracket assembly.
- is repaired as a separate item.

The evaporative emission (EVAP) canister purge valve:

- is normally closed.
- regulates purging of the EVAP canister.
- is controlled by the PCM.
- is located in the engine compartment near the LH strut tower.

Fuel vapor vent (FVV) valve

- in fuel tank mounted.
- prevents suspended liquid fuel from being drawn into the EVAP canister along with the fuel vapors.

Fuel vapor control valve:

- is fuel tank mounted.
- controls fuel tank refueling fill level.
- prevents suspended liquid fuel from being drawn into the EVAP canister along with the fuel vapors.
- relieves system pressure above 14 kPa (56.21 inches H₂O).

The underbody fuel supply and vapor tube assembly:

- is located under the LH rocker panel.
- includes both the fuel supply line and the EVAP canister purge outlet tube.
- supplies fuel from the fuel pump to the fuel filter.
- routes fuel vapors from the fuel vapor control valve tube assembly to the engine compartment fuel supply and vapor tube.
- is repaired as an assembly.

The engine compartment fuel supply and vapor tube assembly:

- is located on the LH side of the engine compartment.
- supplies fuel from the fuel filter to the fuel injection manifold.
- routes fuel vapors from the underbody fuel supply and vapor tube assembly to the EVAP canister purge valve.
- is repaired as an assembly.

The evaporative emission (EVAP) system monitor:

- is a self-test strategy within the PCM, which tests the integrity of the EVAP system.
- monitors the EVAP system for leaks.
- monitors electronic EVAP components for irrationally high or low voltages.
- monitors for correct EVAP system operation.
- uses negative and positive leak test methods to test and activate the EVAP system.

The evaporative emission (EVAP) test port:



- is used to connect the Evaporative Emission System Leak Tester to the EVAP system.
- is located on the EVAP canister purge valve.

The EVAP Running Loss System Leak Test:

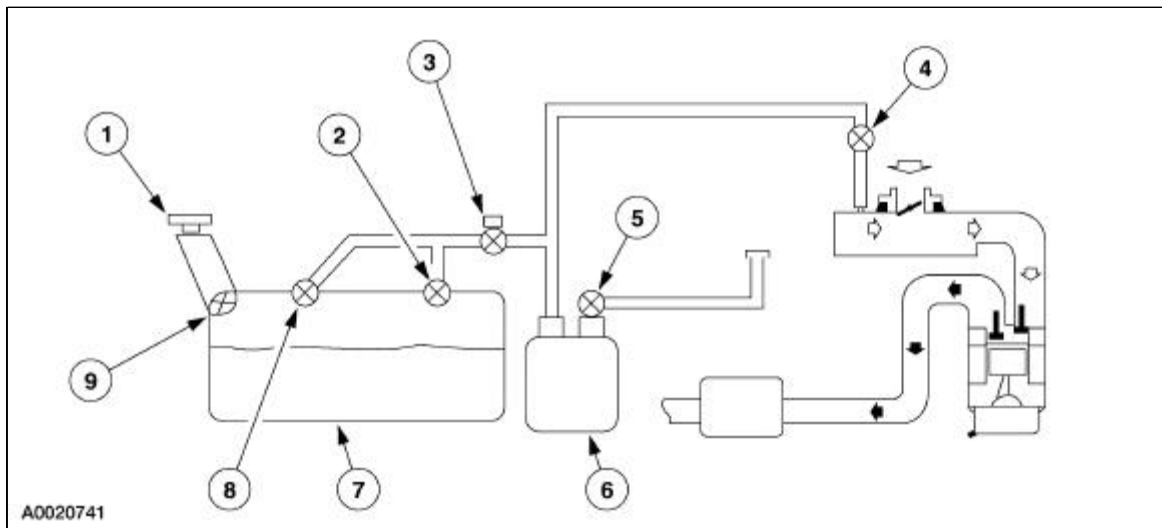
- utilizes intake manifold vacuum to test the EVAP system and involves several stages.
-

Evaporative Emissions

Special Tool(s)

 <p>ST2116-A</p>	<p>Evaporative Emission System Leak Tester 310-F007 (134-00130) or equivalent</p>
 <p>ST2332-A</p>	<p>Worldwide Diagnostic System (WDS) 418-F224, New Generation STAR (NGS) Tester 418-F052, or equivalent scan tool</p>

Evaporative Emission System



Item	Part Number	Description
1	9030	Fuel filler cap
2	9B190	Fuel vapor control valve
3	9C052	Fuel tank pressure sensor
4	9C915	Evaporative emission canister purge valve
5	9F945	Canister vent solenoid
6	9D653	Evaporative emission canister
7	9002	Fuel tank
8	9B593	Fuel vapor vent valve
9	9189	Fuel filler pipe check valve

Principles of Operation

Fuel Filler Cap

The fuel filler cap is used to prevent fuel spill and to close the EVAP system to the atmosphere.

Fuel Vapor Control Valve

The fuel vapor control valve is normally between the EVAP canister and the fuel vapor vent valve. Its function is to prevent the flow of liquid fuel into the EVAP canister or up to the canister purge valve during refueling, and to prevent the collection of liquid fuel in the fuel vapor hoses by overfilling the fuel tank.

Fuel Tank Pressure (FTP) Sensor

The fuel tank pressure sensor is used to measure the fuel tank pressure during the Evaporative Emissions Monitor Test. It is also used to control excessive fuel tank pressures by forcing the EVAP system to purge. The fuel tank pressure sensor is mounted in the fuel vapor control valve tube assembly as it crosses over the fuel tank.

Evaporative Emission (EVAP) Canister Purge Valve

The EVAP canister purge valve is controlled by the powertrain control module (PCM). The EVAP canister purge valve controls the flow of fuel vapors from the EVAP canister to the engine intake manifold during various engine operating modes. The EVAP canister purge valve is normally closed.

Canister Vent Solenoid

During the Evaporative Emission Running Loss System Test Monitor, Evaporative Emissions Repair Verification Drive Cycle, and the Evaporative Emission System Leak Test, the canister vent solenoid is closed to allow either a vacuum to be drawn on the fuel tank or to hold a specified pressure in the system. The canister vent solenoid is normally open.

Evaporative Emission (EVAP) Canister

Fuel vapors from the fuel tank are stored in the EVAP canister. When the engine is running, the vapors are purged from the EVAP canister for combustion.

Fuel Vapor Vent Valve (FVV) Assembly

The fuel vapor vent (FVV) valve assembly is mounted on the top of the fuel tank. It is used to control the flow of fuel vapors entering the EVAP system. The assembly also has a spring float, which prevents liquid fuel from entering the vapor delivery system under severe handling or vehicle rollover conditions. In the upright position, the open bottom of the float will lift and shut off the orifice. Under severe handling conditions, the spring will push the float closed when angles allow liquid fuel to reach the orifice. In a rollover condition, the weight of the open bottom float and spring pressure will close the orifice. The FVV valve has a pressure relief feature which will vent excessive fuel tank pressure to atmosphere.

Fuel Filler Pipe Check Valve

The fuel filler pipe check valve is an integral part of the fuel filler pipe. It is intended to prevent liquid fuel from re-entering the fuel filler pipe from the fuel tank on refueling or rollover conditions.

Evaporative Emission System Monitor

When a fault occurs, the EVAP system monitor is reset to NO and a diagnostic trouble code (DTC) is set in the PCM memory. After the DTC is repaired, the vehicle drive cycle must be completed to reset the monitor in preparation for inspection and maintenance testing.

EVAP Running Loss System Leak Test

To start the testing, conditions of stable purging and vehicle speed must be satisfied. During the first stage, the canister vent solenoid is closed, while the EVAP canister purge valve remains open, applying and building vacuum in the system as indicated by the FTP sensor. This phase checks for major leaks in the EVAP system.

In the second stage, the EVAP canister purge valve closes and the system looks for minimal decay rate in the EVAP vacuum, indicating the absence of any small EVAP system leaks.

The last stage is entered only if stage two of the leak test has failed and checks whether the failed test was due to excess vapor generation. It monitors fuel vapor generation rate. Initially, the canister vent solenoid is opened to equalize EVAP system pressure to atmosphere. Then the canister vent solenoid is closed, allowing pressure to build if vapor generation is present in sufficient quantity. If the rate of generation is found to be too high, the EVAP running loss system leak test is aborted. If not, then a small leak is diagnosed.

On-Board Refueling Vapor Recovery (ORVR) Evaporative Emission (EVAP) System

The basic elements forming the ORVR system are as follows:

- The fuel filler pipe forms a seal to prevent vapors from escaping the fuel tank while liquid is entering the fuel tank. Liquid in the one inch diameter tube blocks vapors from rushing back up the fuel filler pipe.
- A fuel vapor control valve controls the flow of vapors out of the fuel tank. The valve closes when the liquid level reaches a height associated with fuel tank usable capacity. The valve accomplishes the following:
 - Limits the total amount of fuel that can be dispensed into the fuel tank.
 - Prevents liquid gasoline from exiting the fuel tank when submerged or when tipped well beyond a horizontal plane as part of the vehicle rollover protection in road accidents.
 - Minimizes vapor flow resistance during anticipated refueling conditions.
- Fuel vapor tubing connects the fuel vapor control valve to the EVAP canister. This routes the fuel tank vapors, displaced by the incoming liquid, to the EVAP canister.
- A check valve in the fuel filling system prevents liquid from rushing back up the fuel filler pipe during the liquid flow variations associated with the filler nozzle shut-off.

Between refueling events, the EVAP canister is purged with fresh air so that it may be used again to store vapors accumulated during engine soaks or subsequent refueling events. The vapors drawn off of the carbon in the EVAP canister are consumed by the engine.

Inspection and Verification

1. Verify the customer concern is with the evaporative emission (EVAP) system.
2. Visually inspect the following for obvious signs of mechanical damage.

Visual Inspection Chart

Mechanical
<ul style="list-style-type: none">● Fuel filler cap● EVAP test port

- EVAP canister or canister vent solenoid
- EVAP lines or hoses
- Vacuum lines or hoses

3. If the concern remains after the inspection, connect the scan tool to the data link connector (DLC) located beneath the instrument panel and select the vehicle to be tested from the scan tool menu. If the scan tool does not communicate with the vehicle:
 - check that the program card is correctly installed.
 - check the connections to the vehicle.
 - check the ignition switch position.
4. If the scan tool still does not communicate with the vehicle, refer to the scan tool manual.
5. Carry out the DATA LINK DIAGNOSTICS test. If the scan tool responds with:
 - CKT914, CKT915 or CKT70 = ALL ECUS NO RESP/NOT EQUIP, refer to [Section 418-00](#).
 - NO RESP/NOT EQUIP for PCM, refer to the Powertrain Control/Emissions Diagnosis (PC/ED) manual.
 - SYSTEM PASSED, retrieve and record the continuous diagnostic trouble codes (DTCs), erase the continuous DTCs and carry out the PCM KOEO self-test.
6. If the DTCs retrieved are related to the concern, go to the PCM Diagnostic Trouble Code (DTC) Index to continue diagnostics.
7. If the concern remains after the inspection, determine the symptom and proceed to the Symptom Chart.

PCM Diagnostics Trouble Code (DTC) Index

DTC	Description	Source	Action
P0442	Small leak detected in EVAP system (As small as 1.02 mm [0.040 inch])	PCM	GO to Pinpoint Test A .
P0455	Major leak or no flow detected	PCM	GO to Pinpoint Test B .
P1443	Very small or no purge flow detected	PCM	GO to Pinpoint Test B .
P1450	Excessive vacuum detected in the fuel tank	PCM	GO to Pinpoint Test C .
—	Any other PCM DTC	PCM	REFER to the Powertrain Control/Emissions Diagnosis (PC/ED) manual.

Symptom Chart

SYMPTOM CHART

Condition	Possible Sources	Action
<ul style="list-style-type: none"> ● Hissing Sound When Removing Fuel Cap 	<ul style="list-style-type: none"> ● Canister vent solenoid. ● Evaporative emissions canister. ● Fuel vapor control valve 	<ul style="list-style-type: none"> ● GO to Pinpoint Test D.

	tube assembly. ● EVAP canister tube. ● EVAP canister purge outlet tube.	
● Excessive Fuel Odor	● Canister vent solenoid. ● Evaporative emissions canister. ● Fuel vapor control valve tube assembly. ● Evaporative emissions test port. ● EVAP canister purge outlet tube.	● GO to Pinpoint Test E .
● Unable to Refuel Vehicle	● Fuel filler pipe. ● Canister vent solenoid. ● Fuel vapor control valve tube assembly.	● GO to Pinpoint Test F .

Pinpoint Tests

NOTE: Reinstall or install new evaporative emission hose clamps removed or damaged during testing procedures.

PINPOINT TEST A: DTC P0442 SMALL LEAK IN EVAP SYSTEM

CONDITIONS	DETAILS/RESULTS/ACTIONS
<p>NOTE: Condition P0442 DTC set: less than 0.625 kPa (2.5 inches H₂O) bleed-up over 15 seconds at 75% fuel fill. Vapor generation limit: more than 0.625 kPa (2.5 inches H₂O) over 120 seconds.</p>	
<p>A1 VISUALLY INSPECT THE COMPONENTS FOR SMALL LEAKS</p>	
	<ol style="list-style-type: none"> 1 Check for the presence of a fuel filler cap. Do not tighten or check for correct installation at this time. 2 Verify the canister vent solenoid hose is correctly seated on the canister vent solenoid. 3 Check for cut or loose connections to fuel vapor hoses, tubes and connections in the following locations: <ul style="list-style-type: none"> ● EVAP canister to EVAP canister purge valve ● EVAP canister to fuel vapor vent valve assembly ● fuel vapor control valve tube assembly to fuel tank 4 Check the fuel filler pipe for damage. <p>● Is a concern with a hose, tube, connection or valve visually evident?</p>

- **Yes**
REPAIR or INSTALL new components as necessary. GO to [A2](#).
- **No**
GO to [A2](#).

A2 CHECK AT THE EVAP TEST PORT FOR SMALL SYSTEM LEAKS

- 1 Disconnect and plug the evaporative emission return tube at the intake manifold.
 - 2 Complete the evaporative emission system leak test. Refer to [Evaporative Emission System Leak Test](#) in this section.
- **Does the system pass the leak test?**
- **Yes**
GO to [A3](#).
 - **No**
GO to [A4](#).

A3 VISUALLY INSPECT THE FUEL FILLER CAP

- 1 Visually inspect the fuel filler cap for damage.
- **Is the fuel filler cap damaged?**
- **Yes**
INSTALL a new fuel filler cap. GO to [A4](#).
 - **No**
GO to [A4](#).

A4 CHECK FOR SMALL LEAKS AT THE FUEL FILLER CAP AND EVAP TEST PORT

2



- 1 Connect the Evaporative Emission System Leak Tester to the fuel filler pipe.
- 3 Close the canister vent solenoid. Refer to [Canister Vent Solenoid Closing Procedure](#) in this section.
- 4 Pressurize the EVAP system to 3.48 kPa (14 inches H₂O).
- 5 Using the ultrasonic leak detector, check the fuel filler cap and EVAP test port for leaks.

● **Is a leak detected?**

→ **Yes**
REPAIR or INSTALL new components as necessary. GO to [A5](#).

→ **No**
INSTALL the fuel filler cap. CARRY OUT the evaporative emission system leak test. REFER to [Evaporative Emission System Leak Test](#) in this section. If the system passes the leak test, CARRY OUT the evaporative emissions repair verification drive cycle. REFER to [Evaporative Emission Repair Verification Drive Cycle](#) in this section.

A5 CHECK FOR CONCERN OTHER THAN THE FUEL FILLER CAP

1 Refer to previous test results.

● **Did the system pass the evaporative emission system leak test carried out in pinpoint test Step A2?**

→ **Yes**
CARRY OUT the evaporative emission system leak test. REFER to [Evaporative Emission System Leak Test](#) in this section. If the system passes the leak test, CARRY OUT the evaporative emission repair verification drive cycle. REFER to [Evaporative Emission Repair Verification Drive Cycle](#) in this section.

→ **No**
INSTALL the fuel filler cap. GO to [A6](#).

A6 CHECK FOR SMALL LEAK WITH TESTER SET AT FILL POSITION

2



1 Connect the Evaporative Emission System Leak Tester to the EVAP test port.

3 Close the canister vent solenoid. Refer to [Canister Vent Solenoid Closing Procedure](#) in this section.

4 Turn the selector on the Evaporative Emission System Leak Tester to the FILL position.

5 Pressurize the EVAP system to 3.48 kPa (14 inches H₂O).

● **Does the pressure on the EVAP**

system hold between 3.43 kPa and 3.53 kPa (13.80 inches and 14.20 inches H₂O)?

→ **Yes**
GO to [A7](#).

→ **No**
DISCONTINUE pressurizing the system.
GO to [A8](#).

A7 CHECK FOR LEAKS IN THE COMPLETE EVAP SYSTEM

2



1 Connect the Evaporative Emission System Leak Tester to the EVAP test port.

3 Close the canister vent solenoid. Refer to [Canister Vent Solenoid Closing Procedure](#) in this section.

4 Pressurize the EVAP system to 3.48 kPa (14 inches H₂O).

5 Using the ultrasonic leak detector, check the following EVAP system locations:

- EVAP return tube to EVAP canister purge valve
- EVAP canister purge valve to EVAP canister— canister vent solenoid assembly
- EVAP canister — canister vent solenoid assembly to fuel tank
- fuel filler cap and fuel filler tube

● **Is a leak detected at EVAP return tube, EVAP canister purge outlet tube or EVAP canister tube or associated hose?**

→ **Yes**
REPAIR or INSTALL new components as necessary. CARRY OUT the evaporative emission system leak test. REFER to [Evaporative Emission System Leak Test](#) in this section. If the system passes the leak test, CARRY OUT the evaporative emissions repair verification drive cycle. REFER to [Evaporative Emission Repair Verification Drive Cycle](#) in this section.

→ **No**
DISCONTINUE pressurizing the system.
GO to [A8](#).

A8 CHECK FOR SMALL LEAK FROM THE EVAP RETURN TUBE TO THE FUEL VAPOR

CONTROL VALVE TUBE

1



1 Disconnect the fuel vapor control valve tube assembly from the under vehicle fuel supply and vapor tube assembly. Plug the open end of the under vehicle fuel supply and vapor tube assembly.

2 Connect the Evaporative Emission System Leak Tester to the EVAP test port.

3 Pressurize the EVAP system to 3.48 kPa (14 inches H₂O).

4 Using the ultrasonic leak detector, check the EVAP system from the intake manifold to the plugged end of the under vehicle fuel supply and vapor tube assembly.

● **Is a leak detected?**

→ **Yes**
REPAIR or INSTALL new components as necessary. REPEAT Step A6 to verify the repair. GO to [A9](#).

→ **No**
GO to [A9](#).

A9 CHECK FOR SMALL LEAK BETWEEN EVAP CANISTER AND FUEL TANK FILLER PIPE

4



1 Connect the Evaporative Emission System Leak Tester to the fuel filler pipe.

2 Transfer the plug from the under-vehicle fuel supply and vapor tube assembly to the fuel vapor control valve tube .

3 Turn the Evaporative Emission System Leak Tester selector to the FILL position.

5 Close the canister vent solenoid. Refer to [Canister Vent Solenoid Closing Procedure](#) in this section.

6 Pressurize the EVAP system to 3.48 kPa (14 inches H₂O).

7 Using the ultrasonic leak detector, check

the fuel vapor control valve tube to the fuel tank for leaks. Check the fuel tank pressure sensor, fuel vapor control valve tube and the fuel filler pipe. Check tubes from the fuel tank to the EVAP canister and the canister vent solenoid.

● **Is a leak detected?**

→ **Yes**
REPAIR or INSTALL new components as necessary.

GO to [A10](#).

→ **No**
GO to [A10](#).

A10 CHECK EVAP SYSTEM AT FUEL FILLER PIPE

1 Reconnect the fuel vapor control valve tube assembly to the under-vehicle fuel supply and vapor tube assembly.

2 Complete the evaporative emission system leak test. Refer to [Evaporative Emission System Leak Test](#) in this section.

● **Does the EVAP system pass the leak test?**

→ **Yes**
RESTORE the system to normal operation. CARRY OUT the evaporative emission system leak test. REFER to [Evaporative Emission System Leak Test](#) in this section. If the system passes the leak test, CARRY OUT the evaporative emissions repair verification drive cycle. REFER to [Evaporative Emission Repair Verification Drive Cycle](#) in this section.

→ **No**
GO to [A6](#).

PINPOINT TEST B: DTC P0455 MAJOR LEAK OR NO FLOW DETECTED OR DTC P1443 VERY SMALL OR NO PURGE FLOW DETECTED IN SYSTEM

CONDITIONS	DETAILS/RESULTS/ACTIONS
<p>NOTE: Condition DTC P0455 set: -1.74 kPa (-7.0 inches H₂O) over 30 seconds.</p>	
<p>NOTE: Condition DTC P1443 set: -1.74 kPa (-7.0 inches H₂O) over 30 seconds with more than 0.02 lb/min vapor flow.</p>	
<p>B1 CHECK FOR DIAGNOSTIC TROUBLE CODE P0455 OR P1443</p>	

1 Use the recorded results from the PCM DTCs.

● **Is DTC P0455 present?**

→ **Yes**
GO to [B2](#).

→ **No**
GO to [B3](#).

B2 VISUALLY CHECK FOR GROSS EVAP SYSTEM LEAKS

1 Check for the presence of a fuel filler cap. Do not tighten or check for correct installation at this time.

2 Check the input port vacuum and EVAP return tube are connected to the EVAP canister purge valve.

3 Check that the canister vent solenoid hose is correctly attached to the canister vent solenoid.

4 Check for disconnected or cracked fuel vapor hoses or tubes between the intake manifold and following components:

- EVAP canister purge valve
- EVAP canister
- fuel vapor vent valve assembly
- fuel vapor control valve tube assembly

5 Check for damaged fuel tank or fuel filler pipe.

● **Is a concern with a hose, tube, connection or valve visually evident?**

→ **Yes**
REPAIR or INSTALL new EVAP components as necessary. GO to [B3](#).

→ **No**
GO to [B3](#).

B3 CHECK FOR EVAP SYSTEM LEAKS

1 Disconnect the EVAP return tube from the intake manifold and plug the EVAP return tube.

2 Connect the Evaporative Emissions System Leak Tester to the EVAP test port.

3 Carry out the evaporative emissions system leak test. Refer to [Evaporative Emission System Leak Test](#) in this section.

● **Does the system pressure stay above 1.99 kPa (8 inches H₂O)?**

→ **Yes**
GO to [B4](#).

→ **No**
VERIFY that the fuel filler cap is installed correctly. REPAIR or INSTALL new components as necessary. CARRY OUT the evaporative emission system leak test. REFER to [Evaporative Emission System Leak Test](#) in this section. If the system passes the leak test, CARRY OUT the evaporative emission repair verification drive cycle. REFER to [Evaporative Emission Repair](#)

[Verification Drive Cycle](#) in this section.

B4 CHECK FOR BLOCKAGE BETWEEN THE EVAP CANISTER PURGE VALVE AND CANISTER VENT SOLENOID

1



2 Close the canister vent solenoid. Refer to [Canister Vent Solenoid Closing Procedure](#) in this section.

3 Pressurize the EVAP system to 3.48 kPa (14 inches H₂O).

4 Open the canister vent solenoid.

● **Does the pressure drop immediately?**

→ **Yes**
GO to [B5](#).

→ **No**
Go to [Pinpoint Test D](#).

B5 CHECK FOR BLOCKAGE BETWEEN FUEL FILLER PIPE AND THE FUEL VAPOR CONTROL VALVE TUBE ASSEMBLY

1 Connect the Evaporative Emissions System Leak Tester to the fuel filler pipe.

2 Pressurize the EVAP system to 6.47 to 6.97 kPa (26 to 28 inches H₂O).

● **Does the pressure drop immediately?**

→ **Yes**
GO to [B6](#).

→ **No**
Go to [Pinpoint Test D](#).

B6 CHECK FOR FAILED EVAP CANISTER PURGE VALVE OR FUEL TANK PRESSURE SENSOR

1 Use the recorded results from the PCM DTCs.

● **Are DTC codes P0455 and P1443 present?**

→ **Yes**
INSTALL a new EVAP canister purge valve. REFER to [Evaporative Emission Canister Purge Valve](#) in this section. CARRY OUT the evaporative emission system leak test. REFER to [Evaporative Emission System Leak Test](#) in this section. If no leak is detected, CARRY OUT the evaporative emissions repair verification drive cycle. REFER to [Evaporative Emission Repair Verification Drive Cycle](#) in this section.

→ **No**
INSTALL a new fuel tank. REFER to [Section 310-01](#). CARRY OUT the evaporative emission system leak test. REFER to [Evaporative Emission System Leak Test](#) in this section. If the system passes the leak test, CARRY out the evaporative emission repair verification drive cycle. REFER to

PINPOINT TEST C: DTC P1450 EXCESSIVE VACUUM DETECTED IN THE FUEL TANK

CONDITIONS	DETAILS/RESULTS/ACTIONS
<p>NOTE: Condition P1450 DTC set: more than -1.79 kPa (-7.2 inches H₂O) over 30 seconds.</p>	
<p>C1 CHECK FOR VISUAL CAUSES OF EXCESSIVE FUEL TANK VACUUM</p>	
	<ol style="list-style-type: none"> 1 Check for kinks or bends in the fuel vapor hoses and tubes. 2 Visually check the canister vent solenoid inlet port for contamination or foreign material. 3 Check the canister vent solenoid for blockage or contamination. <ul style="list-style-type: none"> ● Is a concern with a hose, tube, connection or component visually evident? <p>→ Yes REMOVE any contamination or foreign material around fuel vapor hoses and tubes. REPAIR the hoses, tubes or components as necessary. After all visual concerns are repaired, GO to C2.</p> <p>→ No GO to C2.</p>
<p>C2 CHECK FOR BLOCKAGE BETWEEN EVAP TEST PORT AND CANISTER VENT SOLENOID</p>	
	<ol style="list-style-type: none"> 1 Disconnect and plug the EVAP return tube at the intake manifold. 2 Connect the Evaporative Emissions System Leak Tester to the EVAP test port. 3 Pressurize the EVAP system to 3.48 kPa (14 inches H₂O). <ul style="list-style-type: none"> ● Does the pressure drop immediately? <p>→ Yes GO to C3.</p> <p>→ No GO to Pinpoint Test D.</p>
<p>C3 CHECK FOR BLOCKAGE BETWEEN THE FUEL FILLER PIPE AND THE FUEL VAPOR CONTROL VALVE TUBE ASSEMBLY</p>	

- 1 Connect the Evaporative Emission System Leak Tester to the fuel filler pipe.
- 2 Pressurize the EVAP system to 3.48 kPa (14 inches H₂O).

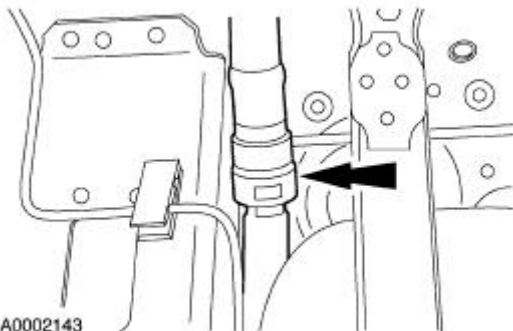
- **Does the pressure drop immediately?**

→ **Yes**
GO to [C4](#).

→ **No**
GO to [Pinpoint Test D](#).

C4 CHECK FOR FUEL TANK PRESSURE SENSOR PID WITHOUT PRESSURE APPLIED

1



2



- 1 Disconnect the EVAP canister outlet tube from the fuel vapor control valve tube assembly.

- 3 Access PCM PID FTP V.

- 4 Record the reading.

- **Is PID FTP V reading between 2.40 and 2.80 volts?**

→ **Yes**
GO to [C5](#).

→ **No**
REFER to Powertrain Control/Emissions Diagnosis (PC/ED) manual to continue diagnosis.

C5 CHECK FOR STUCK OPEN EVAP CANISTER PURGE VALVE CONDITION AT IDLE

- 1 Reconnect the EVAP canister outlet tube.
- 2 Remove the plug from the EVAP return tube and reconnect the tube to the intake manifold.
- 3 Verify that the fuel filler cap is correctly installed.

4



- 5 Access PCM PIDs FTP V and EVAPPDC.
- 6 Start the engine and allow to idle.
- 7 Monitor the FTP V and EVAPPDC PIDs.

- **When PID EVAPPDC is zero, is PID FTP V reading below 2.40 volts?**


→ **Yes**

INSTALL a new EVAP canister purge valve. REFER to [Evaporative Emission Canister Purge Valve](#) in this section. CARRY OUT an EVAP system leak test. REFER to [Evaporative Emission System Leak Test](#) in this section. If the system passes the leak test, CARRY OUT an evaporative emissions repair verification drive cycle. REFER to [Evaporative Emission Repair Verification Drive Cycle](#) in this section.

→ **No**

CARRY OUT the EVAP system leak test. REFER to [Evaporative Emission System Leak Test](#) in this section. If the system passes the leak test, CARRY OUT the evaporative emissions repair verification drive cycle. REFER to [Evaporative Emission Repair Verification Drive Cycle](#) in this section.

PINPOINT TEST D: HISS WHEN OPENING FUEL CAP OR UNABLE TO REFUEL VEHICLE

CONDITIONS	DETAILS/RESULTS/ACTIONS
D1 TEST FOR FUEL TANK PRESSURE SENSOR OPERATION	
<p>2</p> 	<ol style="list-style-type: none"> 1 Connect the Evaporative Emission System Leak Tester to the fuel filler pipe. 3 Close the canister vent solenoid. Refer to Canister Vent Solenoid Closing Procedure in this section. 4 Pressurize the EVAP system to 3.48 kPa (14 inches H₂O).

- Is the FTP (FTP V) PID reading 3.11 kPa to 3.86 kPa (12.5 to 15.5 inches H₂O) (4.22 to 4.90 volts)?

→ **Yes**
GO to [D2](#).

→ **No**
GO to [D3](#).

D2 TEST FOR BLOCKAGE IN VENTING PORTION OF EVAP SYSTEM

1 Open the canister vent solenoid.

- Does the pressure drop immediately?

→ **Yes**
CARRY OUT the evaporative emission system leak test. Refer to [Evaporative Emission System Leak Test](#) in this section. If the system passes the leak test, CARRY OUT the evaporative emission repair verification drive cycle. REFER to [Evaporative Emission Repair Verification Drive Cycle](#) in this section.

→ **No**
GO to [D5](#).

D3 TEST FOR BLOCKAGE IN FUEL FILLER PIPE

1 Connect the Evaporative Emission System Leak Tester to the fuel filler pipe.

2 Disconnect the fuel filler pipe from the fuel tank.

3 Pressurize the EVAP system to (3.48 kPa) (14 inches H₂O).

- Does the pressure drop immediately?

→ **Yes**
GO to [D4](#).

→ **No**
INSTALL a new fuel filler pipe assembly. REFER to [Section 310-01](#). CARRY OUT the evaporative emission system leak test. Refer to [Evaporative Emission System Leak Test](#) in this section. If the system passes the leak test, CARRY OUT the evaporative emission repair verification drive cycle. REFER to [Evaporative Emission Repair Verification Drive Cycle](#) in this section.

D4 TEST FOR PINCHED FUEL VAPOR CONTROL VALVE TUBE

- 1 Reconnect the fuel filler pipe to the fuel tank.
- 2 Lower the fuel tank about 19mm (0.75 in).
- 3 Connect the Evaporative Emission System Leak Tester to the fuel filler pipe.
- 4 Close the canister vent solenoid. Refer to [Canister Vent Solenoid Closing Procedure](#) in this section.
- 5 Pressurize the EVAP system to 3.48 kPa (14 inches H₂O).

- Is the FTP (FTP V) PID reading 3.11 kPa to 3.86 kPa (12.5 to 15.5 inches H₂O)(4.22 to 4.90 volts)?

→ **Yes**

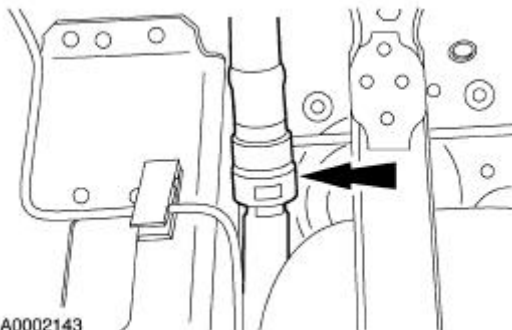
Fuel vapor control valve tube is pinched. INSTALL a new fuel tank assembly. REFER to [Section 310-01](#). CARRY OUT the evaporative emission system leak test. Refer to [Evaporative Emission System Leak Test](#) in this section. If the system passes the leak test, CARRY OUT the evaporative emission repair verification drive cycle. REFER to [Evaporative Emission Repair Verification Drive Cycle](#) in this section.

→ **No**

Fuel vapor control valve tube or fuel tank vapor control valve is blocked. INSTALL a new fuel tank assembly. REFER to [Section 310-01](#). CARRY OUT the evaporative emission system leak test. Refer to [Evaporative Emission System Leak Test](#) in this section. If the system passes the leak test, CARRY OUT the evaporative emission repair verification drive cycle. REFER to [Evaporative Emission Repair Verification Drive Cycle](#) in this section.

D5 ISOLATE LOCATION OF BLOCKAGE

1



A0002143

1

Disconnect the fuel vapor control valve tube assembly from the EVAP canister purge outlet tube.

2 Pressurize the EVAP system to 3.48 kPa (14 inches H₂O).

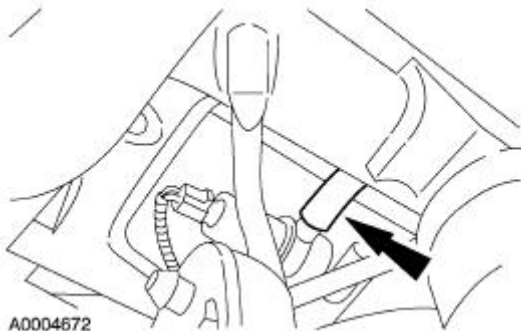
- Does the pressure drop immediately?

→ **Yes**
GO to [D6](#).

→ **No**
INSTALL a new fuel tank assembly.
REFER to [Section 310-01](#).
RECONNECT all components. CARRY OUT the evaporative emission system leak test. Refer to [Evaporative Emission System Leak Test](#) in this section. If the system passes the leak test, CARRY OUT the evaporative emission repair verification drive cycle. REFER to [Evaporative Emission Repair Verification Drive Cycle](#) in this section.

D6 TEST FOR BLOCKAGE IN CANISTER VENT SOLENOID

3



A0004672

1 Reconnect the fuel vapor control valve tube assembly to the EVAP canister purge outlet tube.

2 Lower the differential to access the canister vent solenoid as necessary. If necessary, refer to [Section 205-02](#).

3 Disconnect the canister vent solenoid from the canister vent solenoid hose.

4 Pressurize the EVAP system to 3.48 kPa (14 inches H₂O).

- Does the pressure drop immediately?

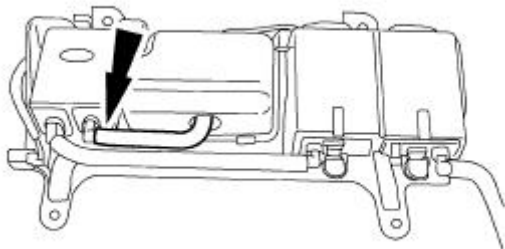
→ **Yes**
INSTALL a new canister vent solenoid.
REFER to [Evaporative Emission Canister Vent Solenoid](#) in this section.
RECONNECT all components. CARRY OUT the evaporative emission system leak test. Refer to [Evaporative Emission System Leak Test](#) in this section. If the system passes the leak test, CARRY OUT the evaporative emission repair

verification drive cycle. REFER to [Evaporative Emission Repair Verification Drive Cycle](#) in this section.

→ **No**
GO to [D7](#).

D7 TEST FOR BLOCKAGE IN THE CANISTER VENT SOLENOID HOSE

4



A0004673

- 1 Reinstall the differential. If necessary, refer to [Section 205-02](#).
- 2 Lower the rear subframe out of the way to access the EVAP canister with bracket assembly. Refer to [Section 502-00](#).
- 3 Lower the EVAP canister with bracket assembly.
- 4 Disconnect the canister vent solenoid hose from the 1.0L EVAP canister.

- 5 Pressurize the EVAP system to 3.48 kPa (14 inches H₂O).

- **Does the pressure drop immediately?**

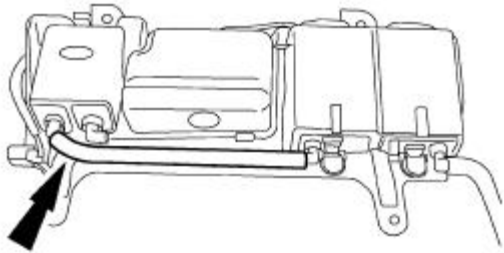
→ **Yes**
INSTALL a new canister vent solenoid hose. RECONNECT all components. CARRY OUT the evaporative emission system leak test. Refer to [Evaporative Emission System Leak Test](#) in this section. If the system passes the leak test, CARRY OUT the evaporative emission repair verification drive cycle. REFER to [Evaporative Emission Repair Verification Drive Cycle](#) in this section.

→ **No**
GO to [D8](#).

D8 TEST FOR BLOCKAGE IN 1.0L EVAP CANISTER

1

- 1 Disconnect the fuel vapor storage canister inlet tube from the 1.0L EVAP canister.



A0004674

- 2 Pressurize the EVAP system to 3.48 kPa (14 inches H₂O).

- Does the pressure drop immediately?

→ Yes

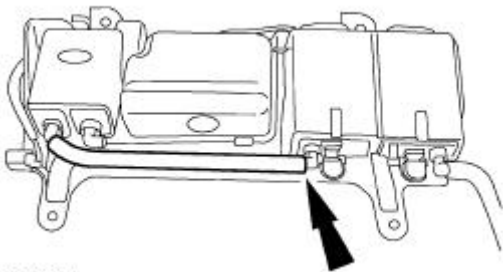
INSTALL a new 1.0L EVAP canister. RECONNECT all components. CARRY OUT the evaporative emission system leak test. Refer to [Evaporative Emission System Leak Test](#) in this section. If the system passes the leak test, CARRY OUT the evaporative emission repair verification drive cycle. REFER to [Evaporative Emission Repair Verification Drive Cycle](#) in this section.

→ No

GO to [D9](#).

D9 TEST FOR BLOCKAGE IN FUEL VAPOR STORAGE CANISTER INLET TUBE

1



A0004675

- 1 Disconnect the fuel vapor storage canister inlet tube from the 2.0L EVAP canister.

- 2 Pressurize the EVAP system to 3.48 kPa (14 inches H₂O).

- Does the pressure drop immediately?

→ Yes

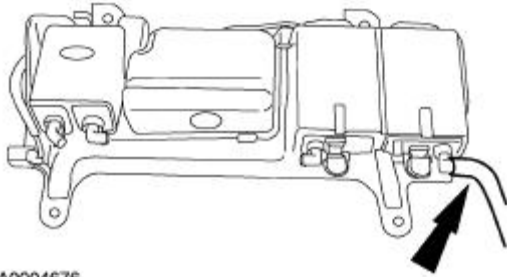
INSTALL a new fuel vapor storage canister inlet tube. RECONNECT all components. CARRY OUT the evaporative emission system leak test. Refer to [Evaporative Emission System](#)

[Leak Test](#) in this section. If the system passes the leak test, CARRY OUT the evaporative emission repair verification drive cycle. REFER to [Evaporative Emission Repair Verification Drive Cycle](#) in this section.

→ **No**
GO to [D10](#).

D10 TEST FOR BLOCKAGE IN 2.0L EVAP CANISTER

1



A0004676

1 Disconnect the EVAP canister purge outlet tube from the 2.0L EVAP canister.

2 Pressurize the EVAP system to 3.48 kPa (14 inches H₂O).

- Does the pressure drop immediately?

→ **Yes**
INSTALL a new 2.0L EVAP canister. RECONNECT all components. CARRY OUT the evaporative emission system leak test. Refer to [Evaporative Emission System Leak Test](#) in this section. If the system passes the leak test, CARRY OUT the evaporative emission repair verification drive cycle. REFER to [Evaporative Emission Repair Verification Drive Cycle](#) in this section.

→ **No**
INSTALL a new EVAP canister purge outlet tube. RECONNECT all components. CARRY OUT the evaporative emission system leak test. Refer to [Evaporative Emission System Leak Test](#) in this section. If the system passes the leak test, CARRY OUT the evaporative emission repair verification drive cycle. REFER to [Evaporative Emission Repair Verification Drive Cycle](#) in this section.

PINPOINT TEST E: EXCESSIVE FUEL ODOR

CONDITIONS	DETAILS/RESULTS/ACTIONS
------------	-------------------------

E1 TEST THE EVAPORATIVE EMISSION (EVAP) RUNNING LOSS SYSTEM MONITOR

1 Carry out the evaporative emission repair verification drive cycle. Refer to [Evaporative Emission Repair Verification Drive Cycle](#) in this section.

● **Are PCM DTCs retrieved?**

→ **Yes**
For DTCs P0442, P0455, P1443 and P1450 REFER to the Diagnostic Trouble Code (DTC) Index in this section. For all other DTCs, REFER to the Powertrain Control/Emissions Diagnosis (PC/ED) manual.

→ **No**
GO to [E2](#).

E2 EVAPORATIVE EMISSION SYSTEM LEAK TEST

1 Carry out the evaporative emission system leak test. Refer to [Evaporative Emission System Leak Test](#) in this section.

● **Does the EVAP system pass the leak test?**

→ **Yes**
GO to [E3](#).

→ **No**
GO to [E9](#).

E3 TEST FOR FUEL TANK PRESSURE SENSOR OPERATION

1 Connect the Evaporative Emission System Leak Tester to the fuel filler pipe.

2 Close the canister vent solenoid. Refer to [Canister Vent Solenoid Closing Procedure](#) in this section.

3 Pressurize the EVAP system to 3.48 kPa (14 inches H₂O).

● **Is the FTP (FTP V) PID reading 3.11 kPa to 3.86 kPa (12.5 to 15.5 inches H₂O)(4.22 to 4.90 volts)?**

→ **Yes**
GO to [E4](#).

→ **No**
GO to [Pinpoint Test D](#).

E4 TEST FOR BLOCKAGE IN VENTING PORTION OF THE EVAP SYSTEM

1 Open the canister vent solenoid.

- Does the pressure drop immediately?

→ **Yes**
GO to [E5](#).

→ **No**
GO to [Pinpoint Test D](#).

E5 TEST FOR BLOCKAGE THROUGH EVAPORATIVE EMISSION TEST PORT

- 1 Connect the Evaporative Emission System Leak Tester to the evaporative emission test port.
- 2 Close the canister vent solenoid. Refer to [Canister Vent Solenoid Closing Procedure](#) in this section.
- 3 Pressurize the EVAP system to 3.48 kPa (14 inches H₂O).

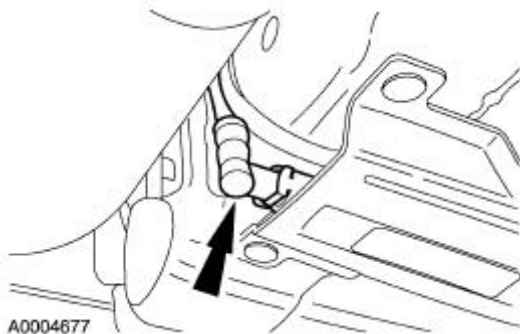
- Is the FTP (FTP V) PID reading 3.11 kPa to 3.86 kPa (12.5 to 15.5 inches H₂O)(4.22 to 4.90 volts)?

→ **Yes**
Evaporative emission system operating correctly. RETURN to Symptom Chart.

→ **No**
GO to [E6](#).

E6 TEST FOR BLOCKAGE IN FUEL VAPOR CONTROL VALVE TUBE ASSEMBLY

1



- 1 Disconnect the fuel vapor control valve tube assembly from the under vehicle fuel supply and vapor tube assembly.

- 2 Pressurize the EVAP system to 3.48 kPa (14 inches H₂O).

- Does the pressure drop immediately?

→ **Yes**
Blockage located in the fuel vapor control valve tube. INSTALL a new fuel tank assembly. REFER to [Section 310-01](#). CARRY OUT the evaporative emission system leak test. Refer to [Evaporative](#)

[Emission System Leak Test](#) in this section. If the system passes the leak test, CARRY OUT the evaporative emission repair verification drive cycle. REFER to [Evaporative Emission Repair Verification Drive Cycle](#) in this section.

→ **No**
GO to [E7](#).

E7 TEST FOR BLOCKAGE IN UNDER-VEHICLE FUEL SUPPLY AND VAPOR TUBE ASSEMBLY

- 1 Disconnect the under-vehicle fuel supply and vapor tube from the engine compartment fuel supply and vapor tube.
- 2 Pressurize the EVAP system to 3.48 kPa (14 inches H₂O).

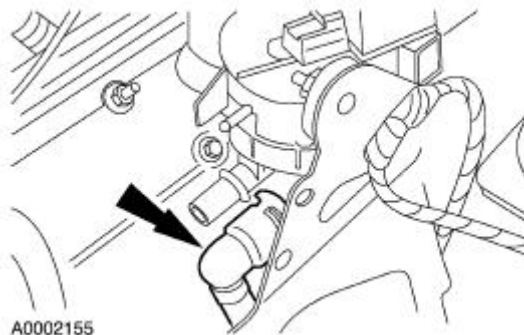
● **Does the pressure drop immediately?**

→ **Yes**
INSTALL a new under-vehicle fuel supply and vapor tube assembly. REFER to [Section 310-01](#). RECONNECT all components. CARRY OUT the evaporative emission system leak test. Refer to [Evaporative Emission System Leak Test](#) in this section. If the system passes the leak test, CARRY OUT the evaporative emission repair verification drive cycle. REFER to [Evaporative Emission Repair Verification Drive Cycle](#) in this section.

→ **No**
GO to [E8](#).

E8 TEST FOR BLOCKAGE IN THE ENGINE COMPARTMENT FUEL SUPPLY AND VAPOR TUBE ASSEMBLY

1



- 1 Disconnect the engine compartment fuel supply and vapor tube assembly from the evaporative emission canister purge valve.

- 2 Pressurize the EVAP system to 3.48 kPa (14 inches H₂O).

● **Does the pressure drop immediately?**

→ **Yes**

INSTALL a new engine compartment fuel supply and vapor tube assembly. RECONNECT all components. GO to [E7](#). CARRY OUT the evaporative emission system leak test. Refer to [Evaporative Emission System Leak Test](#) in this section. If the system passes the leak test, CARRY OUT the evaporative emission repair verification drive cycle. REFER to [Evaporative Emission Repair Verification Drive Cycle](#) in this section.

→ **No**

INSTALL a new evaporative emission canister purge valve. REFER to [Evaporative Emission Canister Purge Valve](#) in this section. RECONNECT all components. CARRY OUT the evaporative emission system leak test. Refer to [Evaporative Emission System Leak Test](#) in this section. If the system passes the leak test, CARRY OUT the evaporative emission repair verification drive cycle. REFER to [Evaporative Emission Repair Verification Drive Cycle](#) in this section.

E9 TEST TO DETERMINE GENERAL LOCATION OF LEAK

2



1 Connect the Evaporative Emission System Leak Tester to the fuel filler pipe.

2 Disconnect the fuel vapor control valve tube from the under-vehicle fuel supply and vapor tube assembly and plug both tubes.

3 Carry out the Evaporative Emission System Leak Test procedure. Refer to [Evaporative Emission System Leak Test](#) in this section.

● **Does the system pass the leak test?**

→ **Yes**

Leak is in the front portion of the EVAP system. GO to [E10](#).

→ **No**

Leak is in the rear portion of the EVAP system. GO to [E14](#).

E10 TEST TO CONFIRM LEAK IS IN THE FRONT PORTION OF THE EVAP SYSTEM

- 1 Connect the Evaporative Emission System Leak Tester to the EVAP system test port.
- 2 Plug the under-vehicle fuel supply and vapor tube assembly.
- 3 Carry out the Evaporative Emission System Leak Test. Refer to [Evaporative Emission System Leak Test](#) in this section.

● **Does the EVAP system pass the leak test?**

→ **Yes**

INSTALL new O-ring seals between the evaporative emission fuel vapor control valve tube assembly and the under-vehicle fuel supply and vapor tube assembly. RECONNECT all components. CARRY OUT the evaporative emission system leak test. Refer to [Evaporative Emission System Leak Test](#) in this section. If the system passes the leak test, CARRY OUT the evaporative emission repair verification drive cycle. REFER to [Evaporative Emission Repair Verification Drive Cycle](#) in this section.

→ **No**

GO to [E11](#).

E11 TEST FOR LEAK IN UNDER-VEHICLE FUEL SUPPLY AND VAPOR TUBE ASSEMBLY

- 1 Disconnect the under-vehicle fuel supply and vapor tube assembly from the engine compartment fuel supply and vapor tube assembly.
- 2 Plug the engine compartment fuel supply and vapor tube assembly.
- 3 Carry out the Evaporative Emission System Leak Test procedure. Refer to [Evaporative Emission System Leak Test](#) in this section.

● **Does the system pass the leak test?**

→ **Yes**

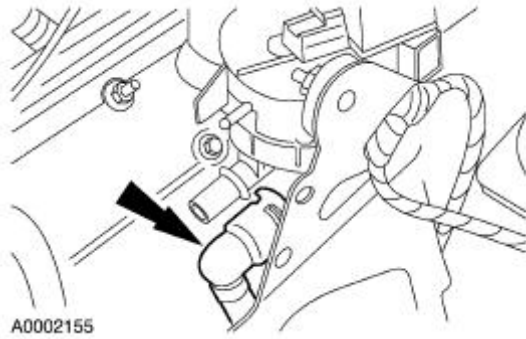
INSTALL a new under-vehicle fuel supply and vapor tube assembly. RECONNECT all components. CARRY OUT the evaporative emission system leak test. Refer to [Evaporative Emission System Leak Test](#) in this section. If the system passes the leak test, CARRY OUT the evaporative emission repair verification

drive cycle. REFER to [Evaporative Emission Repair Verification Drive Cycle](#) in this section.

→ **No**
GO to [E12](#).

E12 TEST FOR LEAK IN THE ENGINE COMPARTMENT FUEL SUPPLY AND VAPOR TUBE ASSEMBLY

1



1 Disconnect the engine compartment fuel supply and vapor tube assembly from the evaporative emission canister purge valve.

2 Plug the evaporative emission canister purge valve.

3 Carry out the Evaporative Emission System Leak Test. Refer to [Evaporative Emission System Leak Test](#) in this section.

● **Does the EVAP system pass the leak test?**

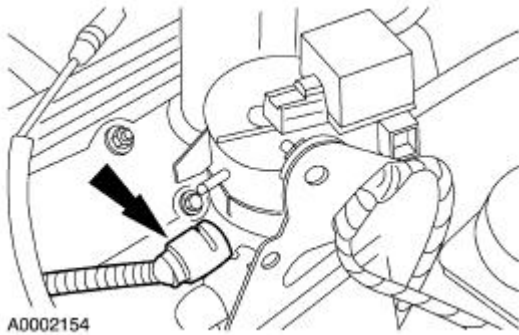
→ **Yes**
INSTALL a new engine compartment fuel supply and vapor tube assembly. RECONNECT all components. CARRY OUT the evaporative emission system leak test. Refer to [Evaporative Emission System Leak Test](#) in this section. If the system passes the leak test, CARRY OUT the evaporative emission repair verification drive cycle. REFER to [Evaporative Emission Repair Verification Drive Cycle](#) in this section.

→ **No**
GO to [E13](#).

E13 TEST FOR LEAK IN EVAP CANISTER PURGE VALVE

1

1 Disconnect the evaporative emission return tube from the EVAP canister purge valve.



- 2 Plug the EVAP canister purge valve.
- 3 Carry out the Evaporative Emission System Leak Test. Refer to [Evaporative Emission System Leak Test](#) in this section.

● **Does the system pass the leak test?**

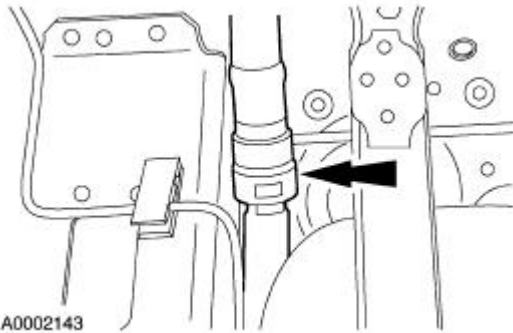
→ **Yes**
 INSTALL a new evaporative emission return tube. RECONNECT all components. CARRY OUT the evaporative emission system leak test. Refer to [Evaporative Emission System Leak Test](#) in this section. If the system passes the leak test, CARRY OUT the evaporative emission repair verification drive cycle. REFER to [Evaporative Emission Repair Verification Drive Cycle](#) in this section.

→ **No**
 INSTALL a new EVAP canister purge valve assembly. REFER to [Evaporative Emission Canister Purge Valve](#) in this section. RECONNECT all components. CARRY OUT the evaporative emission system leak test. Refer to [Evaporative Emission System Leak Test](#) in this section. If the system passes the leak test, CARRY OUT the evaporative emission repair verification drive cycle. REFER to [Evaporative Emission Repair Verification Drive Cycle](#) in this section.

E14 TEST TO DETERMINE IF LEAK IS IN EVAP CANISTER OR FUEL TANK PORTION OF THE SYSTEM

1

- 1 Disconnect the fuel vapor control valve tube from EVAP canister purge outlet tube.



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- 2 Connect evaporative emission system leak tester to the fuel filler pipe.
- 3 Plug open end of the fuel vapor control valve tube.
- 4 Carry out the Evaporative Emission System Leak Test. Refer to [Evaporative Emission System Leak Test](#) in this section.

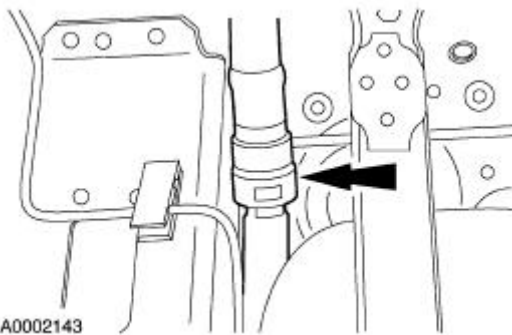
● **Does the EVAP system pass the leak test?**

→ **Yes**
RECONNECT all components. GO to [E15](#).

→ **No**
GO to [E20](#).

E15 TEST FOR LEAK IN CANISTER VENT SOLENOID

1

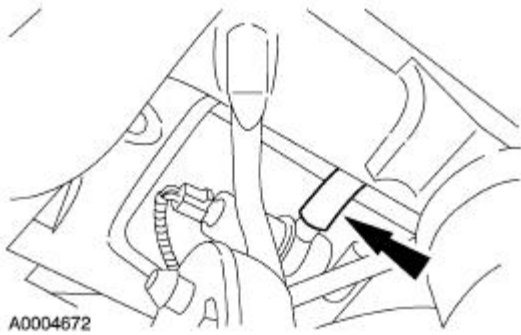


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- 1 Reconnect the fuel vapor control valve tube to the EVAP canister purge outlet tube.

3

- 2 Lower the differential to access the canister vent solenoid. If necessary, refer to [Section 205-02](#).
- 3 Disconnect the canister vent solenoid from the canister vent solenoid hose and plug the hose.



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- 4 Carry out the Evaporative Emission System Leak Test. Refer to [Evaporative Emission System Leak Test](#) in this section.

- Does the EVAP system pass the leak test?

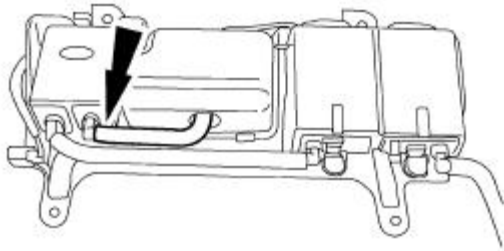
→ **Yes**
INSTALL a new canister vent solenoid. REFER to [Evaporative Emission Canister Vent Solenoid](#) in this section. RECONNECT all components. CARRY OUT the evaporative emission system leak test. Refer to [Evaporative Emission System Leak Test](#) in this section. If the system passes the leak test, CARRY OUT the evaporative emission repair verification drive cycle. REFER to [Evaporative Emission Repair Verification Drive Cycle](#) in this section.

→ **No**
GO to [E16](#).

E16 TEST THE CANISTER VENT SOLENOID HOSE FOR LEAK

5

- 1 Reinstall the differential. If necessary, refer to [Section 205-02](#).
- 2 Lower the rear subframe out of the way. Refer to [Section 502-00](#).
- 3 Remove the EVAP canister and bracket assembly.
- 4 Connect the Evaporative Emission System Leak Tester to the EVAP canister purge outlet tube.
- 5 Disconnect the canister vent solenoid hose from the 1.0L EVAP canister and plug the EVAP canister.



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- 6 Pressurize the system to 3.48 kPa (14 inches H₂O).

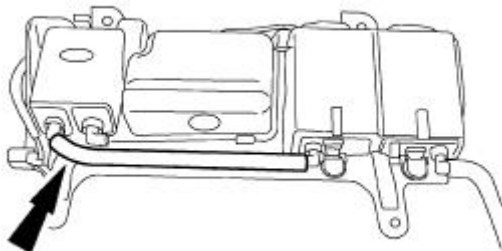
● **Does the pressure hold?**

→ **Yes**
 INSTALL a new canister vent solenoid hose. RECONNECT all components. CARRY OUT the evaporative emission system leak test. Refer to [Evaporative Emission System Leak Test](#) in this section. If the system passes the leak test, CARRY OUT the evaporative emission repair verification drive cycle. REFER to [Evaporative Emission Repair Verification Drive Cycle](#) in this section.

→ **Yes**
 GO to [E17](#).

E17 TEST FOR LEAK IN 1.0L EVAP CANISTER

1



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- 1 Disconnect the fuel vapor storage canister inlet tube from the 1.0L EVAP canister and plug the inlet tube.

- 2 Pressurize the system to 3.48 kPa (14 inches H₂O).

● **Does the pressure hold?**

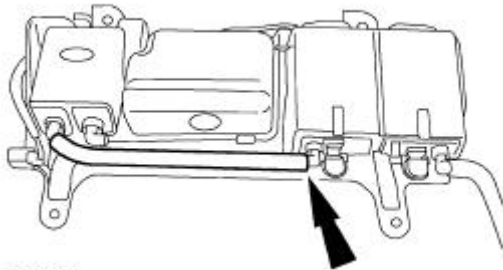
→ **Yes**
 INSTALL a new 1.0L EVAP canister. RECONNECT all components. CARRY OUT the evaporative emission system leak test. Refer to [Evaporative Emission System Leak Test](#) in this section. If the system passes the leak test, CARRY OUT the evaporative emission repair verification drive cycle. REFER to

[Evaporative Emission Repair Verification Drive Cycle](#) in this section.

→ **No**
GO to [E18](#).

E18 TEST FOR LEAK IN FUEL VAPOR STORAGE CANISTER INLET TUBE

1



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1 Disconnect the fuel vapor storage canister inlet tube from the 2.0L EVAP canister and plug the EVAP canister.

2 Pressurize the system to 3.48 kPa (14 inches H₂O).

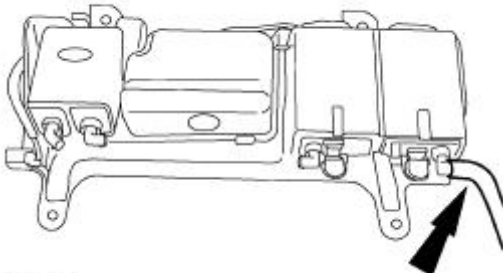
● **Does the pressure hold?**

→ **Yes**
INSTALL a new fuel vapor storage canister inlet tube. RECONNECT all components. CARRY OUT the evaporative emission system leak test. Refer to [Evaporative Emission System Leak Test](#) in this section. If the system passes the leak test, CARRY OUT the evaporative emission repair verification drive cycle. REFER to [Evaporative Emission Repair Verification Drive Cycle](#) in this section.

→ **No**
GO to [E19](#).

E19 TEST FOR LEAK IN 2.0L EVAP CANISTER

1



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1 Disconnect the EVAP canister purge outlet tube from the 2.0L EVAP canister and plug the outlet tube.

2 Pressurize the system to 3.48 kPa (14 inches H₂O).

● **Does the pressure hold?**

→ **Yes**
INSTALL a new 2.0L EVAP canister. RECONNECT all components. CARRY OUT the evaporative emission system leak test. Refer to [Evaporative Emission System Leak Test](#) in this section. If the system passes the leak test, CARRY OUT the evaporative emission repair verification drive cycle. REFER to [Evaporative Emission Repair Verification Drive Cycle](#) in this section.

→ **No**
INSTALL a new EVAP canister purge outlet tube. RECONNECT all components. CARRY OUT the evaporative emission system leak test. Refer to [Evaporative Emission System Leak Test](#) in this section. If the system passes the leak test, CARRY OUT the evaporative emission repair verification drive cycle. REFER to [Evaporative Emission Repair Verification Drive Cycle](#) in this section.

E20 TEST FOR LEAK IN FUEL VAPOR CONTROL VALVE TUBE AND FUEL TANK ASSEMBLY

- 1 Disconnect the fuel filler pipe hose at the fuel tank and plug the hose.
- 2 Carry out the Evaporative Emission System Leak Test. Refer to [Evaporative Emission System Leak Test](#) in this section.

● **Does the EVAP system pass the leak test?**

→ **Yes**
INSTALL a new fuel tank assembly. RECONNECT all components. REFER to [Section 310-01](#). CARRY OUT the evaporative emission system leak test. Refer to [Evaporative Emission System Leak Test](#) in this section. If the system passes the leak test, CARRY OUT the evaporative emission repair verification drive cycle. REFER to [Evaporative Emission Repair Verification Drive Cycle](#) in this section.

→ **No**
GO to [E21](#).

E21 TEST FOR LEAK IN FUEL FILLER PIPE HOSE

- 1 Disconnect the fuel filler pipe hose from the fuel filler pipe and plug the fuel filler pipe.
- 2 Carry out the Evaporative Emission System Leak Test. Refer to [Evaporative](#)

[Emission System Leak Test](#) in this section.

- **Does the EVAP system pass the leak test?**

→ **Yes**

INSTALL a new fuel filler pipe hose. RECONNECT all components. CARRY OUT the evaporative emission system leak test. Refer to [Evaporative Emission System Leak Test](#) in this section. If the system passes the leak test, CARRY OUT the evaporative emission repair verification drive cycle. REFER to [Evaporative Emission Repair Verification Drive Cycle](#) in this section.

→ **No**

INSTALL a new fuel filler pipe assembly. REFER to [Section 310-01](#) . RECONNECT all components. CARRY OUT the evaporative emission system leak test. Refer to [Evaporative Emission System Leak Test](#) in this section. If the system passes the leak test, CARRY OUT the evaporative emission repair verification drive cycle. REFER to [Evaporative Emission Repair Verification Drive Cycle](#) in this section.

PINPOINT TEST F: HISS WHEN OPENING FUEL CAP OR UNABLE TO REFUEL VEHICLE

CONDITIONS	DETAILS/RESULTS/ACTIONS
F1 TEST FOR FUEL TANK PRESSURE SENSOR OPERATION	
	<ol style="list-style-type: none"> 1 Connect the Evaporative Emission System Leak Tester to the fuel filler pipe. 2 Close the canister vent solenoid. Refer to Canister Vent Solenoid Closing Procedure in this section. 3 Pressurize the EVAP system to 3.48 kPa (14 inches H₂O). <ul style="list-style-type: none"> ● Is the FTP (FTP V) PID reading 3.11 kPa to 3.86 kPa (12.5 to 15.5 inches H₂O) (4.22 to 4.90 volts)? <p>→ Yes GO to F2.</p> <p>→ No GO to F3.</p>
F2 TEST FOR BLOCKAGE IN VENTING PORTION OF EVAP SYSTEM	

1 Open the canister vent solenoid.

- Does the pressure drop immediately?

→ **Yes**

CARRY OUT the evaporative emission system leak test. Refer to [Evaporative Emission System Leak Test](#) in this section. If the system passes the leak test, CARRY OUT the evaporative emission repair verification drive cycle. REFER to [Evaporative Emission Repair Verification Drive Cycle](#) in this section.

→ **No**

GO to [F5](#).

F3 TEST FOR BLOCKAGE IN FUEL FILLER PIPE

1 Connect the Evaporative Emission System Leak Tester to the fuel filler pipe.

2 Disconnect the fuel filler pipe from the fuel tank.

3 Pressurize the EVAP system to (3.48 kPa) (14 inches H₂O).

- Does the pressure drop immediately?

→ **Yes**

GO to [F4](#).

→ **No**

INSTALL a new fuel filler pipe assembly. REFER to [Section 310-01](#). CARRY OUT the evaporative emission system leak test. Refer to [Evaporative Emission System Leak Test](#) in this section. If the system passes the leak test, CARRY OUT the evaporative emission repair verification drive cycle. REFER to [Evaporative Emission Repair Verification Drive Cycle](#) in this section.

F4 TEST FOR PINCHED FUEL VAPOR CONTROL VALVE TUBE

1 Reconnect the fuel filler pipe to the fuel tank.

2 Lower the fuel tank about 19mm (0.75 in).

3 Connect the Evaporative Emission System Leak Tester to the fuel filler pipe.

4 Close the canister vent solenoid. Refer to [Canister Vent Solenoid Closing Procedure](#) in this section.

5 Pressurize the EVAP system to 3.48 kPa

(14 inches H₂O).

- **Is the FTP (FTP V) PID reading 3.11 kPa to 3.86 kPa (12.5 to 15.5 inches H₂O)(4.22 to 4.90 volts)?**

→ **Yes**

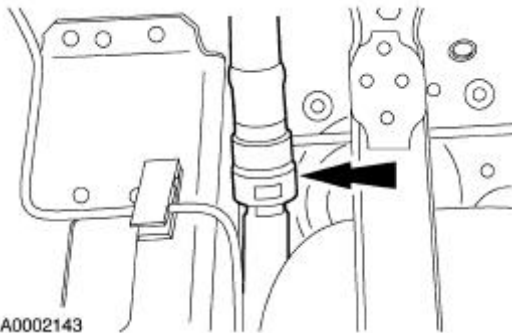
Fuel vapor control valve tube is pinched. INSTALL a new fuel tank assembly. REFER to [Section 310-01](#). CARRY OUT the evaporative emission system leak test. Refer to [Evaporative Emission System Leak Test](#) in this section. If the system passes the leak test, CARRY OUT the evaporative emission repair verification drive cycle. REFER to [Evaporative Emission Repair Verification Drive Cycle](#) in this section.

→ **No**

Fuel vapor control valve tube or fuel tank vapor control valve is blocked. INSTALL a new fuel tank assembly. REFER to [Section 310-01](#). CARRY OUT the evaporative emission system leak test. Refer to [Evaporative Emission System Leak Test](#) in this section. If the system passes the leak test, CARRY OUT the evaporative emission repair verification drive cycle. REFER to [Evaporative Emission Repair Verification Drive Cycle](#) in this section.

F5 ISOLATE LOCATION OF BLOCKAGE

1



1

Disconnect the fuel vapor control valve tube assembly from the EVAP canister purge outlet tube.

2

Pressurize the EVAP system to 3.48 kPa (14 inches H₂O).

- **Does the pressure drop immediately?**

→ **Yes**

GO to [F6](#).

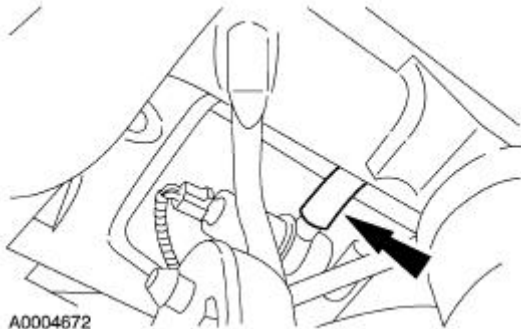
→ **No**

INSTALL a new fuel tank assembly. RECONNECT all components. REFER to

[Section 310-01](#). CARRY OUT the evaporative emission system leak test. Refer to [Evaporative Emission System Leak Test](#) in this section. If the system passes the leak test, CARRY OUT the evaporative emission repair verification drive cycle. REFER to [Evaporative Emission Repair Verification Drive Cycle](#) in this section.

F6 TEST FOR BLOCKAGE IN CANISTER VENT SOLENOID

3



- 1 Reconnect the fuel vapor control valve tube assembly to the EVAP canister purge outlet tube.
- 2 Lower the differential to access the canister vent solenoid as necessary. If necessary, refer to [Section 205-02](#).
- 3 Disconnect the canister vent solenoid from the canister vent solenoid hose.
- 4 Pressurize the EVAP system to 3.48 kPa (14 inches H₂O).

- **Does the pressure drop immediately?**

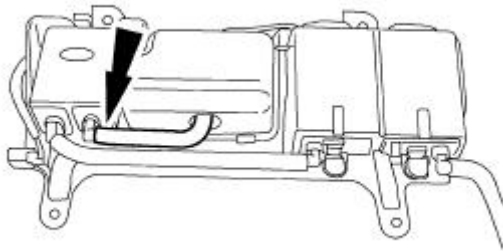
→ **Yes**
INSTALL a new canister vent solenoid. RECONNECT all components. CARRY OUT the evaporative emission system leak test. Refer to [Evaporative Emission System Leak Test](#) in this section. If the system passes the leak test, CARRY OUT the evaporative emission repair verification drive cycle. REFER to [Evaporative Emission Repair Verification Drive Cycle](#) in this section.

→ **No**
GO to [F7](#).

F7 TEST FOR BLOCKAGE IN THE CANISTER VENT SOLENOID HOSE

- 1 Reinstall the differential. If necessary, refer to [Section 205-02](#).
- 2 Lower the rear subframe out of the way to access the EVAP canister with bracket assembly. Refer to [Section 502-00](#).

4



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3 Lower the EVAP canister with bracket assembly.

4 Disconnect the canister vent solenoid hose from the 1.0L EVAP canister.

5 Pressurize the EVAP system to 3.48 kPa (14 inches H₂O).

● Does the pressure drop immediately?

→ Yes

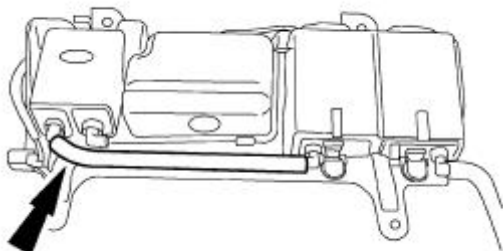
INSTALL a new canister vent solenoid hose. RECONNECT all components. CARRY OUT the evaporative emission system leak test. Refer to [Evaporative Emission System Leak Test](#) in this section. If the system passes the leak test, CARRY OUT the evaporative emission repair verification drive cycle. REFER to [Evaporative Emission Repair Verification Drive Cycle](#) in this section.

→ No

GO to [F8](#).

F8 TEST FOR BLOCKAGE IN 1.0L EVAP CANISTER

1



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1 Disconnect the fuel vapor storage canister inlet tube from the 1.0L EVAP canister.

2 Pressurize the EVAP system to 3.48 kPa (14 inches H₂O).

● Does the pressure drop immediately?

→ Yes

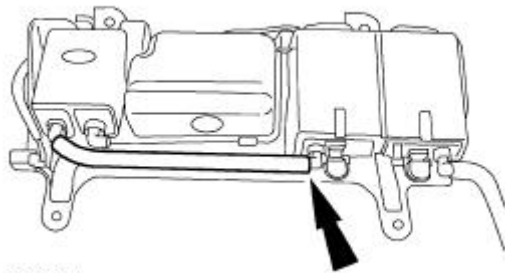
INSTALL a new 1.0L EVAP canister.

RECONNECT all components. CARRY OUT the evaporative emission system leak test. Refer to [Evaporative Emission System Leak Test](#) in this section. If the system passes the leak test, CARRY OUT the evaporative emission repair verification drive cycle. REFER to [Evaporative Emission Repair Verification Drive Cycle](#) in this section.

→ **No**
GO to [F9](#).

F9 TEST FOR BLOCKAGE IN FUEL VAPOR STORAGE CANISTER INLET TUBE

1



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1 Disconnect the fuel vapor storage canister inlet tube from the 2.0L EVAP canister.

2 Pressurize the EVAP system to 3.48 kPa (14 inches H₂O).

- Does the pressure drop immediately?

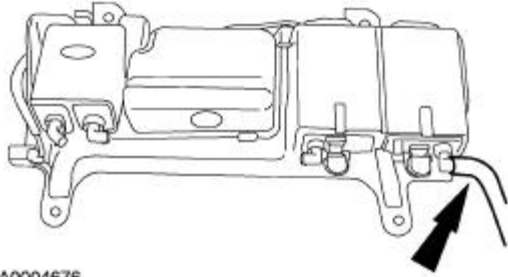
→ **Yes**
INSTALL a new fuel vapor storage canister inlet tube. RECONNECT all components. CARRY OUT the evaporative emission system leak test. Refer to [Evaporative Emission System Leak Test](#) in this section. If the system passes the leak test, CARRY OUT the evaporative emission repair verification drive cycle. REFER to [Evaporative Emission Repair Verification Drive Cycle](#) in this section.

→ **No**
GO to [F10](#).

F10 TEST FOR BLOCKAGE IN 2.0L EVAP CANISTER

1

1 Disconnect the EVAP canister purge outlet tube from the 2.0L EVAP canister.



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2 Pressurize the EVAP system to 3.48 kPa (14 inches H₂O).

- Does the pressure drop immediately?

→ **Yes**



INSTALL a new 2.0L EVAP canister. RECONNECT all components. CARRY OUT the evaporative emission system leak test. Refer to [Evaporative Emission System Leak Test](#) in this section. If the system passes the leak test, CARRY OUT the evaporative emission repair verification drive cycle. REFER to [Evaporative Emission Repair Verification Drive Cycle](#) in this section.

→ **No**

INSTALL a new EVAP canister purge outlet tube. RECONNECT all components. CARRY OUT the evaporative emission system leak test. Refer to [Evaporative Emission System Leak Test](#) in this section. If the system passes the leak test, CARRY OUT the evaporative emission repair verification drive cycle. REFER to [Evaporative Emission Repair Verification Drive Cycle](#) in this section.

Evaporative Emission System Leak Test

Special Tool(s)


 <p>ST2116-A</p>	Evaporative Emission System Leak Tester 310-F007 (134-00056) or equivalent
 <p>ST2332-A</p>	Worldwide Diagnostic System (WDS) 418-F224, New Generation STAR (NGS) Tester 418-F052, or equivalent scan tool

 **CAUTION:** The evaporative emission system must not be pressurized to more than 3.48 kPa (14 inches H₂O) or damage to the evaporative emission system may occur.

1. Connect the Evaporative Emission System Leak Tester to the evaporative emission test port.
2. Close the canister vent solenoid. For additional information, refer to [Canister Vent Solenoid Closing Procedure](#) in this section.
3. Pressurize the evaporative emission system to 3.48 kPa (14 inches/H₂O).
4. Monitor the system for two minutes. The system fails the Leak Test if the pressure falls below 2.0 kPa (8 inches/H₂O).
5. Repair any leaks as required.
6. Repeat the Leak Test until the system remains above 2.0 kPa (8 inches/H₂O) after the two-minute test period.

Canister Vent Solenoid Closing Procedure

Special Tool(s)


 <p>ST2332-A</p>	<p>Worldwide Diagnostic System (WDS) 418-F224, New Generation STAR (NGS) Tester 418-F052, or equivalent scan tool</p>
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⚠ CAUTION: The canister vent solenoid must not be energized for more than nine minutes at one time. Once the canister vent solenoid is energized and de-energized, adequate time must be allowed for the component to cool adequately. Failure to allow the component to cool may create a false failure in the diagnostics, causing unnecessary repairs.

1. Connect the scan tool and select the output test mode.
 2. If PID monitors are not active, select PIDs.
 3. Select the fuel tank pressure (FTP) and the volts (V) parameter identification (PID) for monitoring.
 4. Select the ALL OFF mode.
 5. Close the canister vent solenoid by pushing the START button on the scan tool.
-

Evaporative Emission Repair Verification Drive Cycle

Special Tool(s)

 ST2332-A	Worldwide Diagnostic System (WDS) 418-F224, New Generation STAR (NGS) Tester 418-F052, or equivalent scan tool
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Drive Cycle Recommendations

NOTE: The following procedure is designed to execute and complete the evaporative emission repair verification drive cycle and to clear the Ford P1000, inspection and maintenance (I/M) readiness code. When the ambient air temperature is below 4.4°C (40°F) or above 37.8°C (100°F), or the altitude is above 2,438 meters (8,000 feet), the EVAP monitor will not run. If the P1000 must be cleared in these conditions, the powertrain control module (PCM) must detect them once (twice on some applications) before the EVAP monitor can be bypassed and the P1000 cleared. The EVAP bypassing procedure is described in the following drive cycle.

1. Most OBD II monitors will complete more readily using a steady foot driving style during cruise or acceleration modes. Operating the throttle in a smooth fashion will minimize the time necessary for monitor completion.
2. Fuel tank level should be between one-half and three-quarters full with three-quarters full being the most desirable.
3. The evaporative monitor can only operate during the first 30 minutes of engine operation. When executing the procedure for this monitor, stay in part throttle mode and drive in a smooth fashion to minimize fuel slosh.

Drive Cycle Preparation

NOTE: For best results, follow each of the following steps as accurately as possible.

4. **NOTE:** This step bypasses the engine soak timer and resets OBD II monitor status.

Install the scan tool. Turn the key ON with the engine OFF. Cycle the key off, then on. Select the appropriate vehicle and engine qualifier. Clear all diagnostic trouble codes (DTCs) and carry out a PCM reset.

5. Begin to monitor the following PIDs: ECT, EVAPDC, FLI (if available) and TP MODE. Press Diagnostic Data Link, PCM, PID/Data monitor and record, press trigger to select each PID, then start.
6. Start the engine without returning the key to the OFF position.

Preparation for Monitor Entry



WARNING: Strict observance of posted speed limits and attention to driving conditions

are mandatory when proceeding through the following drive cycle.

7. **NOTE:** This step allows engine warm-up and provides intake air temperature (IAT) input to the PCM.

Idle the vehicle for 15 seconds. Drive at 64 km/h (40 mph) until the ECT is at least 76.7°C (170° F).

8. Is IAT above 4.4°C (40°F) and below 37.8°C (100°F)? If not, continue with the following steps but note that the EVAP Monitor Bypass portion of the drive cycle (Step 13) will be required to bypass the EVAP monitor and clear the P1000.

9. **NOTE:** This step executes the heated oxygen sensor (HO2S) monitor.

Cruise at 64 km/h (40 mph) for 60 seconds.

10. **NOTE:** This executes the EVAP monitor if IAT is above 4.4°C (40°F) and below 37.8°C (100°F).

NOTE: To initiate the monitor, TP MODE should equal PT, EVAPDC must be greater than 75%, and FLI must be between 15 and 85%.

NOTE: Avoid sharp turns and hills.

Cruise at 72 to 104 km/h (45 to 65 mph) for 10 minutes.

11. **NOTE:** This step executes the ISC portion of the Secondary Air/CCM.

Bring the vehicle to a stop. Idle with the transmission in DRIVE (for automatic transmission) or NEUTRAL (for manual transmission) for two minutes.

Pending Code and EVAP Monitor Bypass Check

12. **NOTE:** This determines if a pending code is preventing the clearing of P1000.

NOTE: If the EVAP monitor is not complete and IAT was below 4.4°C (40°F) or above 37.8°C (100°F) temperature range in Step 8, or the altitude is above 2,438 meters (8,000 feet), the EVAP Monitor Bypass (Step 13) must be carried out.

Using the scan tool, check for pending codes. Conduct normal repair procedures for any pending code concerns. Rerun any incomplete monitor.

EVAP Monitor Bypass

13. **NOTE:** This allows the bypass counter to increment to two.

NOTE: Do not repeat Step 4.

Park the vehicle for a minimum of eight hours. Repeat Steps 5 through 12.

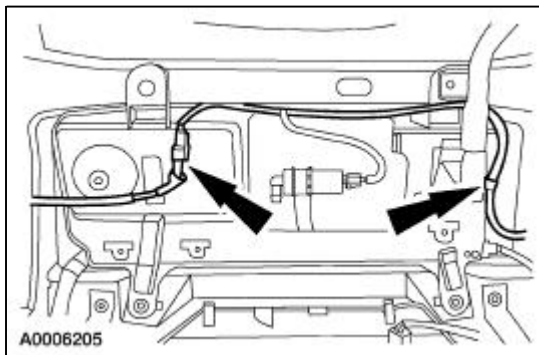
Evaporative Emission Canister

Removal and Installation

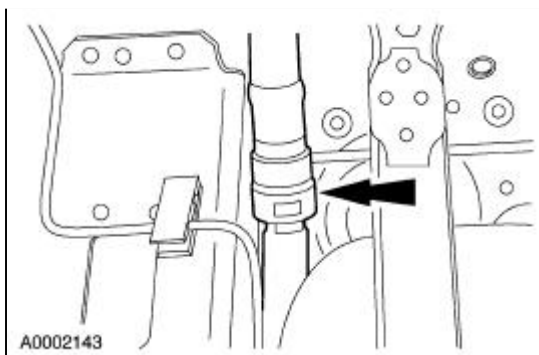
⚠ WARNING: The evaporative emission system contains fuel vapor and condensed fuel vapor. Although not present in large quantities, it still presents the danger of explosion or fire. Disconnect the battery ground cable from the battery to minimize the possibility of an electrical spark occurring, possibly causing a fire or explosion if fuel vapor or liquid fuel are present in the area. Failure to follow these instructions may result in personal injury.

⚠ WARNING: Do not smoke or carry lighted tobacco or open flame of any type when working on or near any fuel-related component. Highly flammable mixtures are always present and may be ignited. Failure to follow these instructions may result in personal injury.

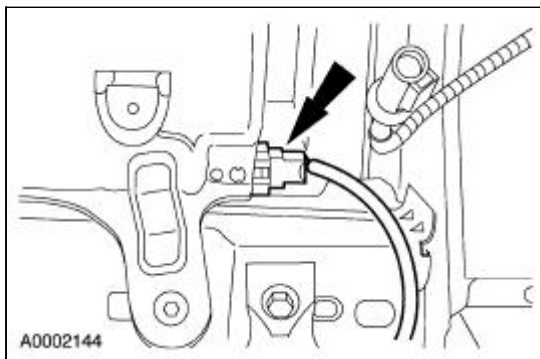
1. Disconnect the battery ground cable. For additional information, refer to [Section 414-01](#).
2. Raise and support the vehicle. For additional information, refer to [Section 100-02](#).
3. Lower the rear subframe to access the evaporative emission canister assembly. For additional information, refer to [Section 502-00](#).
4. Disconnect the connectors.



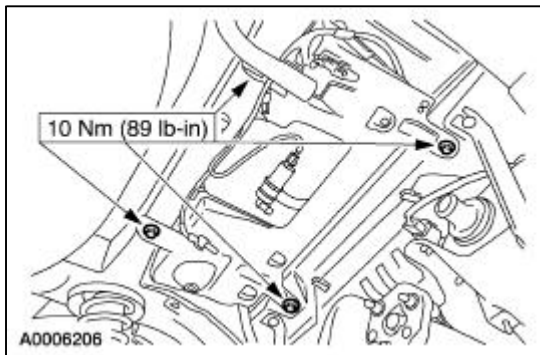
5. Disconnect the hose.



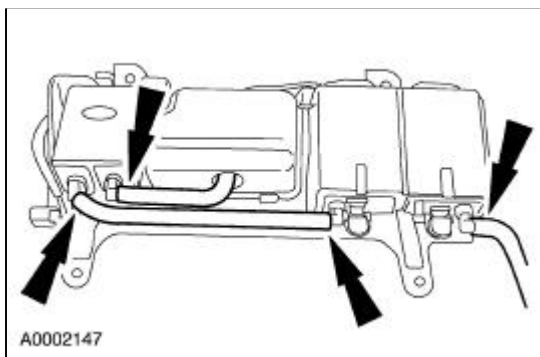
6. Disconnect the connector.



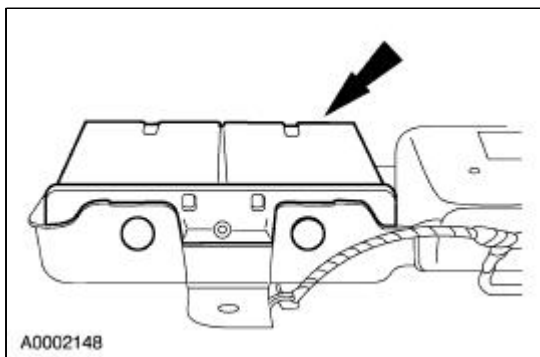
7. Remove the evaporative emission (EVAP) canister and bracket assembly (9E857).
 - Remove the four bolts.



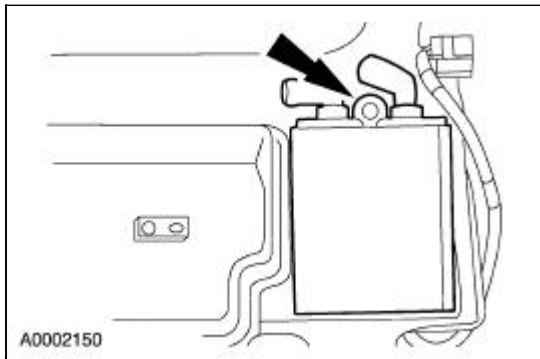
8. Disconnect the hoses.



9. Remove the EVAP canister.



10. Remove the EVAP canister.
 - Remove the rivet.



11. **NOTE:** The evaporative emission canister assembly must be leak-tested prior to installation on the vehicle.

NOTE: Lubricate the O-ring seals with MERPOL® or equivalent meeting Ford specifications ESE-M99B144-B.

To install, reverse the removal procedure.

- Carry out a leak test. For additional information, refer to [Evaporative Emission System Leak Test](#) in this section.
 - Carry out the evaporative emission repair verification drive cycle. For additional information, refer to [Evaporative Emission Repair Verification Drive Cycle](#) in this section.
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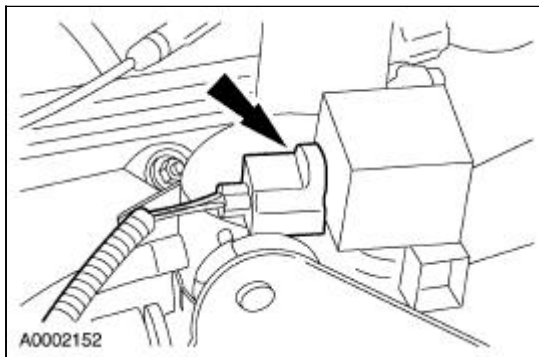
Evaporative Emission Canister Purge Valve

Removal and Installation

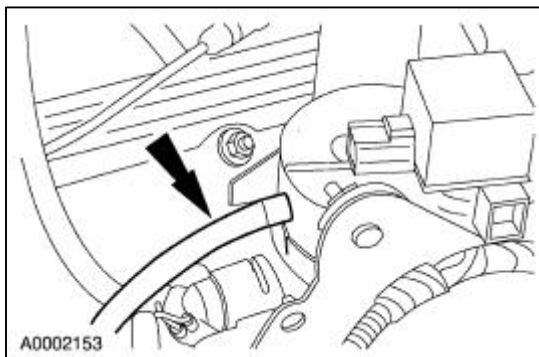
⚠ WARNING: The evaporative emission system contains fuel vapor and condensed fuel vapor. Although not present in large quantities, it still presents the danger of explosion or fire. Disconnect the battery ground cable from the battery to minimize the possibility of an electrical spark occurring, possibly causing a fire or explosion if fuel vapor or liquid fuel are present in the area. Failure to follow these instructions may result in personal injury.

⚠ WARNING: Do not smoke or carry lighted tobacco or open flame of any type when working on or near any fuel-related component. Highly flammable mixtures are always present and may be ignited. Failure to follow these instructions may result in personal injury.

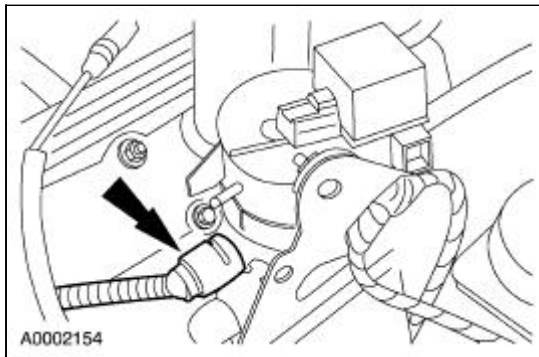
1. Disconnect battery cable. For additional information, refer to [Section 414-01](#).
2. Disconnect the connector.



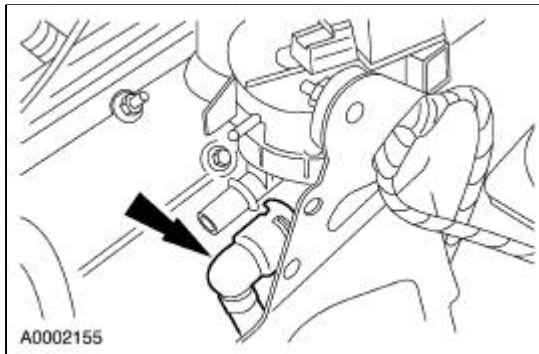
3. Disconnect the vacuum line.



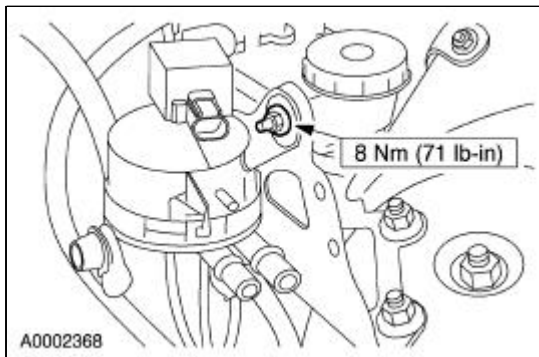
4. Disconnect the evaporative emission (EVAP) return tube.



5. Disconnect the EVAP canister purge outlet tube.



6. Remove the EVAP canister purge valve.



7. **NOTE:** The EVAP canister assembly must be leak-tested prior to installation on the vehicle.

NOTE: Lubricate the O-ring seals with MERPOL® or equivalent meeting Ford specifications ESE-M99B144-B.

To install, reverse the removal procedure.

- Carry out a leak test. For additional information, refer to [Evaporative Emission System Leak Test](#) in this section.
 - Carry out the evaporative emission repair verification drive cycle. For additional information, refer to [Evaporative Emission Repair Verification Drive Cycle](#) in this section.
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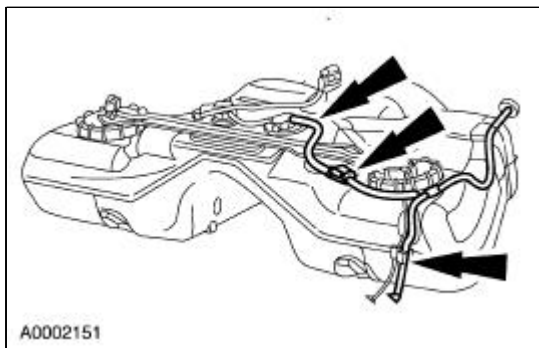
Fuel Vapor Control Tube Assembly Valve

Removal and Installation

⚠ WARNING: The evaporative emission system contains fuel vapor and condensed fuel vapor. Although not present in large quantities, it still presents the danger of explosion or fire. Disconnect the battery ground cable from the battery to minimize the possibility of an electrical spark occurring, possibly causing a fire or explosion if fuel vapor or liquid fuel are present in the area. Failure to follow these instructions may result in personal injury.

⚠ WARNING: Do not smoke or carry lighted tobacco or open flame of any type when working on or near any fuel-related component. Highly flammable mixtures are always present and may be ignited. Failure to follow these instructions may result in personal injury.

1. Disconnect the battery ground cable. For additional information, refer to [Section 414-01](#).
2. Remove the fuel tank. For additional information, refer to [Section 310-01](#).
3. Disconnect and remove the fuel vapor control valve tube assembly.



4. **NOTE:** Lubricate the O-ring seals with MERPOL® or equivalent meeting Ford specifications ESE-M99B144-B.

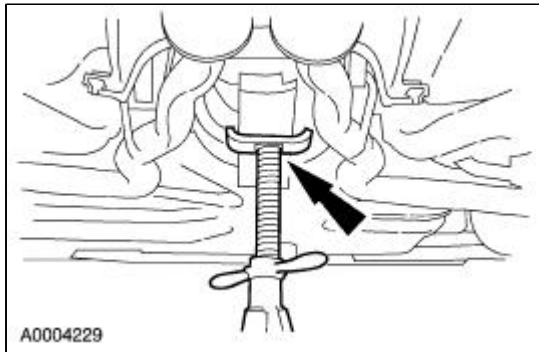
To install, reverse the removal procedure.

- Carry out a leak test. For additional information, refer to [Evaporative Emission System Leak Test](#) in this section.
- Carry out the evaporative emission repair verification drive cycle. For additional information, refer to [Evaporative Emission Repair Verification Drive Cycle](#) in this section.

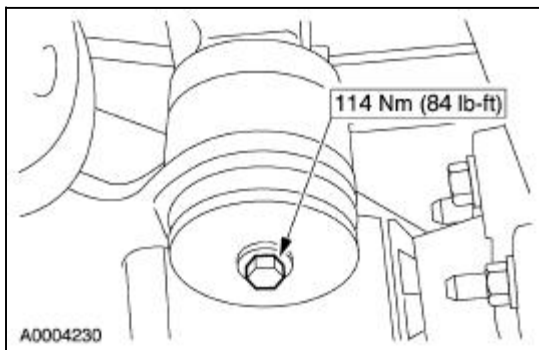
Evaporative Emission Canister Vent Solenoid

Removal and Installation

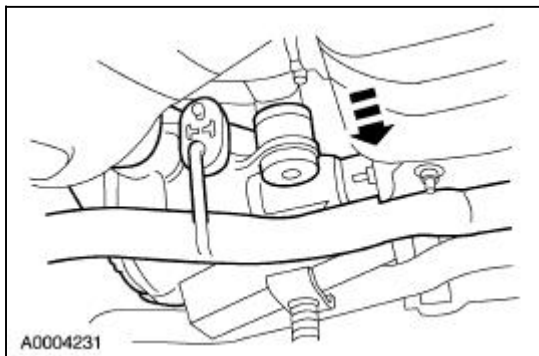
1. Raise and support the vehicle. For additional information, refer to [Section 100-02](#).
2. Position a jack stand under the differential.



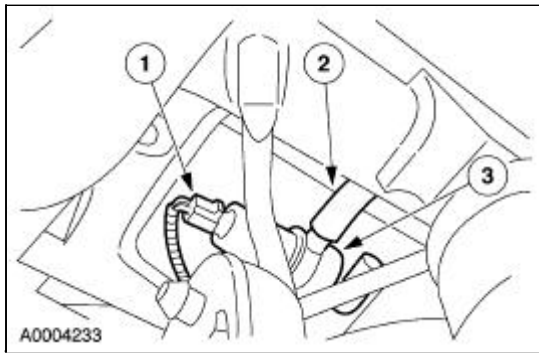
3. Remove the bolt.



4. Lower the differential to access the canister vent solenoid as necessary.



5. Remove the canister vent solenoid.
 1. Disconnect the connector.
 2. Disconnect the hose.
 3. Remove the canister vent solenoid.



6. **NOTE:** Lubricate the O-ring seals with MERPOL® or equivalent meeting Ford specifications ESE-M99B144-B.

To install, reverse the removal procedure.

- Carry out a leak test. For additional information, refer to [Evaporative Emission System Leak Test](#) in this section.
 - Carry out the evaporative emission repair verification drive cycle. For additional information, refer to [Evaporative Emission Repair Verification Drive Cycle](#) in this section.
-

General Specifications

Item	Specification
High Temperature Nickel Anti-Seize Lubricant F6AZ-9L494-AA	ESE-M12A4-A
Super Premium SAE 5W-30 Motor Oil XO-5W30-QSP	WSS-M2C153-G

Torque Specifications

Description	Nm	lb-ft	lb-in
Camshaft position (CMP) sensor bolt	11	8	—
Crankshaft position (CKP) sensor bolt	10	—	89
Cross vehicle support	20	15	—
Cylinder head temperature (CHT) sensor	22	16	—
Differential pressure feedback EGR (DPFE) nuts	6	—	53
Fuel pressure sensor bolts	8	—	71
Fuel pressure sensor shield bolts	10	—	89
Fuel pressure sensor shield nut	6	—	53
Heated oxygen sensor (HO2S)	41	30	—
Idle air control (IAC) valve bolts—3.0L	10	—	89
Intake manifold tuning valve (IMTV) bolts	10	—	89
Intake manifold tuning valve harness bracket nut	7	—	62
Idle air control (IAC) valve—3.9L	12	9	—
Knock sensor (KS) bolt—3.9L	20	15	—
Knock sensor (KS) nut/bolt—3.0L	25	18	—
Mass airflow (MAF) sensor plate nuts	5	—	44
Powertrain control module (PCM) bracket bolts	7	—	62
Powertrain Control module (PCM) harness connector bolts	10	—	89
Power steering pressure (PSP) switch	17	13	—
Throttle position (TP) sensor screws	3	—	27
Wiring harness bracket to cylinder head nuts	10	—	89

Electronic Engine Controls

The electronic engine controls consist of the following:

- powertrain control module (PCM)
- throttle position (TP) sensor
- idle air control (IAC) valve
- camshaft position (CMP) sensor
- crankshaft position (CKP) sensor
- mass air flow (MAF) sensor
- intake air temperature (IAT) sensor
- heated oxygen sensor (HO2S)—front
- heated oxygen sensor (HO2S)—rear
- knock sensor (KS) (12A699)
- cylinder head temperature (CHT) sensor
- power steering pressure (PSP) switch
- fuel pressure sensor
- vehicle speed sensor (VSS)

The powertrain control module needs the following inputs to calibrate the engine correctly:

- camshaft position
- engine rpm
- cylinder head temperature
- clutch pedal position
- amount of engine detonation
- mass air flow (MAF) sensor

The throttle position sensor:

- sends the powertrain control module a signal indicating the throttle plate angle.
- is the main input to the powertrain control module from the driver.

The idle air control valve:

- supplies air to the fuel rail for better atomization of fuel (3.9L only)
- controls bypass air around the throttle plate at low speeds.
- is controlled by the powertrain control module.

The camshaft position sensor:

- sends the powertrain control module a signal indicating camshaft position used for fuel synchronization.

The power steering pressure switch:

- is located on the power steering pump, generates a differential pressure, and is dependent on current input.
- controls the spool valve in the power steering pump.
- regulates the hydraulic flow and, when combined with a current controlling device, yields a variable assist power steering system.
- is controlled by the PCM to increase power steering pump flow and power steering assist at low vehicle speeds and to reduce power steering pump flow and power steering assist at high vehicle speeds.
- is controlled by the PCM to increase the power steering pump flow, thereby increasing power steering assist for evasive maneuvering at high vehicle speeds (steering wheel rotation rate greater than 22 rpm).

The crankshaft position sensor:

- sends the powertrain control module a signal indicating crankshaft position.
- is essential for calculating spark timing.

The mass air flow sensor:

- sends the powertrain control module a signal indicating mass air flow rate of air entering the engine.

The intake air temperature sensor:

- sends the powertrain control module a signal indicating the temperature of the air entering the engine.
- resistance decreases as temperature increases.

The heated oxygen sensors:

- monitor oxygen content before and after the exhaust flows through the catalytic converter.
- provide a voltage to the powertrain control module used to calculate catalytic converter integrity.

The knock sensor:

- is located in the intake valley.
- sends a signal to the powertrain control module indicating engine detonation. (If detonation is occurring, the powertrain control module then changes spark timing.)

The cylinder head temperature sensor:

- is mounted into the wall of the cylinder head and is not connected to any coolant passages.

The knock sensor:

- is located in the intake valley.
- sends a signal to the powertrain control module indicating engine detonation. (If detonation is occurring, the powertrain control module then changes spark timing.)

The fuel pressure sensor:

- sends the powertrain control module a signal indicating fuel pressure.
 - The powertrain control module uses the fuel pressure sensor signal and the fuel temperature sensor signal to maintain the fuel liquid pressure in the fuel line which reduces the fuel vapor pressure in the fuel line.
- sends a signal to the powertrain control module indicating the cylinder head temperature.
 - If the temperature exceeds approximately 121°C (250°F), the powertrain control module disables half the fuel injectors at a time. The powertrain control module will alternate which fuel injectors are disabled every 32 engine cycles. The cylinders that are not being fuel injected act as air pumps to aid in cooling the engine.
 - If the temperature exceeds approximately 166°C (330°F), the powertrain control module disables all of the fuel injectors until the engine temperature drops below approximately 154°C (310°F).
 - The coolant temperature gauge pointer will read fully hot.
 - The check gauge warning indicator will illuminate and DTCs are set.

The vehicle speed sensor:

- sends a frequency signal to the powertrain control module.
 - The powertrain control module uses the vehicle speed sensor signal to calculate vehicle speed and to determine shift scheduling and electronic pressure control.

The intake manifold tuning valve:

- connects the plenums to improve upper rpm power.
-

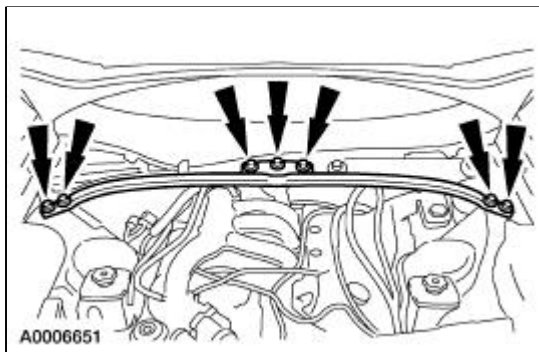
Electronic Engine Controls

Refer to the Powertrain Control/Emissions Diagnosis (PC/ED) manual.

Intake Manifold Tuning (IMT) Valve —3.0L

Removal

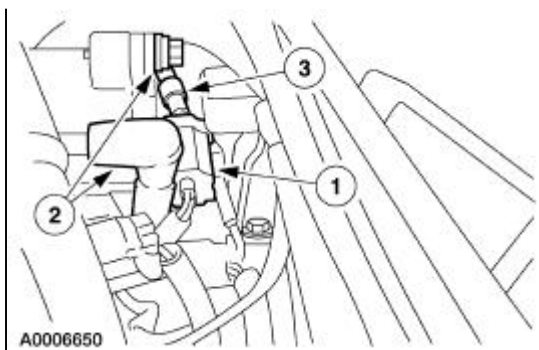
1. Disconnect the battery ground cable. For additional information, refer to [Section 414-01](#).
2. Remove the cowl vent screen. For additional information, refer to [Section 501-02](#).
3. Remove the bolts and the cross vehicle support.




4. Remove the wiring harness bracket.



5. Remove the intake manifold tuning valve (IMTV).
 1. Disconnect the electrical connector.
 2. Remove the two bolts.
 3. Remove the IMTV.

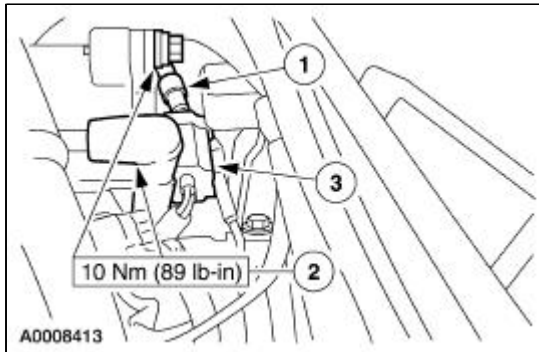


Installation

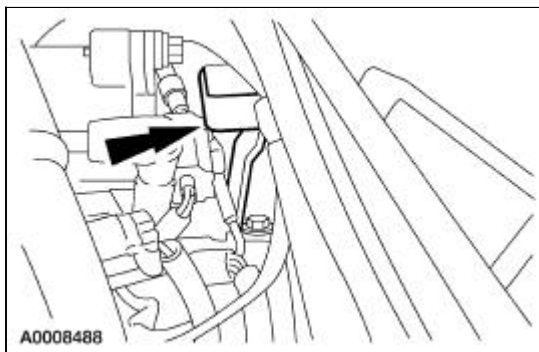
1.  **CAUTION: The IMTV must be fully seated in the intake manifold prior to installing the bolts, or damage to the IMTV may occur.**

Install the intake manifold tuning valve (IMTV).

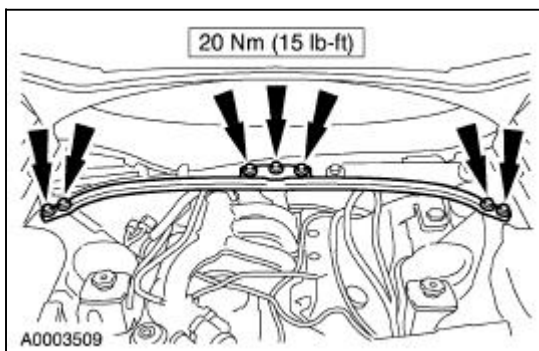
1. Coat the IMTV with Super Premium SAE 5W-30 Motor Oil XO-5W30-QSP or equivalent meeting Ford specification WSS-M2C153-G, and install into the intake manifold.
2. Install the two bolts.
3. Connect the electrical connector.



2. Install the wiring harness bracket.



3. Position the cross vehicle support and install the bolts.

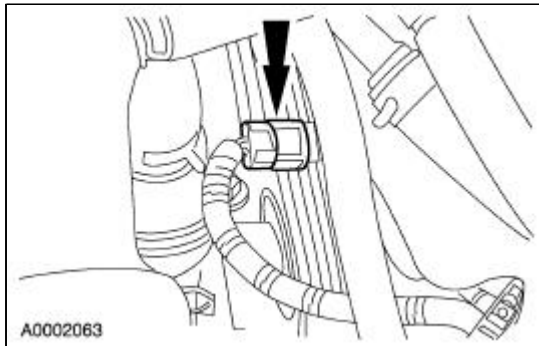


4. Install the cowl vent screen. For additional information, refer to [Section 501-02](#).

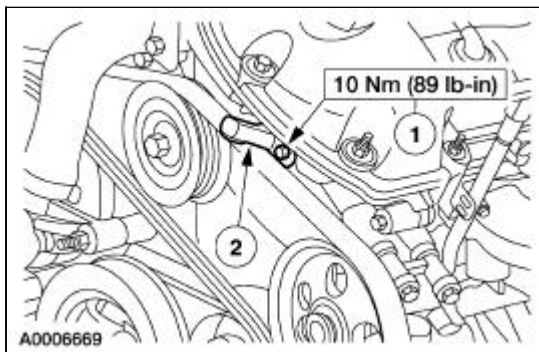
Camshaft Position (CMP) Sensor —3.0L

Removal and Installation

1. Disconnect the battery ground cable. For additional information, refer to [Section 414-01](#).
2. Disconnect the camshaft position (CMP) sensor electrical connector.



3. Remove the CMP sensor.
 1. Remove the bolt from the CMP sensor.
 2. Remove the CMP sensor from the vehicle.



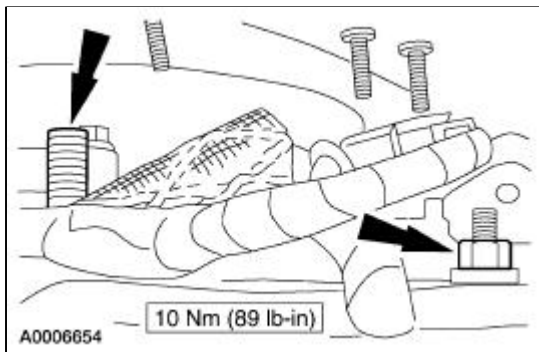
4.  **CAUTION:** Do not overtighten the screw or damage to the CMP sensor may occur.

To install, reverse the removal procedure.

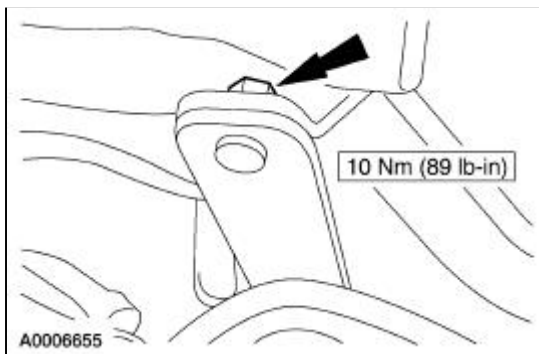
Camshaft Position (CMP) Sensor —3.9L

Removal and Installation

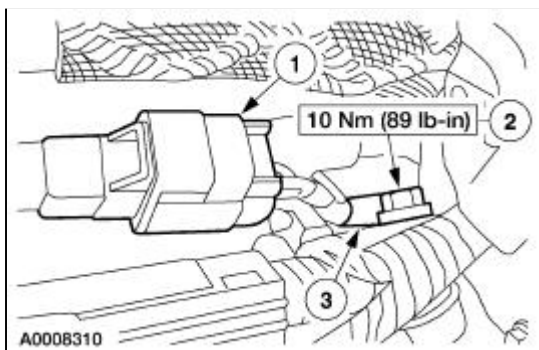
1. Disconnect the battery ground cable. For additional information, refer to [Section 414-01](#).
2. Remove the wiper motor. Refer to [Section 501-16](#).
3. Remove the harness bracket nut and stud from the rear of the LH cylinder head.



4. Remove the harness bracket nut and position the bracket away from the cylinder head.



5. Remove the camshaft position (CMP) sensor.
 1. Disconnect the electrical connector.
 2. Remove the bolt.
 3. Remove the CMP sensor.



6.  **CAUTION: Do not overtighten the screw or damage to the camshaft position sensor may occur.**

NOTE: When the battery is disconnected and reconnected, some abnormal drive symptoms may occur while the vehicle relearns its adaptive strategy. The vehicle may need to be driven 16 km (10 miles) or more to relearn the strategy.

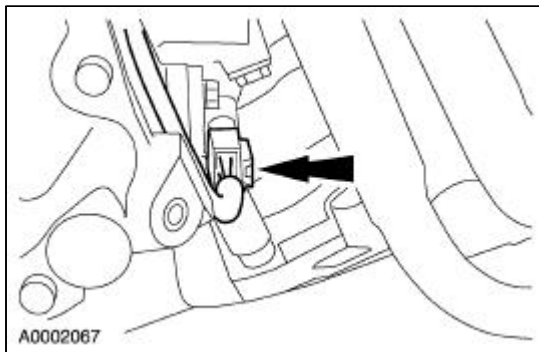
To install, reverse the removal procedure.

Crankshaft Position (CKP) Sensor —3.0L

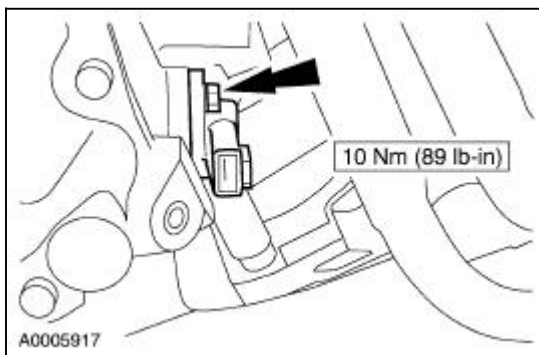
Removal and Installation

1. Disconnect the battery ground cable. For additional information, refer to [Section 414-01](#).
2. Raise and support the vehicle. For additional information, refer to [Section 100-02](#).
3. **NOTE:** Generator removed for clarity.

Disconnect the crankshaft position (CKP) sensor electrical connector.



4. Remove the CKP sensor bolt and the CKP sensor.

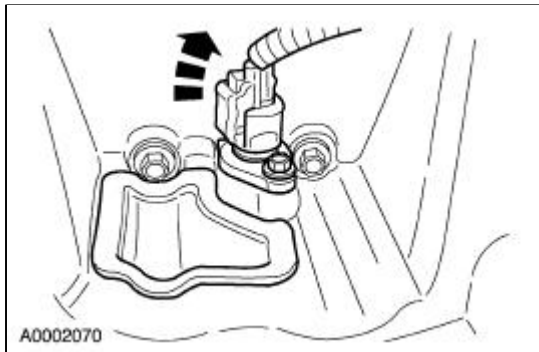


5. To install, reverse the removal procedure.

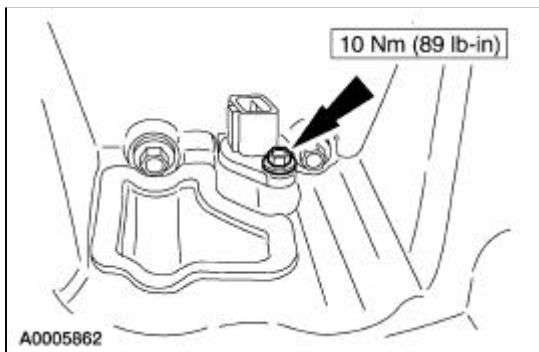
Crankshaft Position (CKP) Sensor —3.9L

Removal and Installation

1. Disconnect the battery ground cable. For additional information, refer to [Section 414-01](#).
2. Raise and support the vehicle. For additional information, refer to [Section 100-02](#).
3. Disconnect the crankshaft position (CKP) sensor electrical connector.



4. Remove the bolt and the CKP sensor.

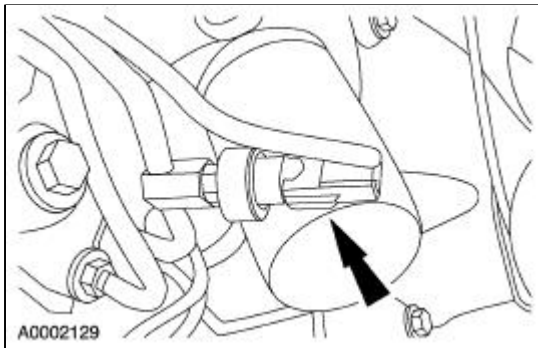


5. To install, reverse the removal procedure.

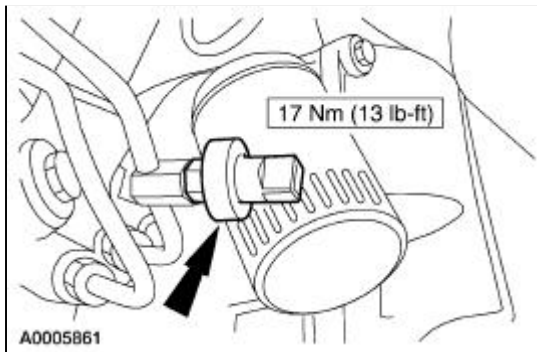
Power Steering Pressure (PSP) Switch —3.0L

Removal

1. Disconnect the battery ground cable. For additional information, refer to [Section 414-01](#).
2. Raise and support the vehicle. For additional information, refer to [Section 100-02](#).
3. Disconnect the power steering pressure (PSP) switch electrical connector.



4. Remove the PSP switch.

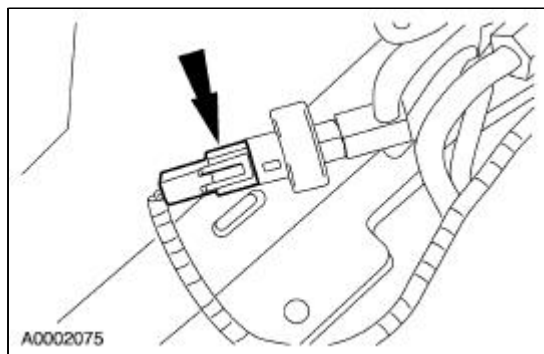


5. To install, reverse the removal procedure.

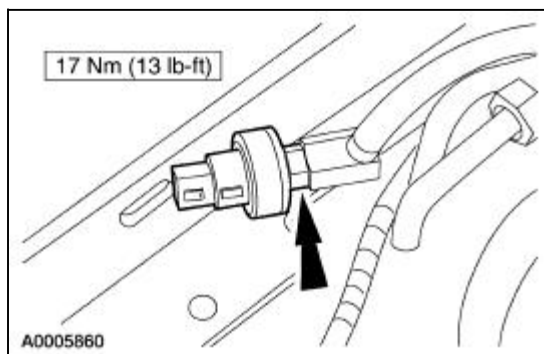
Power Steering Pressure (PSP) Switch —3.9L

Removal and Installation

1. Disconnect the battery ground cable. For additional information, refer to [Section 414-01](#).
2. Disconnect the power steering pressure (PSP) switch electrical connector.




3. Remove the PSP switch.



4. To install, reverse the removal procedure.

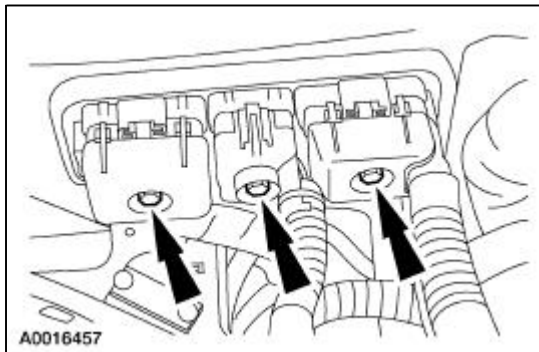
Powertrain Control Module (PCM)

Special Tool(s)

 <p>ST2332-A</p>	<p>Worldwide Diagnostic System (WDS) 418-F224, New Generation STAR (NGS) Tester 418-F052, or equivalent scan tool</p>
---	--

Removal

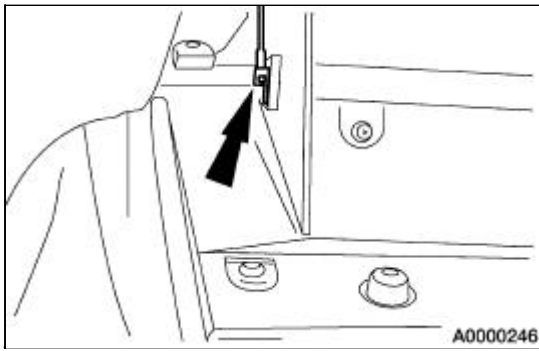
1. Disconnect the battery ground cable. For additional information, refer to [Section 414-01](#).
2. Remove the cabin air filter and plenum. For additional information, refer to [Section 412-01](#).
3. Loosen the bolts and disconnect the powertrain control module (PCM) harness connectors.



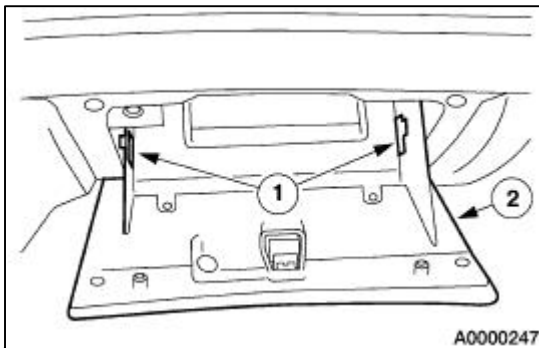
4. Remove the instrument panel finish panel.



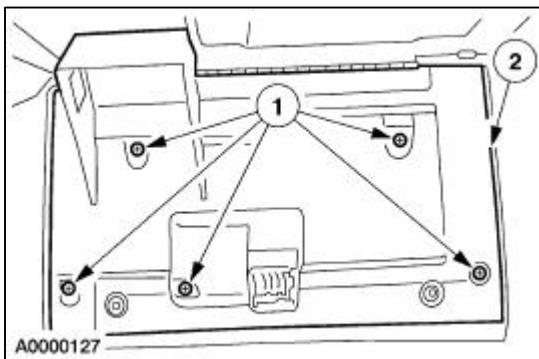
5. Release the assist cable from the glove compartment.



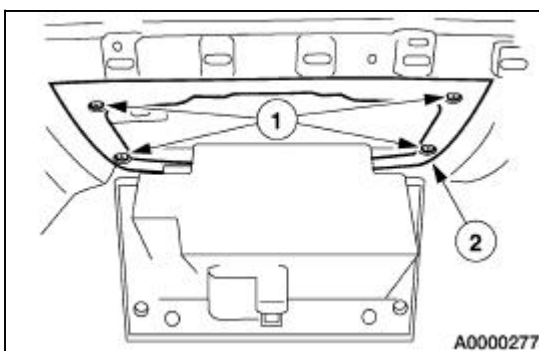
6. Lower the glove compartment.
 1. Release the tabs.
 2. Lower the glove compartment.



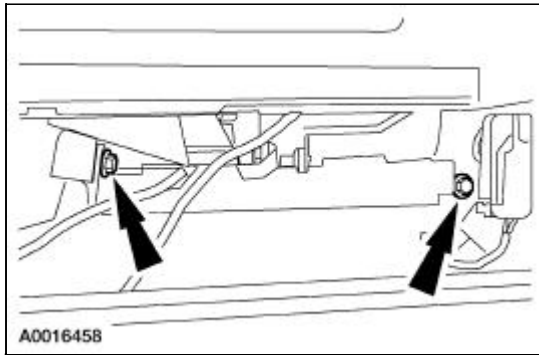
7. If equipped with a compact disc changer, remove the glove compartment inner panel.
 1. Remove the screw.
 2. Remove the panel.



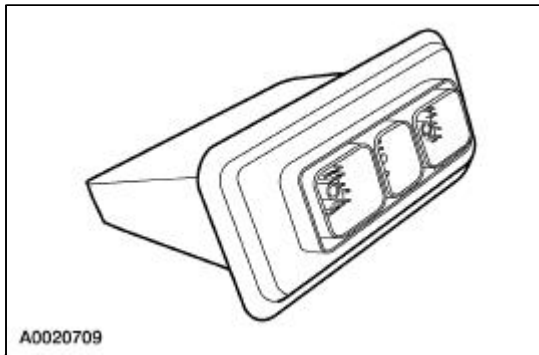
8. Remove the glove compartment instrument panel finish panel.
 1. Remove the screws.
 2. Remove the panel.



9. Remove the PCM bracket bolts and bracket.



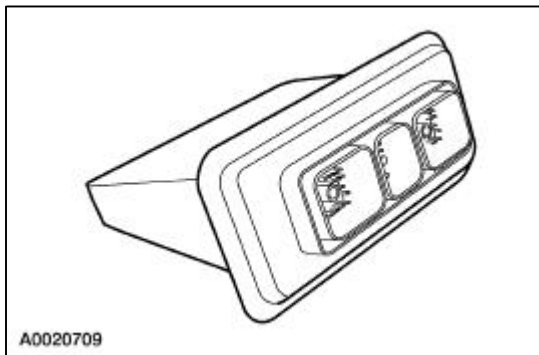
10. Remove the PCM.



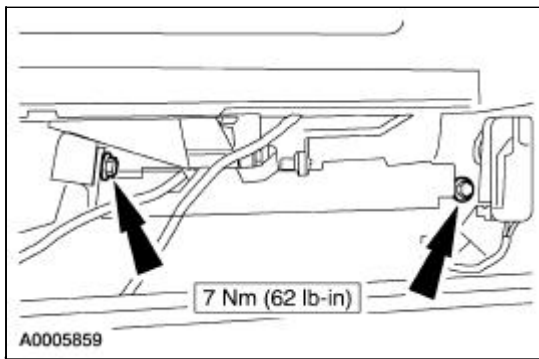
Installation

All Vehicles

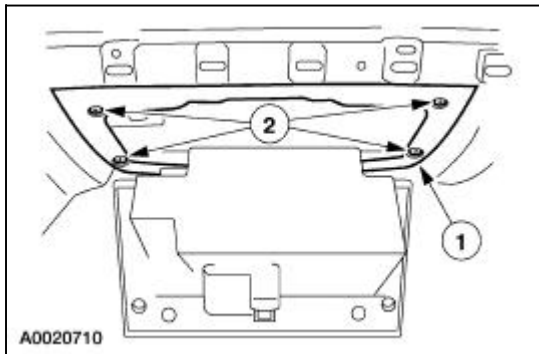
1. Install the PCM into the bracket.



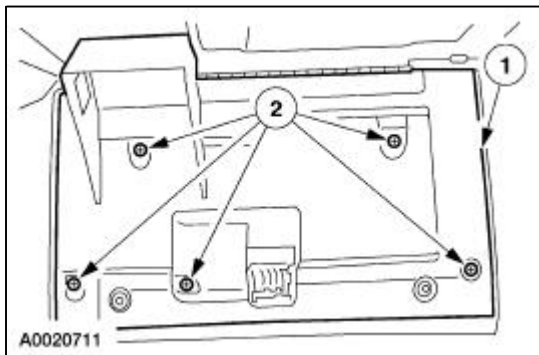
2. Install the PCM into the vehicle through the glove box and install the bolts.



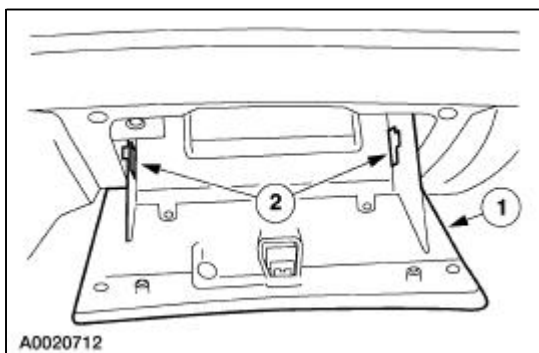
3. Install the glove compartment instrument panel finish panel.
 1. Position the panel.
 2. Install the screws.



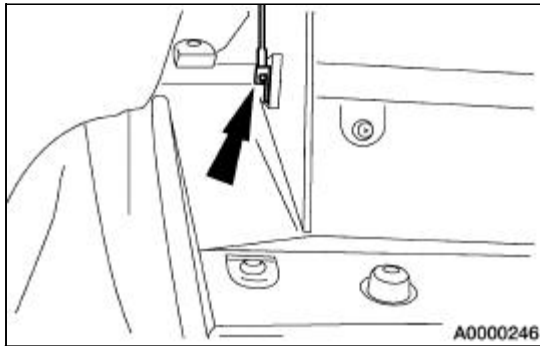
4. If equipped with a compact disc changer, install the glove compartment inner panel.
 1. Position the panel.
 2. Install the screws.



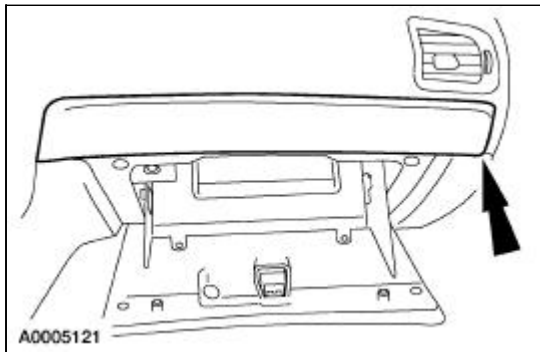
5. Raise the glove compartment.
 1. Raise the glove compartment.
 2. Position the stop tabs.



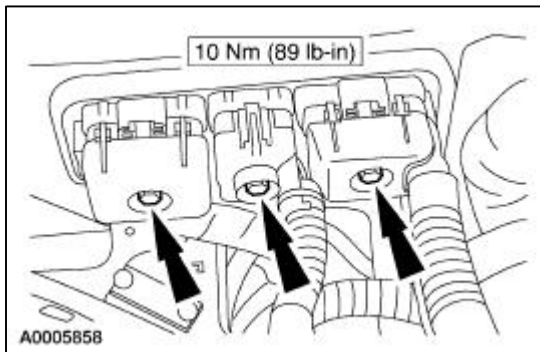
6. Connect the assist cable to the glove compartment.



7. Install the instrument panel finish panel.



8. Connect the PCM harness connectors and tighten the bolts.



9. Install the cabin air filter and plenum. For additional information, refer to [Section 412-01](#).
10. Connect the battery ground cable.

Vehicles With Automatic Transmission

11. Connect the scan tool.
12. Select ICM.
13. Select ENTER SECURITY ACCESS. Wait 10 minutes for security access to be granted.
14. Select PARAMETER RESET.
15. Disconnect the scan tool.

16. Place ignition key in the OFF position.
17. Place ignition key in the RUN position.
18. Remove the ignition key.

Vehicles With Manual Transmission

19. **NOTE:** The steering column lock (SCL) actuator will only allow communication with a tester after the SCL actuator has been activated. To activate the SCL actuator, open the driver door and **do not** put the key in the ignition (or alternatively, you can press one of the buttons on the key fob while there is no key in the ignition.) The SCL actuator will stay activated for 30 minutes after the driver door is opened (or a key fob button is pressed).

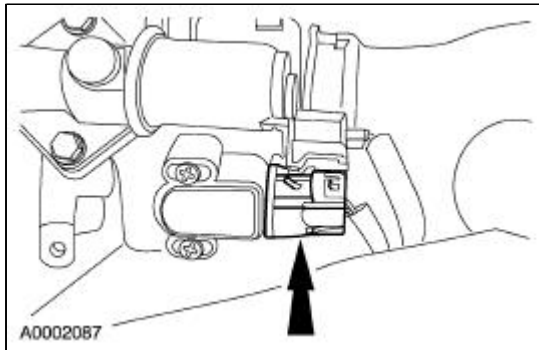
Connect the scan tool.

20. Place the ignition switch in the OFF position.
 21. Select SCLM.
 22. Select ENTER SECURITY ACCESS. Wait 8 minutes for security access to be granted.
 23. Select PARAMETER RESET.
 24. Place the ignition in the RUN position.
 25. Select ICM.
 26. Select ENTER SECURITY ACCESS. Wait 10 minutes for security access to be granted.
 27. Select RESET SCLM PARAMETER.
 28. Select PARAMETER RESET.
 29. Disconnect the scan tool.
 30. Place ignition key in the OFF position.
 31. Place ignition key in the RUN position.
 32. Remove the ignition key.
-

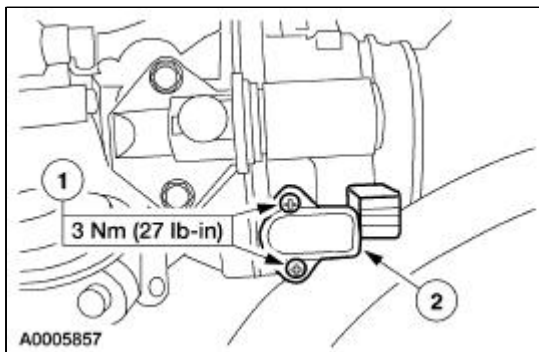
Throttle Position (TP) Sensor —3.0L

Removal and Installation

1. Disconnect the battery ground cable. For additional information, refer to [Section 414-01](#).
2. Disconnect the throttle position (TP) sensor electrical connector.



3. Remove the TP sensor.
 1. Remove the screws from the TP sensor.
 2. Remove the TP sensor from the vehicle.



4. **NOTE:** The TP sensor cannot be adjusted. If necessary, a new sensor must be installed.

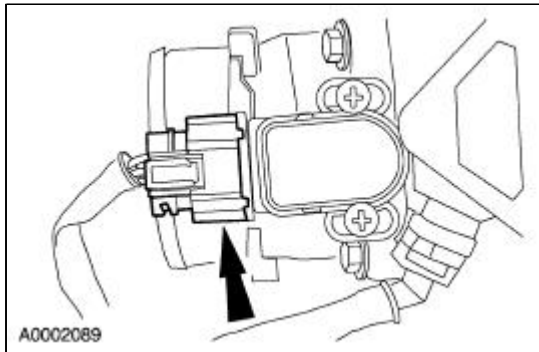
To install, reverse the removal procedure.

- After installation, cycle the throttle lever to wide open throttle (WOT). It should return without interference.

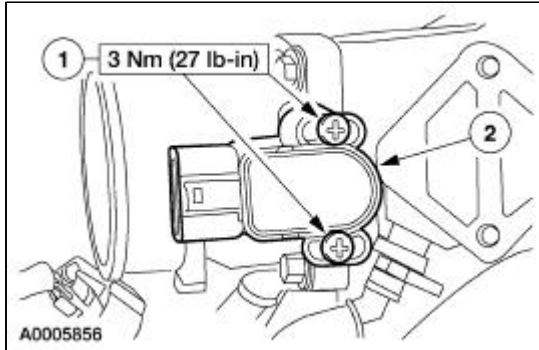
Throttle Position (TP) Sensor —3.9L

Removal and Installation

1. Remove the idler air control (IAC) valve. Refer to [Idle Air Control \(IAC\) Valve—3.9L](#).
2. Disconnect the throttle position (TP) sensor electrical connector.



3. Remove the TP sensor.
 1. Remove the screws from the TP sensor.
 2. Remove the TP sensor from the vehicle.

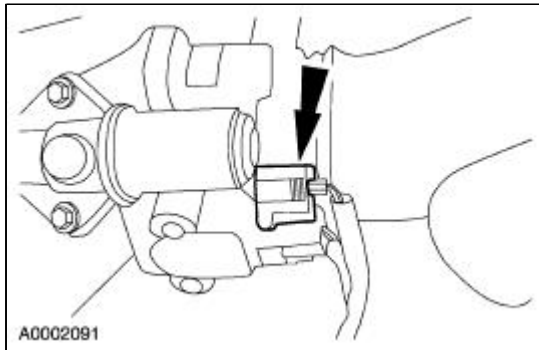


4. To install, reverse the removal procedure.
 - After installation, cycle the throttle lever to wide open throttle (WOT). It should return without interference.

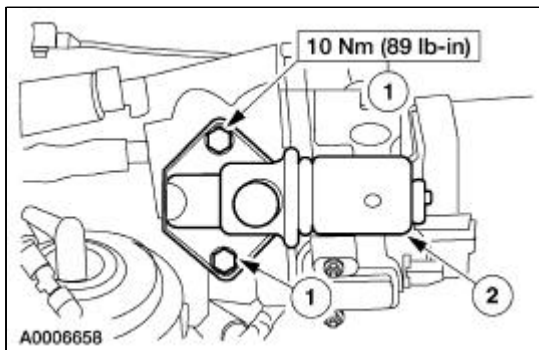
Idle Air Control (IAC) Valve —3.0L


Removal and Installation

1. Disconnect the battery ground cable. For additional information, refer to [Section 414-01](#).
2. Disconnect the electrical connector from the idle air control (IAC) valve.



3. Remove the IAC valve.
 1. Remove the bolts from the IAC valve.
 2. Lift and remove the IAC valve from the vehicle and discard the gasket.



4.  **CAUTION:** Do not use Carburetor Tune-up Cleaner D9AZ-19579-BA meeting Ford specifications ESR-M14P9-A or any other type of solvent as damage to the valve internal components may result.

NOTE: The engine control sensor wiring (12A581) cannot be cleaned. If necessary, new wiring must be installed.

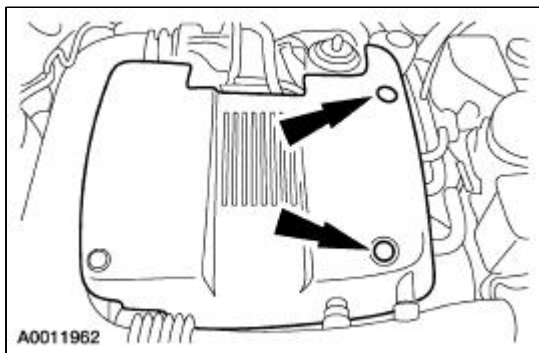
Clean the gasket mating surfaces.

5. To install, reverse the removal procedure.
 - Install a new gasket.

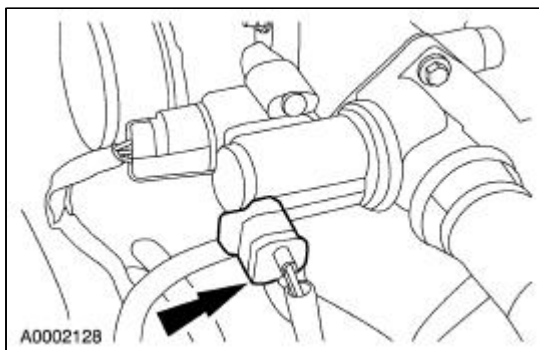
Idle Air Control (IAC) Valve —3.9L

Removal and Installation

1. Disconnect the battery ground cable. For additional information, refer to [Section 414-01](#).
2. Remove the engine appearance cover.
 - Remove the pin-type retainers.



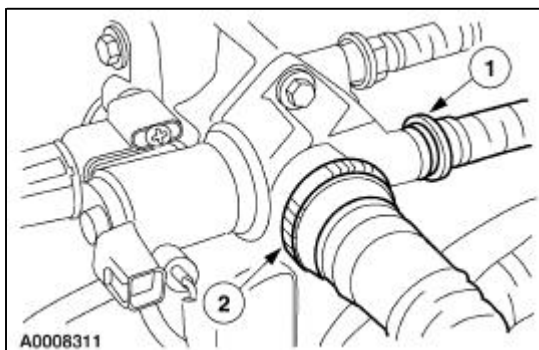
3. Disconnect the electrical connector from the idle air control (IAC) valve (9F715).



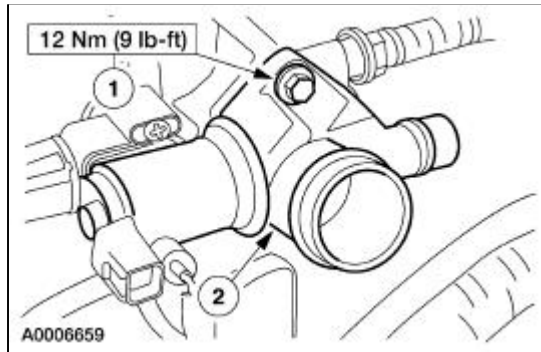
4.  **CAUTION:** In order to disconnect the Noma type hose fittings, squeeze the tabs and pull the hose straight back. Failure to squeeze tabs may result in fitting damage.


Disconnect the hoses.

1. Disconnect the air assist hose.
2. Disconnect the idle air bypass hose.



5. Remove the IAC valve.
 1. Remove the bolts from the IAC valve.
 2. Lift and remove the IAC valve from the vehicle and discard the gasket.



6.  **CAUTION: Do not use Carburetor Tune-up Cleaner D9AZ-19579-BA meeting Ford specification ESR-M14P9-A or any other type of solvent as damage to the valve internal components may result.**

NOTE: The engine control sensor wiring cannot be cleaned. If necessary, new wiring must be installed.

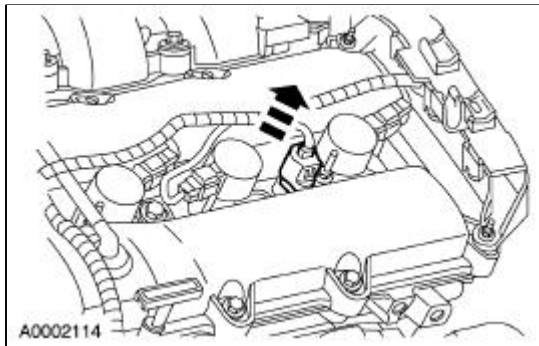
Clean the gasket mating surfaces.

7. To install, reverse the removal procedure.
 - Install a new gasket.
-

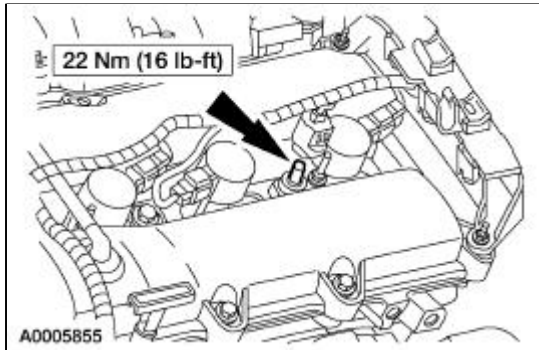
Cylinder Head Temperature (CHT) Sensor —3.0L

Removal and Installation

1. Disconnect the battery ground cable. For additional information, refer to [Section 414-01](#).
2. Remove the engine appearance cover.
3. Disconnect the cylinder head temperature (CHT) sensor electrical connector.



4. Remove and discard the CHT sensor.

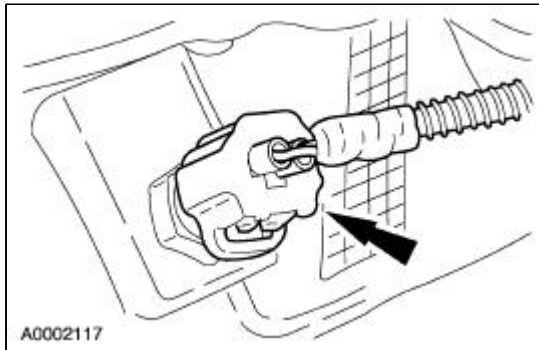


5. To install, reverse the removal procedure.

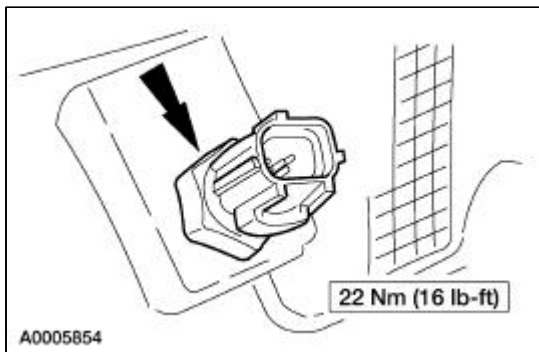
Cylinder Head Temperature (CHT) Sensor —3.9L


Removal and Installation

1. Remove the intake manifold. Refer to [Section 303-01B](#).
2. Disconnect the cylinder head temperature (CHT) sensor electrical connector.



3. Remove and discard the CHT sensor.



4.  **CAUTION:** The tip of the CHT sensor must contact the cylinder head at the bottom of the hole. When removed, it will be slightly crushed. This is a normal condition.

NOTE: 3.9L CHT sensors are not to be reused. Always install a new sensor.

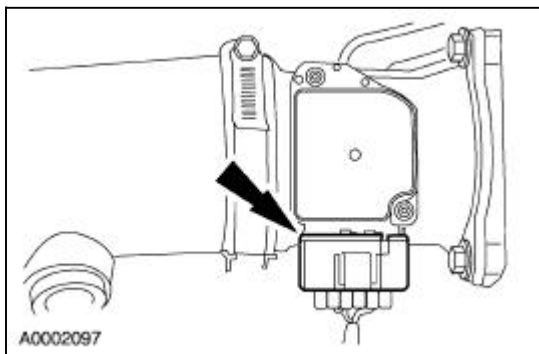
To install, reverse the removal procedure.

Mass Air Flow (MAF) Sensor

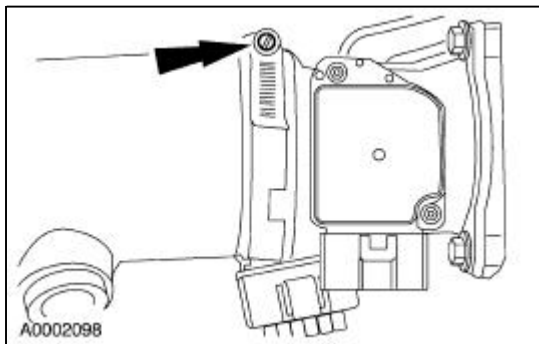
Removal and Installation

⚠ CAUTION: The mass airflow sensor hot wire sensing element and housing are calibrated as a unit and must be repaired as a complete assembly. Do not damage the sensing element (internal to housing) or possible failure of the MAF sensor may occur.

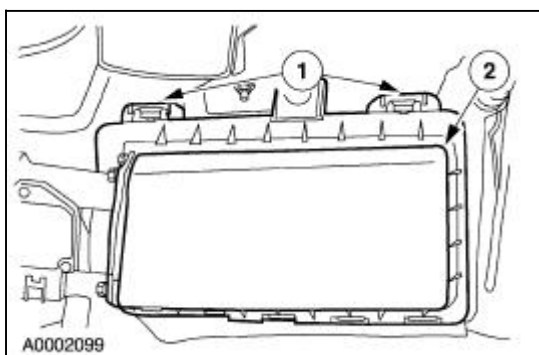
1. Disconnect the battery ground cable. For additional information, refer to [Section 414-01](#).
2. Disconnect the mass airflow (MAF) sensor electrical connector.



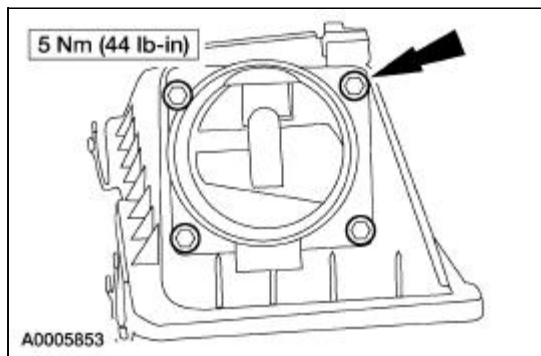
3. Loosen the screws on the air cleaner outlet tube clamp.



4. Remove the air cleaner housing cover.
 1. Release the cover clips.
 2. Remove the cover.



5. Remove the bolts and the MAF sensor.
 - Discard the gasket.

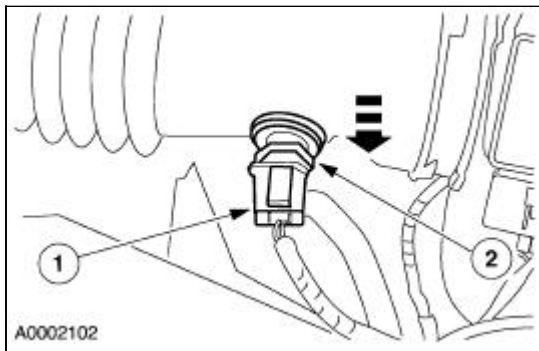


6. **NOTE:** A new gasket must be installed.
To install, reverse the removal procedure.
-

Intake Air Temperature (IAT) Sensor

Removal and Installation

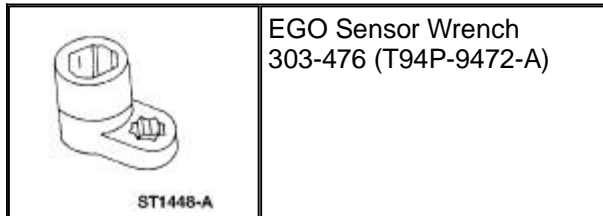
1. Disconnect the battery ground cable. For additional information, refer to [Section 414-01](#).
2. Remove the intake air temperature (IAT) sensor.
 1. Disconnect the IAT sensor electrical connector.
 2. Remove the IAT sensor.



3. Inspect the IAT sensor O-ring seal for damage or deterioration. Install a new O-ring seal as necessary.
 4. To install, reverse the removal procedure.
-

Heated Oxygen Sensor (HO2S) —3.0L, 3.9L, Front

Special Tool(s)

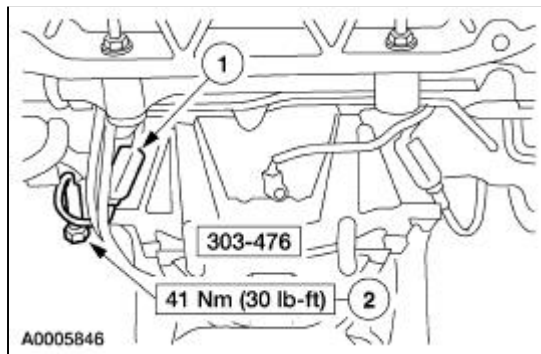


Removal and Installation

1. Disconnect the battery ground cable. For additional information, refer to [Section 414-01](#).
2. Raise and support the vehicle. For additional information, refer to [Section 100-02](#).
3. **NOTE:** RH shown, LH similar.

Remove the heated oxygen sensor (HO2S).

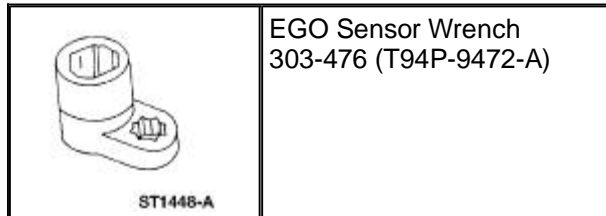
1. Unclip and disconnect the electrical connector.
2. Using the special tool, remove the HO2S.



4. To install, reverse the removal procedure.
 - Apply a light coat of High Temperature Nickel Anti-Seize Lubricant F6AZ-9L494-AA or equivalent meeting Ford specification ESE-M12A4-A to the threads of the heated oxygen sensors.

Heated Oxygen Sensor (HO2S) —3.0L (A/T), 3.9L, Rear

Special Tool(s)

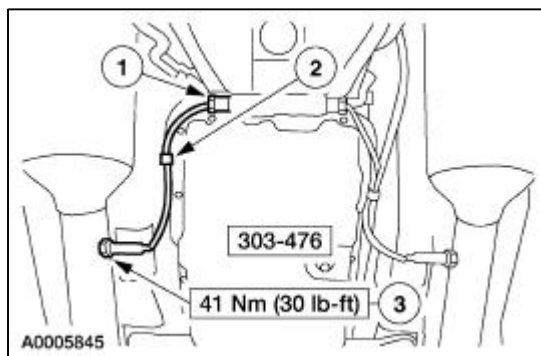


Removal and Installation

1. Disconnect the battery ground cable. For additional information, refer to [Section 414-01](#).
2. Raise and support the vehicle. For additional information, refer to [Section 100-02](#).
3. **NOTE:** RH shown, LH similar.

Remove the heated oxygen sensor (HO2S).

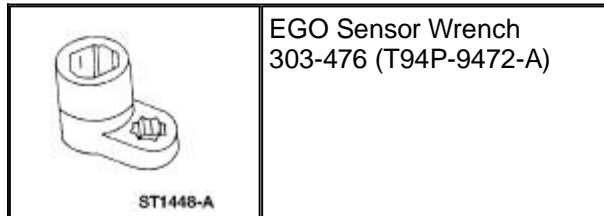
1. Disconnect the electrical connector.
2. Unclip the harness.
3. Using the special tool, remove the sensor.



4. To install, reverse the removal procedure.
 - Apply a light coat of High Temperature Nickel Anti-Seize Lubricant F6AZ-9L494-AA or equivalent meeting Ford specification ESE-M12A4-A to the threads of the heated oxygen sensors.

Heated Oxygen Sensor (HO2S) —3.0L (M/T), Rear

Special Tool(s)

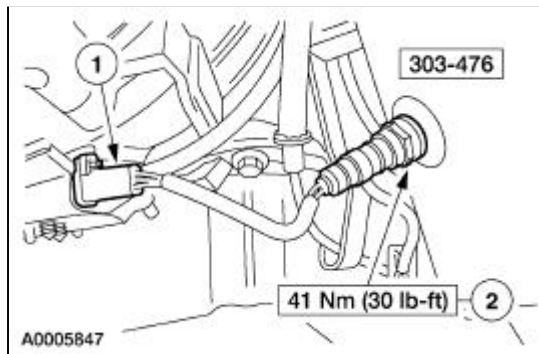


Removal and Installation

1. Disconnect the battery ground cable. For additional information, refer to [Section 414-01](#).
2. Raise and support the vehicle. For additional information, refer to [Section 100-02](#).
3. **NOTE:** LH shown, RH similar.

Remove the heated oxygen sensors (HO2S).

1. Disconnect the electrical connector.
2. Using the special tool, remove the HO2S.

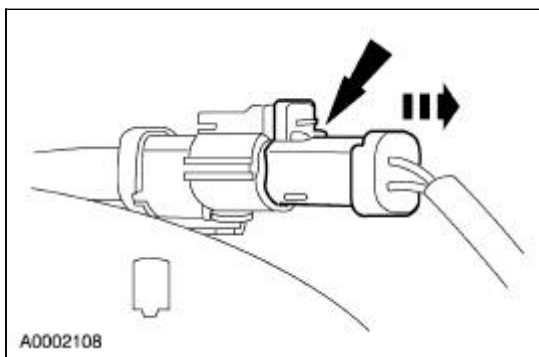


4. To install, reverse the removal procedure.
 - Apply a light coat of High Temperature Nickel Anti-Seize Lubricant F6AZ-9L494-AA or equivalent meeting Ford specification ESE-M12A4-A to the threads of the heated oxygen sensors.

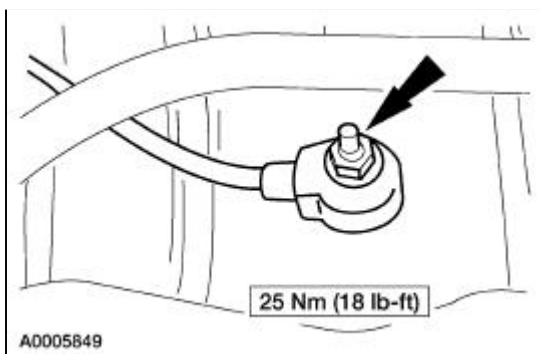
Knock Sensor (KS) —3.0L

Removal and Installation

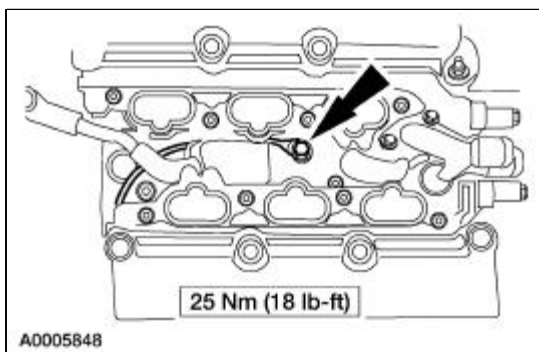
1. Disconnect the battery ground cable. For additional information, refer to [Section 414-01](#).
2. If removing the top-mounted knock sensor, remove the lower intake manifold. Refer to [Section 303-01A](#).
3. Disconnect the electrical connectors from the top-mounted and side-mounted knock sensors (KS).



4. Remove the nut and the side-mounted KS.



5. Remove the bolt and the top-mounted KS.

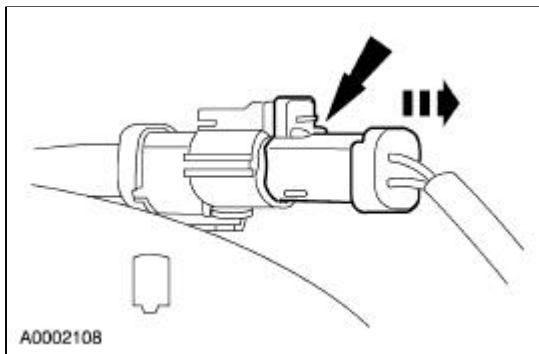


6. To install, reverse the removal procedure.

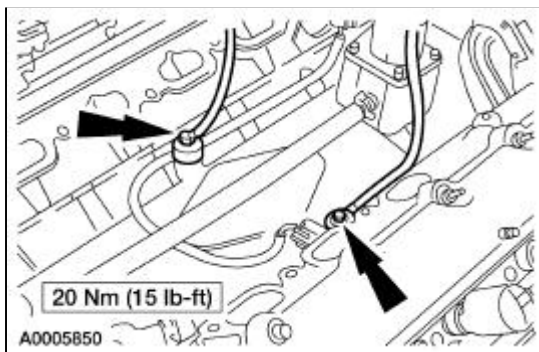
Knock Sensor (KS) —3.9L

Removal and Installation

1. Disconnect the battery ground cable. For additional information, refer to [Section 414-01](#).
2. Remove the lower intake manifold. For additional information, refer to [Section 303-01B](#).
3. Disconnect the knock sensor (KS) electrical connectors.



4. Remove the bolts and the knock sensors.

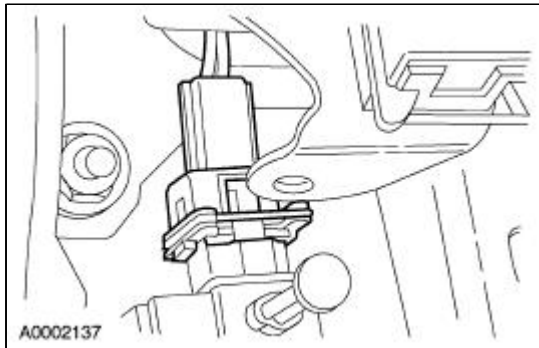


5. To install, reverse the removal procedure.

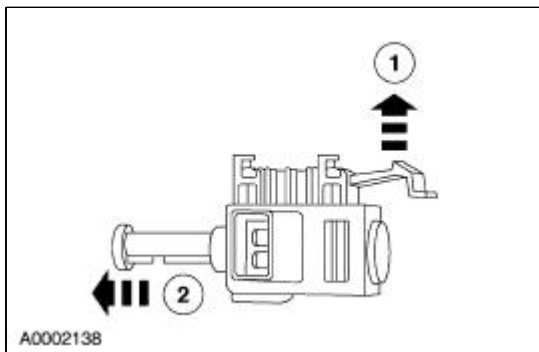
Clutch Pedal Position (CPP) Switch

Removal and Installation

1. Disconnect the battery ground cable. For additional information, refer to [Section 414-01](#).
2. Disconnect the clutch pedal position (CPP) switch electrical connector.



3. Remove the CPP switch.
 1. Lift the CPP switch retaining tag.
 2. Remove the CPP switch.



4. To install, reverse the removal procedure.

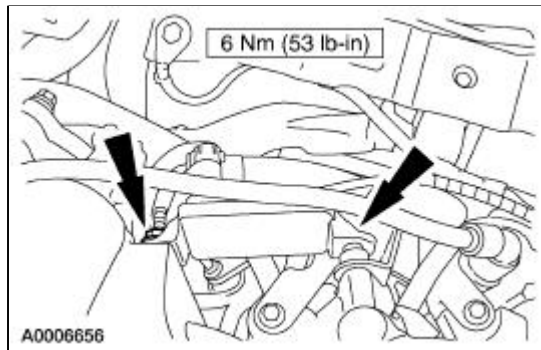
Fuel Pressure Sensor —3.0L

Removal and Installation

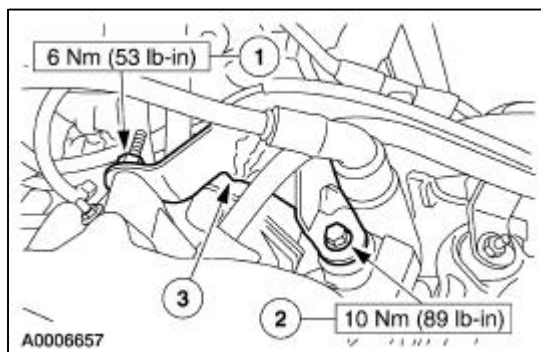
⚠ WARNING: Do not smoke or carry lighted tobacco or open flame of any type when working on or near any fuel-related components. Highly flammable mixtures are always present and may be ignited, resulting in possible personal injury.

⚠ WARNING: Fuel in the fuel system remains under high pressure even when the engine is not running. Before working on or disconnecting any of the fuel lines or fuel system components the fuel system pressure must be relieved. Failure to do so may result in personal injury.

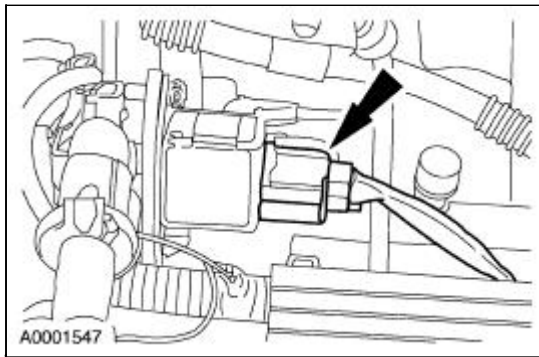
1. Disconnect the battery ground cable. For additional information, refer to [Section 414-01](#).
2. Relieve the fuel system pressure. For additional information, refer to [Section 310-00](#).
3. Remove the cowl vent screen. For additional information, refer to [Section 501-02](#).
4. Remove the differential pressure feedback EGR (DPFE) nuts.



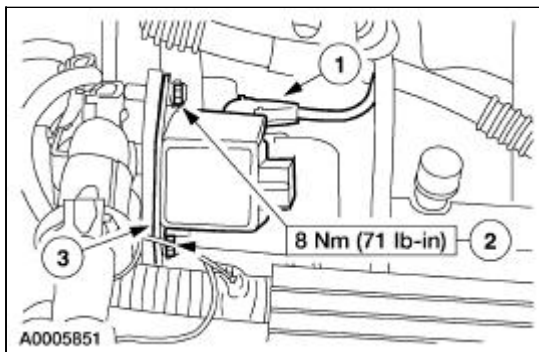
5. Remove the fuel pressure sensor shield.
 1. Remove the nut.
 2. Remove the two bolts.
 3. Remove the shield.




6. Disconnect the fuel pressure sensor electrical connector.



7. Remove the fuel pressure sensor.
 1. Disconnect the fuel pressure sensor vacuum hose.
 2. Remove the bolts.
 3. Remove the fuel pressure sensor.



8.  **WARNING:** Do not smoke or carry lighted tobacco or open flame of any type when working on or near any fuel-related components. Highly flammable mixtures are always present and may be ignited, resulting in possible personal injury.

NOTE: Lubricate the new seal and O-ring seals with clean Super Premium SAE 5W-30 Motor Oil XO-5W30-QSP or equivalent meeting Ford specification ESE-M2C153-G.

To install, reverse the removal procedure.

Fuel Pressure Sensor —3.9L

Removal and Installation

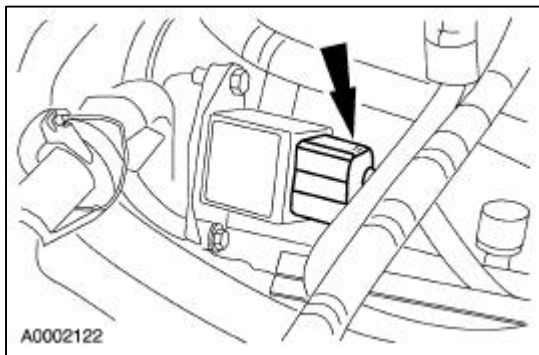
⚠ WARNING: Do not smoke or carry lighted tobacco or open flame of any type when working on or near any fuel-related components. Highly flammable mixtures are always present and may be ignited, resulting in possible personal injury.

⚠ WARNING: Fuel in the fuel system remains under high pressure even when the engine is not running. Before working on or disconnecting any of the fuel lines or fuel system components the fuel system pressure must be relieved. Failure to do so may result in personal injury.

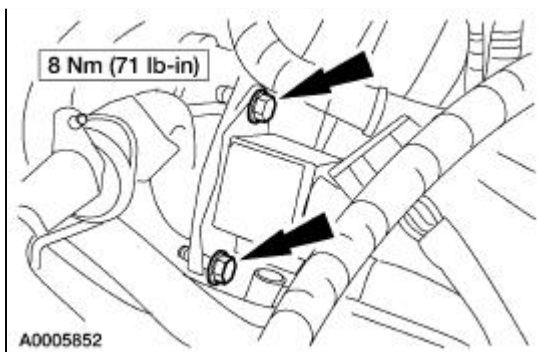
1. **NOTE:** When the battery is disconnected and reconnected, some abnormal drive symptoms may occur while the vehicle relearns its adaptive strategy. The vehicle may need to be driven to relearn the strategy.

Disconnect the battery ground cable. For additional information, refer [Section 414-01](#).

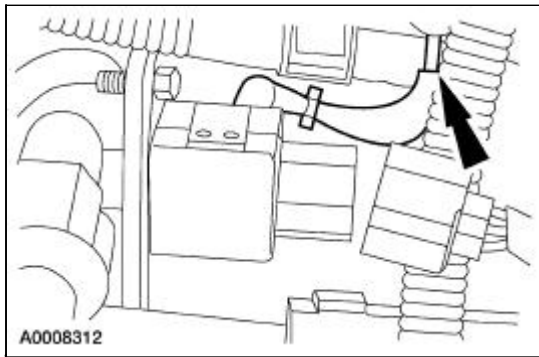
2. Relieve the fuel system pressure. For additional information, refer to [Section 310-00](#).
3. Disconnect the fuel pressure sensor electrical connector.




4. Remove the bolts.



5. Disconnect the fuel pressure sensor vacuum hose and remove the fuel pressure sensor.



6.  **WARNING: Do not smoke or carry lighted tobacco or open flame of any type when working on or near any fuel-related components. Highly flammable mixtures are always present and may be ignited, resulting in possible personal injury.**

NOTE: Lubricate the new seal and O-ring seals with clean Super Premium SAE 5W-30 Motor Oil XO-5W30-QSP or equivalent meeting Ford specification ESE-M2C153-G.

To install, reverse the removal procedure.

Fluid Maintenance



CAUTION: Use only MERCON® V transmission fluid. Use of any other fluids can result in transmission failure.

Intervals	
Normal maintenance	Not necessary. Filled for life.
Severe duty maintenance	Change the fluid at 48,000 km (30,000 miles) intervals. Use MERCON® V.

General Specifications

Vehicle	Engine	Approximate Liters	Refill Capacity ¹ U.S. Quarts	Fluid Type
Lincoln LS— 5R55N	3.0L, 3.9L	11.2	11.9	MERCON® V XT-5-QM

¹ Approximate dry capacity, includes cooler and tubes. Fluid level procedures in this section should be used to determine actual fluid requirements and fluid specification. DO NOT OVERFILL. If it is necessary to add or change fluid, use only fluid that has been certified by the supplier as meeting the Ford Motor Company specification shown.

General Specifications

Item	Specification
Fluid	
Motorcraft MERCON® V Automatic Transmission Fluid XT-5-QM	MERCON® V
Fluid Filter	
Inline Transmission Fluid Filter Kit	XC3Z-7B155-AA
Inline Transmission Fluid Filter	XC3Z-7B155-BA
Lubricant	
Ford Multi-Purpose Grease D0AZ-19584-AA	ESB-M1C93-B
Premium Long Life Grease XG-1-C	ESA-M1C75-B
Sealant	
Threadlock 262 E2FZ-19554-B	WSK-M2G351-A6

Torque Specifications

Description	Nm	lb-ft	lb-in
Case-to-center support screw	11	8	—

Converter drain plug	10	—	89
Digital transmission range (TR) sensor-to-case screws	10	—	89
Driveshaft bolts and nuts	81	60	—
Extension housing screws and studs	26	19	—
Fill plug to extension housing	20	15	—
Fluid level indicator plug-to-drain pipe assembly	10	—	89
Fluid pan drain plug	26	19	—
Fluid pump housing screws	25	18	—
Heat shield screws	10	—	89
Locknut for band adjustment	54	40	—
Main control-to-case bolts	10	—	89
Manual control valve detent spring-to-case bolt	10	—	89
Manual control lever shaft nut	48	35	—
Output shaft-to-flange nut	131	97	—
Overdrive band adjustment screw	14	10	—
Pressure tap plug to case	13	10	—
Pump assembly-to-case screws	24	18	—
Reverse servo assembly-to-case bolts	10	—	89
Separator to main control bolts	10	—	89
Shift cable bracket bolts	25	18	—
Solenoid body-to-case bolts	8	—	71
Speed sensor-to-case screws	10	—	89
Torque converter adapter plate nuts to converter	44	33	—
Torque converter adapter plate-to-flexplate nut	38	28	—
Transmission cooler fitting to case	47	35	—
Transmission cooler line bracket nut (V6 application)	10	—	89
Transmission cooler line bracket nut (V8 application)	18	13	—
Transmission cooler tube nut to case fitting	40	30	—
Transmission fluid filter-to-case bolts	10	—	89
Transmission fluid pan-to-case screws	11	8	—
Transmission mount-to-extension housing center screw	40	30	—
Transmission mount-to-extension housing screws	50	37	—
Transmission mount-to-floor pan bolts	55	41	—
Transmission-to-engine bolts	47	35	—
Vehicle harness-to-solenoid body screw	5	—	44

End Play Specifications

Transmission Overdrive End Play Dimension D	Select Thrust Washer (No. 1 Nylon)		Identification: Color
	Part Number	Thickness	

38.04-38.28 mm (1.50-1.51 in)	XW4Z-XA	1.70-1.75 mm (0.06 in)	Brown/8
38.29-38.43 mm (1.51 in)	XW4Z-NA	1.85-1.90 mm (0.07 in)	Red/4
38.44-38.63 mm (1.51-1.52 in)	XW4Z-RA	2.05-2.10 mm (0.08 in)	Black/6
38.64-38.78 mm (1.52-1.53 in)	XW4Z-YA	2.20-2.25 mm (0.09 in)	Orange/9
38.79-38.97 mm (1.53 in)	XW4Z-ZA	2.40-2.45 mm (0.10 in)	Purple/10

End Play Specifications

Rear (No. 4) Dimension E	Selective Needle Bearings (No. 4)		Identification: Notches
	Part Number	Thickness	
1.67-1.85 mm (0.066-0.073 in)	XW4Z-7D014-CA	2.65-2.80 mm (0.104-0.110 in)	0
1.86-2.04 mm (0.073-0.080 in)	XW4Z-7D014-DA	2.80-2.95 mm (0.110-0.116 in)	1
2.05-2.23 mm (0.081-0.088 in)	XW4Z-7D014-EA	3.00-3.15 mm (0.118-0.124 in)	2
2.25-2.43 mm (0.089-0.096 in)	XW4Z-7D014-FA	3.20-3.35 mm (0.126-0.132 in)	3

Torque Converter End Play

Transmission Model	Converter End Play			
	New or Rebuilt Converter		Used Converter	
	mm	inch	mm	inch
5R55N	0.44 max.	0.017 max.	0.80 max.	0.031 max.

Band Adjustment And Torque Chart

Description	Number of Turns to Back Off	Locknut		Adjusting Screw	
		Nm	Lb-Ft	Nm	Lb-Ft
Intermediate Band	2.0	54	40	14	10
Overdrive Band	2.0	54	40	14	10

Selective Snap Rings

Coast and Direct Clutch Drum					Forward Clutch Cylinder				
Part Number	Thickness		Diameter		Part Number	Thickness		Diameter	
	mm	inch	mm	inch		mm	inch	mm	inch
E860126-S	1.37	0.0539	130.1	5.122					
E860127-S	1.73	0.0681	130.1	5.122	XW4Z-7D483-AB	1.73	0.0681	141.45	5.56

E860128-S	2.08	0.0819	130.1	5.122	XW4Z-7D483-AC	2.08	0.0819	141.45	5.56
E860129-S	2.44	0.0961	130.1	5.122	XW4Z-7D483-AD	2.44	0.0961	141.45	5.56

Service Identification Model Chart

Vehicle Application			
7000 Prefix and Suffix	C=Column F=Floor	Engine Displacement	Vehicle Application
1W4P-BA, RJL-M	F	3.0L	Lincoln LS
1W4P-AA, RJL-L	F	3.9L	Lincoln LS

Solenoid Operation Chart

Base Gearshift Selector Position	Powertrain Control Module (PCM) Commanded Gear	5R55N Solenoid States						
		SSA	SSB	SSC	SSD	PCA	PCB	PCC
P/N	P	On	Off	Off	On	L ¹	C ²	L
R	R	On	Off	Off	On	L	H ³	H
D5	1	On	Off	Off	On	C	L	L
	2	On	Off	On	On	L	C	L
	3	On	On	Off	On	C	L	L
	4	Off	Off	Off	On	C	L	H
	5	Off	Off	On	On	C	C	H
D4	1	On	Off	Off	On	C	L	L
	2	On	Off	On	On	L	C	L
	3	On	On	Off	ON	C	L	L
	4	Off	Off	Off	Off	C	C	H
3	3	On	On	Off	Off	C	C	L
2	2	On	Off	On	Off	C	C	L
1	1	On	Off	Off	Off	C	C	L

¹ Low line pressure

² Control line pressure

³ High line pressure

Solenoid Operation Chart

Select Shift Gearshift Selector Position	Powertrain Control Module (PCM) Commanded Gear	5R55N Solenoid States						
		SSA	SSB	SSC	SSD	PCA	PCB	PCC
P/N	P	On	Off	Off	On	L ¹	C ²	L
R	R	On	Off	Off	On	L	H ³	H
D5	1	On	Off	Off	On	C	L	L
	2	On	Off	On	On	L	C	L
	3	On	On	Off	On	C	L	L
	4	Off	Off	Off	On	C	L	H
	5	Off	Off	On	On	C	C	H

D4	1	On	Off	Off	On	C	L	L
	2	On	Off	On	On	L	C	L
	3	On	On	Off	On	C	L	L
	4	Off	Off	Off	Off	C	C	H
+/-	1	On	Off	Off	Off	H	H	L
	2	On	Off	On	Off	H	H	L
	3	On	On	Off	Off	H	H	L
	4	Off	Off	Off	Off	H	H	H
	5	Off	Off	On	On	H	H	H

¹ Low line pressure

² Control line pressure

³ High line pressure

Band/Clutch Application Chart A

	Overdrive Band	Intermediate Band	Reverse Band	Intermediate Clutch	Forward Clutch	Direct Clutch	Coast Clutch
PARK							
REVERSE			A ³	A ³		A ³	
NEUTRAL							
1st					A ³		
2nd	A ³				A ³		
3rd		Ac ²		A ³	A ³		
4th				ANE ¹	A ³	A ³	
5th	A ³				ANE ¹	A ³	A ³
1st ^a			Ac ²		A ³		Ac ²
2nd ^a	A ³		Ac ²		A ³		Ac ²
3rd ^a		Ac ²		A ³	A ³		Ac ²
4th ^a				ANE ¹	A ³	A ³	Ac ²
MAN. 3rd		Ac ²		A ³	A ³		Ac ²
MAN. 2nd	A ³		Ac ²		A ³		
MAN. 1st			Ac ²		A ³		Ac ²

³ A = Applied

¹ ANE = Applied but no effect

^a D4 Position (overdrive canceled)

² Ac = Applied to carry coast torque

Band/Clutch Application Chart B

	Direct One-Way Clutch		Low One-Way Clutch		Intermediate One-Way Clutch		Engine Braking
	Drive	Coast	Drive	Coast	Drive	Coast	
PARK							
REVERSE	H ⁵	OR ⁶	NE		ORI ⁷		YES
NEUTRAL							

1st	H ⁵	OR ⁶	H ⁵	OR ⁶	NE ⁴		NO
2nd	OR ⁶	OR ⁶	H ⁵	OR ⁶	NE ⁴		NO
3rd	H ⁵	OR ⁶	OR ⁶	OR ⁶	H ⁵	OR ⁶	NO
4th	H ⁵	OR ⁶	OR ⁶	OR ⁶	OR ⁶	OR ⁶	NO
5th	OR ⁶	OR ⁶	OR ⁶	OR ⁶	OR ⁶	OR ⁶	YES
1st ^a	H ⁵	OR ⁶	H ⁵	OR ⁶	NE ⁴		YES
2nd ^a	OR ⁶	OR ⁶	H ⁵	OR ⁶	NE ⁴		YES
3rd ^a	H ⁵	OR ⁶	OR ⁶	OR ⁶	H ⁵	OR ⁶	YES
4th ^a	H ⁵	OR ⁶	OR ⁶	OR ⁶	OR ⁶	OR ⁶	YES
MAN. 3rd	H ⁵	OR ⁶	OR ⁶	OR ⁶	H ⁵	OR ⁶	YES
MAN. 2ND	OR ⁶	OR ⁶	H ⁵	OR ⁶	NE ⁴		YES
MAN. 1ST	H ⁵	OR ⁶	H ⁵	OR ⁶	NE ⁴		YES

⁵ H = Hold

⁶ OR = Overrunning

⁷ ORI = Overrunning but independent for speed

⁴ NE = No effect

Line Pressure Chart

Range	Idle	WOT Stall	Idle	WOT Stall
	PC C	PC C	Line	Line
P/N	0-103 kPa (0-15 psi)	0-103 kPa (0-15 psi)	862-1,137 kPa (125-165 psi)	2,000-2,482 kPa (290-360 psi)
R	793 kPa (115 psi)	793 kPa (115 psi)	758-1,034 kPa (110-150 psi)	1,448-1,793 kPa (210-260 psi)
D5/D4	0-103 kPa (0-15 psi)	0-103 kPa (0-15 psi)	758-1,034 kPa (110-150 psi)	1,448-1,793 kPa (210-260 psi)
M5/M4	0-103 kPa (0-15 psi)	0-103 kPa (0-15 psi)	425-800 kPa (76-116 psi)	1,448-1,793 kPa (210-260 psi)
M3	0-103 kPa (0-15 psi)	0-103 kPa (0-15 psi)	758-1,034 kPa (110-150 psi)	1,448-1,793 kPa (210-260 psi)
M2/M1	0-103 kPa (0-15 psi)	0-103 kPa (0-15 psi)	634-910 kPa (92-132 psi)	1,448-1,793 kPa (210-260 psi)
P/N	0-103 kPa (0-15 psi)	0-103 kPa (0-15 psi)	862-1,137 kPa (125-165 psi)	—
R	793 kPa (115 psi)	793 kPa (115 psi)	634-910 kPa (92-132 psi)	2,000-2,482 kPa (290-360 psi)
D5/D4	0-103 kPa (0-15 psi)	0-103 kPa (0-15 psi)	758-1,034 kPa (110-150 psi)	1,448-1,793 kPa (210-260 psi)
M5/M4	0-103 kPa (0-15 psi)	0-103 kPa (0-15 psi)	758-1,034 kPa (110-150 psi)	1,448-1,793 kPa (210-260 psi)
M3/M2/M1	0-103 kPa (0-15 psi)	0-103 kPa (0-15 psi)	758-1,034 kPa (110-150 psi)	1,448-1,793 kPa (210-260 psi)

Stall Speed

--	--	--

Vehicle	Engine	rpm
Lincoln LS	3.0	2,565-3,060
Lincoln LS	3.9	2,491-2,900

Shift Speeds



CAUTION: Always obey local traffic laws. Do not exceed posted limits.

			D5 Position	Speed km/h (mph)
Vehicle Information	Transmission Model	Throttle Position	Shift	Axle Ratio All
Lincoln LS 3.0L/3.9L	RJL-A	Closed	5-4	38-41 (24-26)
	RJL-B		4-3	28-32 (18-20)
			3-2	17-22 (11-14)
			2-1	11-16 (7-10)
		Minimum		
		Monitor PID: TP volt-1.25	1-3	14-25 (9-16)
			3-4	32-41 (20-26)
			4-5	41-48 (26-30)
			5-4	45-48 (28-30)
			4-3	28-32 (18-20)
			3-2	17-22 (11-14)
			2-1	11-16 (7-10)
		Wide Open	1-2	67-72 (42-45)
			2-3	90-96 (56-60)
			3-4	136-159 (85-99)
			4-5	188-236 (117-147)
			5-4	177-201 (110-125)
			4-3	123-125 (77-78)
			3-2	56-67 (35-42)
			2-1	38-41 (24-26)

Transmission Description

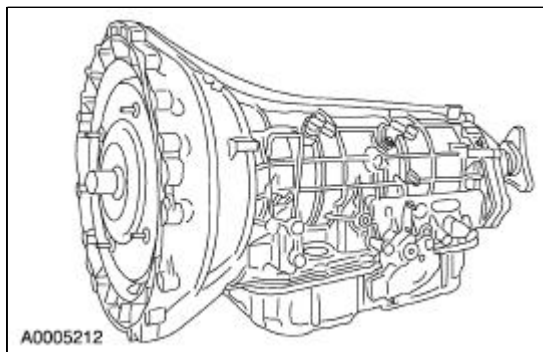
The 5R55N has the following features:

- five forward speeds
- electronic shift, pressure, and torque converter clutch controls
- three compound planetary gearsets
- three bands
- four multi-plate clutches
- three one-way clutches

All hydraulic functions are directed by electronic solenoids to control:

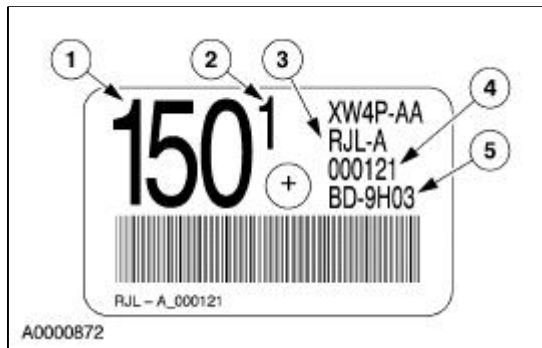
- static engagement feel.
- shift feel.
- shift scheduling.
- modulated torque converter clutch (TCC) applications.
- engine braking utilizing the coast clutch and band.
- manual first and second timing.
- reverse inhibit timing.

Transmission View



Identification Tags

I. D. Tag Located on Transmission Case



Item	Part Number	Description
1	—	Model number
2	—	Assemble level
3	—	Build code
4	—	Serial number
5	—	Build date (YMDD)

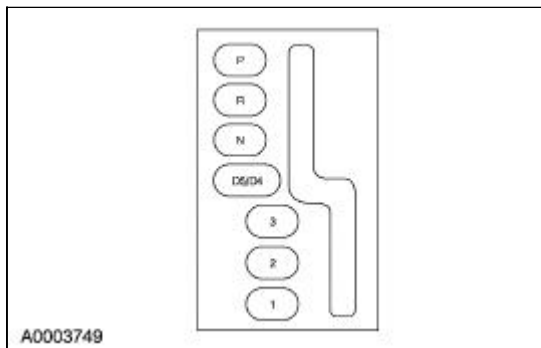
All vehicles are equipped with a Vehicle Certification Label, located on the driver side door lock post. Refer to the code in the space marked TR. For model, service ID level or build date information refer to the transmission service ID tag located on the transmission case.

Range Selection

Depending on the vehicle options selected the transmission range selector may have different range positions.

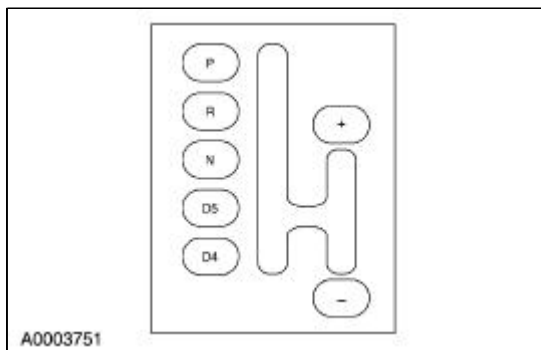
The standard range selector has eight positions: P, R, N, D5, D4, 3, 2, and 1.

Base Range Shifter



The optional Select Shift Transmission (SST) range selector has seven positions P, R, N, D5, or D4, + and -. This option will allow the driver to manually upshift and downshift into any gear range.

Optional Range Shifter



Park

In the PARK position:

- there is no power flow through the transmission.
- the parking pawl locks the output shaft to the case.
- the engine may be started.
- the ignition key may be removed.

Reverse

In the REVERSE position:

- the vehicle may be operated in a rearward direction, at a reduced gear ratio.
- backup lamps are illuminated.

Neutral

In the NEUTRAL position:

- there is no power flow through the transmission.
- the output shaft is not held and is free to turn.
- the engine may be started.

D5 (Overdrive)

D5 (overdrive) is the normal position for most forward driving.

The D5 (overdrive) position provides:

- automatic shift 1-5 and 5-1.
- apply and release of the torque converter clutch.
- maximum fuel economy during normal operation.
- engine braking in 5th gear.

D4 (Overdrive Canceled)

The D4 (overdrive) position provides:

- automatic shift 1-4 and 4-1.
- apply and release of the torque converter clutch.
- engine braking in 4th gear.

Third Position—3rd Gear (Base Shifter)

The 3rd position provides:

- third gear start and hold.
- the torque converter clutch may apply and release.
- improved traction on slippery roads.
- engine braking.

Second Position—2nd Gear (Base Shifter)

The 2nd position provides:

- second gear start and hold.
- the torque converter clutch may apply and release.
- improved traction on slippery roads.
- engine braking.

First Position—1st Gear (Base Shifter)

If this position is selected at normal road speeds, the transmission will downshift into the next lower gear and continue downshifting until the vehicle reaches first gear.

This position provides:

- first gear operation only.
- engine braking for descending steep grades.

+ and - Position Operation (Optional Shifter)

These positions allow the driver to manually select the appropriate upshift (+) or downshift (-) and gear range.

- Can only be entered from the D5 position.
- Gear ranges 1-5 provide the same function and ratio as found in the D5 or D4 automatic mode positions.
- Transmission will not upshift or downshift unless the selector lever is moved forward or rearward.
- One tap forward (+) will command the transmission to upshift one gear range.
- One tap rearward (-) will command the transmission to downshift one gear range.
- Upshifts are allowed at any vehicle speed.
- A second gear start up is normal. A third gear start up will be allowed only if selected. All other selections will revert to second gear.
- If the driver starts in second gear and does not pass 60% throttle, the transmission will remain in second gear. No automatic shift will occur.
- If the driver passes 60% throttle, then a 2-1 automatic kickdown will occur, scheduled by the PCM as used in D5. Once this has occurred, first gear will hold until second gear is selected by the driver moving the shift handle. No automatic upshift is possible under this condition.
- Once a kickdown has occurred, manual shifting in and out of first gear is allowed until the next time the vehicle stops.
- A shift to first gear with the vehicle at rest is never allowed.
- When downshifting at normal road speeds, the transmission will only allow a downshift into the next lower gear.
- If the shifter (-) is tapped more than once in rapid succession, the transmission will downshift only into the next lower gear. Then when the vehicle reaches a speed below a calibrated entry speed, the transmission will allow a downshift into the next lower gear, if again selected by the driver. This is to prevent engine and transmission damage and to keep the engine and transmission within allowable rpm ranges.
- An electronic indicator on the instrument cluster will display the selected gear.

Park Sense Switch

The park sense switch prevents the redundant PRNDL from displaying "P" until the shifter is in the park position.

Electronic Transmission Error Indicator

The vehicle is equipped with a redundant electronic gearshift indicator. This character appears with the key in the run position and displays the same gear selection as shown on the range selector floor console next to the range selector lever. If an "E" character flashes or remains on this indicates a

transmission malfunction.

Shift Patterns

Upshifts

Transmission upshifting is controlled by the powertrain control module. The PCM receives inputs from various engine or vehicle sensors and driver demands to control shift scheduling, shift feel and torque converter clutch (TCC) operation.

The PCM has an adaptive learn strategy to electronically control the transmission which will automatically adjust the shift feel. When the battery has been disconnected, or a new battery installed certain transmission operating parameters may be lost. The Powertrain Control Module (PCM) must re-learn these parameters. During this learning process you may experience slightly firm shifts, delayed, or early shifts. This operation is considered normal and will not affect the function of the transmission. Normal operation will return once these parameters are stored by the PCM.

Downshifts

Under certain conditions the transmission will downshift automatically to a lower gear range (without moving the gearshift lever). There are three categories of automatic downshifts: coastdown, torque demand and forced or kickdown shifts.

Coastdown

The coastdown downshift occurs when the vehicle is coasting down to a stop.

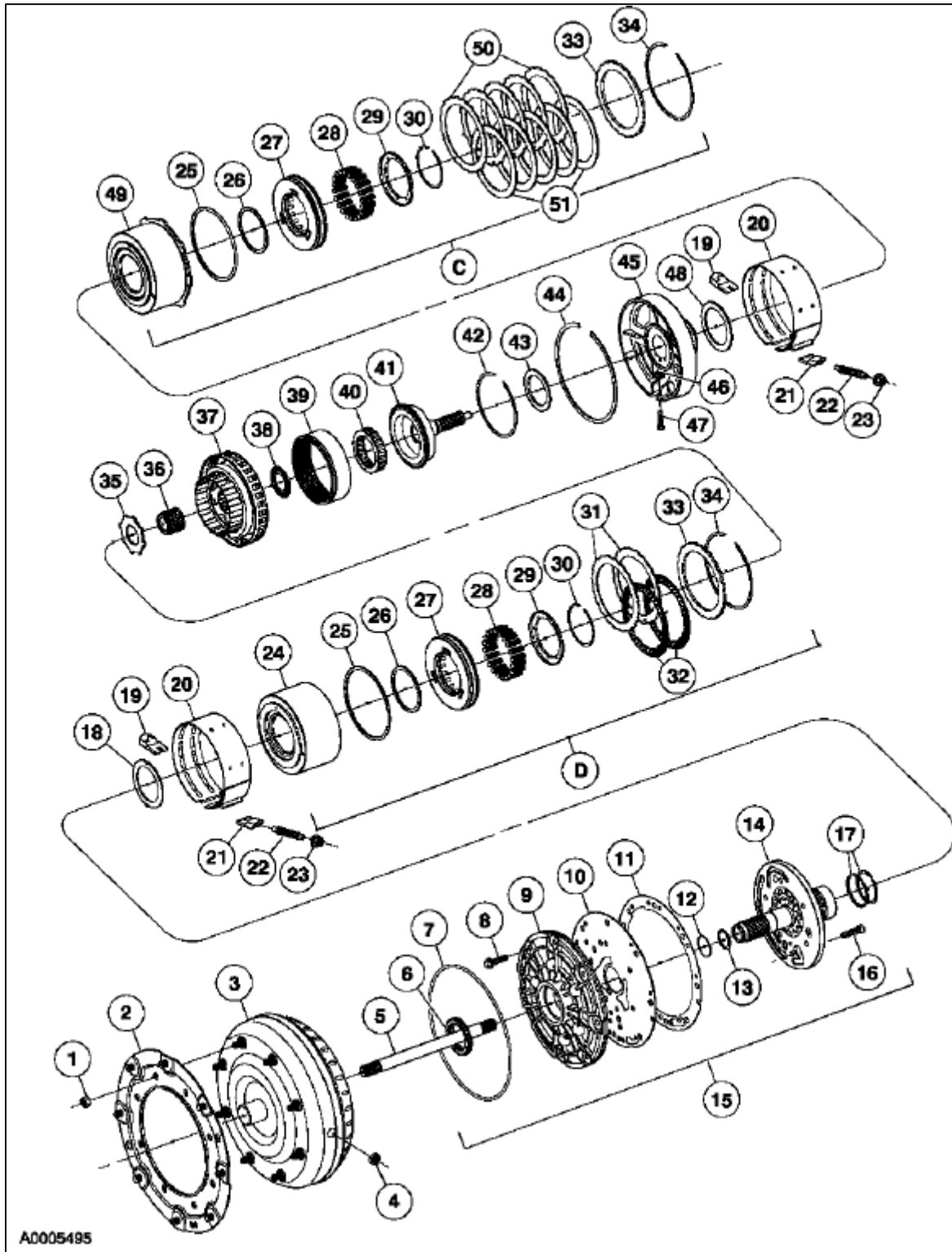
Torque Demand

The torque demand downshift occurs (automatically) during part throttle acceleration when the demand for torque is greater than the engine can provide at that gear ratio. If applied, the transmission will disengage the TCC to provide added acceleration.

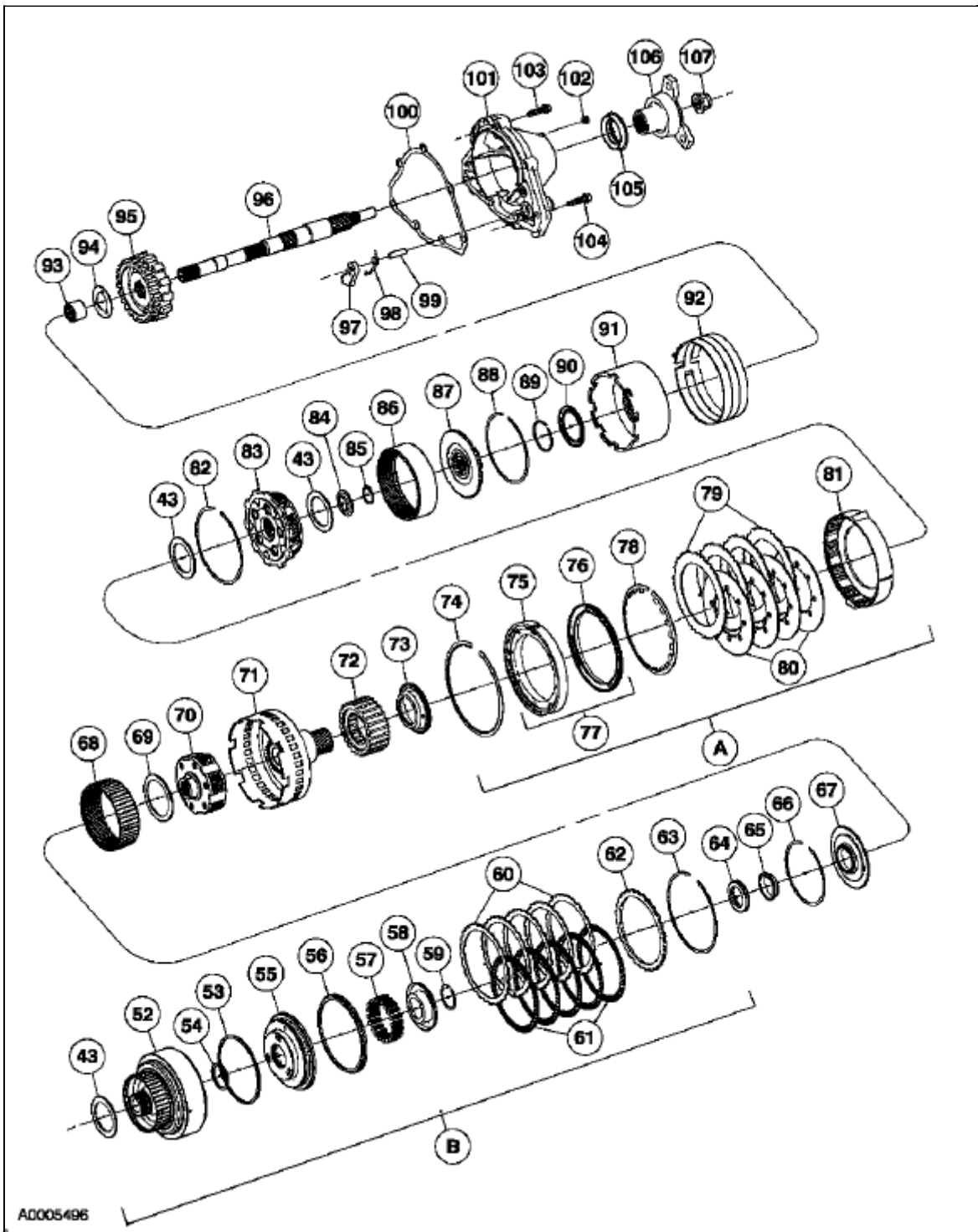
Kickdown

For maximum acceleration, the driver can force a downshift by pressing the accelerator pedal to the floor. A forced downshift into a lower gear is possible below calibrated speeds. Specifications for downshift speeds are subject to variations due to tire size and engine and transmission calibration requirements.

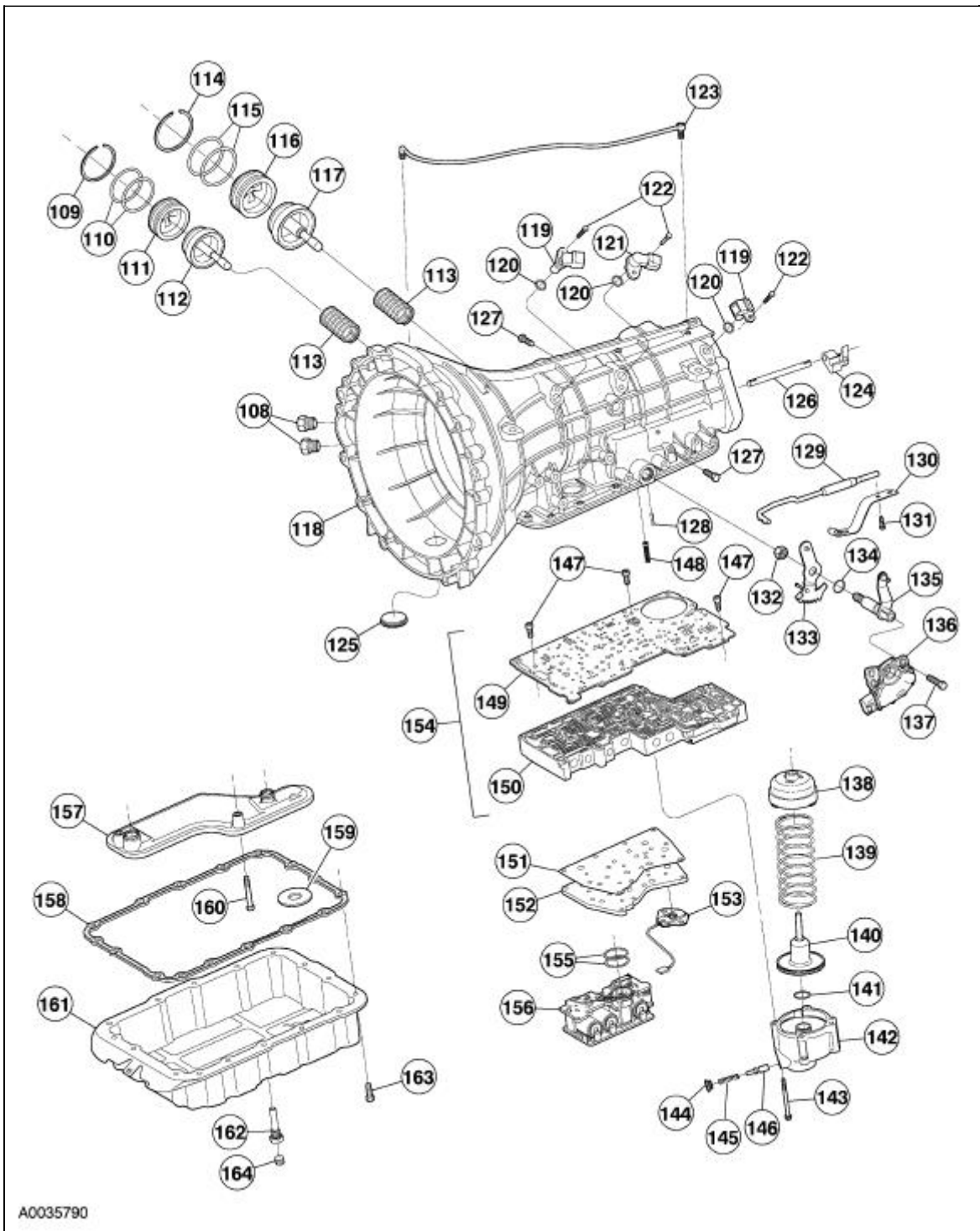
Disassembled Views



Disassembled Views (Continued)



Disassembled Views (Continued)



A0035790

Item	Part Number	Description
1	6441	Nut — converter to flex plate
2	6K374	Flex plate adapter assembly
3	7902	Converter assembly
4	6730	Torque converter drain plug
5	7017	Input shaft
6	7A248	Front fluid pump seal assembly
7	7A248	Front fluid pump seal
8	W704892-	Screw and washer assembly — M8 x 35

	S1300	(attaches pump to case) (8 req'd)
9	7G178	Fluid pump cover assembly
10	7B472	Fluid pump adapter plate
11	7A136	Front fluid pump gasket
12	W701431-S300	O-ring seal — fluid pump shaft to inner gear (also in pump assembly)
13	7L323	Stator support seal
14	7A108	Front pump support assembly
15	7A103	Fluid pump assembly
16	W701429-S309M	Bolt — M8 x 1 x 35 int lob (attaches pump support to pump assembly) (6 req'd)
17	7D025	Overdrive brake drum seal
18	7D014	Washer — fluid pump input thrust (select fit) No. 1
19	7D029	Strut — intermediate and overdrive brake band anchor (2 req'd)
20	7D034	Band assembly — intermediate and overdrive brake band (2 req'd)
21	7D029	Strut — intermediate and overdrive brake band apply (2 req'd)
22	7C492	Overdrive/intermediate band adjusting screw
23	W705582-S430	Overdrive/intermediate locking nut
24	7L669	Overdrive brake band drum assembly
25	7A548	Seal — direct and overdrive piston — outer
26	7D404	Seal — direct and overdrive piston — inner
27	7A262	Direct and overdrive clutch piston
28	7A480	Spring — direct and overdrive clutch piston
29	7A527	Retainer — clutch piston springs (2 req'd)
30	E860125-S	Retaining ring (retains 7D041 to drum) (2 req'd)
31	7B442	Plate — coast clutch external splined (steel) (2 req'd)
32	7B164	Plate — coast clutch internal splined (friction) (2 req'd)
33	7B066	Plate — coast and direct clutch pressure (2 req'd)
34	E860126-S	Retaining ring — coast and direct clutch plates (select fit) (2 req'd)
35	7660	Adapter — coast clutch to overdrive carrier
36	7D063	Gear — sun overdrive
37	7B446	Carrier — planetary gear overdrive (with trigger wheel)
38	7L495	Bearing — overdrive planet thrust No. 2
39	7A153	Gear — overdrive ring
40	7C109	Overdrive one-way clutch assembly (part of 7686)

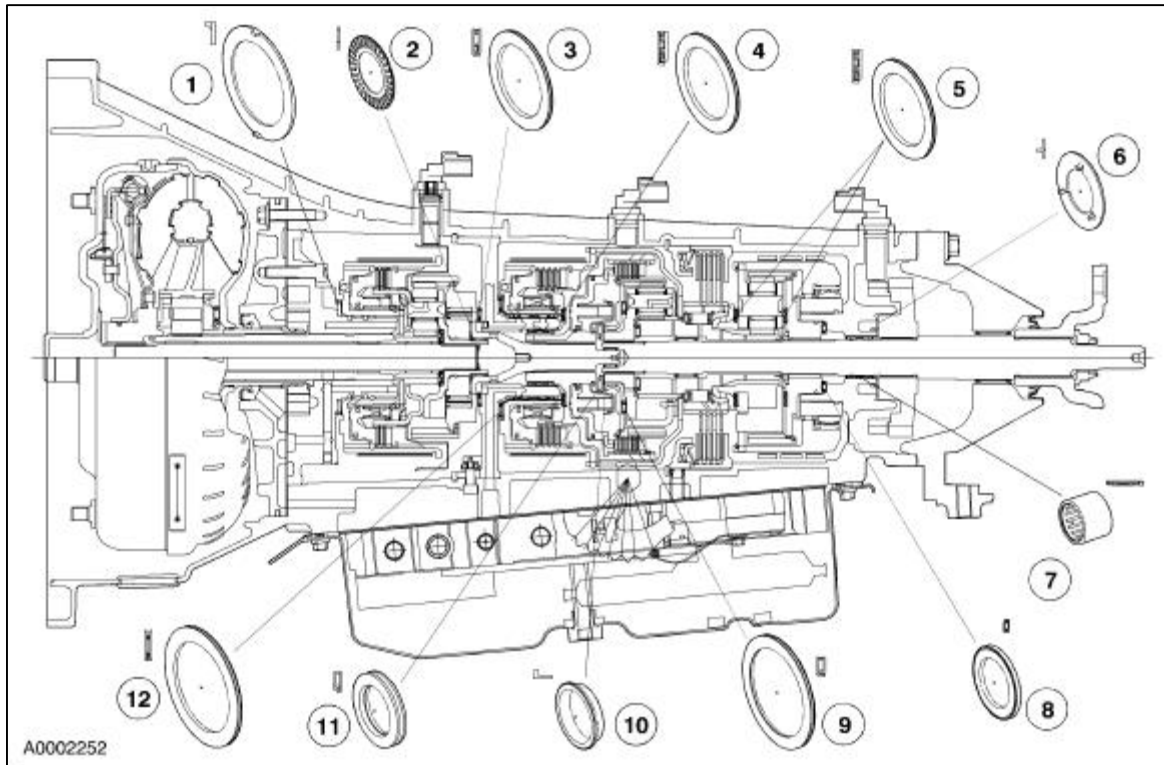
41	7686	Overdrive center shaft assembly
42	W702037-S300	Retaining ring (retains 7686 to 7653)
43	7M153	Bearing assembly— center shaft and forward clutch cylinder No. 3, No. 5, No. 8 and No. 9 (4 req'd)
44	W702465-S300	Retaining ring
45	7A130	Support — center
46	E826160-S76	Nut and cage assembly — (attaches center support to case)
47	W705407-S300	Screw
48	7D014	Bearing assembly — intermediate clutch drum (select fit) No. 4
49	7D044	Drum assembly — intermediate brake
50	7B442	Plate assembly — direct clutch external splined steel (5 req'd)
51	7B164	Plate assembly — direct clutch internal splined friction (5 req'd)
52	7A360	Cylinder assembly — forward clutch
53	7A548	Seal — forward clutch piston — outer
54	7A548	Seal — forward clutch piston — inner
55	7A262	Piston assembly — forward clutch
56	7B070	Spring — forward clutch cushion
57	7C151	Spring — forward clutch cushion (15 req'd)
58	7A527	Retainer — forward clutch piston spring
59	E860109-S	Retaining ring — external spline
60	7B442	Plate — forward clutch external spline (steel) (5 req'd)
61	7B164	Plate — forward clutch internally spline (friction) (5 req'd)
62	7B066	Plate — forward clutch pressure
63	7D483	Retaining ring 141.45 x 1.37 internal (select fit)
64	7D234	Bearing — forward ring gear hub thrust No. 6A
65	7D090	Washer — forward clutch thrust No. 6B
66	7G375	Ring — forward clutch hub retainer
67	7B067	Hub — forward ring gear
68	7D392	Gear — forward ring
69	7G433	Bearing — forward planet thrust No. 7
70	7A398	Planet assembly — forward
71	7A019	Shell and sun gear assembly
72	7A089	Sprag clutch and race assembly
73	7C167	Spacer — low and reverse gear
74	7D483	Ring — bevel retaining

75	7G384	Housing assembly — intermediate clutch (part of 7N060)
76	7E005	Piston — intermediate clutch (part of 7N060)
77	7N060	Intermediate clutch assembly
78	7B070	Spring — intermediate clutch piston
79	7B442	Plate — intermediate clutch external spline (steel) (4 req'd)
80	7B164	Plate — intermediate clutch internal spline (friction) (4 req'd)
81	7F340	Cylinder — intermediate clutch
82	W702775-S300	Snap ring — reverse carrier drum
83	7D006	Planet assembly — reverse
84	7B167	Sleeve — output shaft
85	E860527-S	Retainer — ring external
86	7A153	Gear — output shaft ring
87	7D164	Hub — output shaft
88	7C122	Ring — output shaft ring gear retaining
89	7D019	Seal — output shaft hub
90	7H027	Bearing assembly — low/intermediate sun gear No. 10
91	7C498	Drum and clutch assembly — reverse brake (includes OWC)
92	7D095	Band assembly — reverse
93	7R205	Bearing — output shaft to case
94	7B368	Washer — output shaft thrust No. 11
95	7A233	Gear assembly— transmission parking
96	7060	Shaft assembly — output
97	7A441	Pawl — parking
98	7D070	Spring — parking pawl return
99	7D071	Shaft — parking pawl
100	7086	Gasket — extension housing
101	7A039	Extension housing
102	6026	Plug — fluid fill access
103	W500312-S1309	Bolt — M8 x 45 extension housing to case (2 req'd)
104	W500311-S1427	Bolt — M8 x 1.2 extension housing to case (5 req'd)
105	7052	Seal — extension housing
106	7089	Flange — output shaft
107	W701357-S309	Nut — M20 x 1.5 retains flange to output shaft
108	7D273	Connector assembly — fluid tube (2 req'd)
109	7H074	Ring — overdrive servo retainer

110	W703119-S300	Seal — overdrive servo cover
111	7D027	Cover — overdrive servo
112	7D021	Piston and rod — overdrive servo
113	7D028	Spring — intermediate/overdrive servo piston (2 req'd)
114	W702777-S300	Ring intermediate servo retainer
115	W702969-S300	Seal — intermediate servo cover (2 req'd)
116	7D027	Cover — intermediate servo
117	7D021	Piston and rod — intermediate servo
118	7005	Case assembly
119	7H103	Sensor — output shaft speed and turbine shaft speed
120	W702981-S300	O-ring seal — speed sensor to case (3 req'd)
121	7M183	Sensor assembly— intermediate shaft speed (ISS)
122	W702769-S300	Screw — M6 x 19 (sensor to case)
123	7034	Vent assembly — case
124	7A179	Lever assembly — reverse brake drum
125	7N171	Converter housing access plug
126	7D433	Shaft — reverse band actuating lever
127	390318-S2	Pipe plug
128	7B210	Pin retainer — manual lever shaft
129	7A232	Rod — parking pawl actuating
130	7E332	Spring assembly — manual valve detent
131	E800185-S	Bolt detent spring
132	W703001-S309	Nut — manual lever shaft
133	7C494	Lever — manual valve inner
134	7B498	Seal — manual control lever
135	7A256	Lever — manual control
136	7F293	Sensor assembly — digital transmission range (TR)
137	N806933-S100	Bolt and washer assembly — digital transmission range (TR) sensor (2 req'd)
138	7D372	Plate — servo reverse
139	7D466	Spring — reverse servo accumulator
140	7D189	Piston and seal assembly — reverse servo
141	7423	O-ring seal — reverse servo piston
142	7D036	Cover — reverse servo
143	W703135-	Bolt — (attaches reverse servo piston to case) (4

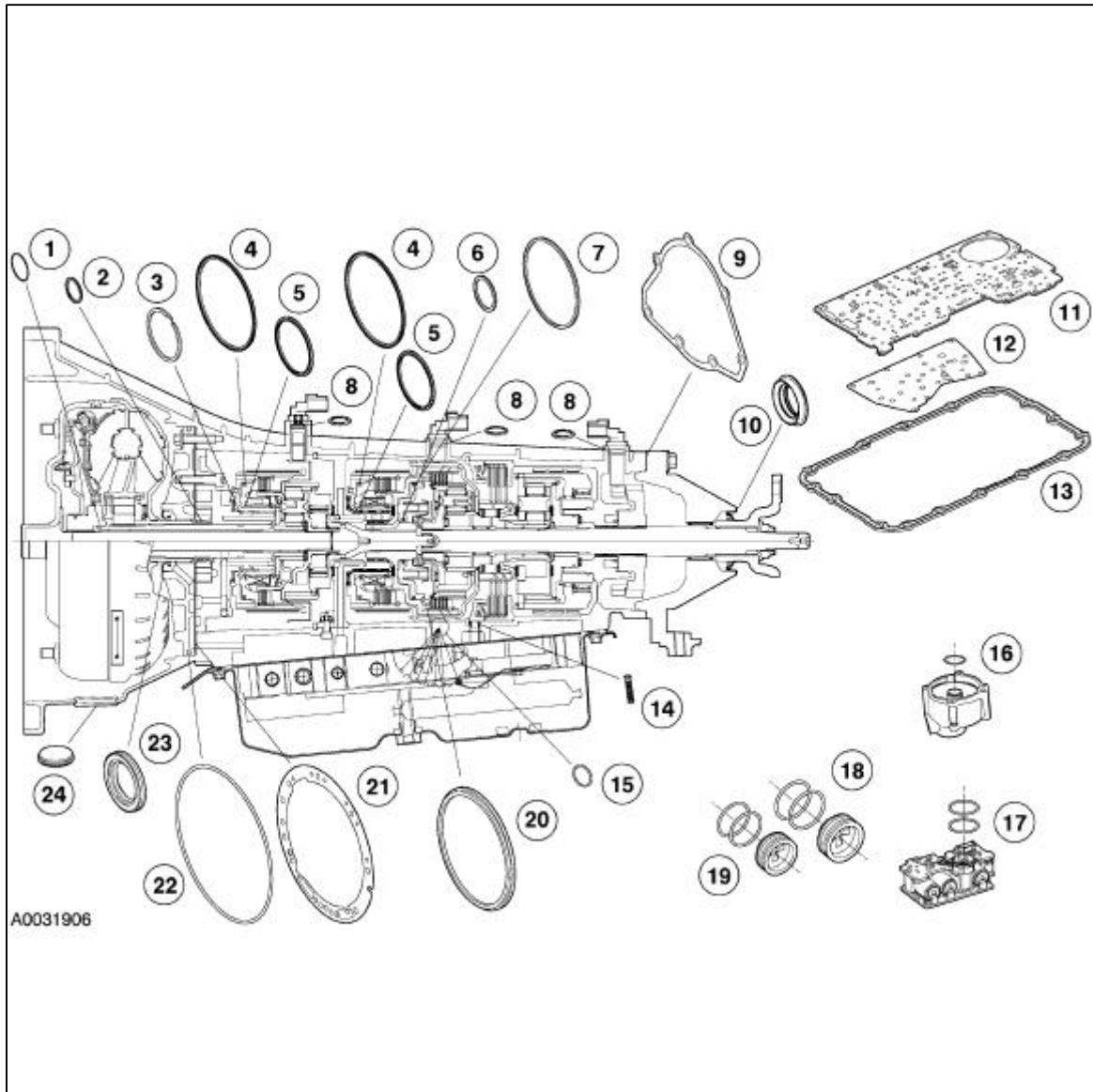
	S1300	req'd)
144	7D321	Retainer — control valve spring
145	7A270	Spring — main fluid pressure regulator valve
146	7D488	Valve — reverse servo check
147	W701099- S1430	Screw — attaches separating plate to main control
148	7H7003	Tube — intermediate clutch fluid inlet
149	7Z490	Plate assembly — valve body separator plate with bonded gasket
150	7A101	Control assembly — lower main
151	7H173	Gasket — valve body cover plate
152	7A008	Plate — valve body cover
153	7E440	Switch assembly — pressure
154	7A100	Control valve body — main (includes 7Z490 and 7A101)
155	W705928	O-ring seal — solenoid body connector
156	7G391	Body assembly — transmission control solenoid
157	7A098	Filter — transmission fluid pan
158	7A191	Gasket — fluid pan
159	7L027	Magnet — fluid pan
160	W705559- S300	Bolt — (attaches filter to main control) (2 req'd)
161	7A194	Pan — transmission fluid
162	7A010	Tube — fluid drain
163	W500213- S1309	Fluid pan bolt
164	W704999- S309	Plug — short hex
A	—	Intermediate clutch assembly
B	—	Forward clutch assembly
C	—	Direct clutch assembly
D	—	Coast clutch assembly

Bushings, Bearing and Thrust Washer Locator



Item	Part Number	Description
1	7D014	Front pump support thrust washer No. 1
2	7L495	Overdrive planetary thrust bearing No. 2
3	7M153	Center shaft and forward clutch cylinder bearing No. 3
4	7M153	Center shaft and forward clutch cylinder bearing No. 5
5	7M153	Center shaft and forward clutch cylinder No. 8, 9
6	7B368	Output shaft thrust washer No. 11
7	7R205	Output shaft to case bearing
8	7H027	Low/intermediate sun gear bearing No. 10
9	7G433	Forward planetary thrust bearing No. 7
10	7D090	Forward clutch hub thrust washer No. 6B
11	7D234	Forward ring gear hub thrust bearing No. 6A
12	7D014	Intermediate clutch drum bearing No. 4

Seals, Rings and Gaskets Locator



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Item	Part Number	Description
1	7L323	Stator support seal
2	W701431-S300	Seal ring
3	7D025	Overdrive brake drum seal
4	7A548	Direct and overdrive piston outer seal
5	7D404	Direct and overdrive piston inner seal
6	—	Forward clutch piston inner seal
7	—	Forward clutch piston outer seal (part of 7A262)
8	W702981-S300	O-ring seal (OSS)
9	7086	Extension housing gasket

10	7052	Extension housing seal
11	7Z490	Valve body separator plate
12	7H173	Valve body cover plate gasket
13	7A191	Gasket (fluid pan)
14	7H003	Intermediate clutch fluid inlet tube
15	7B498	Manual control lever seal
16	7423	Reverse servo piston O-ring seal
17	W705928	Solenoid body connector O-ring seal (2 req'd)
18	W702969- S300	Intermediate servo cover seal
19	W703119- S300	Overdrive servo cover seal
20	7B070	Forward clutch piston cushion spring (part of 7A262)
21	7A136	Front fluid pump gasket
22	7A248	Front fluid pump seal
23	7A248	Front fluid pump seal assembly
24	7N171	Converter housing access plug

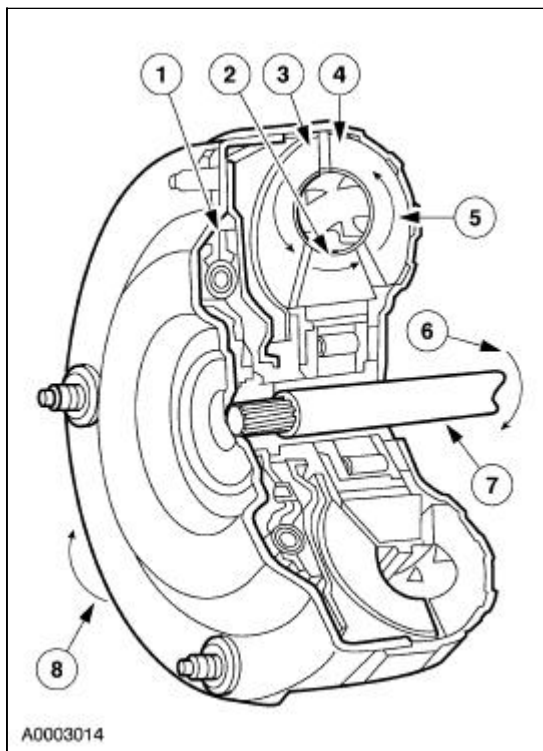
Torque Converter

The torque converter transmits and multiplies torque. The torque converter is a four-element device:

- impeller assembly
- turbine and damper assembly
- reactor assembly
- clutch

The standard torque converter components operate as follows:

- Rotation of the converter housing and impeller set the fluid in motion.
- The turbine reacts to the fluid motion from the impeller, transferring rotation to the geartrain through the input shaft.
- The reactor redirects fluid going back into the impeller, allowing for torque multiplication.
- The clutch and damper assembly dampens powertrain torsional vibration and provides a direct mechanical connection for improved efficiency.
- Power is transmitted from the torque converter to the planetary gearsets and other components through the input shaft.



Item	Part Number	Description
1	—	Converter clutch and damper (part of 7902)
2	—	Reactor (part of 7902)
3	—	Turbine damper (part of 7902)

4	—	Impeller (part of 7902)
5	—	Fluid motion
6	—	Transmission input rotation
7	—	Input shaft
8	—	Engine rotation

Geartrain

Power is transmitted from the torque converter to the planetary gearsets through the input shaft. Bands and clutches are used to hold and drive certain combinations of gearsets. This results in five forward ratios and one reverse ratio, which are transmitted to the output shaft and differential.

Gear Ratio	
1st	3.25 to 1
2nd Early Production Vehicles	2.44 to 1
2nd Late Production Vehicles	2.29 to 1
3rd	1.55 to 1
4th	1.00 to 1
5th Early Production Vehicles	0.75 to 1
5th Late Production Vehicles	0.71 to 1
Reverse	3.07 to 1

Planetary Gearset — Overdrive

For component location, refer to [Disassembled Views](#) in this section.

The planetary gear overdrive carrier is driven by the input shaft.

- The overdrive planetary gearset carrier drives the center shaft via the overdrive one-way clutch in 1st, 3rd, 4th, and reverse gears.
- In 2nd, and 5th, the overdrive sun gear is held causing the pinion gears to rotate around the overdrive sun gear.
- The pinion gears in turn drive the overdrive ring gear resulting in the 5th (overdrive) gear ratio.
- The overdrive planetary gearset is internally splined to the coast clutch for engine braking.

Planetary Gearset — Forward

For component location, refer to [Disassembled Views](#) in this section.

The forward planetary gearset is splined to the output shaft.

- The forward planetary gearset is driven by the forward ring gear when the forward clutch is applied.
- The forward planetary gearset pinions drive the forward sun gear.
- The forward sun gear is splined to the input shell.
- The forward carrier is splined to the output shaft.

Planetary Gearset — Low/Reverse

For component location, refer to [Disassembled Views](#) in this section.

The low/reverse planetary gearset is connected to the reverse brake drum by lugs from the low/reverse brake drum to the lugs of the low/reverse planetary gearset.

- The low/reverse planetary gearset is driven by the forward sun gear which is splined to the input shell.
- The forward sun gear drives the pinions in the low/reverse planetary gearset.
- The pinions of the low/reverse planetary gearset drive the output shaft ring gear and output shaft hub which is splined to the output shaft.
- The low/reverse planetary gearset can be held by the low one-way clutch in the low/reverse brake drum, or by the low/reverse band.

Input Shaft

For component location, refer to [Disassembled Views](#) in this section.

- The radial positioning of the input shaft is controlled by two bushings in the stator support.
- Axial positioning of the input shaft is controlled by the splines in the converter turbine and the retaining ring in the overdrive planetary carrier.

Output Shaft

For component location, refer to [Disassembled Views](#) in this section.

The output shaft is supported by a bearing in the case and by a bearing in the extension housing. End positioning is controlled by the parking pawl gear and by the reverse ring gear hub and snap ring.

Apply Components

Band — Overdrive

For component location, refer to [Disassembled Views](#) in this section.

During 2nd and 5th gear operation, hydraulic pressure is applied to the overdrive servo.

- This pressure causes the piston to move and apply force to the band.
- This action causes the overdrive band to hold the overdrive drum.
- This causes the overdrive sun gear to be held stationary through the adapter plate and the overdrive drum.

Band — Low/Reverse

For component location, refer to [Disassembled Views](#) in this section.

During 2nd gear operation, 1st gear operation and reverse, hydraulic pressure is applied to the low/reverse servo.

- This pressure causes the servo to move and apply force to the low/reverse band.
- This action causes the low/reverse brake drum to be held.
- This action causes the low/reverse planetary assembly to be held stationary.

Band — Intermediate

For component location, refer to [Disassembled Views](#) in this section.

During 3rd gear operation, hydraulic pressure is applied to the intermediate servo.

- This pressure causes the servo to move and apply force to the intermediate band.
- This action causes the direct clutch drum to be held.
- The intermediate band holds the intermediate brake and direct clutch drum to the case in 3rd gear.
- This causes the input shell and forward sun gear to be held stationary.

Clutches — Direct

For component location, refer to [Disassembled Views](#) in this section.

The direct clutch is a multi-disc clutch made up of steel and friction plates.

- The direct clutch is applied with hydraulic pressure and disengaged by return springs and the exhaust of the hydraulic pressure.
- It is housed in the direct clutch drum.
- During 4th, 5th, and reverse gear application, the direct clutch is applied transferring torque from the forward clutch cylinder to the direct clutch drum.

- This action causes the forward sun gear to drive the pinions of the low/reverse planetary carrier.

Clutches — Forward

For component location, refer to [Disassembled Views](#) in this section.

The forward clutch is a multi-disc clutch made up of steel and friction plates.

- The forward clutch is applied with hydraulic pressure and disengaged by return springs and the exhaust of the hydraulic pressure.
- The forward clutch is applied in all forward gears.
- When applied, the forward clutch provides a direct mechanical coupling between the center shaft and the forward ring gear and hub.

Clutches — Coast

For component location, refer to [Disassembled Views](#) in this section.

The coast clutch is a multi-disc clutch made up of steel and friction plates.

- The coast clutch is applied with hydraulic pressure and disengaged by return springs and the exhaust of the hydraulic pressure.
- The coast clutch is housed in the overdrive drum.
- The coast clutch is applied when in 1st, 3rd, D4, and reverse positions.
- When applied, the coast clutch locks the overdrive sun gear to the overdrive planetary carrier, thus preventing the one-way clutch from overrunning when the vehicle is coasting.
 - This allows the use of engine compression to help slow the vehicle and provide engine braking.

Clutches — Intermediate

For component location, refer to [Disassembled Views](#) in this section.

The intermediate clutch is a multi-disc stationary clutch made up of steel and friction plates which are in a module assembly that includes the cylinder and frictions.

- Applied with hydraulic pressure.
- Disengaged by a return spring and releasing of hydraulic pressure.
- Hydraulic pressure is feed through a feed tube in the case worm trail.
- Uses a bonded piston in an aluminum housing.
- Applied in during a 2-3 shift event.
- Transfers torque from the sun gear to the planetary carrier.
- Torque transfer causes the one way clutch to engage and holds the sun gear from turning, delivering 3rd gear.

One-Way Clutch — Direct

For component location, refer to [Disassembled Views](#) in this section.

The direct one-way clutch is a sprag-type one-way clutch that is pressed into the center shaft.

- The direct one-way clutch is driven by the ring gear of the overdrive planetary carrier.
- The direct one-way clutch holds and drives the outer splines of the center shaft in 1st, 3rd, 4th and reverse gears.
- The direct one-way clutch overruns during all coast operations and at all times in 2nd and 5th gear.

One-Way Clutch — Intermediate

For component location, refer to [Disassembled Views](#) in this section.

The Intermediate One-Way Clutch is a sprag type one-way clutch.

- The Intermediate One-Way Clutch connects the intermediate assembly to the input shell and sun gear assembly in third gear.

One-Way Clutch — Low/Reverse

For component location, refer to [Disassembled Views](#) in this section.

The low/reverse one-way clutch is a sprag type one-way clutch.

- The low/reverse one-way clutch holds the low/reverse drum and low/reverse planetary assembly to the case in 1st and 2nd gear.
 - In all other gears the low/reverse one-way clutch overruns.
-

Hydraulic System

Fluid Pump

For component location, refer to [Disassembled Views](#) in this section.

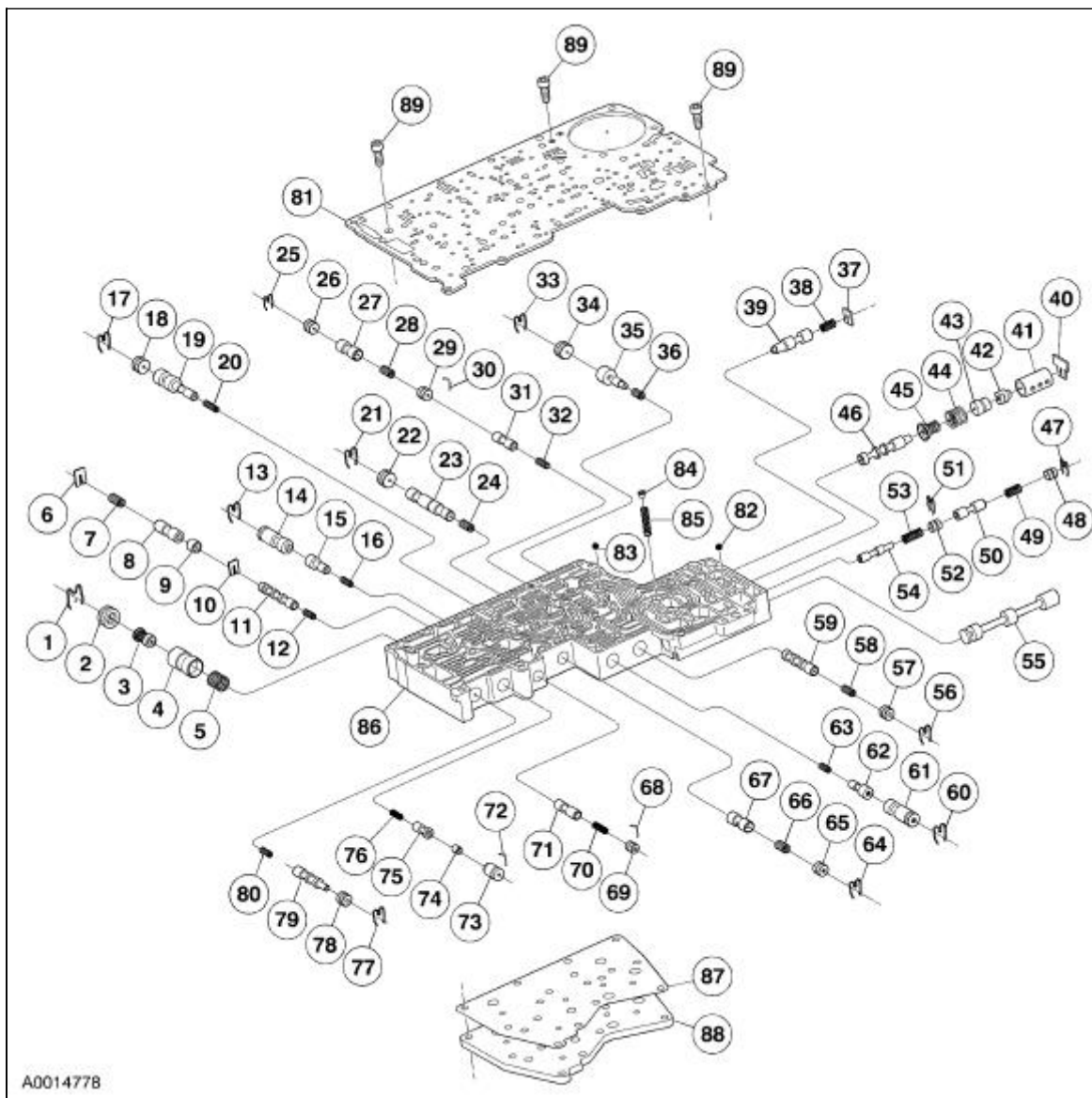
- The fluid pump provides the fluid pressure necessary to charge the torque converter, main control assembly, transmission cooling system, lubrication system and apply devices.
- The fluid pump is a positive displacement, gear type pump.
 - The fluid pump is driven by the torque converter impeller hub.

Filter

For component location, refer to [Disassembled Views](#) in this section.

- All fluid drawn from the transmission fluid pan by the fluid pump passes through the fluid filter.
- The transmission fluid filter and its accompanying seals are part of the fluid path from the sump (pan) to the fluid pump.
 - The transmission fluid filter has a bypass section which allows fluid vented at the main regulator valve to be recirculated to the fluid pump, without passing through the transmission fluid filter.

Main Control



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Item	Part Number	Description
1	7F445	Clip — retainer
2	7D374	Plug — retainer
3	7M094	Valve assembly — thermo
4	7L367	Valve — fluid cooler bypass
5	7M116	Spring — fluid cooler bypass
6	7E336	Plate
7	7G489	Spring — coast clutch control
8	7G490	Valve — coast clutch control
9	7G490	Valve — coast clutch control
10	7E336	Plate
11	7M189	Valve — overdrive servo control
12	7M193	Spring — overdrive servo control valve
13	7M445	Clip — retainer
14	7D374	Plug — retainer
15	7M095	Valve — modulator

16	7M104	Spring — modulator valve
17	7F445	Plug — retainer
18	7D374	Clip — retainer
19	7F259	Valve — 4-3 ISR downshift control
20	7F260	Spring — 4-3 ISR control valve
21	7F445	Plug — retainer
22	7D374	Clip — retainer
23	7M188	Valve — 4-3 pre-stroke intermediate band control
24	7G289	Spring — 4-3 pre-stroke intermediate band control valve
25	7F445	Clip — retainer
26	7D374	Plug — retainer
27	7G317	Valve — reverse engagement
28	7D312	Spring — reverse engagement valve
29	7D374	Plug — retainer
30	7D335	Retainer — wire
31	7M187	Valve — high clutch control
32	7M192	Spring — high clutch control valve
33	7F445	Clip — retainer
34	7D374	Plug — retainer
35	7M095	Valve — reverse modulator
36	7M104	Spring — reverse modulator valve
37	7E336	Plate
38	7M191	Spring — rear servo control valve
39	7M098	Valve — rear servo control
40	7E336	Plate
41	7D002	Sleeve
42	7D003	Valve — booster
43	7D003	Valve — booster
44	7A270	Spring — outer
45	7H149	Spring and retainer assembly
46	7C388	Valve — main regulator
47	7F445	Retainer — clip
48	7D374	Retainer — plug
49	7L317	Spring — reverse inhibition valve
50	7L316	Valve — reverse inhibition
51	7E445	Retainer — clip
52	7D374	Retainer — plug
53	7G411	Spring — solenoid regulator valve
54	7G473	Valve — solenoid regulator
55	7340	Valve — manual

56	7F445	Retainer — clip
57	7D374	Retainer — plug
58	7M009	Spring — select valve
59	7M186	Spring — select
60	7F445	Retainer — clip
61	7D374	Retainer — plug
62	7M095	Valve — modulator
63	7M104	Spring — modulator valve
64	7A445	Retainer — clip
65	7D374	Retainer — plug
66	7G312	Spring — forward engagement control valve
67	7D317	Valve — forward engagement control
68	7E335	Retainer — wire
69	7D374	Retainer — plug
70	7M190	Spring — back pressure
71	7M185	Valve — converter clutch back pressure
72	7E335	Retainer — wire
73	7D002	Sleeve — converter clutch modulator control
74	7M184	Valve — converter clutch modulator control
75	7G307	Valve — converter clutch modulator
76	7G316	Spring — converter clutch modulator control
77	7F445	Retainer — clip
78	7D374	Retainer — plug
79	7L318	Valve — converter clutch control
80	7L490	Spring — converter clutch control valve
81	7Z490	Plate assembly — main control valve body separator
82	7E195	Ball — lubrication check
83	7E195	Ball — shuttle valve
84	7E368	Valve — limit
85	7E340	Spring — limit valve
86	7A101	Body — control valve lower
87	7H173	Gasket — valve body cover plate
88	7C034	Plate — valve body cover
89	W701099-S1430	Screw — separator plate

- The main control assembly and related components are part of the pressure side of the hydraulic system.
- The main control assembly consists of the solenoids, the valve body assembly and the separator plate.
- These components combine to convert electrical signals into hydraulic actions.
 - All valves in the main control assembly are anodized aluminum and cannot be sanded,

filed, or dressed in any other way. If there is any damage to the valves that prevents or restricts their movement, install a new main control assembly.

Transmission Electronic Control System

Electronic System Description

The powertrain control module and its input/output network control the following transmission operations:

- shift timing.
- line pressure (shift feel).
- torque converter clutch.

The transmission control strategy combined with the engine control provides optimum powertrain operation under all conditions. When determining the best operating strategy for transmission operation, the PCM uses input information from certain engine-related and driver-demand related sensors and switches.

In addition, the PCM receives input signals from certain transmission-related sensors and switches. The PCM also uses these signals when determining transmission operating strategy.

Using all of these input signals, the PCM can determine when the time and conditions are right for a shift, or when to apply or release the torque converter clutch. It will also determine the pressure needed to optimize shift feel. To accomplish this the PCM uses three pressure controls, one torque converter clutch and four shift solenoids to control transmission operation.

The following provides a brief description of each of the sensors and actuators used to control transmission operation.

Powertrain Control Module

The operation of the transmission is controlled by the powertrain control module. Many input sensors provide information to the powertrain control module. The powertrain control module then controls the actuators which determine transmission operation.

Air Conditioning (A/C) Clutch

An electromagnetic clutch is energized when the clutch cycling pressure switch closes. The switch is located on the suction accumulator/drier. The closing of the switch completes the circuit to the clutch and draws it into engagement with the compressor driveshaft. When the A/C is engaged, operating pressures are adjusted to compensate for additional load on the engine.

Brake Pedal Position (BPP) Switch

The brake pedal position (BPP) switch tells the powertrain control module (PCM) when the brakes are applied. The torque converter clutch disengages when the brakes are applied. The BPP switch closes when the brakes are applied and opens when they are released. The BPP is also used to disengage the brake shift interlock.

Engine Coolant Temperature (ECT) Sensor

The engine coolant temperature (ECT) sensor detects engine coolant temperature and supplies the information to the PCM. The ECT sensor is used to control torque converter clutch (TCC) operation.

Electronic Ignition (EI) System

The electronic ignition consists of a crankshaft position sensor, two four-tower ignition coils and the powertrain control module. The ignition control module operates by sending crankshaft position information from the crankshaft position sensor to the ignition control module. The ignition control module generates a profile ignition pickup (PIP) signal (engine rpm) and sends it to the PCM. The PCM uses PIP signal in the transmission strategy, wide-open throttle (WOT) shift control, torque converter clutch control and operating pressures.

Intake Air Temperature (IAT) Sensor

The intake air temperature (IAT) sensor provides the sequential fuel injection (SFI) system mixture temperature information. The IAT sensor is used both as a density corrector for air flow calculation and to proportion cold enrichment fuel flow. The IAT sensor is installed in the air cleaner outlet tube. The IAT sensor is also used in determining control pressures.

Mass Air Flow (MAF) Sensor

The mass air flow sensor measures the mass of air flowing into the engine. The MAF sensor output signal is used by the powertrain control module (PCM) to calculate injector pulse width. For transmission strategies, the MAF sensor is used to regulate electronic pressure control, shift and torque converter clutch scheduling.

Transmission Control Switch (TCS)

The transmission control switch (TCS) sends a signal to the powertrain control module (PCM) when the driver selects the D4 position, canceling operation of 5th (overdrive) gear.

The TCS is located within the range selector assembly (base shifter only).

The PCM uses this signal to control the shift solenoids to disengage/disable 5th gear operation and activates coast clutch. At the same time, the PCM changes the instrument panel indicator to display D4.

When the driver moves the range selector lever back to the D5 position, 5th gear operation is enabled, the coast clutch is released and the instrument panel indicator changes to display D5.

Throttle Position (TP) Sensor

The throttle position (TP) sensor is a potentiometer mounted on the throttle body. The TP sensor detects the position of the throttle plate and sends this information to the powertrain control module. The TP sensor is used for shift scheduling, electronic pressure control and torque converter clutch (TCC) control.

Digital Transmission Range (TR) Sensor

The digital transmission range (TR) sensor is located on the outside of the transmission at the manual lever. The digital TR sensor completes the start circuit in PARK, NEUTRAL, and the back-up lamp circuit in REVERSE. The digital TR sensor also opens and closes a set of four switches that are monitored by the powertrain control module to determine the position of the manual lever (P, R, N, D5, 3, 2, 1).

Turbine Shaft Speed (TSS) Sensor

The turbine shaft speed (TSS) sensor is a magnetic pickup that sends the powertrain control module torque converter turbine speed information.

The TSS sensor is mounted externally on the case.

The PCM uses TSS information to help determine appropriate operating pressures and torque converter clutch (TCC) operation.

Output Shaft Speed (OSS) Sensor

The output shaft speed (OSS) sensor is a magnetic pickup, located at the park gear, that sends a signal to the powertrain control module to indicate transmission output shaft speed. The OSS sensor is mounted externally on the case. The OSS is used for torque converter clutch control, speed scheduling and to determine electronic pressure control.

Intermediate Shaft Speed (ISS) Sensor

The intermediate shaft speed (ISS) sensor is a magnetic pickup that sends planetary sun gear speed information to the PCM. The ISS is mounted externally on the center of the case.

The PCM uses the ISS information to aid in determining pressure requirements.

Pressure Control Solenoids (PCA, PCB, PCC)

The pressure control (PC) solenoids are a variable-force style (VFS) solenoid. The VFS-type solenoid is an electrohydraulic actuator combining a solenoid and a regulating valve.

The line pressure tap is used to verify output pressure from PC A or PC B by turning either one off while verifying the output from the other solenoid. The second pressure tap is used to verify the output from the PC C solenoid.

There are three PC solenoids located in the solenoid body assembly used to control line pressure, band and clutch application pressure within the transmission.

The powertrain control module varies the current to the PC solenoid.

The PCM has an adaptive learn strategy to electronically control the transmission which will automatically adjust the shift feel. When the battery is disconnected or a new battery installed, certain transmission operating parameters can be lost. The Powertrain Control Module (PCM) must relearn these parameters. During this learning process, you may experience slightly firm shifts, delayed, or early shifts. This operation is considered normal and will not affect the function of the transmission. Normal operation will return once these parameters are stored by the PCM.

Torque Converter Clutch (TCC) Solenoid

The torque converter clutch (TCC) solenoid is a pulse-width-modulating type solenoid that is used to control the apply and release of the TCC.

Shift Solenoids — (SSA, SSB, SSC, SSD)

Four On/Off shift solenoids allow the powertrain control module to control shift scheduling.

- The solenoids are three-way, normally open style.
- The shift solenoids SSA, SSB, SSC and SSD provide gear selection of 1st through 5th and reverse gears by directing PC pressures to the appropriate elements.

Coast braking and manual gears are also controlled by the shift solenoids.

Transmission Fluid Temperature (TFT) Sensor

- The transmission fluid temperature (TFT) sensor is a thermistor-type sensor that varies a reference voltage signal. The resistance in the TFT varies with temperature. The powertrain control module (PCM) monitors the voltage signal across the TFT, and uses this information to determine the transmission fluid temperature.
- The TFT is located on the solenoid body.

- The PCM uses the TFT signal to help determine shift scheduling, torque converter clutch operation and pressure control requirements.

It sends a voltage signal to the powertrain control module. The voltage signal varies with transmission fluid temperature. The PCM uses this signal to determine whether a cold start shift schedule is necessary. The shift schedule is compensated when the transmission fluid temperature is cold. The PCM also inhibits torque converter clutch (TCC) operation at low transmission fluid temperatures and determines pressure control (PC) solenoid operations.

Reverse Pressure (RP) Switch

The reverse pressure (RP) switch is a simple open or closed switch that is used to detect the presence of pressure in the main control valve body. The switch is mounted on the main control valve body. When pressure is not present, the switch is opened and the voltage reading is high. When pressure is present, the switch is closed and the voltage reading will be near zero.

Instrument Panel Range Selector Indicator

This indicator is an electronic readout in the instrument cluster which will match the position of the range selector (P, R, N, D4, D5, 3, 2, 1). If an error in the range selector assembly occurs, an "E" (error) will be displayed on the instrument panel.

Select Shift Transmission (SST) Switches (+ and -)

The positions indicated by a (+) or a (-) allow the driver to manually select the appropriate upshift (+) or downshift (-) and gear range.

The SST switches are located within the transmission range selector assembly and are momentary contact switches that send a signal to the PCM each time the driver moves the selector lever into the upshift or downshift gear range.

The PCM uses the input signals from the SST+ and the SST- switches, along with other vehicle inputs to determine which gear should be commanded.

Diagnostic Strategy

Troubleshooting an electronically controlled automatic transmission is simplified by using the proven method of diagnosis. One of the most important things to remember is that there is a definite procedure to follow.

NOTE: Do not take any shortcuts or assume that critical checks or adjustments have already been made.

Follow the procedures as written to avoid missing critical components or steps.

To correctly diagnose a concern, have the following publications available:

- Powertrain Control/Emissions Diagnosis (PC/ED) manual
- TSBs and OASIS messages.
- Wiring Diagram.

These publications provide the necessary information when diagnosing transmission concerns.

Use the Diagnostic Flow Chart as a guide and follow the steps as indicated.

Preliminary Inspection

- Know and understand the customer's concern.
- Verify the concern by operating the vehicle.
- Check the fluid levels and condition.
- Check for non-factory add-on items.
- Check shift linkages for correct adjustment.
- Check TSBs and OASIS messages regarding the concern.

Diagnostics

- Carry out on-board diagnostic procedures key on engine off (KOEO) and key on engine running (KOER).
- Record all diagnostic trouble codes (DTCs).
- Repair all non-transmission codes first.
- Repair all transmission codes second.
- Erase all continuous codes and attempt to repeat them.
- Repair all continuous codes.
- If only pass codes are obtained, proceed to Diagnosis by Symptom Index for further information and diagnosis.

Follow the diagnostic sequence to diagnose and repair the concern the first time.

Diagnostic Flow Chart

Diagnostic Flow Chart		
<ul style="list-style-type: none"> ● Know and understand the customer concerns ● Check the fluid level and condition ● Verify the concern by operating the vehicle ● Check for non-factory-installed items and verify correct installation ● Check the shift linkage adjustments ● Check TSBs and OASIS messages for vehicle concerns ● Carry out quick test both KOER and KOEO ● Record all codes <p>1) Did you record any Diagnostic Trouble Codes?</p>	Yes	<ul style="list-style-type: none"> • REPAIR all hard Diagnostic Trouble Codes. FOLLOW the pinpoint tests. REFER to the Powertrain Control/Emissions Diagnosis (PC/ED) manual first, then this workshop manual.
	No	<ul style="list-style-type: none"> • REFER to Diagnosis By Symptom in this section, then GO to Step 5.
2) Are any continuous test memory codes present?	Yes	<ul style="list-style-type: none"> • CLEAR codes and CARRY OUT drive cycle test.
	No	<ul style="list-style-type: none"> • GO to Step 4.
3) Did the continuous test memory codes reappear?	Yes	<ul style="list-style-type: none"> • REPAIR all continuous test memory codes. FOLLOW the pinpoint tests. REFER to the Powertrain Control/Emissions Diagnosis (PC/ED) manual then the transmission reference manual, then this workshop manual, then GO to Step 4.
	No	<ul style="list-style-type: none"> • GO to Step 4.
4) Is the concern repaired?	Yes	<ul style="list-style-type: none"> • CARRY OUT the final quick test to verify that no Diagnostic Trouble Codes are present. CLEAR memory codes.
	No	<ul style="list-style-type: none"> • REFER to Diagnosis By Symptom in this section.
5) Are there any electrical concerns?	Yes	<ul style="list-style-type: none"> • INSTALL the NGS and CARRY OUT output state control test, then GO to Step 6.
	No	<ul style="list-style-type: none"> • REFER to the hydraulic and mechanical routine to diagnose and repair the concern, then GO to Step 7.
6) Was the transmission concern corrected when the NGS was installed?	Yes	<ul style="list-style-type: none"> • REFER to the Powertrain Control/Emissions Diagnosis (PC/ED) manual, intermittent fault diagnosis section and use the NGS or WDS to diagnose cause of concern in the processor, vehicle harness or external inputs (sensors or

		switches).
	No	• REFER to the hydraulic and mechanical routine to diagnose the concern, then GO to Step 7.
7) Is the concern repaired?	Yes	• CARRY OUT the final quick test to verify that no diagnostic trouble codes are present. CLEAR memory codes.
	No	• GET assistance from Technical Hotline.

Preliminary Inspection

The following items must be checked prior to beginning the diagnostic procedures:

Know and Understand the Concern

In order to correctly diagnose a concern, first understand the customer complaint or condition. Customer contact may be necessary in order to begin to verify the concern. Understand the condition as to when the concern occurs, for example:

- hot or cold vehicle temperature.
- hot or cold ambient temperature.
- vehicle driving conditions.
- vehicle loaded/unloaded.

After understanding when and how the concern occurs, proceed to verify the concern.

Verification of Condition

This section provides information that must be used in both determining the actual cause of customer concerns and executing the appropriate procedures.

The following procedures must be used when verifying customer concerns for the engine.

Determine Customer Concern

NOTE: Some transmission conditions can cause engine concerns. An electronic pressure control short circuit can cause engine misfiring. The torque converter clutch not disengaging will stall the engine.

Determine customer concerns relative to vehicle use and dependent driving conditions, paying attention to the following items:

- hot or cold vehicle operating temperature
- hot or cold ambient temperatures
- type of terrain
- vehicle loaded/unloaded
- city/highway driving
- upshift
- downshift
- coasting
- engagement
- noise/vibration — check for dependencies, either rpm dependent, vehicle speed dependent, shift dependent, gear dependent, range dependent, or temperature dependent.

Check Fluid Level and Condition



CAUTION: The vehicle should not be driven if the fluid level is low or internal failure could result.

NOTE: If the vehicle has been operated for an extended period of time at highway speeds, in city traffic, in hot weather, or pulling a trailer, the fluid must cool down 30 minutes to obtain an accurate reading.

This vehicle is not equipped with a fluid level indicator. An incorrect level may affect the transmission operation and can result in transmission damage. To correctly check and add fluid to the transmission, refer to [Transmission Fluid Drain and Refill—Automated Equipment](#), [Transmission Fluid Drain and Refill—Vehicles With Torque Converter Drain Plug](#) or [Transmission Fluid Drain and Refill—Vehicles Without Torque Converter Drain Plug](#) in this section.

High Fluid Level

A fluid level that is too high can cause the fluid to become aerated due to the churning action of the rotating internal parts. This will cause erratic control pressure, foaming, loss of fluid from the vent tube and possible transmission damage. If an overfill reading is indicated, refer to [Transmission Fluid Drain and Refill—Automated Equipment](#), [Transmission Fluid Drain and Refill—Vehicles With Torque Converter Drain Plug](#) or [Transmission Fluid Drain and Refill—Vehicles Without Torque Converter Drain Plug](#) in this section.

Low Fluid Level

A low fluid level can result in poor transmission engagement, slipping or damage. It can also indicate a leak in one of the transmission seals or gaskets.

Adding Fluid



CAUTION: The use of any type of transmission fluid other than specified can result in transmission damage.

If fluid must be added, add fluid in 0.25L (0.5 pint) increments through the fill hole opening. Do not overfill the fluid. For fluid type, refer to the General Specification chart in this section.

Fluid Condition Check

1. Check the fluid level. For additional information, refer to [Transmission Fluid Drain and Refill—Automated Equipment](#), [Transmission Fluid Drain and Refill—Vehicles With Torque Converter Drain Plug](#) or [Transmission Fluid Drain and Refill—Vehicles Without Torque Converter Drain Plug](#) in this section.
2. Observe the color and the odor of the fluid. Under normal circumstances, the color should be dark reddish, not brown or black.
3. Allow the fluid to drip onto a facial tissue and examine the stain.
4. If evidence of solid material is found, the transmission fluid pan should be removed for further inspection.
5. If fluid contamination or transmission failure is confirmed by the sediment in the bottom of the transmission fluid pan, the transmission must be disassembled and completely cleaned.
6. Carry out diagnostic checks and adjustments. For additional information, refer to [Diagnosis By Symptom](#) in this section.

Road Testing Vehicle

NOTE: Always drive the vehicle in a safe manner according to driving conditions and obey all traffic laws.

NOTE: When the battery is disconnected or a new battery installed, certain transmission operating parameters may be lost. The powertrain control module (PCM) must relearn these parameters. During this learning process, you may experience slightly firm shifts, delayed, or early shifts. This operation is considered normal and will not affect the function of the transmission. Normal operation will return once these parameters are stored by the PCM.

The Shift Point Road Test and Torque Converter Clutch Operation Test provide diagnostic information on transmission shift controls and torque converter operation.

Shift Point Road Test

This test verifies that the shift control system is operating correctly.

1. Bring engine and transmission up to normal operating temperature.
2. Operate the vehicle with the selector lever in the D5 position.
3. Apply minimum throttle and observe the speeds at which upshift occurs and torque converter engages. Refer to the following Shift Speeds chart. (Also refer to the Automatic Transmission Specifications Issue.)
4. Stop the vehicle. Select the D4 position. Repeat Step 3. The transmission will make all upshifts except 4-5 and torque converter clutch should apply above 46 km/h (27 mph).
5. Press the accelerator pedal to the floor, wide open throttle (WOT). The transmission should shift from third to second, or third to first, depending on vehicle speed, and torque converter clutch should release.
6. With vehicle speed above 48 km/h (30 mph), move the transmission range selector lever from D4 position to first position and release the accelerator pedal. The transmission should immediately downshift to third gear. When vehicle speed drops below 32 km/h (20 mph), the transmission should downshift into first gear.
7. If transmission fails to upshift/downshift or torque converter clutch does not apply/release, refer to [Diagnosis By Symptom](#) for possible causes.

Shift Speeds



CAUTION: Always obey local traffic laws. Do not exceed posted limits.

			D5 Position	Speed km/h (mph)
Vehicle Information	Transmission Model	Throttle Position	Shift	Axle Ratio All
Lincoln LS 3.0L/3.9L	RJL-A	Closed	5-4	38-41 (24-26)
	RJL-B		4-3	28-32 (18-20)
			3-2	17-22 (11-14)
			2-1	11-16 (7-10)
		Minimum		
		Monitor PID: TP volt-	1-3	14-25 (9-16)

		1.25		
			3-4	32-41 (20-26)
			4-5	41-48 (26-30)
			5-4	45-48 (28-30)
			4-3	28-32 (18-20)
			3-2	17-22 (11-14)
			2-1	11-16 (7-10)
		Wide Open	1-2	67-72 (42-45)
			2-3	90-96 (56-60)
			3-4	136-159 (85-99)
			4-5	188-236 (117-147)
			5-4	177-201 (110-125)
			4-3	123-125 (77-78)
			3-2	56-67 (35-42)
			2-1	38-41 (24-46)

Torque Converter Diagnosis

Prior to installing a new torque converter, all diagnostic procedures must be followed. This is to prevent the unnecessary replacement of good torque converters. Only after a complete diagnostic evaluation can the decision be made to install a new torque converter.

Begin with the normal diagnostic procedures as follows:

1. Preliminary Inspection.
2. Know and Understand the Customer Concern.
3. Verify the Concern — Carry out the Torque Converter Clutch Operation Test. Refer to Torque Converter Operation Test in this section.
4. Carry out Diagnostic Procedures.
 - Run on-board diagnostics; see On-Board Diagnostics With NGS, refer to [Diagnostics](#) in this section.
 - Repair all non-transmission related DTCs first.
 - Repair all transmission DTCs.
 - Rerun on-board diagnostic to verify repair.
 - Carry out the Line Pressure Test. Refer to [Special Testing Procedures](#) in this section.
 - Carry out the Stall Speed Test. Refer to [Special Testing Procedures](#) in this section.
 - Carry out the Diagnosis by Symptom Routine for torque converter diagnosis. Refer to [Diagnosis By Symptom](#) in this section.
 - Use the index to locate the appropriate routine that best describes the symptom(s). The routine will list all possible components that may cause or contribute to the symptom. Check each component listed; diagnose and service as necessary before servicing the torque converter.

Torque Converter Operation Test

This test verifies that the torque converter clutch control system and the torque converter are operating correctly.

5. Carry out the Quick Test; see On-Board Diagnostics With NGS, refer to [Diagnostics](#) in this section. Check for DTCs. Refer to the [Diagnostic Trouble Code Charts](#).
6. Connect a tachometer to the engine.
7. Bring the engine to normal operating temperature by driving the vehicle at highway speeds for approximately 15 minutes in D5 position.
8. After normal operating temperature is reached, maintain a constant vehicle speed of about 80 km/h (50 mph) and tap brake pedal with the left foot.
9. The engine rpm should increase when brake pedal is tapped, and decrease about five seconds after pedal is released. If this does not occur, see Torque Converter Operation Concerns, [Diagnosis By Symptom](#).

10. If the vehicle stalls in D5 or manual 2 at idle with vehicle at a stop, move the transmission range selector lever to manual 1 position. If the vehicle stalls, see Torque Converter Operation Concerns, [Diagnosis By Symptom](#) in this section. Repair as necessary. If the vehicle does not stall in D5, refer to [Diagnosis By Symptom](#) in this section.
-

Visual Inspection

This inspection will identify modifications or additions to the vehicle operating system that may affect diagnosis. Inspect the vehicle for non-Ford factory add-on devices such as:

- electronic add-on items:
 - air conditioning
 - generator (alternator)
 - engine turbo
 - cellular telephone
 - cruise control
 - CB radio
 - linear booster
 - backup alarm signal
 - computer
- Vehicle modification:

These items, if not installed correctly, will affect the powertrain control module, or transmission function. Pay particular attention to add-on wiring splices in the PCM harness or transmission wiring harness, abnormal tire size, or axle ratio changes.

- leaks. Refer to [Leakage Inspection](#) in this section.
- correct linkage adjustments. Refer to [Section 307-05](#).

Shift Linkage Check

Check for a misadjustment in shift linkage by matching the detents in the transmission range selector lever with those in the transmission. If they match, the misadjustment is in the indicator. Do not adjust the shift linkage.

Hydraulic leakage at the manual control valve can cause delay in engagements and/or slipping while operating if the linkage is not correctly adjusted. Refer to [Section 307-05](#) for shift linkage adjustment.

Check TSBs and OASIS


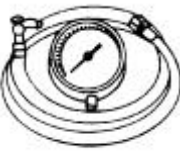
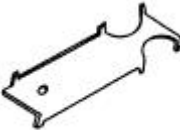
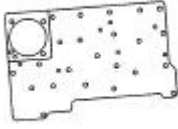



Refer to all Technical Service Bulletins and OASIS messages which pertain to the transmission concern and follow the procedure as outlined.



Carry Out On-Board Diagnostics (KOEO, KOER)

After a road test, with the vehicle warm and before disconnecting any connectors, carry out the Quick Test using New Generation Star (NGS) Tester. Refer to the Powertrain Control/Emissions Diagnosis (PC/ED) manual for diagnosis and testing of the powertrain control system.

Diagnostics

Special Tool(s)

 <p>ST1300-A</p>	<p>UV Leak Detector 164-R0756 or equivalent</p>
 <p>ST1565-A</p>	<p>Pressure Gauge, Transmission Fluid 307-004 (T57L-77820-A)</p>
 <p>ST1633-A</p>	<p>Alignment Gauge, TR Sensor 307-351 (T97L-70010-A)</p>
 <p>ST2408-A</p>	<p>Air Test Plate, Transmission 307-405</p>
 <p>ST1137-A</p>	<p>73 III Automotive Meter 105-R0057 or equivalent</p>
	<p>Trans Tester TR/MLP Overlay and Manual 007-00131 or equivalent</p>
 <p>ST2332-A</p>	<p>Worldwide Diagnostic System (WDS) 418-F224</p> <p>New Generation Star (NGS) Tester 418-F052 or equivalent</p>
	<p>MLP-TR Cable 418-F107 (007-00111) or</p>

 <p>ST1632-A</p>	<p>equivalent</p>
 <p>ST1389-A</p>	<p>Transmission Tester 307-F016 (007-00130) or equivalent</p>

Diagnosing electronically controlled automatic transmissions is simplified using the following procedures. It is important to remember that there is a definite procedure to follow. **DO NOT TAKE SHORTCUTS OR ASSUME THAT CRITICAL CHECKS OR ADJUSTMENTS HAVE ALREADY BEEN MADE.** Follow the procedures as written to avoid missing critical components or steps. By following the diagnostic sequence, the technician will be able to diagnose and repair the concern the first time.

On-Board Diagnostics with NGS

NOTE: For detailed instruction and other diagnostic methods using the NGS, refer to the NGS tester and the Powertrain Control/Emissions Diagnosis (PC/ED) manual.

These quick tests should be used to diagnose the powertrain control module and should be carried out in order.

- Quick Test 1.0 — Visual Inspection
- Quick Test 2.0 — Set Up
- Quick Test 3.0 — Key On, Engine Off
- Quick Test 4.0 — Continuous Memory
- Quick Test 5.0 — Key On, Engine Running
- Special Test Mode
 - Wiggle Test Mode
 - Output Test Mode
- PCM Reset Mode
- Clearing DTCs
- OBD II Drive Cycle
- Other NGS Features

For further information on other diagnostic testing features using the NGS or generic scan tool, refer to the Powertrain Control/Emissions Diagnosis (PC/ED) manual. Other diagnostic methods include the following:

- Parameter Identification (PID) Access Mode
- Freeze Frame Data Access Mode
- Oxygen Sensor Monitor Mode

Output State Control (OSC) Mode

Output state control (OSC) allows the technician to control certain transmission function parameters. For example, OSC allows the technician to shift the transmission only when commanding a gear change. If the technician commands 1st gear in OSC, the transmission will remain in 1st gear until the technician commands the next gear. For another example, the technician can command a shift solenoid to turn on or off when carrying out an electrical circuit check. The OSC has two modes of operation for transmission: the BENCH MODE and the DRIVE MODE. Each mode/parameter has a unique set of vehicle operating requirements that the technician must meet before being allowed to operate OSC.

NOTE: To operate OSC, the digital transmission range (TR) sensor and the vehicle speed sensor (VSS) must be operational. No diagnostic trouble codes (DTCs) related to the digital TR sensor or the VSS can be present.

- The vehicle requirements **MUST BE MET** when **SENDING** the OSC value. Refer to vehicle requirements for each individual test.
- If the vehicle requirements are **NOT MET** when **SENDING** the OSC value, an **ERROR MESSAGE** will appear. When the **ERROR MESSAGE** is received, OSC is aborted and must be restarted.
- If, after a sent value is substituted, the vehicle requirements are no longer met, the PCM will cancel the OSC value and resume normal operation. No error message will be sent.
- The OSC value [XXX] may be sent anytime to cancel OSC.

Output State Control (OSC) Procedures

- Carry out visual inspection and vehicle preparation as necessary.
- Select "Vehicle and Engine Selection" menu.
- Select appropriate vehicle and engine.
- Select "Diagnostic Data Link."
- Select "Powertrain Control Module."
- Select "Diagnostic Test Mode."
- Select "KOEO On-Demand Self Test and KOER On-Demand Self Tests."
- Carry out test and record DTCs.
- Repair all NON-Transmission DTCs.
- Repair all VSS and digital TR sensor DTCs.
- Make sure that VSS/digital TR sensors are functional.
- Select "Active Command Modes."
- Select "Output State Control."
- Select "Trans — Bench Mode" or "Trans — Drive Mode."

OSC — Transmission Bench Modes

The following Transmission Bench Modes may be used as necessary during diagnostics.

SSA, SSB, SSC, SSD and TCC in BENCH MODE



CAUTION: The parking brake must be set prior to carrying out this procedure.

The BENCH MODE allows the technician to carry out electrical circuit checks on the following components:

- SSA — Activates SS A OFF or ON.
- SSB — Activates SS B OFF or ON.
- SSC — Activates SS C OFF or ON.
- SSD — Activates SS D OFF or ON.
- TCC — Activates TCC OFF or ON.

OSC "SSA, SSB, SSC, SSD, TCC" BENCH MODE Operates ONLY when:

- VSS and digital TR sensor are operational.
- No VSS and digital TR sensor DTCs.
- Transmission range selector lever in P or N.
- Key ON.
- Engine OFF.

OSC Command Values

- [OFF] — turns solenoid OFF.
- [ON] — turns solenoid ON.
- [XXX] — cancels OSC value sent.
- [SEND] — sends the values to PCM.

BENCH MODE Procedure for SSA, SSB, SSC, SSD and TCC

Follow operating instructions from the NGS menu screen:

- Select "Output State Control."
- Select "Trans - Bench Mode."
- Select "PIDs" to be monitored.
- Monitor all selected PIDs during test.
- Select "Parameters - SSA, SSB, SSC, SSD or TCC."
- Select "ON" to turn solenoid ON.
- Press "SEND" to send command ON.
- Select "OFF" to turn solenoid OFF.
- Press "SEND" to send command OFF.
- Select "XXX" to cancel at any time.
- Press "SEND."

PC A, PC B, PC C in BENCH MODE



CAUTION: The parking brake must be set prior to carrying out this procedure.

The BENCH MODE is also used to test the functionality of the transmission electronic pressure control. During BENCH MODE, the PCx solenoids can be commanded in increments of 15 psi from zero to 90 psi and 90 to zero psi.

The line pressure tap is used to verify output pressure from PC A or PC B by turning either one off while verifying the output from the other solenoid. The second pressure tap is used to verify the output from the PC C solenoid.

The OSC functions for the parameter PCx allows the technician to choose the following options:

- PCx — Activates PCx to selected values.
- [00] — sets PCx pressure to 00 psi.
- [15] — sets PCx pressure to 15 psi.
- [30] — sets PCx pressure to 30 psi.
- [45] — sets PCx pressure to 45 psi.
- [60] — sets PCx pressure to 60 psi.
- [75] — sets PCx pressure to 75 psi.
- [90] — sets PCx pressure to 90 psi.

The OSC PCx Bench Mode should ONLY be operated to check PRESSURE FUNCTIONALITY using an installed pressure gauge (300 psi) when:

- VSS and digital TR sensor are operational.
- No VSS and digital TR sensor DTCs.
- Transmission range selector lever in P or N.
- Pressure gauge installed.
- Key ON.
- Engine ON.
- Engine rpm at least 1,500.

The OSC PCx Bench Mode should ONLY be operated to complete PCx SOLENOID CIRCUIT PINPOINT TESTS when:

- VSS and Digital TR Sensor are operational.
- No VSS and Digital TR Sensor DTCs are present.
- Transmission range selector lever is in "P" or "N".
- Key "ON".
- Engine "OFF".

OSC Command Values

- [00] — sets PCx pressure to 00 psi.
- [15] — sets PCx pressure to 15 psi.
- [30] — sets PCx pressure to 30 psi.

- [45] — sets PCx pressure to 45 psi.
- [60] — sets PCx pressure to 60 psi.
- [75] — sets PCx pressure to 75 psi.
- [90] — sets PCx pressure to 90 psi.
- [XXX] — cancels OSC value sent.
- [SEND] — sends the values to PCM.

BENCH MODE Procedure for PCx

Following operating instructions from the NGS menu screen:

- Select "Output State Control."
- Select "Trans — Bench Mode."
- Select "PIDs" to be monitored.
- Monitor all selected PIDs during test.
- Select "Parameters — PCx."
- Select Value "0 - 90 psi."
- Press "SEND" to send command.
- Select "XXX" to cancel at any time.
- Press "SEND."

OSC — Transmission DRIVE MODES

The DRIVE MODE allows control of three transmission parameters. Each mode/parameter has a unique set of vehicle operating requirements that the technician must meet before being allowed to operate OSC. When using the DRIVE MODE, the recommended procedure is to control one parameter at a time.

The DRIVE MODE allows the technician to carry out the following functions on the transmission:

- GEAR — allows upshifts or downshifts.
- TCC — engages or disengages the torque converter clutch.
- FIRM_SFT — commands a higher control pressure during upshift.

The pressure control (PCx) solenoids for this transmission are not directly controlled during DRIVE MODE testing. Pressures may be raised during an upshift via the harsh shift control channel (FIRM_SFT)

GEAR in DRIVE MODE

This OSC function is used to test the transmission shift functions.

The OSC functions for the GEAR parameter allow the technician to choose the following options:

- [1] — PCM selects 1st gear.
- [2] — PCM selects 2nd gear.
- [3] — PCM selects 3rd gear.
- [4] — PCM selects 4th gear.

- [5] — PCM selects 5th gear.

The OSC GEAR Mode operates ONLY when:

- VSS and digital TR sensor are operational.
- No VSS and digital TR sensor DTCs.
- Engine ON.
- TCC "OFF" (TCC cannot be engaged)
- Transmission range selector lever in D5.
- Vehicle speed is greater than 3 km/h (2 mph).

OSC Command Values

- [1] — PCM selects 1st gear.
- [2] — PCM selects 2nd gear.
- [3] — PCM selects 3rd gear.
- [4] — PCM selects 4th gear.
- [5] — PCM selects 5th gear.
- [XXX] — cancels OSC value sent.
- [SEND] — sends the values to PCM.

DRIVE MODE Procedure for GEAR

Follow operating instructions from the NGS menu screen.

- Select "Output State Control."
- Select "Trans — DRIVE MODE."
- Select "PIDs" to be monitored.
- Monitor all selected PIDs during test.
- Select "Parameters — GEAR."
- Select Value "1-5."
- Press "SEND" to send command.
- Re-Select Value "1-5."
- Press "SEND" to send command.
- Select "XXX" to cancel at any time.
- Press "SEND."

TCC in DRIVE MODE

This OSC function is used to test whether the torque converter clutch is engaging and disengaging correctly.

The OSC functions for the TCC parameter allows the technician to choose the following:

- TCC — activates TCC OFF and ON.

- [ON] — turns TCC solenoid ON.
- [OFF] — turns TCC solenoid OFF.

OSC "TCC OFF" DRIVE MODE operates ONLY when:

- VSS and digital TR sensors are operational.
- No VSS and digital TR sensor DTCs present.
- Engine ON.
- Transmission range selector lever in D5.
- Vehicle speed is greater than 3 km/h (2 mph).

OSC "TCC ON" DRIVE MODE operates ONLY when:

- VSS and digital TR sensors are operational.
- No VSS and digital TR sensor DTCs present.
- Engine ON.
- Transmission range selector lever in D5.
- Vehicle speed is greater than 3 km/h (2 mph).
- Transmission in 2nd gear or higher.
- TFT is between 33-153°C (60-275° F).
- Brake not applied "OFF" below 32 km/h (20 mph).
- Maintain steady speed.

OSC Command Values

- [OFF] — turns TCC OFF.
- [ON] — turns TCC ON.
- [XXX] — cancels OSC value sent.
- [SEND] — sends the values to PCM.

Drive Mode Procedures for TCC

Follow operating instructions from the NGS menu screen.

- Select "Output State Control."
- Select "Trans — Drive Mode."
- Select "PIDs" to be monitored.
- Monitor all selected PIDs during test.
- Select "Parameters — TCC."
- Select "ON" to turn solenoid ON.
- Press "SEND" to send command ON.
- Select "OFF" to turn solenoid OFF.
- Press "SEND" to send command OFF.

- Select "XXX" to cancel at any time.
- Press "SEND."

FIRM_SFT in DRIVE MODE

This OSC function is used to raise pressure during an upshift to determine whether the pressure control system is functioning correctly. Harsher shifts indicate that the pressure control system works at higher pressure. The best test for isolating pressure control system problems is to carry out the PC A, PC B, PC C in BENCH MODE, using a hydraulic pressure gauge.

The OSC functions for the parameter FIRM_SFT allows the technician to choose the following options:

- FIRM_SFT — activates the harsh shift channel.
 - [ON] — sets control pressure higher for all upshifts (determined by the PCM)
 - [OFF]— sets control pressure to normal for all upshifts (determined by the PCM)
 - [XXX] — cancel OSC for FIRM_SFT

OSC "FIRM_SFT" DRIVE MODE operates ONLY when:

- VSS and digital TR sensor are operational.
- No VSS and digital TR sensor DTCs.
- Transmission range selector lever in O/D.
- Pressure gauge installed (optional).
- Key ON.
- Engine ON.
- Vehicle speed greater than 3 km/h (2 mph).
- TCC is OFF (TCC is not engaged).

OSC Command Values

- [ON] — sets control pressure high for all upshifts (determined by the PCM)
- [OFF] — sets control pressure to normal for all upshifts (determined by the PCM)
- [XXX] — cancel OSC for FIRM_SFT
- [SEND] — sends the values to the PCM

DRIVE MODE Procedure for FIRM_SFT.

Follow operating instructions from the NGS menu screen.

- Select "Output State Control."
- Select "Trans — Drive Mode."
- Select "PIDs" to be monitored.
- Monitor all selected PIDs during test.
- Select "Parameters — FIRM_SFT."
- Press "SEND" to send command.
- Select "XXX" to cancel at any time.

- Press "SEND."

Using Output State Control (OSC) and Accessing PIDs

To confirm that the OSC value was sent by the NGS and the PCM has accepted the OSC substitution, a corresponding PID for each OSC parameter must be monitored. Additional PIDs should be monitored to help the technician adequately diagnose the transmission.

The following is a list of OSC parameters and their corresponding PIDs:

Corresponding PID	PID Description
BPP	Brake Pedal Position Switch On/Off
PCA	Pressure Control Solenoid A — Commanded Pressure
PCB	Pressure Control Solenoid B — Commanded Pressure
PCC	Pressure Control Solenoid C — Commanded Pressure
FIRMST	Firm Shift Control (FMC) status requested by OSC; 0 = FSC not commanded by OSC, NGS PID output = OFF; 1 = FSC commanded by OSC, NGS PID output = ON
GEAR	Commanded Transmission Gear (use in drive only)
RPS	Pinpoint test for reverse pressure switch; 0 = closed, 1 = open
FFG RPS	Instantaneous Failure Flag for reverse pressure switch; Failure = 1
RPM	Engine Revolutions Per Minute
SSA	Shift solenoid A Commanded ON
SSB	Shift solenoid B Commanded ON
SSC	Shift solenoid C Commanded ON
SSD	Shift solenoid D Commanded ON
TCC	Torque converter commanded duty cycles (%)
TCCRAT	Torque converter speed ratio (RPM and/or TSS)
TFT	Transmission Fluid Temperature (degrees F)
VSS	Vehicle Speed (mph)

To confirm that the OSC substitution occurred, SEND the OSC value and monitor the corresponding PID value. If no ERROR MESSAGE was received and the value of the corresponding PID is the same as the value sent from OSC, the OSC substitution was successful.

Transmission Drive Cycle Test

NOTE: Always drive the vehicle in a safe manner according to driving conditions and obey all traffic laws.

NOTE: The Transmission Drive Cycle Test must be followed exactly. Transmission failure must occur four times consecutively for shift error DTC code to be set, and five times consecutively for continuous torque converter clutch code to set.

NOTE: When carrying out the Transmission Drive Cycle Test, use the Solenoid Operation Chart for correct solenoid operation. Refer to [Pinpoint Tests — OSC Equipped Vehicles](#).

After carrying out the Quick Test, use the Transmission Drive Cycle Test for checking continuous codes.

1. Record and then erase Quick Test codes.
2. Warm engine to normal operating temperature.
3. Make sure transmission fluid level is correct.
4. With transmission in D5 position, moderately accelerate from stop to 80 km/h (50 mph). This allows the transmission to shift into fifth gear. Hold speed and throttle open steady for a minimum of 15 seconds.
5. With transmission in fifth gear and maintaining steady speed and throttle opening, lightly apply and release brake to operate stoplamps. Then hold speed and throttle steady for a minimum of five seconds.
6. Brake to a stop and remain stopped for a minimum of 20 seconds.
7. Repeat steps 4 through 6 at least five times.
8. Carry out Quick Test and record continuous DTCs.

After On-Board Diagnostics

NOTE: The vehicle wiring harness, powertrain control module and non-transmission sensors may affect transmission operations. Repair these concerns first.

After the on-board diagnostic procedures are completed, repair all DTCs.

Begin with non-transmission related DTCs, then repair any transmission related DTCs. Refer to the [Diagnostic Trouble Code Charts](#) for information on condition and symptoms. This chart will be helpful in referring to the correct manual(s) and aids in diagnosing internal transmission concerns and external non-transmission inputs. The pinpoint tests are used in diagnosing transmission electrical concerns. Make sure that the vehicle wiring harness and the PCM are diagnosed as well. The Powertrain Control/Emissions Diagnosis (PC/ED) manual will aid in diagnosing non-transmission electronic components.

Before Pinpoint Tests

NOTE: Prior to entering pinpoint tests, check the powertrain control module wiring harness for correct connections, bent or broken pins, corrosion, loose wires, correct routing, correct seals and their condition. Check the PCM, sensors and actuators for damage. Refer to the Powertrain Control/Emissions Diagnosis (PC/ED) manual.

NOTE: If a concern still exists after electrical diagnosis, refer to [Diagnosis By Symptom](#) in this section.

If DTCs appear while carrying out the on-board diagnostics, refer to the [Diagnostic Trouble Code Charts](#) for the appropriate repair procedure. Prior to entering pinpoint tests, refer to any TSBs and OASIS messages for transmission concerns.

Diagnostic Trouble Code Charts

Diagnostic Trouble Code Chart

**May also be generated by some other non-electric transmission hardware system.					
*Output circuit check, generated only by electrical symptoms.					
Five Digit DTC	Component	Description	Condition	Symptom	Action
P0102, P0103, P1100, P1101	MAF	MAF concerns	MAF system inoperative which may cause a transmission concern.	High/low EPC pressure, incorrect shift schedule. Incorrect torque converter clutch engagement scheduling. Symptoms similar to a TP failure.	REFER to the Powertrain Control/Emissions Diagnosis (PC/ED) manual.
P0112	IAT	IAT indicates 125°C (254°F) (grounded)	Voltage drop across IAT exceeds scale set for temperature 125°C (254°F).	Incorrect EPC pressure. Either high or low which will result in harsh or soft shifts.	REFER to the Powertrain Control/Emissions Diagnosis (PC/ED) manual.
P0113	IAT	IAT indicates -40°C (-40°F) (open circuit)	Voltage drop across IAT exceeds scale set for temperature -40°C (-40°F).	Incorrect EPC pressure. Either high or low which will result in harsh or soft shifts.	REFER to the Powertrain Control/Emissions Diagnosis (PC/ED) manual.
P0114	IAT	IAT out of on-board diagnostic range	IAT temperature higher or lower than expected during KOEO and KOER.	Rerun on-board diagnostic at normal operating temperature.	REFER to the Powertrain Control/Emissions Diagnosis (PC/ED) manual.
P1116	ECT	ECT out of on-board diagnostic range	ECT temperature higher or lower than expected during KOEO and KOER.	Rerun on-board diagnostic at normal operating temperature.	REFER to the Powertrain Control/Emissions Diagnosis (PC/ED) manual.
P0117	ECT	ECT indicates 125°C (254°F)	Voltage drop across ECT exceeds scale set for temperature 125°C (254°F) (grounded).	Torque converter clutch will always be off, resulting in reduced fuel economy.	REFER to the Powertrain Control/Emissions Diagnosis (PC/ED) manual.
P0118	ECT	ECT indicates -40°C (-40°F)	Voltage drop across ECT exceeds scale set for temperature -40°C (-40°F) (open circuit).	Torque converter clutch will always be off, resulting in reduced fuel economy.	REFER to the Powertrain Control/Emissions Diagnosis (PC/ED) manual.

P0121, P0122, P0123, P1120, P1121, P1125, P1124	TP	TP concern	PCM has detected an error. This error may cause a transmission concern.	Harsh engagements, firm shift feel, abnormal shift schedule, torque converter clutch does not engage. Torque converter clutch cycling.	REFER to the Powertrain Control/Emissions Diagnosis (PC/ED) manual.
P0300- P0308, P0320, P0340, P1351- P1364	EI	EI concerns	EI system is inoperative which may cause a transmission concern.	Harsh engagements and shifts, late WOT shifts, no torque converter clutch engagement.	REFER to the Powertrain Control/Emissions Diagnosis (PC/ED) manual.
P0503, P0500,	ABS	Insufficient VSS input from ABS through SCP link.	PCM detected a loss of vehicle speed signal through SCP link from ABS.	No transmission symptom. I.P. speedometer may be affected.	REFER to the Powertrain Control/Emissions Diagnosis (PC/ED) manual.
P0705	Digital TR sensor	Digital TR circuit failure	Digital TR circuits, indicating an invalid pattern in TR_D. Condition caused by a short to ground or an open in TR4, TR3A, TR2, and or TR1 circuits. This DTC cannot be set by an incorrectly adjusted digital TR sensor.	Increase in control pressure (harsh shifts). Defaults to D5 or invalid position.	Go To Pinpoint Test C.
P0708	Digital TR sensor	Digital TR sensor circuit TR3A open	Digital TR sensor circuit TR3A reading 2.6v - 5.0v (open circuit). This DTC cannot be set by an incorrectly adjusted digital TR sensor.	Increase in PC pressure. Defaults to D5 for all gear positions.	Go To Pinpoint Test C.
P0712	TFT	157°C (315°F) indicated TFT sensor circuit grounded	Voltage drop across TFT sensor exceeds scale set for temperature of 157°C (315°F).	Firm shift feel.	Go To Pinpoint Test B.
P0713	TFT	-40°C (-40°F) indicated TFT sensor circuit open	Voltage drop across TFT sensor exceeds scale set for temperature -40°C (-40°F).	Firm shift feel.	Go To Pinpoint Test B.
P0715	TSS	Insufficient input from	PCM detected a loss of TSS	Harsh shifts, harsh torque converter	Go To Pinpoint Test E.

		turbine shaft speed sensor	signal during operation.	clutch activation, and harsh engagement.	
P0717	TSS	Turbine shaft speed sensor signal intermittent.	PCM has detected an intermittent TSS signal.	Harsh shifts, harsh torque converter clutch activation, and harsh engagement.	Go To Pinpoint Test E.
P0718	TSS	Turbine shaft speed sensor signal noisy.	PCM has detected a noisy TSS signal.	Harsh shifts, harsh torque converter clutch activation, and harsh engagement.	Go To Pinpoint Test E.
P0720	OSS	Insufficient input from OSS sensor	PCM detected a loss of OSS signal during operation.	Possible abnormal shift schedule.	Go To Pinpoint Test E.
P0721	OSS	Output shaft speed sensor signal noisy	PCM has detected an erratic OSS signal.	Abnormal shift schedule.	Go To Pinpoint Test E.
P0722	OSS	Output shaft speed sensor signal intermittent	PCM has detected an intermittent OSS signal.	Abnormal shift schedule.	Go To Pinpoint Test E.
P0731**	SSA, SSB, SSC or internal parts	1st gear error	No 1st gear.	Incorrect gear selection depending on failure or mode and manual lever position. Shift errors may also be due to other internal transmission concerns (stuck valves, damaged friction material). Engine rpm could be higher or lower than expected.	REFER to the Solenoid On/Off Charts. Go To Pinpoint Test A.
P0732**	SSA, SSB, SSC or internal parts	2nd gear error	No 2nd gear.	Incorrect gear selection depending on failure or mode and manual lever position. Shift errors may also be due to other internal transmission concerns (stuck valves, damaged friction material). Engine rpm could be higher or lower than expected.	REFER to the Solenoid On/Off Charts. Go To Pinpoint Test A.
P0733**	SSA, SSB, SSC or internal parts	3rd gear error	No 3rd gear.	Incorrect gear selection depending on failure or mode and manual lever position. Shift errors may also be due to	REFER to the Solenoid On/Off Charts. Go To Pinpoint Test A.

				other internal transmission concerns (stuck valves, damaged friction material). Engine rpm could be higher or lower than expected.	
P0734**	SSA, SSB, SSC or internal parts	4th gear error	No 4th gear.	Incorrect gear selection depending on failure or mode and manual lever position. Shift errors may also be due to other internal transmission concerns (stuck valves, damaged friction material). Engine rpm could be higher or lower than expected.	REFER to the Solenoid On/Off Charts. Go To Pinpoint Test A.
P0735	SSA, SSB, SSC, SSD or internal parts	5th gear error	No 5th gear.	Incorrect gear selection depending on failure or mode and manual lever position. Shift errors may also be due to other internal transmission concerns (stuck valves, damaged friction material etc.). Engine rpm could be higher or lower than expected.	REFER to the Solenoid On/Off Chart. Go To Pinpoint Test A.
P0741**	TCC	TCC slippage detected	The PCM picked up an excessive amount of TCC slippage during normal vehicle operation.	TCC slippage/erratic or no torque converter clutch operation.	REFER to the Diagnosis by Symptom Index in Diagnosis By Symptom.
P0743*	TCC	TCC solenoid circuit failure during on-board diagnostic	TCC solenoid circuit fails to provide voltage drop across solenoid. Circuit open or shorted or PCM driver failure during on-board diagnostics.	Short circuit — converter clutch always engage. Open circuit — torque converter clutch never engages.	Go To Pinpoint Test A.
P0745, P1747**	PCA	PCA solenoid circuit failure, shorted circuit	Voltage through PCA solenoid is checked. An error will be noted if tolerance is exceeded.	Short circuit — causes minimum PCA pressure (minimum capacity) and limits engine torque (alternate firm). Slips in gear	Go To Pinpoint Test D.

				and third gear incorrect.	
P0750*	SSA	SSA solenoid circuit failure	SSA circuit failed to provide voltage drop across solenoid. Circuit open or shorted or PCM driver failure during on-board diagnostic.	No fourth or fifth gear (short) or no first gear (open). Will flash MIL.	Go To Pinpoint Test A.
P0753*	SSA	SSA solenoid circuit failure	SSA circuit failed to provide voltage drop across solenoid. Circuit open or shorted or PCM driver failure during on-board diagnostic.	No fourth or fifth gear (short) or no first gear (open). Will flash TCIL.	Go To Pinpoint Test A.
P0755*	SSB	SSB solenoid circuit failure	SSB circuit fails to provide voltage drop across solenoid. Circuit open or shorted or PCM driver failure during on-board diagnostic.	No first gear (short) or no third gear (open). Will flash MIL.	Go To Pinpoint Test A.
P0758*	SSB	SSB solenoid circuit failure	SSB circuit fails to provide voltage drop across solenoid. Circuit open or shorted or PCM driver failure during on-board diagnostic.	No first gear (short) or no third gear (open). Will flash TCIL.	Go To Pinpoint Test A.
P0760*	SSC	SSC solenoid circuit failure	SSC circuit failed to provide voltage drop across solenoid. Circuit open or shorted or PCM driver failure during on-board diagnostic.	Incorrect gear selection depending on condition mode and manual lever position. See Solenoid On/Off chart. Will flash MIL.	Go To Pinpoint Test A.
P0763*	SSC	SSC solenoid circuit failure	SSC circuit failed to provide voltage drop across solenoid. Circuit open or shorted or PCM driver failure during on-board diagnostic.	Incorrect gear selection depending on condition mode and manual lever position. See Solenoid On/Off chart. Will flash TCIL.	Go To Pinpoint Test A.
P0765	SSD	SSD solenoid circuit failure	SSD circuit failed to provide voltage drop	No engine braking in manual gears. Will flash MIL.	Go To Pinpoint Test A.

			across solenoid. Circuit open, shorted or PCM driver circuit failure during on-board diagnostics.		
P0768	SSD	SSD solenoid circuit failure	SSD circuit failed to provide voltage drop across solenoid. Circuit open, shorted or PCM driver circuit failure during on-board diagnostics.	No engine braking in manual gears. Will flash TCIL.	Go To Pinpoint Test A.
P0775, P1789**	PCB	PCB solenoid circuit failure, shorted circuit	Voltage through PCB solenoid is checked. An error will be noted if tolerance is exceeded.	Short circuit — causes minimum PCB pressure (minimum capacity) and limits engine torque (alternate firm). Zero PCB — no second and fifth gear.	Go To Pinpoint Test D.
P0779	PCB	PCB solenoid Intermittent short to ground	Voltage through PCB solenoid is checked. An error will be noted if tolerance is exceeded.	Short circuit — causes minimum PCB pressure (minimum capacity) and limits engine torque (alternate firm). Zero PCB — no second and fifth gear.	Go To Pinpoint Test D.
P0791	ISS	Intermediate shaft speed sensor signal failure.	PCM has detected a loss of the ISS signal.	Harsh shifts (2-3).	Go To Pinpoint Test E.
P0794	ISS	Intermediate shaft speed sensor signal intermittent	PCM has detected an intermittent ISS signal.	Harsh shifts (2-3).	Go To Pinpoint Test E.
P0795, P0797**	PCC	PCC solenoid circuit failure, shorted circuit	Voltage through PCC solenoid is checked. An error will be noted if tolerance is exceeded.	Incorrect gear ratio in fourth and fifth gear.	Go To Pinpoint Test D.
P0796**	PCC	PCC solenoid circuit open	Voltage through PCC solenoid is checked. Error is noted if tolerance is exceeded.	Open circuit — causes maximum PCC pressure, harsh engagements and shifts.	Go To Pinpoint Test D.
P0799	PCC	PCC solenoid intermittent short to ground	Voltage through PCC solenoid is checked. An error will be noted if tolerance	Short circuit — causes minimum PCC pressure (minimum capacity) and limits engine	Go To Pinpoint Test D.

			is exceeded.	torque (alternate firm). Incorrect gear ratio in fourth and fifth gear.	
P0814	J-GATE	J-GATE circuit input signal failed.	PCM has detected incorrect J gate voltage.	No or improper illumination of the J-gate position.	REFER to Section 307-05 .
P0815	SST +/-	SST +/- circuit input signal failed.	PCM has detected an incorrect voltage SST input.	May not be able to shift in manual mode.	REFER to Section 307-05 .
P0840	REV	Reverse pressure switch circuit input signal failed.	PCM has detected incorrect voltage at the reverse pressure switch input.	No engine braking in manual third or fourth gear.	Go To Pinpoint Test G .
P1124	TP	TP voltage high/low for on-board diagnostic.	TP was not in the correct position for on-board diagnostic.	Rerun at appropriate throttle position per application.	REFER to the Powertrain Control/Emissions Diagnosis (PC/ED) manual.
P1460	A/C	A/C clutch cycling pressure switch error	A/C or defrost ON condition may result from A/C clutch being ON during on-board diagnostic.	DTC set during on-board diagnostic — rerun with A/C OFF. Failed ON — EPC pressure slightly low with A/C OFF.	REFER to the Powertrain Control/Emissions Diagnosis (PC/ED) manual.
P1636	SSx	SSx ISIG communication error	PCM has detected an error with the ISIG chip.	—	INSTALL a new PCM.
P1700	TRANS	Transmission indeterminate failure	Internal component failure. Direct one-way clutch failure.	Failed a neutral condition. FMEM becomes active — engine rpm limited to 4000 rpms. No 1st, 3rd, or 4th gear in automatic mode. Other DTCs that may set P1700: P0745, P1747, P1760, P1714, P1715, P0750, P0755.	If other solenoid DTCs are present, diagnose and repair them first. CLEAR DTCs and drive vehicle. If P1700 returns, disassemble transmission and inspect the direct one-way clutch. Repair as required. CLEAR DTC. Drive vehicle and verify repair.
P1702	Digital TR	Digital TR signal intermittent, code P0705, P0708 are set.	See P0705, P0708 conditions.	See P0705, P0708 symptoms.	Go To Pinpoint Test C .
P1703	BPP	Brake not actuated during on-board diagnostic KOER	Brake not cycled during KOER.	Failed ON or not connected — torque converter clutch will not engage at less than 1/3 throttle. Failed OFF or not	REFER to the Powertrain Control/Emissions Diagnosis (PC/ED) manual.

				connected — torque converter clutch will not disengage when brake is applied.	
P1703	BPP	BPP switch circuit failed	Brake ON circuit failure during KOEO.	Failed ON or not connected — torque converter clutch will not engage at less than 1/3 throttle. Failed OFF or not connected — torque converter clutch will not disengage when brake is applied.	REFER to the Powertrain Control/Emissions Diagnosis (PC/ED) manual.
P1704	Digital TR	Digital TR not in P or N positions during KOEO/KOER.	Digital TR sensor or shift cable incorrectly adjusted or digital TR circuit failure.	Wrong commanded PC pressure. Digital TR reading the wrong gear position. (i.e., in overdrive position, transmission stuck in manual three for base shifter and four for SST shifter).	Go To Pinpoint Test C.
P1705	Digital TR	Digital TR not in PARK or NEUTRAL during KOEO/KOER.	KOEO/KOER not run in PARK or NEUTRAL, or digital TR circuit failure.	DTC is set.	RERUN KOEO/KOER in PARK or NEUTRAL or Go To Pinpoint Test C.
P1711	TFT	TFT out of on-board diagnostic range	Transmission not at operating temperature during on-board diagnostic.	DTC set — vehicle cold or overheated.	Warm or cool vehicle to normal operating temperature. Go To Pinpoint Test B.
P1713	TFT	No change in TFT - low range	PCM has detected no TFT change at low range during operation.	Increase EPC, incorrect TCC engagement schedule, harsh engagement, harsh shifts.	Go To Pinpoint Test B.
P1714	SSA	SSA inoperative	Mechanical failure of the solenoid detected.	No fourth or fifth gear (short) or no first gear (open).	Go To Pinpoint Test F.
P1715	SSB	SSB inoperative	Mechanical failure of the solenoid detected.	No first gear (short) or no third gear (open)	Go To Pinpoint Test F.
P1716	SSC	SSC inoperative	Mechanical failure of the solenoid detected.	Incorrect gear selection depending on condition mode and manual lever position. See Solenoid On/Off Chart.	Go To Pinpoint Test F.

P1717	SSD	SSD inoperative	Mechanical failure of the solenoid detected.	Incorrect gear selection depending on condition, mode and manual lever position. See the Solenoid On/Off Chart.	Go To Pinpoint Test F.
P1718	TFT	No change in TFT - high range	PCM has detected no TFT change at high range during operation.	Increase EPC, incorrect TCC engagement schedule, harsh engagement, harsh shifts.	Go To Pinpoint Test B.
P1740	TCC	TCC inoperative	Mechanical failure of the solenoid detected.	Failed ON — Converter clutch always on. Failed OFF — torque converter never applies.	Go To Pinpoint Test F.
P1746**	PCA	PCA solenoid circuit open	Voltage through PCA solenoid is checked. Error is noted if tolerance is exceeded.	Open circuit — causes maximum PCA pressure, harsh engagements and shifts.	Go To Pinpoint Test D.
P1760	PCA	PCA solenoid Intermittent short to ground	Voltage through PCA solenoid is checked. An error will be noted if tolerance is exceeded.	Short circuit — causes minimum PCA pressure (minimum capacity) and limits engine torque (alternate firm). Slips in gear, third incorrect.	Go To Pinpoint Test D.
P1780	TCS	TCS input incorrect per selected position	TCS voltage incorrect.	No overdrive cancel when range selector is moved	RERUN on-board diagnostic and cycle switch. REFER to Section 307-05.
P1783	TFT	Transmission overtemp condition indicated	Transmission fluid temperature exceeded 127°C (270°F).	Increase in control pressure.	Go To Pinpoint Test B.
P1788**	PCB	PCB solenoid circuit open	Voltage through PCB solenoid is checked. Error is noted if tolerance is exceeded.	Open circuit — causes maximum PCB pressure, harsh engagements and shifts.	Go To Pinpoint Test D.

Rotunda Transmission Tester

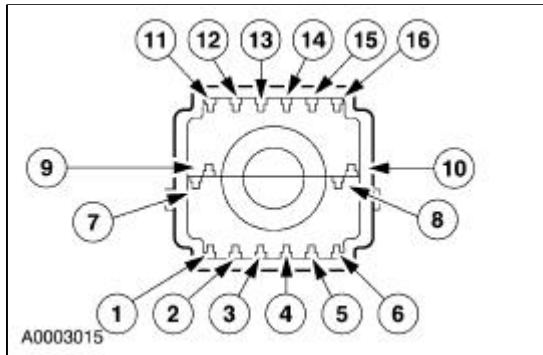
The Rotunda Transmission Tester is used to diagnose electronically controlled transmissions and is used in conjunction with the pinpoint tests. The tests should be carried out in order. Installing the Rotunda Transmission Tester allows separation of the vehicle electronics from transmission electronics. Refer to the Rotunda Transmission Tester manual for these tests.

- Digital Transmission Range (TR) Sensor Testing
- Resistance/Continuity Test

- Switch Test - Park/Neutral, Backup Lamp, and Optional Circuits
-

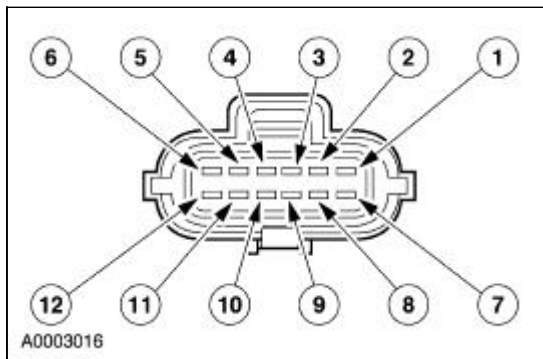
Transmission Connector Layouts

Transmission Vehicle Harness Connector



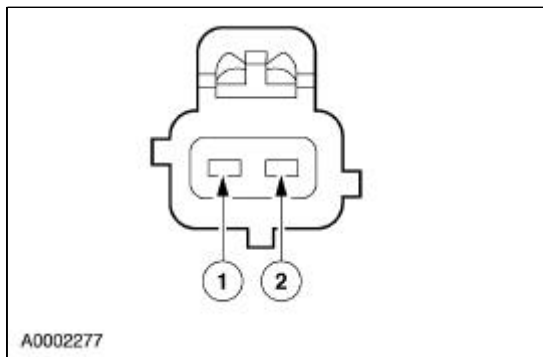
Pin Number	PTEC-B Pin number	Circuit Function
1	B7	PCA
2	B23	Transmission fluid temperature (TFT) sensor
3	—	Shift solenoid power
4	B13	PCB
5	B4	SSD
6	B3	SSC
7	—	NOT USED
8	—	NOT USED
9	—	NOT USED
10	—	NOT USED
11	B12	PCC
12	B17	Signal return
13	B30	Reverse pressure switch
14	B5	Torque converter clutch (TCC) solenoid
15	B2	SSB
16	B1	SSA

Digital Transmission Range (TR) Sensor Vehicle Harness Connector



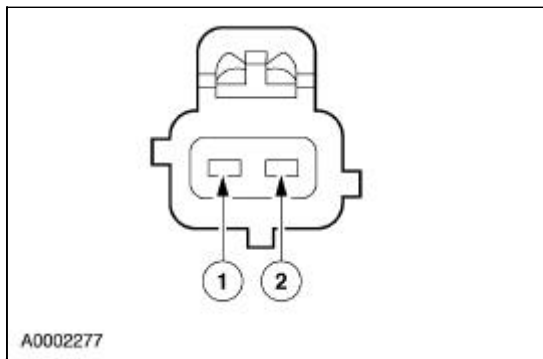
Pin Number	PTEC-B Pin Number	Circuit Function
1	—	NOT USED
2	B17	Signal return
3	B9	TR3A
4	B22	TR1
5	B18	TR2
6	B10	TR4
7	—	Ground
8	—	Neutral sense
9	—	Fused power feed
10	—	Starter control
11	—	Back up
12	—	Starter to starter interrupt relay

Turbine Shaft Speed (TSS) Sensor Harness Connector



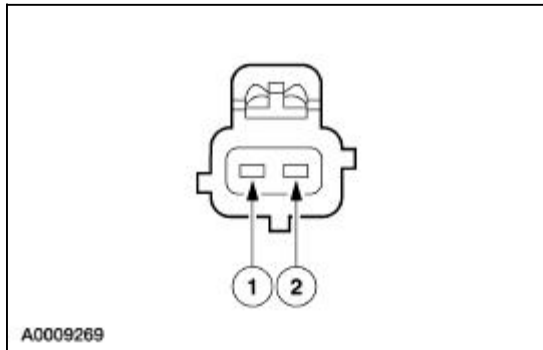
Pin Number	PTEC-B Pin Number	Circuit Function
1	B27	Turbine Shaft Speed Sensor (TSS)
2	B17	Signal Return

Output Shaft Speed (OSS) Sensor Harness Connector



Pin Number	PTEC-B Pin Number	Circuit Function
1	B26	Output shaft speed sensor (OSS)
2	B17	Signal return

Intermediate Shaft Speed (ISS) Sensor Harness Connector



Pin Number	PTEC-B Pin Number	Circuit Function
1	B21	Intermediate shaft speed sensor (ISS)
2	B17	Signal return

Digital Transmission Range (TR) Sensor Diagnosis Chart

Selector Position	Base Shift Lever Indicator	Select Shift Lever Indicator	PID: TR_D				PID: TR_V (volts)
			TR4	TR3A	TR2	TR1	TR3A (PCM pin 64 to sigtrn)
PARK	P	P	0	0	0	0	0.0 Volts
In Between	R	R	0	1	0	0	1.3 - 1.8 Volts
REVERSE	R	R	1	1	0	0	1.3 - 1.8 Volts
In Between	R	R	0	1	0	0	1.3 - 1.8 Volts
NEUTRAL	N	N	0	1	1	0	1.3 - 1.8 Volts
In Between	D5/D4	D5	1	1	1	0	1.3 - 1.8 Volts
OVERDRIVE	D5/D4	D5	1	1	1	1	1.3 - 1.8 Volts
In Between	D5/D4	D5	1	1	1	0	1.3 - 1.8 Volts

Manual 3	3	D4	1	0	1	0	0.0 Volts
In-Between	2	—	1	0	1	1	0.0 Volts
Manual 2	2	—	1	0	0	1	0.0 Volts
In Between	2	—	1	0	1	1	0.0 Volts
Manual 1	Man 1	—	0	0	1	1	0.0 Volts

- A. TR_V is the voltage at the PCM pin 64 (TR3A Circuit) to signal return.
- B. "In Between" reading could be caused by a shift cable or digital TR sensor misaligned or a digital TR sensor circuit failure of TR1, TR2, TR3A, or TR4.
- C. TR_D: 1= Open digital TR switch, 0= Closed digital TR switch.
- D. EEC-V Control System Breakout Box Readings: Taken from PCM signal pins for TR1, TR2, TR3A, TR4 to signal return.

- **Voltages for TR1, TR2, TR4:**

- 0 = 0.0 volts.
- 1 = 9.0 - 14.0 volts.

- **Voltage for TR3A:**

- 0 = 0.0 volts.
- 1 = 1.3 - 1.8 volts.

Wiggle Test Information for Open/Shorts

- A. TR4, TR3A, TR2, and TR1 are all closed in PARK, PARK is a good position to check for intermittent open circuits (with scan tool monitoring TR_D).
- B. TR4, TR3A, TR2, and TR1 are all open in D5, so D5 is a good position to check for shorts to ground. To determine the shorted components while observing TR_D, unplug the TR and see if the short goes away. If the short is still present unplug the transmission harness and see if the short goes away. If the short is still present, then the short is in the PCM or vehicle harness. Remove the suspect circuit(s) wire terminal from the PCM connector. If the short is still present, then the PCM has an internal failure, otherwise the failure is in the vehicle harness.

Reverse Pressure (RP) Switch Diagnosis Chart

Selector Lever Position	Actual Gear	PID RPS
P,R,N	—	1
D5	1	0/1 ^a
	2	0/1 ^a
	3	1
	4	1
	5	1
D4	1	0/1 ^a
	2	0/1 ^a
	3	1
	4	1
3	3	1
2	2	0/1 ^a

1	1	0/1 ^a
---	---	------------------







^a RPS will read "0" when pressure is above 23 psi and "1" when PC A pressure is below 8 psi. This reading should show "0" for a calibrated time then go to "1".

RP Switch Symptoms

Conditions	Actions	Results
FFG_RPS = 1 FFG = Failure Flag	RPS does not match RPS diagnosis chart	No manual third gear and fourth gear
P0840 set	RPS reads zero (0) in first, third, fourth, and fifth or one (1) in first, third, fourth, and fifth (PCM sees this condition three times in first)	"E" symbol will appear on the instrument panel. If equipped with the message center, a message to "Check Transmission" will be transmitted. No manual third and fourth gears.

Pinpoint Tests — OSC Equipped Vehicles

Special Tool(s)

 <p>ST1565-A</p>	<p>Transmission Fluid Pressure Gauge 307-004 (T57L-77820-A)</p>
 <p>ST1137-A</p>	<p>73III Automotive Meter 105-R0057 or equivalent</p>
	<p>Trans Tester TR/MLP Overlay and Manual 007-00131 or equivalent</p>
 <p>ST2332-A</p>	<p>Worldwide Diagnostic System (WDS) 418-F224 New Generation Star (NGS) Tester 418-F205 or equivalent</p>
 <p>ST1632-A</p>	<p>MLP-TR Cable 418-F107 (007-00111) or equivalent</p>
 <p>ST1389-A</p>	<p>Transmission Tester 307-F016 (007-00130) or equivalent</p>

Shift Solenoid Pre-Diagnosis

Any time an electrical connector or solenoid body is disconnected, inspect the connector for terminal condition, corrosion and contamination. Also inspect the connector seal for damage. Clean, repair or install new as necessary.

Use the following shift solenoid operation information when carrying out Pinpoint Test A.

Solenoid Operation Chart

Base Gearshift Selector Position	Powertrain Control Module (PCM) Commanded Gear	5R55N Solenoid States						
		SSA	SSB	SSC	SSD	PCA	PCB	PCC
P/N	P	On	Off	Off	On	L ¹	C ²	L
R	R	On	Off	Off	On	L	H ³	H
D5	1	On	Off	Off	On	C	L	L
	2	On	Off	On	On	L	C	L
	3	On	On	Off	On	C	L	L
	4	Off	Off	Off	On	C	L	H
	5	Off	Off	On	On	C	C	H
D4	1	On	Off	Off	On	C	L	L
	2	On	Off	On	On	L	C	L
	3	On	On	Off	On	C	L	L
	4	Off	Off	Off	Off	C	C	H
3	3	On	On	Off	Off	C	C	L
2	2	On	Off	On	Off	C	C	L
1	1	On	Off	Off	Off	C	C	L

¹ Low line pressure

² Control line pressure

³ High line pressure

Solenoid Operation Chart

Select Shift (optional) Gearshift Selector Position	Powertrain Control Module (PCM) Commanded Gear	5R55N Solenoid States						
		SSA	SSB	SSC	SSD	PCA	PCB	PCC
P/N	P	On	Off	Off	On	L ¹	C ²	L
R	R	On	Off	Off	On	L	H ³	H
D5	1	On	Off	Off	On	C	L	L
	2	On	Off	On	On	L	C	L
	3	On	On	Off	On	C	L	L
	4	Off	Off	Off	On	C	L	H
	5	Off	Off	On	On	C	C	H
D4	1	On	Off	Off	On	C	L	L
	2	On	Off	On	On	L	C	L
	3	On	On	Off	On	C	L	L
	4	Off	Off	Off	Off	C	C	H
+/-	1	On	Off	Off	Off	H	H	L
	2	On	Off	On	Off	H	H	L
	3	On	On	Off	Off	H	H	L
	4	Off	Off	Off	Off	H	H	H
	5	Off	Off	On	On	H	H	H

¹ Low line pressure

² Control line pressure

³ High line pressure

Shift Solenoid Failure Mode Chart "Always Off"

Failed OFF due to powertrain control module and/or vehicle wiring concerns, solenoid electrically, mechanically or hydraulically stuck OFF.

SSA Always "OFF":	Transmission Range Selector Lever Position	
	D5	D4
PCM Gear Commanded	Actual Gear	
1	3	3
2	2	2
3	3	3
4	4	4M ^a
5	5	

^a Manual

SSB Always "OFF":	Transmission Range Selector Lever Position	
	D5	D4
PCM Gear Commanded	Actual Gear Obtained	
1	1	1
2	2	2
3	1	1
4	4	4M ¹
5	5	

¹ Manual

SSC Always "OFF":	Transmission Range Selector Lever Position	
	D5	D4
PCM Gear Commanded	Actual Gear Obtained	
1	1	1
2	1	1
3	3	3
4	4	4M ¹
5	4	

¹ Manual

SSD Always "OFF":	Transmission Range Selector Lever Position	
	D5	D4
PCM Gear Commanded	Actual Gear Obtained	
1	1/1M ¹	1/1M ¹

2	2M ¹	2M ¹
3	3/3M ¹	3M ¹
4	4/4M ¹	4M ¹
5	5	

¹ Manual

Shift Solenoid Failure Mode Chart "Always On"

Failed OFF due to powertrain control module and/or vehicle wiring concerns, solenoid electrically, mechanically or hydraulically stuck ON.

SSA Always "ON":	Transmission Range Selector Lever Position	
	D5	D4
PCM Gear Commanded	Actual Gear Obtained	
1	1	1
2	2	2
3	3	3
4	1	1M ¹
5	2	

¹ Manual

SSB Always "ON":	Transmission Range Selector Lever Position	
	D5	D4
PCM Gear Commanded	Actual Gear Obtained	
1	3	3
2	2	2
3	3	3
4	4	4M ¹
5	5	

¹ Manual

SSC Always "ON":	Transmission Range Selector Lever Position	
	D5	D4
PCM Gear Commanded	Actual Gear Obtained	
1	1/2	1/2
2	2	2
3	3/Ratio 1.16	3/Ratio 1.16
4	4/5	4/5
5	5	

	Transmission Range Selector Lever Position

SSD Always "ON":	D5	D4
PCM Gear Commanded	Actual Gear Obtained	
1	1	1
2	2	2
3	3	3
4	4	4
5	5	

Pressure Control Solenoid Failure Mode Chart "Always Low"

PC A "Low":	Transmission Range Selector Lever Position	
	D5	D4
PCM Gear Commanded	Actual Gear Obtained	
1	S ² /1	1
2	2	2
3	S ² /1	1
4	S ² /4	4M
5	5	

²Slips

PC B "Low":	Transmission Range Selector Lever Position	
	D5	D4
PCM Gear Commanded	Actual Gear Obtained	
1	1	1
2	1	1
3	3	3
4	4	4
5	4	

PC C "Low":	Transmission Range Selector Lever Position	
	D5	D4
PCM Gear Commanded	Actual Gear Obtained	
1	1	1
2	2	2
3	3	3
4	3	3
5	1.1	

Pressure Control Solenoid Failure Mode Chart "Always High"

PC A "High":	Transmission Range Selector Lever Position	
	D5	D4

PCM Gear Commanded	Actual Gear Obtained	
1	1	1
2	2	2
3	3	3
4	4	4M ¹
5	5	

¹ Manual

PC B "High":	Transmission Range Selector Lever Position	
	D5	D4
PCM Gear Commanded	Actual Gear Obtained	
1	1	1
2	2	2
3	3	3
4	4	4M ¹
5	5	

¹ Manual

PC C "High":	Transmission Range Selector Lever Position	
	D5	D4
PCM Gear Commanded	Actual Gear Obtained	
1	1	1
2	2	2
3	3	3
4	4	4M ¹
5	5	

¹ Manual

Pinpoint Tests

PINPOINT TEST A: SHIFT AND TORQUE CONVERTER CLUTCH SOLENOIDS

CONDITIONS	DETAILS/RESULTS/ACTIONS
<p>NOTE: Refer to the Transmission Vehicle Harness Connector illustration preceding these pinpoint tests.</p> <p>NOTE: Refer to the Internal Harness Diagram illustration preceding these pinpoint tests.</p> <p>NOTE: Read and record all DTCs. All Digital TR Sensor and VSS DTCs must be repaired before entering Output State Control (OSC).</p>	
<p>A1 ELECTRONIC DIAGNOSTICS</p>	
<p>1</p>	



2



4



NGS Tester

5



6



Diagnostic Data Link

7



PCM

8



Active Command Modes

9



Output State Control (OSC)

10



Trans-Bench Mode

3 Check to make sure the transmission harness connector is fully seated, terminals are fully engaged in connector and in good condition before proceeding.

● Does vehicle enter Trans-Bench Mode?

- **Yes**
REMAIN in Trans-Bench Mode. GO to [A2](#).
- **No**
REPEAT procedure to enter Trans-Bench Mode. If vehicle did not enter Trans-Bench Mode, REFER to the Powertrain Control/Emissions Diagnosis (PC/ED) manual for diagnosis of PCM or NGS.

A2 WIGGLE TEST

- 1 Remain in Trans-Bench Mode.
 - 2 Select PIDs to be monitored.
- | PID Command | PID Actual |
|-------------|------------|
| SSA | SSA |
| SSB | SSB |
| SSC | SSC |
| SSD | SSD |
| TCC | TCC |
- 3 Select "ON" to turn suspect solenoid on.
 - 4 Press "SEND".
 - 5 Wiggle all wiring and connectors to the transmission. Monitor the solenoid state for changes.
 - 6 Select "OFF" to turn solenoid off.
 - 7 Press "SEND".
- **Does the suspect solenoid(s) fault state change?**
- **Yes**
REPAIR the circuit. TEST the system for normal operation.
 - **No**
GO to [A3](#).

A3 SOLENOID FUNCTIONAL CHECK

- 1 Monitor each solenoid state.
 - 2 Turn each solenoid ON and OFF.
- **Does the solenoid turn ON and OFF when commanded and can solenoid activation be heard?**
- **Yes**
GO to [A4](#).

→ **No**
GO to [A5](#).

A4 OSC TRANS-DRIVE MODE (GEAR OR TCC)

- 1 Carry out OSC Trans-Drive Mode.
- 2 Select GEAR for shift solenoids or follow procedures for GEAR as listed in this section.
- 3 Select TCC for Torque Converter Clutch Solenoid. Follow procedures of TCC in Drive Mode as listed in this section.

- **Does the transmission upshift and downshift or torque converter engage/disengage when commanded?**

→ **Yes**
CLEAR all DTCs. ROAD TEST to verify if concern is still present. If concern is still present, REFER to [Diagnosis By Symptom](#) to diagnose shift or torque converter concern.

→ **No**
GO to [A5](#).

A5 CHECK FOR BATTERY VOLTAGE

1

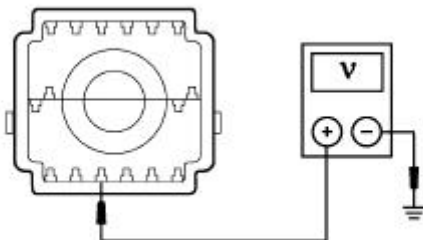


Transmission Vehicle Harness Connector

3



4



A0005135

- 2 Visually inspect all wires and connectors for damage.

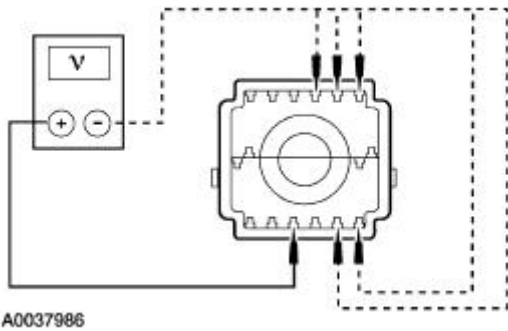
- 4 Measure the voltage on pin 3 harness side and ground.

- **Is the voltage greater than 10 volts?**

- **Yes**
GO to [A6](#).
- **No**
REPAIR the circuit. TEST for normal operation.

A6 ELECTRICAL SIGNAL CHECK

1



2



Trans-Bench Mode

1 Leave positive lead connected to pin 3 and connect negative lead to pin 5, 6, 14, 15 and 16.

- 3 Select Parameter SSA, SSB, SSC, SSD or TCC.
- 4 Select "ON".
- 5 Press "SEND".
- 6 Measure the voltage while cycling the solenoids ON and OFF.
- 7 Select "OFF", press "SEND".

● **Does the voltage change?**

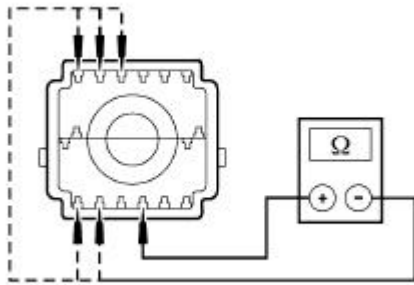
- **Yes**
GO to [A7](#).
- **No**
REPAIR the circuit. TEST the system for normal operation.

A7 CHECK SOLENOID RESISTANCE AT SOLENOID

1

1 Measure the resistance between pin 3 and pin 5, 6, 14, 15, and 16 solenoid side.

Solenoid	Resistance (ohms)
SSA	16-45
SSB	16-45
SSC	16-45
SSD	16-45



A0039133

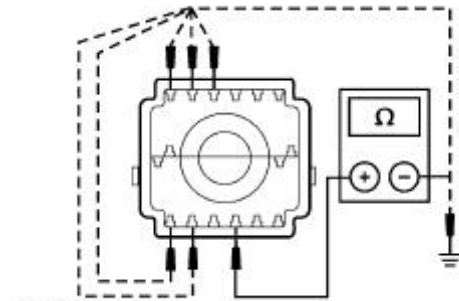
● Is the resistance within specification?

→ **Yes**
GO to [A8](#).

→ **No**
INSTALL a new solenoid body assembly.
TEST the system for normal operation.

A8 CHECK SOLENOID FOR SHORT TO GROUND

1



A0005137

1

Measure the resistance between pin 3 and pin 5, 6, 14, 15, and 16 solenoid side and ground.

● Is the resistance less than 5 ohms?

→ **Yes**
INSTALL a new solenoid body assembly.

→ **No**
REFER to [Diagnosis By Symptom](#) in this section for diagnosis of shift or torque converter concerns.

PINPOINT TEST B: TRANSMISSION FLUID TEMPERATURE (TFT) SENSOR

CONDITIONS	DETAILS/RESULTS/ACTIONS
NOTE: Refer to the Transmission Vehicle Harness Connector illustration preceding these pinpoint tests.	
B1 ELECTRONIC DIAGNOSTICS	
1	



2



4



NGS Tester

5



9



PIDs; TFT, TFTV

3 Check to make sure the transmission harness connector is fully seated, terminals are fully engaged in connector and in good condition before proceeding.

6 Select Diagnostic Data Link.

7 Select PCM.

8 Select PID/Data Monitor and Record.

• Does the vehicle enter PID/Data Monitor and Record?

→ Yes
REMAIN in PID/Data Control.GO to [B2](#).

→ No
REPEAT procedure to enter PID. If vehicle did not enter PID, REFER to the Powertrain Control/Emissions Diagnosis (PC/ED) manual for diagnosis of PCM and NGS.

B2 WARM-UP/COOL-DOWN CYCLE

1 While monitoring the TFT PIDs, carry out the following test: If transmission is cold, run transmission to warm it up. If transmission is warm, allow transmission to cool down.

• Do the TFT PIDs increase as the transmission is warmed up or

decrease as the transmission is cooled or does the TFT or TFTV drop in and out of range?

→ **Yes**

If the TFT PIDs increase as the transmission is warmed or decrease as the transmission is cooled, CLEAR all DTCs. ROAD TEST to verify if concern is still present. If concern is still present, REFER to [Diagnosis By Symptom](#) in this section to diagnose transmission overheating.

If the TFT or TFTV drop in and out of range, INSPECT for intermittent concern in the internal/external harness, sensor or connector.

→ **No**

GO to [B3](#).

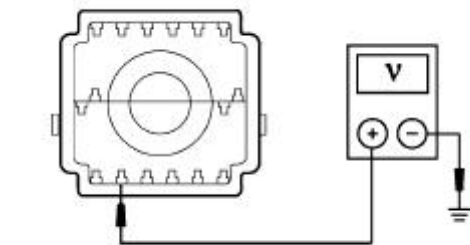
B3 ELECTRICAL SIGNAL CHECK

1



Transmission Harness Connector

3



A0005138

2

Visually inspect all wires and connectors for damage.

3

Measure the voltage between pin 2 harness side and ground.

● Is the voltage between 4.5 and 5.0 volts?

→ **Yes**

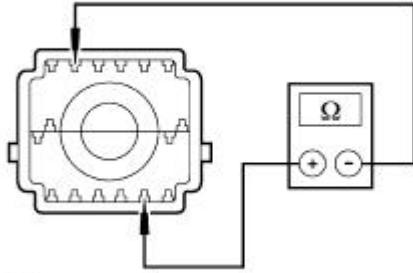
GO to [B4](#).

→ **No**

REPAIR the circuit. TEST the system for normal operation.

B4 CHECK RESISTANCE OF TFT SENSOR

1



A0038288

- 2 Measure the resistance between pin 2 and 12 at the solenoid body connector.
- 3 Record the resistance.
- 4 Resistance should be approximately in the following ranges:

Transmission Fluid Temperature






°C	°F	Resistance (Ohms)
-40 to -20	-40 to 4	967K - 284K
-19 to -1	-3 - 31	284K - 100K
0 - 20	32 - 68	100K - 37K
21 - 40	69 - 104	37K - 16K
41 - 70	105 - 158	16K - 5K
71 - 90	159 - 194	5K - 2.7K
91 - 110	195 - 230	2.7K - 1.5K
111 - 130	231 - 266	1.5K - 0.8K
131 - 150	267 - 302	0.8K - 0.54K

● **Is the resistance in the range?**

→ **Yes**
REFER to [Diagnosis By Symptom](#) in this section to diagnose an overheating concern.

→ **No**
INSTALL a new solenoid body assembly.

PINPOINT TEST C: DIGITAL TRANSMISSION RANGE (TR) SENSOR

CONDITIONS	DETAILS/RESULTS/ACTIONS
<p>NOTE: Refer to the Digital Transmission Range (TR) Sensor Connector illustration and Digital Transmission Range (TR) Sensor Diagnosis Chart preceding these pinpoint tests.</p>	
<p>C1 VERIFY DIAGNOSTIC TROUBLE CODES</p>	
<p>1 </p> <p>2 </p>	<p>3 Carry out on-board diagnostic test.</p> <ul style="list-style-type: none"> ● Are only DTC codes P0705, P0708 present? <p>→ Yes GO to C4.</p> <p>→ No GO to C2.</p>
<p>C2 VERIFY DIGITAL TRANSMISSION RANGE SENSOR ALIGNMENT</p>	
<p>1 </p> <p>2 </p> <p>5 </p>	<p>3 Check to make sure the digital TR sensor harness connector is fully seated, terminals are fully engaged in connector and in good condition before proceeding.</p> <p>4 Apply the parking brake.</p> <p>6 Disconnect the shift cable/linkage from the manual lever.</p> <p>7 Verify that the TR Sensor Alignment Gauge fits in the appropriate slots.</p> <ul style="list-style-type: none"> ● Is the digital TR sensor correctly adjusted?

- **Yes**
GO to [C3](#).
- **No**
ADJUST the digital TR sensor; REFER to [Digital Transmission Range \(TR\) Sensor](#) in this section. PLACE transmission range selector lever into PARK and CLEAR DTCs. RERUN OBD Tests.GO to [C3](#).

C3 VERIFY SHIFT CABLE/LINKAGE ADJUSTMENT

1



D5

- 2 Connect the shift cable/linkage.
- 3 Verify that the shift cable/linkage is correctly adjusted. Refer to [Section 307-05](#).

- **Is the shift cable/linkage is correctly adjusted?**

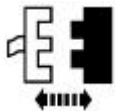
- **Yes**
GO to [C4](#).
- **No**
ADJUST the shift cable/linkage. REFER to [Section 307-05](#).GO to [C4](#).

C4 CHECK ELECTRICAL SIGNAL OPERATION


1



2



Digital TR Sensor

- 2  **CAUTION: Do not pry on connector. This will damage the connector and result in a transmission concern.**

Press button and pull out on the digital TR harness connector.

- 3 Inspect both ends of the connector for damage or pushed out pins, corrosion, loose wires and missing or damaged seals.

- **Is there damage to the connector, pins or harness?**

- **Yes**
REPAIR as necessary. CLEAR DTCs and RERUN OBD Tests.

→ **No**
If diagnosing a DTC, GO to [C5](#).

If diagnosing a starting concern or a backup lamp concern, GO to [C10](#).

C5 CHECK ELECTRICAL SYSTEM OPERATION (DTR AND PCM)

1



2



NGS Tester

3



Digital TR Sensor

4



5



TR PIDS TR_D, TR_V

6 Move transmission range selector lever into each gear and stop.

7 Observe the PIDs, TR_D, and TR_V (vehicle-dependent) while wiggling harness, tapping on sensor, or driving the vehicle. Use PIDs TR_D for DTCs P0705, P1704, and P1705. Use PIDs TR_V for DTC P0708.

8 Compare the PIDs to the Digital Transmission Range (TR) Sensor Diagnosis Chart.

- **Do the PIDs TR_D and TR_V match the Digital Transmission Range (TR) Sensor Diagnosis chart, and does the TR_D PID remain steady when the harness is wiggled, the sensor is tapped on, or the vehicle driven?**

→ **Yes**
The problem is not in the digital TR

sensor system. REFER to [Diagnosis By Symptom](#) in this section for further diagnosis.

→ **No**
If TR_D changes when wiggling harness, tapping on the sensor or driving the vehicle, the problem may be intermittent.

GO to [C6](#).

C6 CHECK DIGITAL TRANSMISSION RANGE SENSOR OPERATION

1



Digital TR Sensor

2



TR-E Cable to Transmission Tester

3



TR-E Cable to Digital TR Sensor

4 Place the DIGITAL TR Overlay onto Transmission Tester.

5 Carry out SENSOR Test as instructed on the digital TR Overlay.

- Does the status lamp on the tester TRS-E cable match the selected gear positions?

→ **Yes**
Concern is not in the digital TR sensor. GO to [C7](#).

→ **No**
INSTALL a new digital TR sensor and ADJUST. REFER to [Digital Transmission Range \(TR\) Sensor](#) in this section. CLEAR DTCs and RERUN OBD Tests.

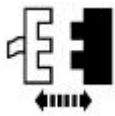
C7 CHECK PCM HARNESS CIRCUITS FOR OPENS

1



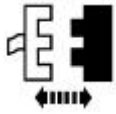
2

2 Inspect for damaged or pushed out pins, corrosion or loose wires.



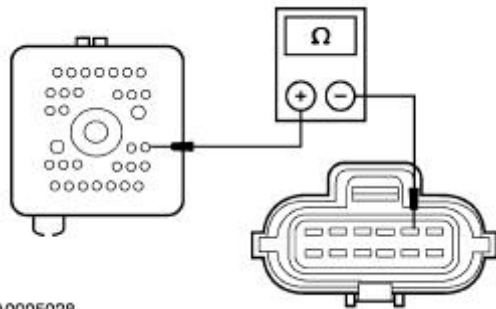
150 Pin PTEC Module Connector "B"

3



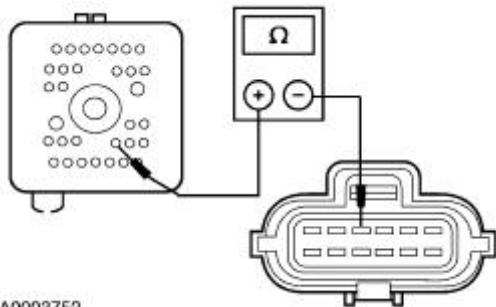
Digital TR Sensor

4



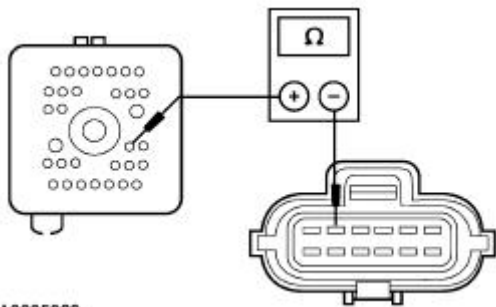
A0005028

5



A0003752

6



A0005029

7

3



CAUTION: Do not pry the connector. This will damage the connector and result in a transmission concern.

Disconnect the digital TR sensor connector.

4

Measure the resistance between pin 2 harness side and signal return pin 17 harness side.

5

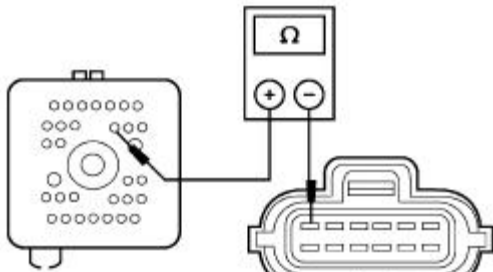
Measure the resistance between pin 22 and pin 4 harness side.

6

Measure the resistance between pin 18 and pin 5 harness side.

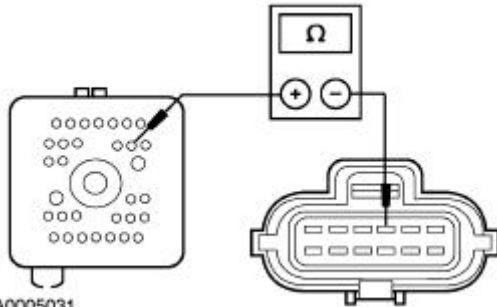
7

Measure the resistance between pin 10 and pin 6 harness side.



A0005030

8



A0005031

8 Measure the resistance between pin 9 and pin 3 harness side.

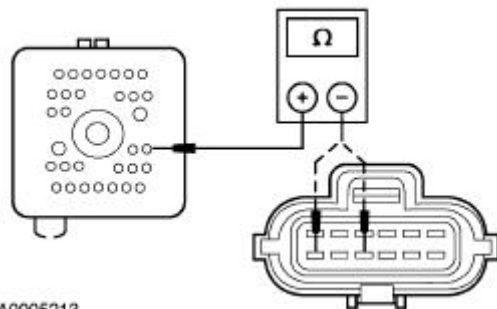
• Are the resistances less than 5 ohms?

→ **Yes**
GO to [C8](#).

→ **No**
REPAIR the circuits. TEST the system for normal operation.

C8 CHECK PCM HARNESS CIRCUITS FOR SHORT TO GROUND OR POWER

1

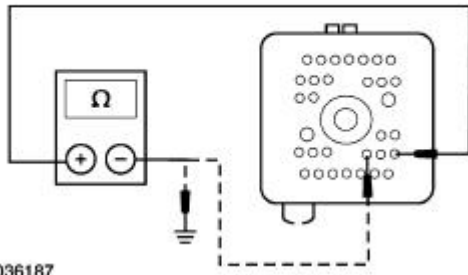


A0005213

2

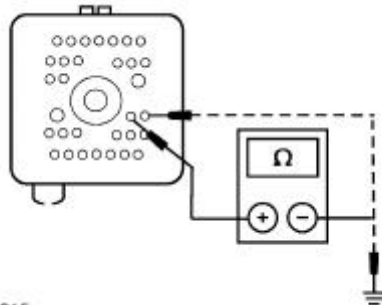
1 Measure the resistance between pin 17 and pin 10 harness side and ground; and pin 12 harness side.

2 Measure the resistance between pin 22 harness side and ground; and pin 17 harness side and ground.



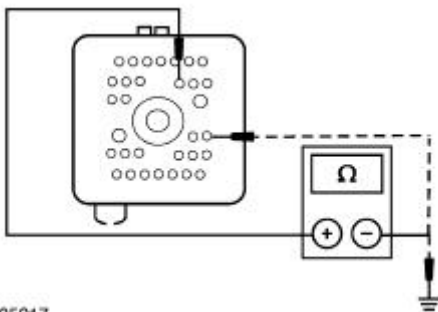
A0036187

3



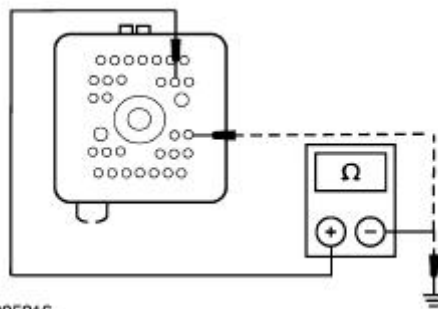
A0005215

4



A0005217

5



A0005216

3 Measure the resistance between pin 18 harness side and ground; and pin 17 harness side and ground.

4 Measure the resistance between pin 10 harness side and ground; and pin 17 harness side and ground.

5 Measure the resistance between pin 9 harness side and ground; and pin 17 harness side and ground.

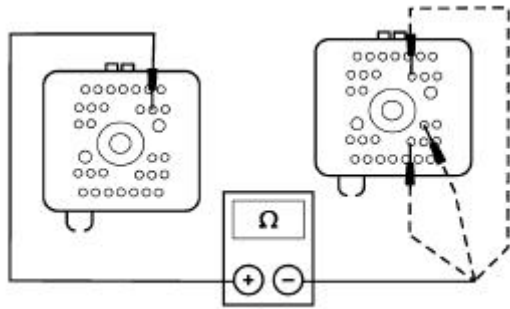
• Are the resistances greater than 10,000 ohms?

→ **Yes**
GO to [C9](#).

→ **No**
REPAIR the circuits. TEST the system for normal operation. CLEAR DTCs. RERUN OBD Tests.

C9 CHECK FOR SHORT BETWEEN TR/PCM INPUT SIGNAL CIRCUITS

1

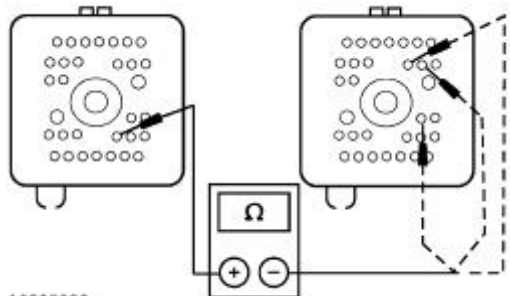


A0036188

1

Measure the resistance between pin 9 harness side and pin 22; pin 18; pin 10 harness side.

2

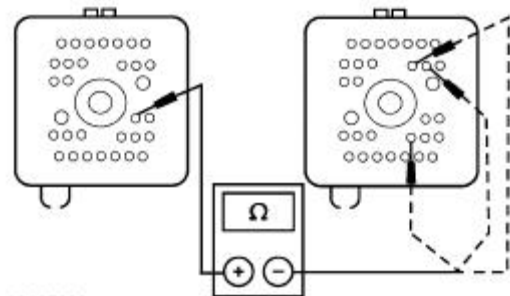


A0005032

2

Measure the resistance between pin 22 harness side and pin 9; pin 18; pin 10 harness side.

3

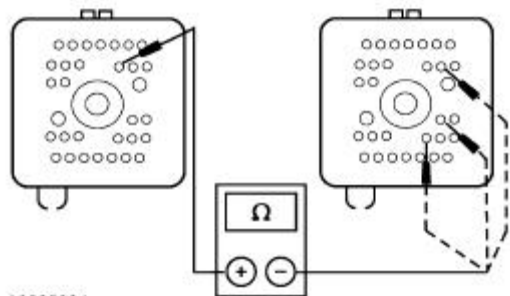


A0005033

3

Measure the resistance between pin 18 harness side and pin 22; pin 9; pin 10 harness side.

4



A0005034



4

Measure the resistance between pin 10 harness side and pin 22; pin 18; pin 9 harness side.


- Are the resistances greater than 10,000 ohms?

→ Yes

INSTALL a new PCM. TEST the system for normal operation.

	→ No REPAIR the circuit. TEST the system for normal operation.
C10 CHECK THE NON-PCM INTERNAL CIRCUITS OF SENSOR	
<p>1 </p> <p>TRS-E Cable to Transmission</p> <p>2 </p> <p>TRS-E Cable to Digital TR Sensor</p>	<p>3 Place the Digital TR Overlay onto Transmission Tester.</p> <p>4 Carry out Switch Test as instructed on the digital TR Overlay.</p> <ul style="list-style-type: none"> ● Does the status lamp on the tester indicate RED for the correct gear position? <p>→ Yes Concern is not in the digital TR sensor. For start system concerns, REFER to Section 303-06 . For backup lamp concerns, REFER to Section 417-01 .</p> <p>→ No INSTALL a new digital TR sensor and ADJUST; REFER to Digital Transmission Range (TR) Sensor in this section. CLEAR DTCs and RERUN OBD Tests.</p>

PINPOINT TEST D: PRESSURE CONTROL (PC) SOLENOIDS (PCA, PCB, PCC)

CONDITIONS	DETAILS/RESULTS/ACTIONS
<p>NOTE: Refer to the Transmission Vehicle Harness Connector illustration preceding these pinpoint tests.</p> <p>NOTE: Read and record all DTCs. All digital TR Sensor and VSS DTCs must be repaired before entering Output State Control (OSC).</p>	
D1 ELECTRONIC DIAGNOSTICS	
<p>1 </p> <p>2</p>	

PRND
↑

5



NGS Tester

6



7



Diagnostic Data Link

8



PCM

9



Active Command Modes

10



Output State Control (OSC)

11



Trans-Bench Mode

3 Check to make sure the transmission harness connector is fully seated, terminals are fully engaged in the connector and in good condition before proceeding.

4 Install 300 psi pressure gauges into Line and PC C tap.

● Does the vehicle enter the Trans-Bench Mode?

→ Yes

REMAIN in Trans-Bench Mode. GO to [D2](#).

→ **No**
REPEAT procedure to enter Trans-Bench Mode. If vehicle did not enter OSC, REFER to Powertrain Control/Emissions Diagnosis (PC/ED) manual for diagnosis of PCM or NGS.

D2 SOLENOID FUNCTIONAL TEST

2



Parameter; PCx

8



XXX

1 Monitor pressure gauges.

3 **NOTE:** Make sure that the solenoids not being tested are off or at zero.

Select PC A, PC B, or PC C.

4 Select value - 15, 30, 45, 60, 70 or 90 psi.

5 Press "SEND".

6 Select another value "0-90 psi".

7 Press "SEND".

9 Press "SEND".

- For PC A and PC B: Does the pressure reading for A or B follow the commanded pressure, (actual A and B pressure will be higher than the commanded pressure)?

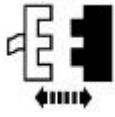
For PC C: Does the pressure reading match the commanded pressure?

→ **Yes**
CLEAR DTCs.

→ **No**
GO to [D3](#).

D3 CHECK FOR BATTERY VOLTAGE

1

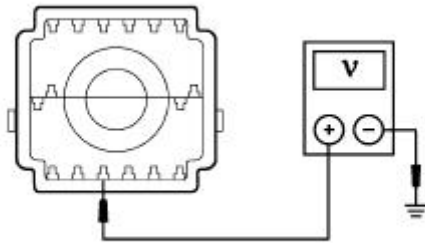


Transmission Harness Connector

3



4



A0005135

2 Visually inspect all wires and connectors for damage.

4 Measure the voltage between pin 3 harness side and ground.

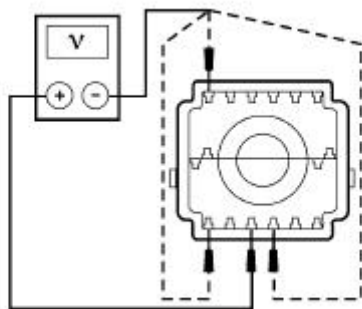
• Is the voltage greater than 10 volts?

→ Yes
GO to [D4](#).

→ No
REPAIR the circuit. TEST the system for normal operation.

D4 ELECTRICAL SIGNAL CHECK

1



A0035164

1 Leave positive lead connected pin 3 and connect negative lead to pins 1, 4 and 11 harness side.

3



Trans-Bench Mode

4

2 Activate solenoids (ON and OFF) while monitoring the voltage reading.



Parameter; PCx

9



XXX

- 5 Select a value "0-90 psi".
- 6 Press "SEND".
- 7 Select another value "0-90 psi".
- 8 Press "SEND".

- 10 Press "SEND".

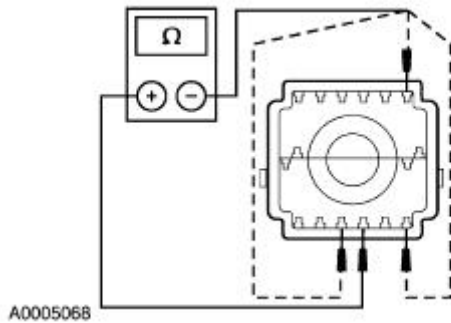
- Does the voltage and solenoid state change?

→ **Yes**
GO to [D5](#).

→ **No**
CHECK for open or short circuit in harness or PCM.

D5 CHECK SOLENOID RESISTANCE AT SOLENOID

1



- 1 Measure and record the resistance between PC solenoid pin 3 and pins 1, 4, and 11. Resistance should be between 3.3 and 7.5 ohms.

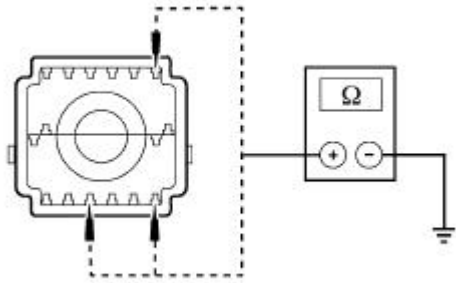
- Is the resistance within specifications?

→ **Yes**
GO to [D6](#).

→ **No**
INSTALL a new solenoid body assembly.

D6 CHECK SOLENOID FOR SHORT TO GROUND

1



A0037992



2 Measure and record the resistance between the PC solenoid pins 1, 4, 11, and ground solenoid side.

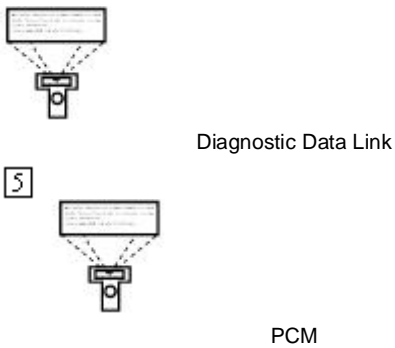
• Is the resistance less than 10,000 ohms?

→ **Yes**
INSTALL a new solenoid body assembly.
TEST the system for normal operation.

→ **No**
REFER to [Diagnosis By Symptom](#) in this section for diagnosis of pressure concerns. TEST the system for normal operation.

PINPOINT TEST E: TURBINE SHAFT SPEED (TSS), INTERMEDIATE SHAFT SPEED (ISS), AND OUTPUT SHAFT SPEED (OSS) SENSORS

CONDITIONS	DETAILS/RESULTS/ACTIONS
<p>NOTE: Refer to the turbine shaft speed (TSS), intermediate shaft speed (ISS), and output shaft speed (OSS) sensor connector illustrations preceding these pinpoint tests.</p>	
<p>E1 ELECTRONIC DIAGNOSTICS</p>	
<p>2 </p> <p>NGS Tester</p> <p>3 </p> <p>4</p>	<p>1 Check to make sure the transmission harness connectors are fully seated, terminals are fully engaged in connector and in good condition before proceeding.</p>



- 6 Select PID/Data Monitor and Record.
- 7 Select the following PIDs: TSS, ISS, or OSS.

● **Does vehicle enter PID/Data Monitor and Record?**

- **Yes**
REMAIN in PID/Data.GO to [E2](#).
- **No**
REPEAT procedure to ENTER PID. If vehicle did not enter PID, REFER to the Powertrain Control/Emissions Diagnosis (PC/ED) manual for diagnosis of PCM or NGS.

E2 DRIVE CYCLE TEST

- 1 While monitoring the appropriate sensor PID, drive the vehicle so that the transmission upshifts and downshifts through all gears.

● **Does the TSS, ISS, or OSS Speed PID increase and decrease with engine and vehicle speed?**

- **Yes**
GO to [E3](#).
- **No**
If the TSS, ISS, or OSS Speed PID does not increase and decrease with engine and vehicle speed, INSPECT for open or short in vehicle harness, sensor, a PCM concern, or internal hardware concern.GO to [E4](#).

E3 DRIVE CYCLE TEST ERRATIC

- 1 While monitoring the appropriate sensor PID, drive the vehicle so that the transmission upshifts and downshifts through all gears.

● **Is the TSS, ISS, or OSS Speed PID signal erratic (drop to zero or near**

zero and return to normal operation)?

→ **Yes**

If the sensor signal is erratic, INSPECT for intermittent concern in the harness, sensor, or connector. GO to [E4](#).

→ **No**

CLEAR all DTCs. Rerun OBD.

E4 CHECK PCM HARNESS CIRCUITS FOR OPENS

1

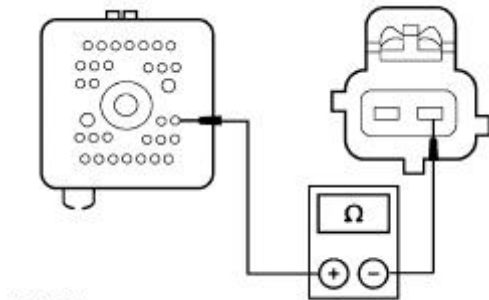


2



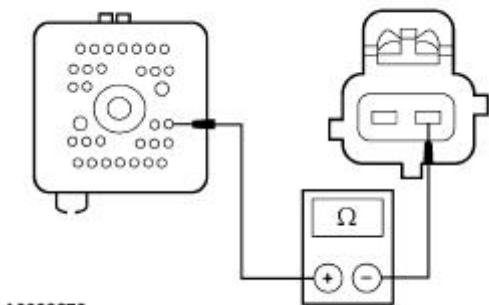
150 Pin PTEC Module Connector "B"

3



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4



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5

2

Inspect for damaged or pushed out pins, corrosion or loose wires.

3

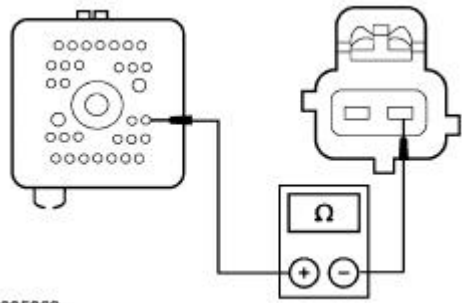
For OSS, measure the resistance between pin 17 and the appropriate sensor connector pin 2 harness side.

4

For ISS, measure the resistance between pin 17 and the appropriate sensor connector pin 2 harness side.

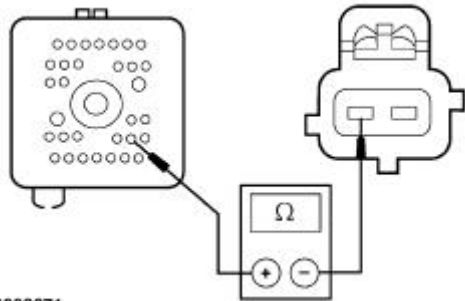
5

For TSS, measure the resistance between pin 17 and the appropriate sensor connector pin 2 harness side.



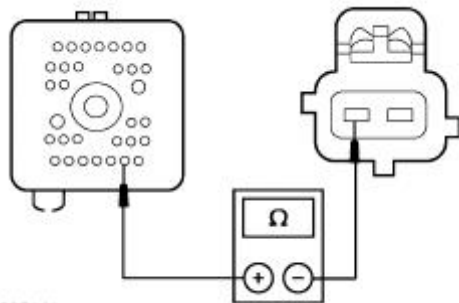
A0005069

6



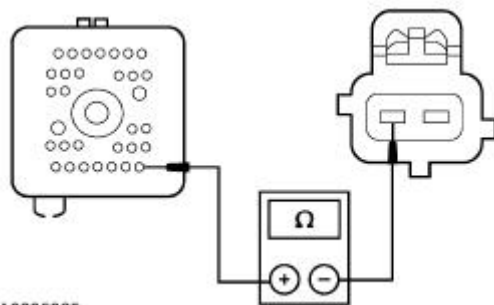
A0009271

7



A0005141

8



A0005035

6 For ISS, measure the resistance between pin 21 and the appropriate sensor connector pin 1 harness side.

7 For TSS, measure the resistance between pin 27 and the appropriate sensor connector pin 1 harness side.

8 For OSS, measure the resistance between pin 26 and the appropriate sensor connector pin 1 harness side.

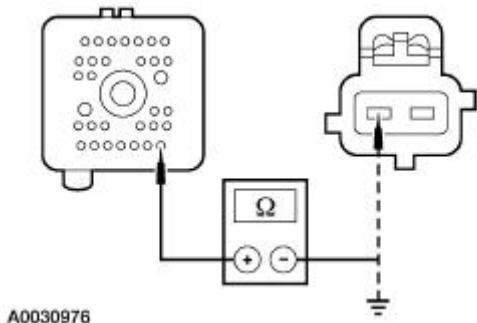
• Are all resistances less than 5 ohms?

→ **Yes**
GO to [E5](#).

→ **No**
REPAIR the circuit. TEST the system for normal operation.

E5 CHECK PCM HARNESS CIRCUITS FOR SHORT TO GROUND

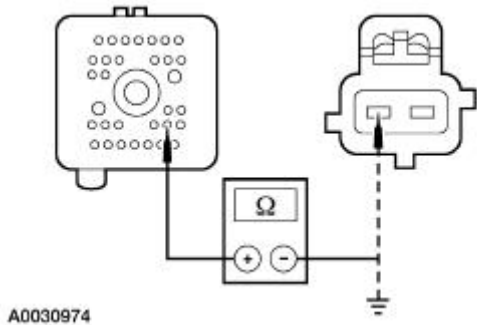
1



1

For OSS, measure the resistance between pin 26 and sensor connector pin 1 harness side and ground.

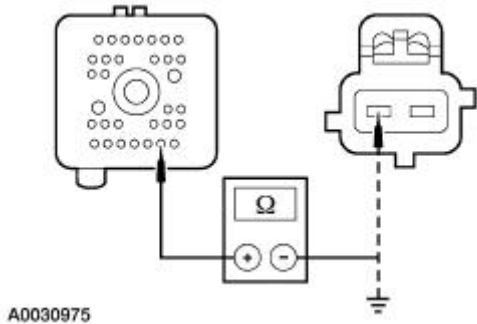
2



2

For ISS, measure the resistance between PCM pin 21 and sensor connector pin 1 harness side and ground.

3



3

For TSS, measure the resistance between PCM pin 27 and sensor connector pin 1 harness side and ground.

- Are the resistances greater than 10,000 ohms?

→ **Yes**
GO to [E6](#).

→ **No**
REPAIR the circuits. TEST the system for normal operation. CLEAR DTCs. RERUN OBD Tests.

E6 CHECK RESISTANCE OF TSS, ISS or OSS SENSOR

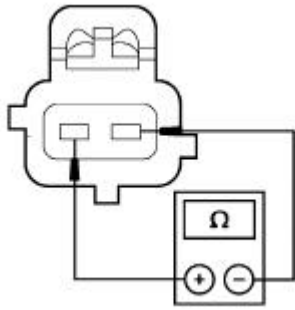
2

1

Disconnect the appropriate vehicle harness connector from the TSS, ISS or OSS sensor.

2

Connect ohmmeter negative lead to one pin of the sensor and the positive lead to the other pin on the sensor.



A0005211

- 3 Record the resistance. Resistance should be as follows:

Resistance (ohms)	Temperature C° (F°)
266-390	-20° (4°)
325-485	21° (70°)
492-738	150° (302°)

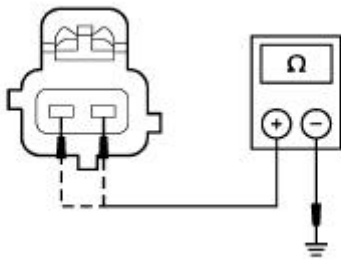
- Is the resistance within specification for the appropriate sensor?

→ **Yes**
GO to [E7](#).

→ **No**
INSTALL a new sensor.

E7 CHECK SENSORS FOR SHORT TO GROUND

1



A0005501





- 1 Measure the resistance between pin 1 and 2 of each sensor and ground.



- Is the resistance less than 10,000 ohms?

→ **Yes**
INSTALL a new sensor.





→ **No**
REFER to [Diagnosis By Symptom](#) for diagnosis of shift or torque converter concerns in this section.

PINPOINT TEST F: SOLENOID MECHANICAL FAILURE

CONDITIONS	DETAILS/RESULTS/ACTIONS
<p>NOTE: Repair all other DTCs before repairing the following DTCs: P1714, P1715, P1716, P1717, P1740.</p>	
<p>F1 ELECTRONIC DIAGNOSIS</p>	
<p>1 </p> <p>NGS Tester</p> <p>2 </p> <p>3 </p>	<p>4 Carry out KOEO test until continuous DTCs have been displayed.</p> <p>5 If any of the following DTCs are present, continue with this test: P1714, P1715, P1716, P1717, P1740.</p> <ul style="list-style-type: none"> ● Are other DTCs present for TFT or shift solenoids? <p>→ Yes REPAIR the DTCs for TFT or shift solenoids first. CLEAR DTCs and CARRY OUT transmission Drive Cycle test. RERUN Quick Test.</p> <p>→ No INSTALL a new solenoid and/or body. REFER to the Diagnostic Trouble Code Charts for code description. GO to F2.</p>
<p>F2 TRANSMISSION DRIVE CYCLE TEST</p>	
	<p>1 Carry out transmission drive cycle test. Refer to Transmission Drive Cycle Test in this section.</p> <ul style="list-style-type: none"> ● Does the vehicle upshift and downshift OK? <p>→ Yes GO to F3.</p> <p>→ No REFER to Diagnosis By Symptom in this section to diagnose shift concerns.</p>
<p>F3 RETRIEVE DTCS</p>	
<p>1 </p> <p>NGS Tester</p>	

<p>2</p> 	
<p>3</p> 	
	<p>4 Carry out KOEO test until continuous DTCs have been displayed.</p> <ul style="list-style-type: none"> • Are DTCs P1714, P1715, P1716, P1717, P1740 still present? <p>→ Yes INSTALL a new PCM. ROAD TEST and RERUN Quick Test.</p> <p>→ No Testing completed. If a concern still exists, REFER to Diagnosis By Symptom in this section for concern diagnosis.</p>

PINPOINT TEST G: REVERSE PRESSURE SWITCH

CONDITIONS	DETAILS/RESULTS/ACTIONS
<p>NOTE: Refer to the Reverse Pressure (RP) Switch Diagnosis Chart preceding these pinpoint tests.</p>	
<p>G1 ELECTRONIC DIAGNOSIS</p>	
<p>1</p> 	
<p>2</p> 	
<p>4</p> 	
<p>5</p> 	
	<p>3 Check to make sure that the transmission harnesses is fully seated, the terminals are fully engaged in the connector, and the terminals are in good condition.</p>
	<p>6 Select Diagnostic Data Link.</p>

9



PIDs: RPS, FFG RPS

7 Select PCM.

8 Select PID DATA Monitor and record.

● Does the vehicle enter PID/DATA Monitor and record?

→ Yes
REMAIN in PID/DATA control. GO to [G2](#).

→ No
REPEAT the procedure. If vehicle did not enter PID, REFER to the Powertrain Control/Emissions Diagnosis (PC/ED) manual for PCM and NGS.

G2 ELECTRICAL SIGNAL CHECK

1 Carry out Transmission Drive Cycle Test and monitor line pressure and PIDs: RPS, FFG RPS.

● Do the PIDs: RPS, FFG RPS match the chart for a given gear?

→ Yes
RP switch is OK. REFER to [Diagnosis By Symptom](#) in this section.

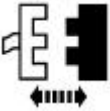
→ No
GO to [G3](#).

G3 CHECK HARNESS FOR OPENS

1



2



150 Pin PTEC Module Connector "B"

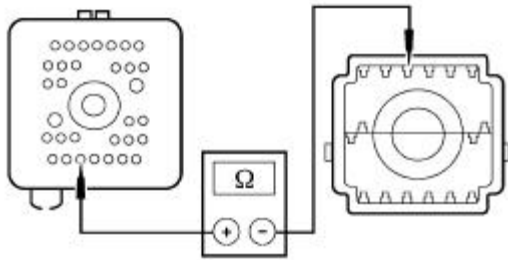
3



Transmission Connector

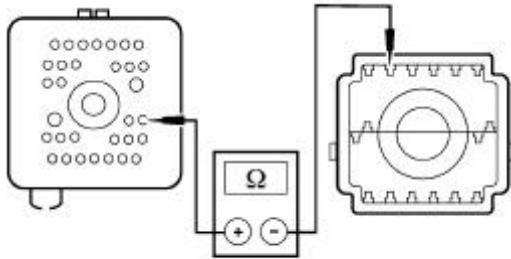
4

4 Measure the resistance between PCM pin 30 and pin 13 harness side.



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5



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5 Measure the resistance between PCM pin 17 and pin 12 harness side.

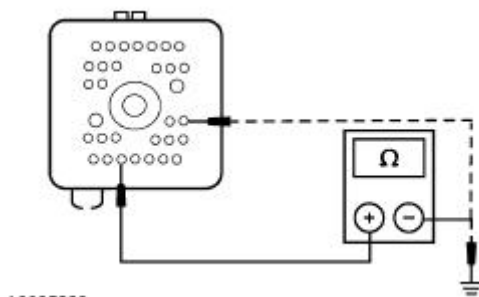
• Are the resistances less than 5 ohms?

→ **Yes**
GO to [G4](#).

→ **No**
REPAIR the circuit. CLEAR DTCs.
RERUN OBD tests.

G4 CHECK CIRCUIT FOR SHORT TO GROUND OR POWER

1



A0005220

1 Measure the resistance between PCM pin 30 and pin 17 harness side and ground.

• Is the resistance less than 10,000 ohms?

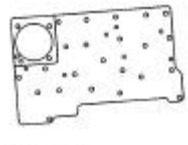

→ **Yes**
INSTALL a new reverse pressure switch.
TEST the system for normal operation.

→ **No**
REPAIR the circuit. CLEAR the DTCs.
RERUN OBD test. TEST the system for

normal operation.

Special Testing Procedures

Special Tool(s)

 ST2408-A	Air Test Plate, Transmission 307-405
 ST1565-A	Transmission Fluid Pressure Gauge 307-004 (T57L-77820-A)

The special tests are designed to aid the technician in diagnosing the hydraulic and mechanical portion of the transmission.

Engine Idle Speed Check

Refer to the Powertrain Control/Emissions Diagnosis (PC/ED) manual for diagnosis and testing of the engine idle speed.

Line Pressure Test



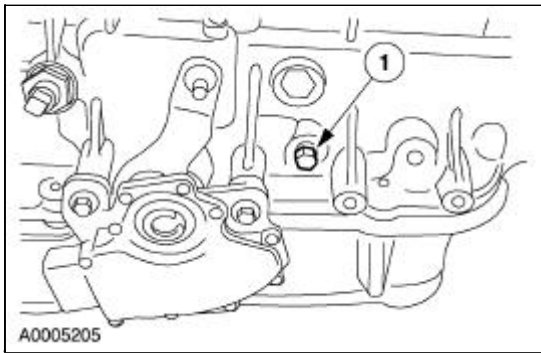
CAUTION: Carry out Line Pressure Test prior to carrying out Stall Speed Test. If line pressure is low at stall, do not carry out the Stall Speed Test or further transmission damage will occur. Do not maintain wide open throttle in any gear range for more than five seconds.

NOTE: Certain sensor failures may cause high PC, FMEM (Failure Mode Effect Management) actions. Be sure that self test and electrical repairs have been carried out, or test results may be incorrect.

NOTE: The line pressure tap is used to verify output pressure from PC A or PC B by turning either one off while verifying the output from the other solenoid. The second pressure tap is used to verify the output from the PC C solenoid.

This test verifies that the line pressure is within specifications.

1. Connect pressure gauge to the line pressure tap.



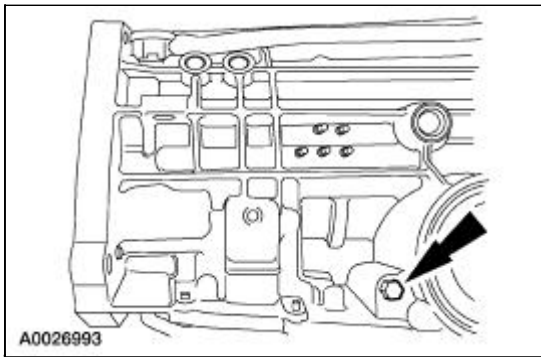
Item	Part Number	Description
1	—	Line Pressure Tap

2. Start engine and check line pressures. Refer to the following Line Pressure Chart to determine if line pressure is within specifications.

Line Pressure Chart

Range	Idle	WOT Stall	Idle	WOT Stall
	PC C	PC C	Line	Line
P/N	0-103 kPa (0-15 psi)	0-103 kPa (0-15 psi)	862-1,137 kPa (125-165 psi)	2,000-2,482 kPa (290-360 psi)
R	793 kPa (115 psi)	793 kPa (115 psi)	758-1,034 kPa (110-150 psi)	1,448-1,793 kPa (210-260 psi)
D5/D4	0-103 kPa (0-15 psi)	0-103 kPa (0-15 psi)	758-1,034 kPa (110-150 psi)	1,448-1,793 kPa (210-260 psi)
M5/M4	0-103 kPa (0-15 psi)	0-103 kPa (0-15 psi)	425-800 kPa (76-116 psi)	1,448-1,793 kPa (210-260 psi)
M3	0-103 kPa (0-15 psi)	0-103 kPa (0-15 psi)	758-1,034 kPa (110-150 psi)	1,448-1,793 kPa (210-260 psi)
M2/M1	0-103 kPa (0-15 psi)	0-103 kPa (0-15 psi)	634-910 kPa (92-132 psi)	1,448-1,793 kPa (210-260 psi)
P/N	0-103 kPa (0-15 psi)	0-103 kPa (0-15 psi)	862-1,137 kPa (125-165 psi)	—
R	793 kPa (115 psi)	793 kPa (115 psi)	634-910 kPa (92-132 psi)	2,000-2,482 kPa (290-360 psi)
D5/D4	0-103 kPa (0-15 psi)	0-103 kPa (0-15 psi)	758-1,034 kPa (110-150 psi)	1,448-1,793 kPa (210-260 psi)
M5/M4	0-103 kPa (0-15 psi)	0-103 kPa (0-15 psi)	758-1,034 kPa (110-150 psi)	1,448-1,793 kPa (210-260 psi)
M3/M2/M1	0-103 kPa (0-15 psi)	0-103 kPa (0-15 psi)	758-1,034 kPa (110-150 psi)	1,448-1,793 kPa (210-260 psi)

3. If line pressure is not within specifications, check PC C pressure.
4. Connect Pressure Gauge to PC C pressure tap.



Item	Part Number	Description
1	—	Pressure Control (PC C) Tap

5. Start engine and check PC C pressure. Refer to Line Pressure Diagnosis Chart in this section for specification.
6. If PC C pressure is not within specification, [Go To Pinpoint Test D](#) to diagnose PC C operation. If PC C operation is OK, refer to Line Pressure Diagnosis Chart in this section for line pressure concern causes.

Line Pressure Diagnosis Chart

Test Results	Possible Source
High at Idle — All Ranges	<ul style="list-style-type: none"> ● Wiring Harnesses ● EPC Boost Valve ● EPC Solenoid ● Main Regulator Valve
Low at Idle — All Ranges	<ul style="list-style-type: none"> ● Low Fluid Level ● Fluid Inlet Filter/Seal ● Main Control Body ● Cross Leaks ● Gaskets ● Pump ● Separator Plate
Low — All Forward Ranges	<ul style="list-style-type: none"> ● Forward Clutch ● Main Control ● Overdrive Servo ● Intermediate Servo
Low in Park Only	<ul style="list-style-type: none"> ● Valve Body
Low in Reverse Only	<ul style="list-style-type: none"> ● Separator Plate ● Rear Servo Piston, Cover Seal ● Reverse Clutch ● Overdrive Servo ● Intermediate Servo ● Valve Body ● Forward Clutch
Low in Neutral Only	<ul style="list-style-type: none"> ● Valve Body ● Overdrive Servo ● Intermediate Servo
Low in Overdrive Only	<ul style="list-style-type: none"> ● Forward Clutch ● Overdrive Servo ● Intermediate Servo ● Valve Body
Low in Drive Only (O/D Cancelled)	<ul style="list-style-type: none"> ● Forward Clutch ● Overdrive Servo ● Intermediate Servo

	<ul style="list-style-type: none"> ● Valve Body
Low in 1st Position	<ul style="list-style-type: none"> ● Forward Clutch ● Valve Body
Low in 2nd Position	<ul style="list-style-type: none"> ● Intermediate Servo ● Overdrive Servo ● Intermediate Servo ● Forward Clutch

Stall Speed Test

This test checks operation of the following items:

- torque converter clutch
- forward clutch
- low-one way clutch (OWC) assembly
- engine performance
- overdrive one-way clutch assembly




WARNING: Apply the parking brake firmly while carrying out each stall test.



CAUTION: Always carry out the Line Pressure Test procedures prior to carrying out the Stall Speed Test. If line pressure is low at stall, do not carry out the Stall Speed Test or further transmission damage will occur.

NOTE: The Stall Speed Test should be carried out with the engine and transmission at normal operating temperatures.

1. Connect tachometer to the engine.
2.  **CAUTION:** After testing each of the following ranges D5, D4, 3, 2, 1, and R, move the transmission range selector lever to N (NEUTRAL) and run the engine at 1,000 rpm for about 15 seconds to allow the torque converter to cool before testing the next range.



CAUTION: Do not maintain wide open throttle in any range for more than five (5) seconds.



CAUTION: If the engine rpm recorded by the tachometer exceeds maximum specified rpm, release the accelerator pedal immediately. Clutch or band slippage is indicated.

NOTE: Prolonged use of this procedure may set Diagnostic Trouble Code P0712, P1783. After Carrying out Stall Speed Test run OBD Test and clear DTCs from memory.

Press accelerator pedal to floor (WOT) in each range. Record rpm reached in each range. Stall speeds should be as follows:

Stall Speed Chart

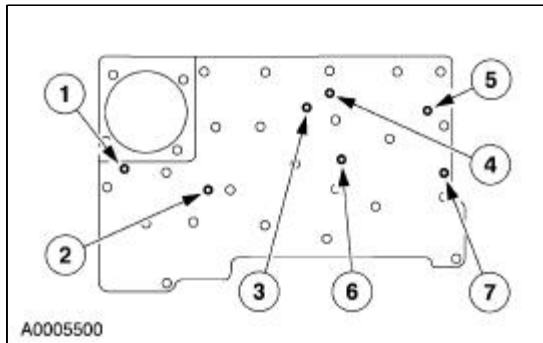
Vehicle	Engine	RPM
Lincoln LS	3.0	2,565-3,060
Lincoln LS	3.9	2,491-2,900

If stall speeds were too high, refer to the following Stall Speed Diagnosis Chart. If stall speeds were too low, first check the engine idle speed. If engine idle is OK, remove torque converter and check the torque converter one-way clutch for slippage.

Stall Speed Diagnosis Chart

Transmission Range Selector Lever Position	Stall Speeds High	Stall Speeds Low
D5, D4, and 1	Overdrive One-Way Clutch, Rear One-Way Clutch	—
D4, 2 and 1	Forward Clutch, Overdrive One-Way Clutch	—
D5	Forward Clutch, Overdrive One-Way Clutch	—
D5, D4, 2, 1 and R	General Pressure Concerns, Forward Clutch, Overdrive One-Way Clutch	Converter One-Way Clutch or Engine Driveability Concerns
R Only	High/Reverse, High Clutch, Low and Reverse Band/Servo	—
2 Only	Intermediate Band/Servo	—
1 Only	Low/Reverse Band/Servo	—

Air Pressure Tests



Item	Part Number	Description
1	—	Reverse servo
2	—	Intermediate clutch apply
3	—	Intermediate servo apply
4	—	Direct clutch
5	—	Overdrive servo apply
6	—	Forward clutch
7	—	Coast clutch

A no-drive condition can exist even with correct transmission fluid pressure because of inoperative clutches or bands. An erratic shift can be located through a series of checks by substituting air pressure for fluid pressure to determine the location of the failure.

Follow the procedure to determine the location of the inoperative clutch or band by introducing air pressure into the various test plate passages.

NOTE: Use only dry, regulated (276 kPa [40 psi] maximum) air pressure.

Apply air to the appropriate passage(s). A dull thud should be felt or heard or movement could be observed when the component applies. There should be no hissing sound when the component is fully applied.

NOTE: Cover the vent hole in the test plate with a clean, lint-free shop towel to prevent spray when the air is applied. Plugging the vent hole during testing will result in inaccurate results.

1. Drain transmission fluid and remove the transmission fluid pan.
2. Remove the main control valve body.
3. Install the Transmission Test Plate and gasket. Tighten bolts to 10 Nm (89 lb-in).
4. **NOTE:** Do not apply air to the test plate vent hole.

Apply air to the appropriate clutch port (refer to diagram). A dull thud may be heard or movement felt when the component is applied or released. If clutch seals or check balls are leaking a hissing sound may be heard.

If test results find that the servos do not operate, disassemble, clean and inspect them to locate the source of the concern.

If air pressure applied to the clutch passages fails to operate a clutch, or operates another clutch simultaneously, disassemble and use air pressure to check the fluid passages in the center support and clutches to detect obstructions.

Leakage Inspection



CAUTION: Do not try to stop the fluid leak by increasing the torque beyond specifications. This may cause damage to the case threads.

Leakage at the transmission fluid pan to case gasket often can be stopped by tightening the attaching bolts to 14 Nm (10 lb-ft). If necessary, install a new oil pan case gasket.

Check the fluid filler plug at the transmission case. If leakage is found here, install a new plug.

Check fluid tubes and fittings between the transmission and the cooler for looseness, wear, or damage. If leakage cannot be stopped by tightening a fluid tube nut, install new parts. When fluid is found leaking between the case and cooler line fitting, check for missing or damaged O-ring seal, then tighten the fitting to maximum specification.

If the leak continues, install a new cooler line fitting and tighten to specification. The same procedure should be followed for fluid leaks between the cooler and the cooler line fittings in this section. For additional information, refer to [Section 307-02](#).

The cooler can be further checked for leaks. For additional information, refer to [Section 307-02](#).

If leakage is found at the transmission range selector lever, install a new seal.

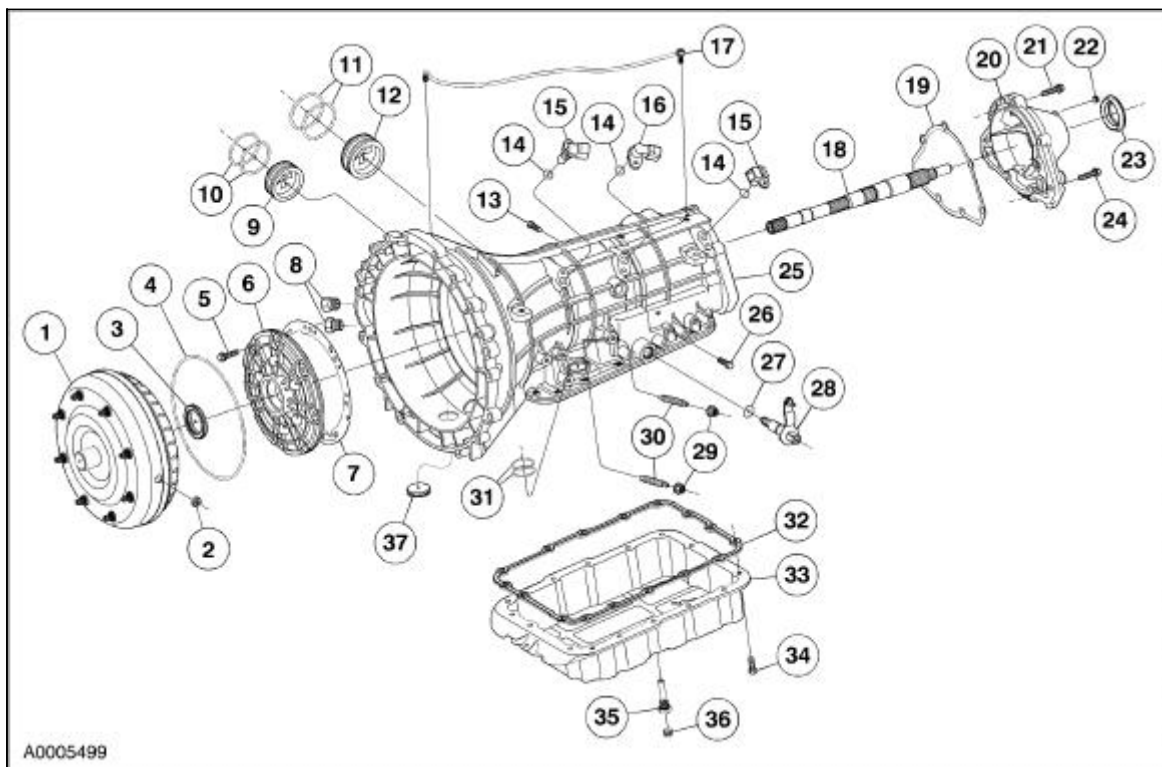
If leakage is found at the transmission harness connector, install a new O-ring seal.

External Sealing

The transmission has the following parts to prevent external fluid leakage:

- gaskets
- lip-type seals
- O-ring seals
- seal rings
- seal grommets
- thread sealant

External Sealing



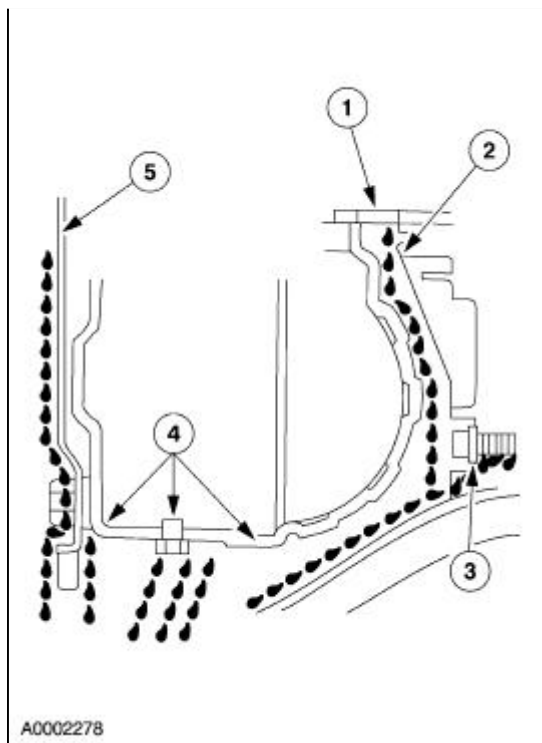
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Item	Part Number	Description
1	7902	Torque converter assembly
2	6730	Torque converter drain plug
3	7A248	Front pump fluid seal assembly
4	7A248	Seal— front fluid pump
5	W704892-S1300	Screw and washer assembly
6	7G187	Cover assembly fluid pump
7	7A136	Gasket front fluid pump
8	7D273	Fluid tube connector assembly
9	7D027	Overdrive servo cover
10	W703119-S300	Overdrive servo cover seal
11	W702969-S300	Intermediate servo cover seal
12	7D027	Intermediate servo cover
13	390318-S2	Pipe plug
14	W702981-S300	O-ring seal — speed sensor
15	7H103	Turbine shaft speed and output shaft speed sensors
16	7M183	Intermediate shaft speed sensor
17	7034	Vent assembly
18	7060	Output shaft
19	7086	Gasket — extension housing
20	7A039	Housing assembly — extension
22	W500312-S1309	Screw — extension housing to case (2 req'd)
22	W701516-S304	Fluid fill access plug

23	7052	Seal assembly — extension housing
24	W500311-S1427	Screw — extension housing to case (5 Req'd)
25	7005	Case
26	3930318-S2	Pipe plug
27	7B498	Seal assembly — main control lever
28	7A256	Manual control lever
29	W705582-S430	Overdrive intermediate lock nut
30	7C492	Screw — intermediate band adjuster/lock
31	W705928	Solenoid body connector O-ring seal
32	7A191	Gasket — fluid pan
33	7A194	Pan — fluid
34	W500213-S1309	Screw — fluid pan to case
35	7A010	Fluid fill drain tube
36	W704999-S309	Short hex plug
37	7N171	Converter housing access plug

Fluid Leakage in Torque Converter Area

In diagnosing and correcting fluid leaks in the front pump support and gear and torque converter area, use the following procedures to locate the exact cause of the leakage. Leakage at the front of transmission, as evidenced by fluid around the torque converter housing, may have several sources. By careful observation it is possible, in many instances, to pinpoint the source of leak before removing the transmission from the vehicle. The paths which the fluid takes to reach the bottom of the torque converter housing are shown in the illustration. The five steps following correspond with the numbers in the illustration.



1. Fluid leaking by the pump seal lip will tend to move along the impeller hub and onto the back of the impeller housing. Except in the case of a total seal failure, fluid leakage by the lip of the seal will be deposited on the inside of the torque converter housing only, near the outside diameter of the housing. Fluid from the vent assembly may move along the impeller hub and onto the back of the impeller housing. Fluid from a converter hub weld leak will move along a path on the inside of the converter housing.
2. Fluid leakage by the outside diameter of the pump seal and pump body will follow the same path that leaks by the inside diameter of the pump seal follow. Fluid from a converter hub weld leak will move along a path on the inside of the converter housing.
3. Fluid that leaks by a pump to case screw or pump gasket will be deposited on the inside of the torque converter housing only. Fluid will not be deposited on the back of the torque converter.
4. Fluid leakage from the converter drain plug, (vehicle-dependent) converter seal weld or converter to flexplate stud weld will appear at the outside diameter of the torque converter on the back face of the flexplate, and in the converter housing only near the flexplate. Fluid leaks from the torque converter will leave a ring of fluid around the inside of the torque converter housing.
5. **NOTE:** White facial tissue paper may aid in determining the color (red is transmission fluid) and source of the leaking fluid.

Engine oil leaks are sometimes incorrectly diagnosed as transmission pump gasket leaks. The following areas of possible leakage should also be checked to determine if engine oil leakage is causing the concern.

- a. Leakage at the valve cover gasket may allow oil to flow over the torque converter housing or seep down between the torque converter housing and cylinder block causing oil to be present in or at the bottom of the torque converter housing.
- b. Oil galley plug leaks will allow oil to flow down the rear face of the cylinder block to the bottom of the torque converter housing.
- c. Leakage at the crankshaft rear oil seal will work back to the flexplate, and then into the torque converter housing.
- d. Leakage at the oil pressure sensor.

Leak Check Test

1. Remove the fluid drain tube and note the color of the fluid. Original factory fill fluid is dyed red to aid in determining if leakage is from the engine or transmission. The red color should assist in pinpointing the leak.
2. Clean off any fluid from the top and bottom of the torque converter housing, of the case, and the rear face of the engine and oil pan. Clean the torque converter area by washing with a suitable nonflammable solvent and blow dry with compressed air.
3. Wash out the torque converter housing, and the front of the flexplate. The torque converter housing may be washed out using cleaning solvent and a squirt-type oil can. Blow all washed areas dry with compressed air.
4. Start and run the engine until the transmission reaches its normal operating temperature. Observe the back of the cylinder block and the top of the torque converter housing for evidence of fluid leakage. Raise the vehicle on a hoist. Refer to [Section 100-02](#) and run the engine at fast idle, then at engine idle, occasionally shifting to the D5 and REVERSE positions to increase pressure within the transmission. Observe the front of the flexplate, back of the cylinder block (in as far as possible), and inside the torque converter housing and front of the case. Run the engine until fluid leakage is evident and the probable source of leakage can be determined.

Leak Check Test With Black Light

Fluid soluble aniline or fluorescent dyes premixed at the rate of 2.5ml (1/2 teaspoon) of dye powder to 0.24L (1/2 pint) of automatic transmission fluid have proven helpful in locating the source of fluid leakage. Such dyes may be used to determine whether an engine fluid or transmission fluid leak is present. An ultraviolet light must be used to detect the fluorescent dye solution.

Transmission Fluid Cooler



CAUTION: Whenever a transmission has been disassembled to install new parts, the transmission fluid cooler must be replaced and the transmission fluid cooler tubes must be cleaned and backflushed.

NOTE: Cleaning and backflushing the transmission fluid cooling system along with normal cleaning and inspection procedures as outlined in this section during disassembly and reassembly will keep contamination from reentering the transmission and causing a repeat repair.

When internal wear or damage has occurred in the transmission, metal particles, clutch plate material, or band material may have been carried into the torque converter and transmission fluid cooler. These contaminants are a major cause of recurring transmission troubles and must be removed from the system before the transmission is put back in use.

If the vehicle was not equipped with a fluid filter, install a fluid filter kit follow the instructions supplied in the kit. If the vehicle was equipped with a filter install a new filter.

Transmission Fluid Cooler Flow Test

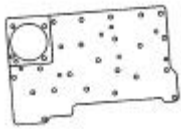





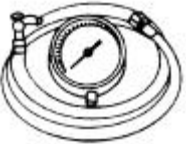
Prior to carrying out the Transmission Fluid Cooler Flow Test check to see if the vehicle is equipped with a fluid filter. If the vehicle was not equipped with a in-line fluid filter, install a fluid filter kit follow the instructions supplied in the kit. If the vehicle was equipped with a filter install a new filter. For additional information, refer to [Section 307-02](#).

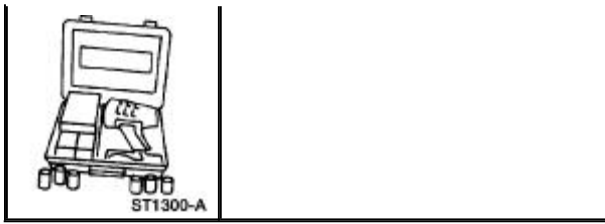
Transmission Fluid Cooler Tube Replacement

Prior to carrying out the Transmission Fluid Cooler Tube Replacement check to see if the vehicle is equipped with a in-line fluid filter. If the vehicle was not equipped with a fluid filter, install a fluid filter kit follow the instructions supplied in the kit. If the vehicle was equipped with a filter install a new filter. For additional information, refer to [Section 307-02](#).

Diagnosis By Symptom

Special Tool(s)

 ST2408-A	Air Test Plate, Transmission 307-405
 ST1137-A	73 III Automotive Meter 105-R0057 or equivalent
 ST1137-A	Trans Tester TR/MLP Overlay and Manual 007-00131 or equivalent
 ST2332-A	Worldwide Diagnostic System (WDS) 418-F224 New Generation Star (NGS) Tester 418-F052 or equivalent
 ST1632-A	MLP-TR Cable 418-F107 (007-00111) or equivalent
 ST1389-A	Transmission Tester 307-F016 (007-00130) or equivalent
 ST1565-A	Pressure Gauge, Transmission Fluid 307-004 (T57L-77820-A)
	UV Leak Detector Kit 164-R0756 or equivalent



The Diagnosis by Symptom Index gives the technician diagnostic information and direction, and suggests possible components, using a symptom as a starting point.

The Diagnosis by Symptom Index is divided into two categories: Electrical Routines (indicated by 200 series numbers) and Hydraulic/Mechanical Routines (indicated by 300 series numbers). The Electrical Routines list the possible electrical components that can cause or contribute to the symptom described. The Hydraulic/Mechanical Routines list the possible hydraulic or mechanical components that can cause or contribute to the symptom described.

Diagnosis by Symptom Index — Directions

1. Using the Symptom Index, select the Concern/Symptom that best describes the condition.
2. Refer to the routine indicated in the Diagnosis by Symptom Index.
3. Always begin diagnosis of a symptom with:
 - a. Preliminary inspections.
 - b. Verifications of condition.
 - c. Checking the fluid levels.
 - d. Carrying out other test procedures as directed.
4. **NOTE:** Not all concerns and conditions with electrical components will set a diagnostic trouble code (DTC). Be aware that the components listed may still be the cause. Verify correct function of these components prior to proceeding to the Hydraulic/Mechanical Routine listed.

NOTE: When the battery is disconnected or a new battery installed, certain transmission operating parameters can be lost. The powertrain control module (PCM) must relearn these parameters. During this learning process, you may experience slightly firm shifts, delayed, or early shifts. This operation is considered normal and will not affect the function of the transmission. Normal operation will return once these parameters are stored by the PCM.

Begin with the Electrical Routine, if indicated. Follow the reference or action statements. Always carry out the on-board diagnostic tests as necessary. Never skip steps. Repair as necessary. If the concern is still present after electrical diagnosis, then proceed to the Hydraulic/Mechanical Routine listed.

5. The Hydraulic/Mechanical Routines list possible hydraulic or mechanical components that can cause the concern. These components are listed in the removal sequence and by most probable cause. All components listed must be inspected to ensure correct repair.

Diagnosis by Symptom Index

Diagnosis by Symptom Index

5R55N	Routines	
	Electrical ¹	Mechanical/ Hydraulic
Engagement Concerns:		
● No Forward in D5 or D4 Only	201A	301A
● No Forward Only (All Positions)	201B	301B

● No Reverse Only	202	302
● Harsh Reverse Only	203	303
● Harsh Forward Only	204A	304A
● Harsh Manual 1st Gear Only	204B	304B
● Delayed/Soft Reverse Only	205	305
● Delayed/Soft Forward Only	206	306
● No Forward and No Reverse	207	307
● Harsh Forward and Harsh Reverse	208	308
● Delayed Forward and Delayed Reverse	209	309
Shift Concerns:		
● Some/All Shifts Missing (Automatic Mode Only)	210	310
● Timing Concern		
Early/Late (Some/All)	211	311
Erratic/Hunting (Some/All)	212	312
● Feel Concerns		
Soft/Slipping (Some/All)	213	313
Harsh (Some/All)	214	314
● No First Gear in Drive, Engages in a Higher Gear	215	315
● No First Gear in Manual 1st	216	316
● No Manual 2nd Gear	217	317
Torque Converter Clutch Operation Concerns:		
● Does Not Apply	240	340
● Always Applied/Stalls Vehicle	241	341
● Cycling/Shudder/Chatter	242	342
Other Concerns:		
● Shift Lever Efforts High	251	351
● External Leaks	252	352
● Poor Vehicle Performance	253	353
● Noise/Vibration — Forward or Reverse	254	354
● Engine Will Not Crank	255	355
● No Park Range	256	356
● Transmission Overheating	257	357
● No Engine Braking in Manual 2nd Position	258	358
● No Engine Braking in Manual 1st Position	259	359
● Fluid Venting or Foaming	261	361
● Vehicle Movement with Gear Selector in "N"	262	362
● Slips/Chatters in Manual 1st Gear	263	363
● Slips/Chatters in Manual 2nd Gear	264	364
● No Engine Braking in Manual 3rd Position	280	380
● No Engine Braking in Manual 4th (D4) Position	281	381
● Slips/Chatters in Manual 3rd Gear	282	382
● Engine Braking in ALL Gears	283	383
● No 2nd and 5th Gears	284	384
● No 3rd, 4th and 5th gears		

¹ Carry out electrical routine first.

Diagnostic Routines

Engagement Concern: No Forward in D5 or D4 Only

Possible Component	Reference/Action
201A — ELECTRICAL ROUTINE	
Powertrain Control System	
<ul style="list-style-type: none"> PCM, vehicle wiring harnesses, Pressure Control Solenoid B 	<ul style="list-style-type: none"> Carry out on-board diagnostic tests. Refer to the Powertrain Control/Emissions Diagnosis (PC/ED) manual for diagnosis and testing of the PCM.
	<ul style="list-style-type: none"> Go To Pinpoint Test D.
	<ul style="list-style-type: none"> Repair as required. Clear DTCs, road test and carry out on-board diagnostic test again.
301A — HYDRAULIC/MECHANICAL ROUTINE	
Fluid	
<ul style="list-style-type: none"> Incorrect level 	<ul style="list-style-type: none"> Adjust fluid to the correct level. Refer to Transmission Fluid Level Check in this section.
<ul style="list-style-type: none"> Condition 	<ul style="list-style-type: none"> Carry out the Fluid Condition Check in this section.
Forward Clutch Assembly	
<ul style="list-style-type: none"> Seals, piston damaged 	<ul style="list-style-type: none"> Inspect for damage. Repair as necessary.
<ul style="list-style-type: none"> Check ball damaged, missing, not seating, off location 	<ul style="list-style-type: none"> Inspect for mislocation, poor seating, damage. Install a new cylinder.
<ul style="list-style-type: none"> Friction elements damaged or worn 	<ul style="list-style-type: none"> Inspect for damage. Repair as necessary.
<ul style="list-style-type: none"> Return springs damaged 	<ul style="list-style-type: none"> Inspect for damage. Repair as necessary.
OD Servo	
<ul style="list-style-type: none"> Servo retaining ring damaged 	<ul style="list-style-type: none"> Inspect for damage. Repair as necessary.
<ul style="list-style-type: none"> Seals (piston and cover) damaged 	<ul style="list-style-type: none"> Inspect for damage. Repair as necessary.
OD Band	
<ul style="list-style-type: none"> Band damaged 	<ul style="list-style-type: none"> Inspect for damage. Repair as necessary.
<ul style="list-style-type: none"> Servo worn or damaged 	<ul style="list-style-type: none"> Inspect for damage. Repair as necessary.
<ul style="list-style-type: none"> Not adjusted correctly 	<ul style="list-style-type: none"> Inspect for damage. Repair as necessary.
Case	
<ul style="list-style-type: none"> Damaged 	<ul style="list-style-type: none"> Inspect for damage. Repair as necessary.

Engagement Concern: No Forward

Possible Component	Reference/Action
201B — ELECTRICAL ROUTINE	
Powertrain Control System	
<ul style="list-style-type: none"> PCM, vehicle wiring 	<ul style="list-style-type: none"> Carry out on-board diagnostic tests. Refer to the Powertrain

harnesses, Pressure Control Solenoid B	Control/Emissions Diagnosis (PC/ED) manual for diagnosis and testing of the PCM.
	<ul style="list-style-type: none"> • Go To Pinpoint Test D.
	<ul style="list-style-type: none"> • Repair as required. Clear DTCs, road test and carry out on-board diagnostic test again.
301B — HYDRAULIC/MECHANICAL ROUTINE	
Main Control	
<ul style="list-style-type: none"> • Bolt not tightened to specification. 	<ul style="list-style-type: none"> • Tighten to specification.
<ul style="list-style-type: none"> • Separator plate damage. 	<ul style="list-style-type: none"> • Inspect for damage. If damaged, install a new separator plate.
<ul style="list-style-type: none"> • Contamination 	<ul style="list-style-type: none"> • Disassemble and clean.
<ul style="list-style-type: none"> • Valves and springs damaged, misassembled, missing, stuck, or bore damaged 	<ul style="list-style-type: none"> • If damaged or parts are missing, install a new main control assembly. If misassembled, assemble correctly. DO NOT stone, file or sand valves. This removes the anodized finish and can result in further main control or transmission damage.
Center Support	
<ul style="list-style-type: none"> • Screw not tightened to specification. 	<ul style="list-style-type: none"> • Tighten to specification.
<ul style="list-style-type: none"> • Seal rings or bearing damaged 	<ul style="list-style-type: none"> • Inspect for damage. Repair as necessary.
<ul style="list-style-type: none"> • Outside diameter of case bore damage 	<ul style="list-style-type: none"> • Inspect for damage. Repair as necessary.
<ul style="list-style-type: none"> • Support damaged or leaking 	<ul style="list-style-type: none"> • Inspect for damage. Repair as necessary.
Forward Clutch Assembly	
<ul style="list-style-type: none"> • Seals, piston damaged 	<ul style="list-style-type: none"> • Inspect for damage. Repair as necessary.
<ul style="list-style-type: none"> • Check ball damaged, missing, not seating, off location 	<ul style="list-style-type: none"> • Inspect for mislocation, poor seating, damage. Install a new cylinder.
<ul style="list-style-type: none"> • Friction elements damaged or worn 	<ul style="list-style-type: none"> • Inspect for damage. Repair as necessary.
<ul style="list-style-type: none"> • Return springs damaged 	<ul style="list-style-type: none"> • Inspect for damage. Repair as necessary.
Forward Planetary Assembly	
<ul style="list-style-type: none"> • Planetary damage 	<ul style="list-style-type: none"> • Inspect for damage. Repair as necessary.
Intermediate Clutch Assembly	
<ul style="list-style-type: none"> • Seals, piston damaged 	<ul style="list-style-type: none"> • Inspect for damage. Repair as necessary.
<ul style="list-style-type: none"> • Check ball damaged, missing, not seating, off location 	<ul style="list-style-type: none"> • Inspect for mislocation, poor seating, damage. Install a new cylinder.
<ul style="list-style-type: none"> • Feed tube or seal damaged 	<ul style="list-style-type: none"> • Inspect for damage. Install a new feed tube.
<ul style="list-style-type: none"> • Friction elements damaged or worn 	<ul style="list-style-type: none"> • Inspect for damage. Repair as necessary.
<ul style="list-style-type: none"> • Return springs damaged 	<ul style="list-style-type: none"> • Inspect for damage. Repair as necessary.
Low One-Way Clutch	
<ul style="list-style-type: none"> • Worn, damaged or assembled incorrectly 	<ul style="list-style-type: none"> • Inspect for damage. Repair as necessary.

Engagement Concern: No Reverse

Possible Component	Reference/Action
202 — ELECTRICAL ROUTINE	
Powertrain Control System	
<ul style="list-style-type: none"> PCM, vehicle wiring harnesses, Pressure Control Solenoid C (PC C), Shift Solenoid B (SSB) 	<ul style="list-style-type: none"> Carry out on-board diagnostic tests. Refer to the Powertrain Control/Emissions Diagnosis (PC/ED) manual for diagnosis and testing of the PCM.
	<ul style="list-style-type: none"> Go To Pinpoint Test A and Go To Pinpoint Test D.
	<ul style="list-style-type: none"> Repair as required. Clear DTCs, road test and carry out on-board diagnostic test again.
302 — HYDRAULIC/MECHANICAL ROUTINE	
Main Control	
<ul style="list-style-type: none"> Bolts not tightened to specifications 	<ul style="list-style-type: none"> Tighten to specifications.
<ul style="list-style-type: none"> Separator plate damaged 	<ul style="list-style-type: none"> Inspect for damage. If damaged, install a new separator plate.
<ul style="list-style-type: none"> Contamination 	<ul style="list-style-type: none"> Disassemble and clean.
<ul style="list-style-type: none"> Valves and springs damaged, misassembled, missing, stuck, or bore damage 	<ul style="list-style-type: none"> If damaged or parts are missing, install a new main control assembly. If misassembled, assemble correctly. DO NOT stone, file or sand valves. This removes the anodized finish and can result in further main control or transmission damage.
Direct Clutch Assembly	
<ul style="list-style-type: none"> Seals, piston damaged 	<ul style="list-style-type: none"> Inspect or damage. Repair as necessary.
<ul style="list-style-type: none"> Check ball damaged, missing, not seating, off location 	<ul style="list-style-type: none"> Inspect for mislocation, poor seating, damage. Install a new cylinder.
<ul style="list-style-type: none"> Friction elements damaged or worn 	<ul style="list-style-type: none"> Inspect for damage. Repair as necessary.
<ul style="list-style-type: none"> Return springs damaged 	<ul style="list-style-type: none"> Inspect for damage. Repair as necessary.
Forward Clutch Assembly	
<ul style="list-style-type: none"> Seals, piston damaged 	<ul style="list-style-type: none"> Inspect for damage. Repair as necessary.
<ul style="list-style-type: none"> Check ball damaged, missing, not seating, off location 	<ul style="list-style-type: none"> Inspect for mislocation, poor seating, damage. Install a new cylinder.
<ul style="list-style-type: none"> Friction elements damaged or worn 	<ul style="list-style-type: none"> Inspect for damage. Repair as necessary.
<ul style="list-style-type: none"> Return springs damaged 	<ul style="list-style-type: none"> Inspect for damage. Repair as necessary.
Intermediate Clutch Assembly	
<ul style="list-style-type: none"> Seals, piston damaged 	<ul style="list-style-type: none"> Inspect for damage. Repair as necessary.
<ul style="list-style-type: none"> Check ball damaged, missing, not seating, off location 	<ul style="list-style-type: none"> Inspect for mislocation, poor seating, damage. Install a new cylinder.
<ul style="list-style-type: none"> Feed tube or seal damaged 	<ul style="list-style-type: none"> Inspect for damage. Install a new feed tube.
<ul style="list-style-type: none"> Friction elements damaged or worn 	<ul style="list-style-type: none"> Inspect for damage. Repair as necessary.
<ul style="list-style-type: none"> Return springs damaged 	<ul style="list-style-type: none"> Inspect for damage. Repair as necessary.
Reverse Servo	
<ul style="list-style-type: none"> Servo retaining ring damaged 	<ul style="list-style-type: none"> Inspect for damage. Repair as necessary.
<ul style="list-style-type: none"> Seals (piston and cover) 	<ul style="list-style-type: none"> Inspect for damage. Repair as necessary.

damaged	
Reverse Band	
· Band damaged	· Inspect for damage. Repair as necessary.
· Servo worn or damaged	· Inspect for damage. Repair as necessary.
Reverse Drum Assembly	
· One-way clutch damaged	· Inspect for damage. Install a new drum assembly.
· Bearing damaged	· Inspect for damage. Install a new drum assembly.

Engagement Concern: Harsh Reverse ONLY

Possible Component	Reference/Action
203 — ELECTRICAL ROUTINE	
Powertrain Control System	
· PCM, vehicle wiring harnesses, Pressure Control Solenoid C (PC C)	· Carry out on-board diagnostic tests. Refer to the Powertrain Control/Emissions Diagnosis (PC/ED) manual for diagnosis and testing of the PCM.
	· Go To Pinpoint Test D .
	· Repair as required. Clear DTCs, road test and carry out on-board diagnostic test again.
303 — HYDRAULIC/MECHANICAL ROUTINE	
Incorrect Pressures	
· High pressures	· Check pressure at Line and PC C taps.
	· Carry out Line Pressure Test, refer to procedure in this section. Follow pressure diagnosis and repair as required.
Main Control	
· Bolts not tightened to specification	· Tighten to specification.
· Separator plate damaged	· Inspect for damage. If damaged, install a new separator plate.
· Contamination	· Disassemble and clean.
· Valves and springs damaged, misassembled, missing, stuck or bore damaged	· If damaged or parts are missing, install a new main control assembly. If misassembled, assemble correctly. DO NOT stone, file or sand valves. This removes the anodized finish and can result in further main control or transmission damage.
Direct Clutch Assembly	
· Seals, piston damaged	· Inspect for damage. Repair as necessary.
· Check ball damaged, missing not seating, off location	· Inspect for mislocation, poor seating, damage. Install a new cylinder.
· Friction elements damaged or worn	· Inspect for damage. Repair as necessary.
· Return springs damaged	· Inspect for damage. Repair as necessary.
Forward Clutch Assembly	
· Seals, piston damaged	· Inspect for damage. Repair as necessary.
· Check ball damaged, missing, not seating, off location	· Inspect for mislocation, poor seating, damage. Install a new cylinder.

· Friction elements damaged or worn	· Inspect for damage. Repair as necessary.
· Return springs damaged	· Inspect for damage. Repair as necessary.
Intermediate Clutch Assembly	
· Seals, piston damaged	· Inspect for damage. Repair as necessary.
· Check ball damaged, missing, not seating, off location	· Inspect for mislocation, poor seating, damage. Install a new cylinder.
· Feed tube or seal damaged	· Inspect for damage. Install a new feed tube.
· Friction elements damaged or worn	· Inspect for damage. Repair as necessary.
· Return springs damaged	· Inspect for damage. Repair as necessary.
Reverse Servo	
· Servo retaining ring damaged	· Inspect for damage. Repair as necessary.
· Seals (piston and cover) damaged	· Inspect for damage. Repair as necessary.
Reverse Band	
· Band damaged	· Inspect for damage. Repair as necessary.
· Servo worn or damaged	· Inspect for damage. Repair as necessary.
Reverse Drum Assembly	
· One-way clutch damaged	· Inspect for damage. Install a new drum assembly.
· Bearing damaged	· Inspect for damage. Install a new drum assembly.

Engagement Concern: Harsh Forward ONLY

Possible Component	Reference/Action
204A — ELECTRICAL ROUTINE	
Powertrain Control System	
· PCM, vehicle wiring harnesses, Pressure Control Solenoid A (PC A), Pressure Control Solenoid C (PC C)	· Carry out on-board diagnostic tests. Refer to the Powertrain Control/Emissions Diagnosis (PC/ED) manual for diagnosis and testing of the PCM.
	· Go To Pinpoint Test D .
	· Repair as required. Clear DTCs, road test and carry out on-board diagnostic test again.
304A — HYDRAULIC/MECHANICAL ROUTINE	
Incorrect Pressures	
· High Pressures	· Check pressure at line and PC C taps
	· Carry out Line Pressure Test. Follow pressure diagnosis and repair as required.
Main Control	
· Bolts not tightened to specification	· Tighten to specification.
· Separator plate damaged	· Inspect for damage. If damaged, install a new separator plate.

<ul style="list-style-type: none"> Contamination 	<ul style="list-style-type: none"> Disassemble and clean.
<ul style="list-style-type: none"> Valves and springs damaged, misassembled, missing, stuck or bore damaged 	<ul style="list-style-type: none"> If damaged or parts are missing, install a new main control assembly. If misassembled, assemble correctly. DO NOT stone, file or sand valves. This will remove the anodized finish and may result in further main control or transmission damage.
OD Servo	
<ul style="list-style-type: none"> Servo retaining ring damaged 	<ul style="list-style-type: none"> Inspect for damage. Repair as necessary.
<ul style="list-style-type: none"> Seals (piston and cover) damaged 	<ul style="list-style-type: none"> Inspect for damage. Repair as necessary.
OD Band	
<ul style="list-style-type: none"> Band damaged 	<ul style="list-style-type: none"> Inspect for damage. Repair as necessary.
<ul style="list-style-type: none"> Servo worn or damaged 	<ul style="list-style-type: none"> Inspect for damage. Repair as necessary.
<ul style="list-style-type: none"> Not adjusted correctly 	<ul style="list-style-type: none"> Inspect for damage. Repair as necessary.
Center Support	
<ul style="list-style-type: none"> Screw not tightened to specification 	<ul style="list-style-type: none"> Tighten to specification.
<ul style="list-style-type: none"> Seal rings or bearing damage 	<ul style="list-style-type: none"> Inspect for damage. Repair as necessary.
<ul style="list-style-type: none"> Outside diameter of case bore damage 	<ul style="list-style-type: none"> Inspect for damage. Repair as necessary.
<ul style="list-style-type: none"> Support damaged or leaking 	<ul style="list-style-type: none"> Inspect for damage. Repair as necessary.
Forward Clutch Assembly	
<ul style="list-style-type: none"> Seals, piston damaged 	<ul style="list-style-type: none"> Inspect for damage. Repair as necessary.
<ul style="list-style-type: none"> Check ball damaged, missing, not seating, off location 	<ul style="list-style-type: none"> Inspect for mislocation, poor seating, damage. Install a new cylinder.
<ul style="list-style-type: none"> Friction elements damaged or worn 	<ul style="list-style-type: none"> Inspect for damage. Repair as necessary.
<ul style="list-style-type: none"> Return springs damaged 	<ul style="list-style-type: none"> Inspect for damage. Repair as necessary.
Intermediate Clutch Assembly	
<ul style="list-style-type: none"> Seals, piston damaged 	<ul style="list-style-type: none"> Inspect for damage. Repair as necessary.
<ul style="list-style-type: none"> Check ball damaged, missing, not seating, off location 	<ul style="list-style-type: none"> Inspect for mislocation, poor seating, damage. Install a new cylinder.
<ul style="list-style-type: none"> Feed tube or seal damaged 	<ul style="list-style-type: none"> Inspect for damage. Install a new feed tube.
<ul style="list-style-type: none"> Friction elements damaged or worn 	<ul style="list-style-type: none"> Inspect for damage. Repair as necessary.
<ul style="list-style-type: none"> Return springs damaged 	<ul style="list-style-type: none"> Inspect for damage. Repair as necessary.

Engagement Concern: Harsh Manual 1st Gear ONLY

Possible Component	Reference/Action
204B — ELECTRICAL ROUTINE	
Powertrain Control System	
<ul style="list-style-type: none"> PCM, vehicle wiring harnesses, Pressure Control Solenoid B (PC B), Turbine Shaft Speed (TSS) sensor 	<ul style="list-style-type: none"> Carry out on-board diagnostic tests. Refer to the Powertrain Control/Emissions Diagnosis (PC/ED) manual for diagnosis and testing of the PCM.
	<ul style="list-style-type: none"> Go To Pinpoint Test D and Go To Pinpoint Test E.

	<ul style="list-style-type: none"> Repair as necessary. Clear DTCs, road test and carry out on-board diagnostic test again.
304B — HYDRAULIC/MECHANICAL ROUTINE	
<ul style="list-style-type: none"> No hydraulic or mechanical concerns 	

Engagement Concern: Delayed or Soft Reverse ONLY

Possible Component	Reference/Action
205 — ELECTRICAL ROUTINE	
Powertrain Control System	
<ul style="list-style-type: none"> PCM, vehicle wiring harnesses, Pressure Control Solenoid C (PC C) 	<ul style="list-style-type: none"> Carry out on-board diagnostic tests. Refer to the Powertrain Control/Emissions Diagnosis (PC/ED) manual for diagnosis and testing of the PCM.
	<ul style="list-style-type: none"> Go To Pinpoint Test D.
	<ul style="list-style-type: none"> Repair as required. Clear DTCs, road test and carry out on-board diagnostic test again.
305 — HYDRAULIC/MECHANICAL ROUTINE	
Incorrect pressures	
<ul style="list-style-type: none"> Low pressure 	<ul style="list-style-type: none"> Check pressure at line and PC C taps.
	<ul style="list-style-type: none"> Carry out Line Pressure Test, refer to the procedure in this section. Follow pressure diagnosis and repair as necessary.
Main Control	
<ul style="list-style-type: none"> Bolts not tightened to specification 	<ul style="list-style-type: none"> Tighten to specification.
<ul style="list-style-type: none"> Separator plate damaged 	<ul style="list-style-type: none"> Inspect for damage. If damaged, install a new separator plate.
<ul style="list-style-type: none"> Contamination 	<ul style="list-style-type: none"> Disassemble and clean.
<ul style="list-style-type: none"> Valves and springs damaged, misassembled, missing, stuck or bore damaged 	<ul style="list-style-type: none"> If damaged or parts are missing, install a new main control assembly. If misassembled, assemble correctly. DO NOT stone, file or sand valves. This removes the anodized finish and can result in further main control or transmission damage.
Direct Clutch Assembly	
<ul style="list-style-type: none"> Seals, piston damaged 	<ul style="list-style-type: none"> Inspect for damage. Repair as necessary.
<ul style="list-style-type: none"> Check ball damaged, missing not seating, off location 	<ul style="list-style-type: none"> Inspect for mislocation, poor seating, damage. Install a new cylinder.
<ul style="list-style-type: none"> Friction elements damaged or worn 	<ul style="list-style-type: none"> Inspect for damage. Repair as necessary.
<ul style="list-style-type: none"> Return springs damaged 	<ul style="list-style-type: none"> Inspect for damage. Repair as necessary.
Reverse Servo	
<ul style="list-style-type: none"> Servo retaining ring damaged 	<ul style="list-style-type: none"> Inspect for damage. Repair as necessary.
<ul style="list-style-type: none"> Seals (piston and cover) damaged 	<ul style="list-style-type: none"> Inspect for damage. Repair as necessary.
Reverse Band	
<ul style="list-style-type: none"> Band damaged 	<ul style="list-style-type: none"> Inspect for damage. Repair as necessary.
<ul style="list-style-type: none"> Servo worn or damaged 	<ul style="list-style-type: none"> Inspect for damage. Repair as necessary.

Engagement Concern: Delayed/Soft Forward ONLY

Possible Component	Reference/Action
206 — ELECTRICAL ROUTINE	
Powertrain Control System	
<ul style="list-style-type: none"> PCM, vehicle wiring harnesses, Pressure Control Solenoid B (PC B) 	<ul style="list-style-type: none"> Carry out on-board diagnostic tests. Refer to the Powertrain Control/Emissions Diagnosis (PC/ED) manual for diagnosis and testing of the PCM.
	<ul style="list-style-type: none"> Go To Pinpoint Test D .
	<ul style="list-style-type: none"> Repair as necessary. Clear DTCs, road test and carry out on-board diagnostic test again.
306 — HYDRAULIC/MECHANICAL ROUTINE	
Incorrect Pressures	
<ul style="list-style-type: none"> Low pressures 	<ul style="list-style-type: none"> Check pressure at line and PC C taps.
	<ul style="list-style-type: none"> Carry out Line Pressure Test, refer to procedure in this section. Follow pressure diagnosis and repair as required.
Main Control	
<ul style="list-style-type: none"> Bolts not tightened to specification 	<ul style="list-style-type: none"> Tighten to specification.
<ul style="list-style-type: none"> Separator plate damaged 	<ul style="list-style-type: none"> Inspect for damage. If damaged, install a new separator plate.
<ul style="list-style-type: none"> Contamination 	<ul style="list-style-type: none"> Disassemble and clean.
<ul style="list-style-type: none"> Valves and springs damaged, misassembled, missing, stuck or bore damaged 	<ul style="list-style-type: none"> If damaged or parts are missing, install a new main control assembly. If misassembled, assemble correctly. DO NOT stone, file or sand valves. This removes the anodized finish and can result in further main control or transmission damage.
OD Servo	
<ul style="list-style-type: none"> Servo retaining ring damaged 	<ul style="list-style-type: none"> Inspect for damage. Repair as necessary.
<ul style="list-style-type: none"> Seals (piston and cover) damaged 	<ul style="list-style-type: none"> Inspect for damage. Repair as necessary.
OD Band	
<ul style="list-style-type: none"> Band damaged. 	<ul style="list-style-type: none"> Inspect for damage. Repair as necessary.
<ul style="list-style-type: none"> Servo worn or damaged 	<ul style="list-style-type: none"> Inspect for damage. Repair as necessary.
<ul style="list-style-type: none"> Not adjusted correctly 	<ul style="list-style-type: none"> Inspect for damage. Repair as necessary.
Center Support	
<ul style="list-style-type: none"> Screw not tightened to specification 	<ul style="list-style-type: none"> Tighten to specification.
<ul style="list-style-type: none"> Seal rings or bearing damaged 	<ul style="list-style-type: none"> Inspect for damage. Repair as necessary.
<ul style="list-style-type: none"> Outside diameter of case bore damage 	<ul style="list-style-type: none"> Inspect for damage. Repair as necessary.
<ul style="list-style-type: none"> Support damaged or leaking 	<ul style="list-style-type: none"> Inspect for damage. Repair as necessary.
Forward Clutch Assembly	
<ul style="list-style-type: none"> Seals, piston damaged 	<ul style="list-style-type: none"> Inspect for damage. Repair as necessary.
<ul style="list-style-type: none"> Check ball damaged, 	<ul style="list-style-type: none"> Inspect for mislocation, poor seating, damage. Install a new

missing, not seating, off location	cylinder.
• Friction element damaged or worn	• Inspect for damage. Repair as necessary.
• Return springs damaged	• Inspect for damage. Repair as necessary.

Engagement Concern: No Forward and No Reverse

Possible Component	Reference/Action
207 — ELECTRICAL ROUTINE	
Powertrain Control System	
• PCM, vehicle wiring harnesses, Pressure Control Solenoid B (PC B)	• Carry out on-board diagnostic tests. Refer to the Powertrain Control/Emissions Diagnosis (PC/ED) manual for diagnosis and testing of the PCM.
	• Go To Pinpoint Test D .
	• Repair as required. Clear DTCs, road test and carry out on-board diagnostic test again.
307 — HYDRAULIC/MECHANICAL ROUTINE	
Fluid	
• Incorrect level	• Adjust to the correct level. Refer to Transmission Fluid Level Check in this section.
• Condition	• Carry out Fluid Condition Check. Refer to Preliminary Inspection in this section.
Shift Cable/Digital TR Sensor	
• Cable system or digital TR sensor damaged, misaligned	• Inspect and repair as necessary. Refer to Digital Transmission Range (TR) Sensor or Section 307-05 .
Main Control	
• Bolts not tightened to specification	• Tighten bolts to specification.
• Separator plate damaged	• Inspect for damage. If damaged, install a new separator plate.
• Contamination	• Disassemble and clean.
• Valves and springs damaged, misassembled, missing, stuck, or bore damaged	• If damaged or parts are missing, install new main control assembly. If misassembled, reassemble correctly. DO NOT stone, file or sand valves. This removes the anodized finish and can result in further main control or transmission damage.
Input Shaft	
• Damaged	• Inspect for damage. Repair as necessary.
Fluid Pump Assembly	
• Bolts not tightened to specification	• Tighten bolts to specification.
• Gasket damaged	• Inspect for damage. If damaged, install a new gasket.
• Porosity, cross leaks, ball missing, plugged hole	• Inspect for damage. If damaged, repair as necessary.
• Pump gears cracked and/or siezed	• Inspect for damage. Install a new pump.
• Flow control valves, springs, or seal damaged,	• Inspect for damage. Install a new seal or flow control valve.

stuck or not assembled correctly	
OD Planetary Assembly	
· Planetary damaged	· Inspect for damage. Repair as necessary.
Center Shaft Assembly	
· Damaged. One-way clutch damaged	· Inspect for damage. Repair as necessary.
Forward Clutch Assembly	
· Seals, piston damaged	· Inspect for damage. Repair as necessary.
· Check ball damaged, missing, not seating, off location	· Inspect for mislocation, poor seating, damage. Install a new cylinder.
· Friction elements damaged or worn	· Inspect for damage. Repair as necessary.
· Return springs damaged	· Inspect for damage. Repair as necessary.
Forward Planetary Assembly	
· Planetary damaged	· Inspect for damage. Repair as necessary.
Intermediate Clutch Assembly	
· Seals, piston damaged	· Inspect for damage. Repair as necessary.
· Check ball damaged, missing, not seating, off location	· Inspect for mislocation, poor seating, damage. Install a new cylinder.
· Friction elements damaged or worn	· Inspect for damage. Repair as necessary.
· Return springs damaged	· Inspect for damage. Repair as necessary.
Reverse Planetary Assembly	
· Planetary damaged	· Inspect for damage. Repair as necessary.
Output Shaft	
· Damage	· Inspect for damage. Repair as necessary.
Torque Converter	
· Damaged flexplate or adapter plate	· Inspect for damage. Carry out the Torque Converter checks, refer to the procedure in this section. Repair as necessary.
· Damaged impeller hub	
· Damaged turbine hub	
Direct One-way Clutch	
· Worn, damaged or assembled incorrectly	· Inspect for damage. Repair as necessary.

Engagement Concern: Harsh Forward and Harsh Reverse

Possible Component	Reference/Action
208 — ELECTRICAL ROUTINE	
Powertrain Control System	
· PCM, vehicle wiring harnesses, digital TR	· Carry out on-board diagnostic tests. Refer to the Powertrain Control/Emissions Diagnosis (PC/ED) manual for diagnosis and

sensor, Transmission Fluid (TFT) sensor	testing of the PCM.
	<ul style="list-style-type: none"> • Go To Pinpoint Test B and Go To Pinpoint Test C.
	<ul style="list-style-type: none"> • Repair as necessary. Clear DTCs, road test and carry out on-board diagnostic test again.
308 — HYDRAULIC/MECHANICAL ROUTINE	
Fluid	
<ul style="list-style-type: none"> • Incorrect level 	<ul style="list-style-type: none"> • Adjust to the correct level. Refer to Transmission Fluid Level Check
<ul style="list-style-type: none"> • Condition 	<ul style="list-style-type: none"> • Carry out Fluid Condition Check. Refer to Preliminary Inspection.
Incorrect Pressures	
<ul style="list-style-type: none"> • High pressures. 	<ul style="list-style-type: none"> • Check line pressure at line and PC C taps.
	<ul style="list-style-type: none"> • Carry out Line Pressure Test. Refer to procedure in this section. Follow pressure diagnosis and repair as required.
Main Control	
<ul style="list-style-type: none"> • Bolts not tightened to specification 	<ul style="list-style-type: none"> • Tighten to specification.
<ul style="list-style-type: none"> • Separator plate damaged 	<ul style="list-style-type: none"> • Inspect for damage. If damaged, install a new separator plate.
<ul style="list-style-type: none"> • Contamination 	<ul style="list-style-type: none"> • Disassemble and clean.
<ul style="list-style-type: none"> • Valves and springs damaged, misassembled, missing, stuck, or bore damaged 	<ul style="list-style-type: none"> • If damaged or parts are missing, install new main control assembly. If misassembled, reassemble correctly. DO NOT stone, file or sand valves. This removes the anodized finish and can result in further main control or transmission damage.
Forward Clutch Assembly	
<ul style="list-style-type: none"> • Seals, piston damaged 	<ul style="list-style-type: none"> • Inspect for damage. Repair as necessary.
<ul style="list-style-type: none"> • Check ball damaged, missing, not seating, off location 	<ul style="list-style-type: none"> • Inspect for mislocation, poor seating, damage. Install a new cylinder.
<ul style="list-style-type: none"> • Friction elements damaged or worn 	<ul style="list-style-type: none"> • Inspect for damage. Repair as necessary.
<ul style="list-style-type: none"> • Return springs damaged 	<ul style="list-style-type: none"> • Inspect for damage. Repair as necessary.
Intermediate Clutch Assembly	
<ul style="list-style-type: none"> • Seals, piston damaged 	<ul style="list-style-type: none"> • Inspect for damage. Repair as necessary.
<ul style="list-style-type: none"> • Check ball damaged, missing, not seating, off location 	<ul style="list-style-type: none"> • Inspect for mislocation, poor seating, damage. Install a new cylinder.
<ul style="list-style-type: none"> • Feed tube or seal damaged 	<ul style="list-style-type: none"> • Inspect for damage. Install a new feed tube.
<ul style="list-style-type: none"> • Friction elements damaged or worn 	<ul style="list-style-type: none"> • Inspect for damage. Repair as necessary.
<ul style="list-style-type: none"> • Return springs damaged 	<ul style="list-style-type: none"> • Inspect for damage. Repair as necessary.

Engagement Concern: Delayed Forward and Delayed Reverse

Possible Component	Reference/Action
209 — ELECTRICAL ROUTINE	
Powertrain Control System	

<ul style="list-style-type: none"> PCM, vehicle wiring harnesses, Transmission Fluid Temperature (TFT) sensor 	<ul style="list-style-type: none"> Carry out on-board diagnostic tests. Refer to the Powertrain Control/Emissions Diagnosis (PC/ED) manual for diagnosis and testing of the PCM.
	<ul style="list-style-type: none"> Go To Pinpoint Test B.
	<ul style="list-style-type: none"> Repair as necessary. Clear DTCs, road test and carry out on-board diagnostic test again.
309 — HYDRAULIC/MECHANICAL ROUTINE	
Fluid	
<ul style="list-style-type: none"> Incorrect level 	<ul style="list-style-type: none"> Adjust to the correct level. Refer to Transmission Fluid Level Check.
<ul style="list-style-type: none"> Condition 	<ul style="list-style-type: none"> Carry out Fluid Condition Check. Refer to Preliminary Inspection.
Incorrect Pressures	
<ul style="list-style-type: none"> High pressures 	<ul style="list-style-type: none"> Check line pressure at line and PC C taps.
	<ul style="list-style-type: none"> Carry out Line Pressure Test. Refer to the procedure in this section. Follow pressure diagnosis and repair as required.
Main Control	
<ul style="list-style-type: none"> Bolts not tightened to specification 	<ul style="list-style-type: none"> Tighten to specification.
<ul style="list-style-type: none"> Separator plate damaged 	<ul style="list-style-type: none"> Inspect for damage. If damaged, install a new separator plate.
<ul style="list-style-type: none"> Contamination 	<ul style="list-style-type: none"> Disassemble and clean.
<ul style="list-style-type: none"> Valves and springs damaged, misassembled, missing, stuck, or bore damaged 	<ul style="list-style-type: none"> If damaged or parts are missing, install a new main control assembly. If misassembled, reassemble correctly. DO NOT stone, file, or sand valves. This removes the anodized finish and can result in further main control or transmission damage.
Fluid Pump Assembly	
<ul style="list-style-type: none"> Bolts not tightened to specification 	<ul style="list-style-type: none"> Tighten to specification.
<ul style="list-style-type: none"> Gasket damaged 	<ul style="list-style-type: none"> Inspect for damage. If damaged, install a new gasket.
<ul style="list-style-type: none"> Porosity, cross leaks, ball missing, plugged hole 	<ul style="list-style-type: none"> Inspect for damage. If damaged, repair as necessary.
<ul style="list-style-type: none"> Pump gears cracked and/or siezed 	<ul style="list-style-type: none"> Inspect for damage. Install a new pump.
<ul style="list-style-type: none"> Flow control valves, springs, or seal damaged, stuck or not assembled correctly 	<ul style="list-style-type: none"> Inspect for damage. Install a new seal or flow control valve.

Shift Concern: Some/All Shifts Missing (Automatic Mode Only)

Possible Component	Reference/Action
210 — ELECTRICAL ROUTINE	
Powertrain Control System	
<ul style="list-style-type: none"> PCM, vehicle wiring harnesses, Shift Solenoids A, B, C, Torque Converter Clutch (TCC) solenoid, Pressure Control Solenoids A, B, C, Output Shaft Speed (OSS) sensor, digital TR sensor, IAT sensor, VSS input 	<ul style="list-style-type: none"> Carry out on-board diagnostic tests. Refer to the Powertrain Control/Emissions Diagnosis (PC/ED) manual for diagnosis and testing of the PCM, IAT, and VSS.

	<ul style="list-style-type: none"> • Go To Pinpoint Test A , Go To Pinpoint Test C , Go To Pinpoint Test D and Go To Pinpoint Test E.
	<ul style="list-style-type: none"> • Repair as necessary. Clear DTCs, road test and carry out on-board diagnostic test again.
310 — HYDRAULIC/MECHANICAL ROUTINE	
Some Shifts Missing ONLY	
	<ul style="list-style-type: none"> • If only some shifts are missing, determine which shift(s) is missing.
	<ul style="list-style-type: none"> • Refer to the following routine(s) for further No Shift concerns: <ul style="list-style-type: none"> ■ No 1-2 Shift, Routine 220/320 ■ No 2-3 Shift, Routine 221/321 ■ No 3-4 Shift, Routine 222/322 ■ No 4-5 Shift, Routine 270/370 ■ No 5-4 Shift, Routine 271/371 ■ No 4-3 Shift, Routine 223/323 ■ No 3-2 Shift, Routine 224/324 ■ No 2-1 Shift, Routine 225/325
Fluid	
<ul style="list-style-type: none"> • Incorrect level 	<ul style="list-style-type: none"> • Adjust to correct level. Refer to the procedure in this section.
<ul style="list-style-type: none"> • Condition 	<ul style="list-style-type: none"> • Carry out Fluid Condition Check. Refer to the procedure in this section.
Shift Cable/Digital TR Sensor	
<ul style="list-style-type: none"> • Cable system or digital TR sensor damaged, misaligned 	<ul style="list-style-type: none"> • Inspect and repair as necessary. Refer to Digital Transmission Range (TR) Sensor or Section 307-05.
Incorrect Pressures	
<ul style="list-style-type: none"> • High/Low pressures 	<ul style="list-style-type: none"> • Check pressure at line and PC C taps.
	<ul style="list-style-type: none"> • Carry out Line Pressure Test. Follow pressure diagnosis and repair as required.
Main Control	
<ul style="list-style-type: none"> • Bolts not tightened to specification 	<ul style="list-style-type: none"> • Tighten to specification.
<ul style="list-style-type: none"> • Separator plate damaged 	<ul style="list-style-type: none"> • Inspect for damage. If damaged, install a new separator plate.
<ul style="list-style-type: none"> • Contamination 	<ul style="list-style-type: none"> • Disassemble and clean.
<ul style="list-style-type: none"> • Valves and springs damaged, misassembled, missing, stuck, or bore damaged 	<ul style="list-style-type: none"> • If damaged or parts are missing, install new main control assembly. If misassembled, reassemble correctly. DO NOT stone, file or sand valves. This removes the anodized finish and can result in further main control or transmission damage.
Fluid Pump Assembly	
<ul style="list-style-type: none"> • Bolts not tightened to specification 	<ul style="list-style-type: none"> • Tighten to specification.
<ul style="list-style-type: none"> • Gasket damaged 	<ul style="list-style-type: none"> • If damaged, install a new gasket.
<ul style="list-style-type: none"> • Porosity, cross leaks, ball missing, plugged hole 	<ul style="list-style-type: none"> • If damaged, repair as necessary.
<ul style="list-style-type: none"> • Pump gears cracked and/or siezed 	<ul style="list-style-type: none"> • Inspect for damage. Install a new pump.
<ul style="list-style-type: none"> • Flow control valves, springs, or seal damaged, stuck or not assembled correctly 	<ul style="list-style-type: none"> • Inspect for damage. Install a new seal or flow control valve.

OD Planetary Assembly	
· Planetary damaged	· Inspect for damage. Repair as necessary.
Center Support	
· Screw not tightened to specification	· Tighten to specification.
· Seal rings or bearing damaged	· Inspect for damage. Repair as necessary.
· Outside diameter of case bore damaged	· Inspect for damage. Repair as necessary.
· Support damaged or leaking	· Inspect for damage. Repair as necessary.
Direct Clutch Assembly	
· Seals, piston damaged	· Inspect for damage. Repair as necessary.
· Check ball damaged, missing, not seating, off location	· Inspect for mislocation, poor seating, damage. Install a new cylinder.
· Friction elements damaged or worn	· Inspect for damage. Repair as necessary.
· Return springs damaged	· Inspect for damage. Repair as necessary.
Intermediate Clutch Assembly	
· Seals, piston damaged	· Inspect for damage. Repair as necessary.
· Check ball damaged, missing, not seating, off location	· Inspect for mislocation, poor seating, damage. Install a new cylinder.
· Feed tube or seal damaged	· Inspect for damage. Install a new feed tube.
· Friction elements damaged or worn	· Inspect for damage. Repair as necessary.
· Return springs damaged	· Inspect for damage. Repair as necessary.
Intermediate One-Way Clutch	
· Worn, damaged, or assembled incorrectly	· Inspect for damage. Repair as necessary.

Shift Concern: Timing Concerns—Early/Late

Possible Component	Reference/Action
211— ELECTRICAL ROUTINE	
Powertrain Control System	
· PCM, vehicle wiring harnesses, Output Shaft Speed (OSS) sensor, IAT sensor	· Carry out on-board diagnostic tests. Refer to the Powertrain Control/Emissions Diagnosis (PC/ED) manual for diagnosis and testing of the PCM and IAT.
	· Go To Pinpoint Test E .
	· Repair as necessary. Clear DTCs, road test and carry out on-board diagnostic test again.
311 — HYDRAULIC/MECHANICAL ROUTINE	
Only some Shifts Early/Late	
	· If only some shifts are early/late, determine which shift(s) is missing.
	· Refer to the following routine(s) for further No Shift concerns: <ul style="list-style-type: none"> ■ Soft/Slipping 1-2 Shift, Routine 226/326 ■ Soft/Slipping 2-3 Shift, Routine 227/327 ■ Soft/Slipping 3-4 Shift, Routine 228/328 ■ Soft/Slipping 4-5 Shift, Routine 272/372 ■ Soft/Slipping 5-4 Shift, Routine 273/373

	<ul style="list-style-type: none"> ■ Soft/Slipping 4-3 Shift, Routine 229/329 ■ Soft/Slipping 3-2 Shift, Routine 230/330 ■ Soft/Slipping 2-1 Shift, Routine 221/321
Fluid	
· Incorrect level	· Adjust to the correct level. Refer to Transmission Fluid Level Check .
· Condition	· Carry out Fluid Condition Check. Refer to Preliminary Inspection .
Main Control	
· Bolts not tightened to specification	· Tighten to specification.
· Separator plate damaged	· Inspect for damage. If damaged, install a new separator plate.
· Contamination	· Disassemble and clean.
· Valves and springs damaged, misassembled, missing, stuck, or bore damaged	· If damaged or parts are missing, install new main control assembly. If misassembled, reassemble correctly. DO NOT stone, file or sand valves. This removes the anodized finish and can result in further main control or transmission damage.
OD Servo	
· Servo retaining ring damaged	· Inspect for damage. Repair as necessary.
· Seals (piston and cover) damaged	· Inspect for damage. Repair as necessary.
OD Band	
· Band damaged	· Inspect for damage. Repair as necessary.
· Servo worn or damaged	· Inspect for damage. Repair as necessary.
· Not adjusted correctly	· Inspect for damage. Repair as necessary.

Shift Concern: Timing Concerns—Erratic/Hunting (Some/All)

Possible Component	Reference/Action
212 — ELECTRICAL ROUTINE	
Powertrain Control System	
· PCM, vehicle wiring harnesses, Output Shaft Speed (OSS) sensor, IAT sensor	· Carry out on-board diagnostic tests. Refer to the Powertrain Control/Emissions Diagnosis (PC/ED) manual for diagnosis and testing of the PCM and IAT.
	· Go To Pinpoint Test E .
	· Repair as necessary. Clear DTCs, road test and carry out on-board diagnostic test again.
312 — HYDRAULIC/MECHANICAL ROUTINE	
Fluid	
· Incorrect level	· Adjust to the correct level. Refer to Transmission Fluid Level Check .
· Condition	· Carry out Fluid Condition Check. Refer to procedure in this section.
Main Control	
· Bolts not tightened to specification	· Tighten to specification.

<ul style="list-style-type: none"> • Separator plate damaged 	<ul style="list-style-type: none"> • Inspect for damage. If damaged, install a new separator plate.
<ul style="list-style-type: none"> • Contamination 	<ul style="list-style-type: none"> • Disassemble and clean.
<ul style="list-style-type: none"> • Valves and springs damaged, misassembled, missing, stuck, or bore damaged 	<ul style="list-style-type: none"> • If damaged or parts are missing, install new main control assembly. If misassembled, reassemble correctly. DO NOT stone, file or sand valves. This removes the anodized finish and can result in further main control or transmission damage.
<p>Further Diagnosis</p> <ul style="list-style-type: none"> • For further diagnosis for timing issues, refer to Reference/Actions 	<ul style="list-style-type: none"> • Refer to the following routine(s) for specific diagnosis: <ul style="list-style-type: none"> ● No 1-2 shift see Routine 220/320 ● No 2-3 shift see Routine 221/321 ● No 3-4 shift see Routine 222/323 ● No 4-5 shift see Routine 270/370 ● No 5-4 shift see Routine 271/371 ● No 4-3 shift see Routine 223/323 ● No 3-2 shift see Routine 224/324 ● No 2-1 shift see Routine 225/325 ● Soft/Slip 1-2 shift see Routine 226/326 ● Soft/Slip 2-3 shift see Routine 227/327 ● Soft/Slip 3-4 shift see Routine 228/328 ● Soft/Slip 4-5 shift see Routine 272/372 ● Soft/Slip 5-4 shift see Routine 273/373 ● Soft/Slip 4-3 shift see Routine 229/329 ● Soft/Slip 3-2 shift see Routine 230/330 ● Soft/Slip 2-1 shift see Routine 231/331 ● Harsh 1-2 shift see Routine 232/332 ● Harsh 2-3 shift see Routine 234/334 ● Harsh 3-4 shift see Routine 234/334 ● Harsh 4-5 shift see Routine 274/374 ● Harsh 5-4 shift see Routine 275/375 ● Harsh 4-3 shift see Routine 235/335 ● Harsh 3-2 shift see Routine 236/336 ● Harsh 2-1 shift see Routine 237/337

Engagement Concern: Feel—Soft/Slipping (Some/All)

Possible Component	Reference/Action
213 — ELECTRICAL ROUTINE	
Powertrain Control System	
<ul style="list-style-type: none"> • PCM, vehicle wiring harnesses, Shift Solenoids A, B, C, Pressure Control Solenoids A, B, C, D, Intermediate Shaft Speed (ISS) sensor, Transmission Fluid Temperature (TFT) sensor, IAT Sensor, VSS input 	<ul style="list-style-type: none"> • Carry out on-board diagnostic tests. Refer to the Powertrain Control/Emissions Diagnosis (PC/ED) manual for diagnosis and testing of the PCM, IAT, and VSS.
	<ul style="list-style-type: none"> • Go To Pinpoint Test A, Go To Pinpoint Test B, Go To Pinpoint Test D and Go To Pinpoint Test E.
	<ul style="list-style-type: none"> • Repair as necessary. Clear DTCs, road test and carry out on-board diagnostic test again.
313 — HYDRAULIC/MECHANICAL ROUTINE	
Only some Shifts Soft/Slipping	
	<ul style="list-style-type: none"> • If only some of the shifts are soft/slipping, determine which shift(s) is missing.
	<ul style="list-style-type: none"> • Refer to the following routine(s) for further

	<p>Soft/Slipping concerns:</p> <ul style="list-style-type: none"> ■ Soft/Slipping 1-2 Shift, Routine 226/326 ■ Soft/Slipping 2-3 Shift, Routine 227/327 ■ Soft/Slipping 3-4 Shift, Routine 228/328 ■ Soft/Slipping 4-5 Shift, Routine 272/372 ■ Soft/Slipping 5-4 Shift, Routine 273/373 ■ Soft/Slipping 4-3 Shift, Routine 229/329 ■ Soft/Slipping 3-2 Shift, Routine 230/330 ■ Soft/Slipping 2-1 Shift, Routine 231/331
Fluid	
· Incorrect level	· Adjust to the correct level. Refer to Transmission Fluid Level Check in this section.
· Condition	· Carry out Fluid Condition Check. Refer to the procedure in this section.
Incorrect Pressures	
· High/Low pressures	· Check pressure at line and PC C taps.
	· Carry out Line Pressure Test. Refer to the procedure in this section. Follow pressure diagnosis and repair as necessary.
Main Control	
· Bolts not tightened to specification	· Tighten to specification.
· Separator plate damaged	· Inspect for damage. If damaged, install a new separator plate.
· Contamination	· Disassemble and clean.
· Valves and springs damaged, misassembled, missing, stuck, or bore damaged	· If damaged or parts are missing, install new main control assembly. If misassembled, reassemble correctly. DO NOT stone, file or sand valves. This removes the anodized finish and can result in further main control or transmission damage.
Fluid Pump Assembly	
· Bolts not tightened to specification	· Tighten to specification.
· Gasket damaged	· Inspect for damage. If damaged, install a new gasket.
· Porosity, cross leaks, misassembled, ball missing, plugged hole	· Inspect for damage. If damaged, repair as necessary.
· Pump gears cracked and/or siezed	· Inspect for damage. Install a new pump.
· Flow control valves, springs, or seal damaged, stuck or not assembled correctly	· Inspect for damage. Install a new seal or flow control valve.
Coast Clutch Assembly	
· Seals, piston damaged	· Inspect for damage. Repair as necessary.
· Check ball damaged, missing, not seating, off location	· Inspect for mislocation, poor seating, damage. Install a new cylinder.
· Friction elements damaged or worn	· Inspect for damage. Repair as necessary.
· Return springs damaged	· Inspect for damage. Repair as necessary.
Center Support	
· Screw not tightened to specification	· Tighten to specification.
· Seal rings or bearings damaged	· Inspect for damage. Repair as necessary.
· Outside diameter of case bore damage	· Inspect for damage. Repair as necessary.

· Support damaged or leaking	· Inspect for damage. Repair as necessary.
Intermediate Servo	
· Servo retaining ring damaged	· Inspect for damage. Repair as necessary.
· Seals (piston and cover) damaged	· Inspect for damage. Repair as necessary.
Intermediate Band	
· Band damaged	· Inspect for damage. Repair as necessary.
· Servo worn or damaged	· Inspect for damage. Repair as necessary.
· Not adjusted correctly	· Inspect for damage. Repair as necessary.
Direct Clutch Assembly	
· Seals, piston damaged	· Inspect for damage. Repair as necessary.
· Check ball damaged, missing, not seating, off location	· Inspect for mislocation, poor seating, damage. Install a new cylinder.
· Friction elements damaged or worn	· Inspect for damage. Repair as necessary.
· Return springs damaged	· Inspect for damage. Repair as necessary.
Forward Clutch Assembly	
· Seals, piston damaged	· Inspect for damage. Repair as necessary.
· Check ball damaged, missing, not seating, off location	· Inspect for mislocation, poor seating, damage. Install a new cylinder.
· Friction elements damaged or worn	· Inspect for damage. Repair as necessary.
· Return springs damaged	· Inspect for damage. Repair as necessary.
Intermediate Clutch Assembly	
· Seals, piston damaged	· Inspect for damage. Repair as necessary.
· Check ball damaged, missing, not seating, off location	· Inspect for mislocation, poor seating, damage. Install a new cylinder.
· Feed tube or seal damaged	· Inspect for damage. Install a new feed tube.
· Friction elements damaged or worn	· Inspect for damage. Repair as necessary.
· Return springs damaged	· Inspect for damage. Repair as necessary.
Reverse Servo	
· Servo retaining ring damaged	· Inspect for damage. Repair as necessary.
· Seals (piston and cover) damaged	· Inspect for damage. Repair as necessary.
Reverse Band	
· Band damaged	· Inspect for damage. Repair as necessary.
· Servo worn or damaged	· Inspect for damage. Repair as necessary.
Case	
· Damaged	· Inspect for damage. Repair as necessary.

Shift Concern: Feel—Harsh (Some/All)

Possible Component	Reference/Action
214— ELECTRICAL ROUTINE	
Powertrain Control System	
· PCM, vehicle wiring harnesses, Shift Solenoids A, B, C, Pressure Control	· Carry out on-board diagnostic tests. Refer to the Powertrain Control/Emissions Diagnosis

Solenoids A, B, C, D, Intermediate Shaft Speed (ISS) sensor, digital TR sensor, Transmission Fluid Temperature (TFT) sensor, IAT sensor, VSS input	(PC/ED) manual for diagnosis and testing of the PCM, IAT, and VSS.
	<ul style="list-style-type: none"> • Go To Pinpoint Test A, Go To Pinpoint Test B, Go To Pinpoint Test D and Go To Pinpoint Test E.
	<ul style="list-style-type: none"> • Repair as necessary. Clear DTCs, road test and carry out on-board diagnostic test again.
314 — HYDRAULIC/MECHANICAL ROUTINE	
Only some Shifts Harsh	
	<ul style="list-style-type: none"> • If only some of the shifts are harsh, determine which shift(s) is missing.
	<ul style="list-style-type: none"> • Refer to the following routine(s) for further No Shift concerns: <ul style="list-style-type: none"> ■ Harsh 1-2 Shift, Routine 232/332 ■ Harsh 2-3 Shift, Routine 233/333 ■ Harsh 3-4 Shift, Routine 234/334 ■ Harsh 4-5 Shift, Routine 274/374 ■ Harsh 5-4 Shift, Routine 275/375 ■ Harsh 4-3 Shift, Routine 235/335 ■ Harsh 3-2 Shift, Routine 236/336 ■ Harsh 2-1 Shift, Routine 237/337
Incorrect Pressures	
<ul style="list-style-type: none"> • High/Low pressures 	<ul style="list-style-type: none"> • Check pressure at line and PC C taps.
	<ul style="list-style-type: none"> • Carry out Line Pressure Test, refer to procedure in this section. Follow pressure diagnosis and repair as required.
Main Control	
<ul style="list-style-type: none"> • Bolts not tightened to specification 	<ul style="list-style-type: none"> • Tighten to specification.
<ul style="list-style-type: none"> • Separator plate damaged 	<ul style="list-style-type: none"> • Inspect for damage. If damaged, install a new separator plate.
<ul style="list-style-type: none"> • Contamination 	<ul style="list-style-type: none"> • Disassemble and clean.
<ul style="list-style-type: none"> • Valves and springs damaged, misassembled, missing, stuck, or bore damaged 	<ul style="list-style-type: none"> • If damaged or parts are missing, install new main control assembly. If misassembled, reassemble correctly. DO NOT stone, file or sand valves. This removes the anodized finish and can result in further main control or transmission damage.
Input Shaft	
<ul style="list-style-type: none"> • Damaged 	<ul style="list-style-type: none"> • Inspect for damage. Repair as necessary.
OD Servo	
<ul style="list-style-type: none"> • Servo retaining ring damaged 	<ul style="list-style-type: none"> • Inspect for damage. Repair as necessary.
<ul style="list-style-type: none"> • Seals (piston and cover) damaged 	<ul style="list-style-type: none"> • Inspect for damage. Repair as necessary.
OD Band	
<ul style="list-style-type: none"> • Band damaged 	<ul style="list-style-type: none"> • Inspect for damage. Repair as necessary.
<ul style="list-style-type: none"> • Servo worn or damaged 	<ul style="list-style-type: none"> • Inspect for damage. Repair as necessary.
<ul style="list-style-type: none"> • Not adjusted correctly 	<ul style="list-style-type: none"> • Inspect for damage. Repair as necessary.
<ul style="list-style-type: none"> • Anchor pins worn or damaged 	<ul style="list-style-type: none"> • Inspect for damage. Repair as necessary.
Center Shaft Assembly	

· Center shaft assembly damaged	· Inspect for damage. Repair as necessary.
· One-way clutch damaged	· Inspect for damage. Repair as necessary.
Intermediate Servo	
· Servo retaining ring damaged	· Inspect for damage. Repair as necessary.
· Seals (piston and cover) damaged	· Inspect for damage. Repair as necessary.
Intermediate Band	
· Band damaged	· Inspect for damage. Repair as necessary.
· Servo worn or damaged	· Inspect for damage. Repair as necessary.
· Not adjusted correctly	· Inspect for damage. Repair as necessary.
Forward Clutch Assembly	
· Seals, piston damaged	· Inspect for damage. Repair as necessary.
· Check ball damaged, missing, not seating, off location	· Inspect for mislocation, poor seating, damage. Install a new cylinder.
· Friction elements damaged or worn	· Inspect for damage. Repair as necessary.
· Return springs damaged	· Inspect for damage. Repair as necessary.
Intermediate Clutch Assembly	
· Seals, piston damaged	· Inspect for damage. Repair as necessary.
· Check ball damaged, missing, not seating, off location	· Inspect for mislocation, poor seating, damage. Install a new cylinder.
· Feed tube or seals damaged	· Inspect for damage. Install a new feed tube.
· Friction elements damaged or worn	· Inspect for damage. Repair as necessary.
· Return springs damaged	· Inspect for damage. Repair as necessary.
Reverse Servo	
· Servo retaining ring damaged	· Inspect for damage. Repair as necessary.
· Seals (piston and cover) damaged	· Inspect for damage. Repair as necessary.
Reverse Band	
· Band damaged	· Inspect for damage. Repair as necessary.
· Servo worn or damaged	· Inspect for damage. Repair as necessary.
Output Shaft	
· Damaged	· Inspect for damage. Repair as necessary.
Case	
· Damaged	· Inspect for damage. Repair as necessary.

Shift Concern: No 1st and 2nd Gear in Drive, Engages in a Higher Gear

Possible Component	Reference/Action
215 — ELECTRICAL ROUTINE	
Powertrain Control System	
· PCM, vehicle wiring harnesses, Shift Solenoids A, B, C, digital TR sensor	· Carry out on-board diagnostic tests. Refer to the Powertrain Control/Emissions Diagnosis (PC/ED) manual for diagnosis and testing of the PCM.
	· Go To Pinpoint Test A and Go To Pinpoint Test C .

	<ul style="list-style-type: none"> Repair as necessary. Clear DTCs, road test and carry out on-board diagnostic test again.
315 — HYDRAULIC/MECHANICAL ROUTINE	
Incorrect Pressures	
<ul style="list-style-type: none"> High/Low pressures 	<ul style="list-style-type: none"> Check which pressures are on at Line and PC C taps. Refer to the Band/Clutch Chart in this section to determine which gears are on. Follow the diagnostic routines to repair the missing gears.
Main Control	
<ul style="list-style-type: none"> Bolts not tightened to specification 	<ul style="list-style-type: none"> Tighten to specification.
<ul style="list-style-type: none"> Separator plate damaged 	<ul style="list-style-type: none"> Inspect for damage. If damaged, install a new separator plate.
<ul style="list-style-type: none"> Contamination 	<ul style="list-style-type: none"> Disassemble and clean.
<ul style="list-style-type: none"> Valves and springs damaged, misassembled, missing, stuck, or bore damaged 	<ul style="list-style-type: none"> If damaged or parts are missing, install new main control assembly. If misassembled, reassemble correctly. DO NOT stone, file, or sand valves. This removes the anodized finish and can result in further main control or transmission damage.
Intermediate Clutch Assembly	
<ul style="list-style-type: none"> Seals, piston damaged 	<ul style="list-style-type: none"> Inspect for damage. Repair as necessary.
<ul style="list-style-type: none"> Check ball damaged, missing, not seating, off location 	<ul style="list-style-type: none"> Inspect for mislocation, poor seating, damage. Install a new cylinder.
<ul style="list-style-type: none"> Feed tube or seal damaged 	<ul style="list-style-type: none"> Inspect for damage. Install a new feed tube.
<ul style="list-style-type: none"> Friction elements damaged or worn 	<ul style="list-style-type: none"> Inspect for damage. Repair as necessary.
<ul style="list-style-type: none"> Return springs damaged 	<ul style="list-style-type: none"> Inspect for damage. Repair as necessary.
Direct One-way Clutch	
<ul style="list-style-type: none"> Worn, damaged or assembled incorrectly 	<ul style="list-style-type: none"> Inspect for damage. Repair as necessary.
Low One-Way Clutch	
<ul style="list-style-type: none"> Worn, damaged or assembled incorrectly 	<ul style="list-style-type: none"> Inspect for damage. Repair as necessary.

Engagement Concern: No 1st Gear in Manual 1 Position

Possible Component	Reference/Action
216 — ELECTRICAL ROUTINE	
Powertrain Control System	
<ul style="list-style-type: none"> PCM, vehicle wiring harnesses, Shift Solenoids A, B, Pressure Control Solenoids B, C 	<ul style="list-style-type: none"> Carry out on-board diagnostic tests. Refer to the Powertrain Control/Emissions Diagnosis (PC/ED) manual for diagnosis and testing of the PCM.
	<ul style="list-style-type: none"> Go To Pinpoint Test A and Go To Pinpoint Test D.
	<ul style="list-style-type: none"> Repair as necessary. Clear DTCs, road test and carry out on-board diagnostic test again.
316 — HYDRAULIC/MECHANICAL ROUTINE	
Incorrect Pressures	

<ul style="list-style-type: none"> High/Low pressures 	<ul style="list-style-type: none"> Carry out Line Pressure Test. Refer to the procedure in this section. Follow pressure diagnosis and repair as required.
Main Control	
<ul style="list-style-type: none"> Bolts not tightened to specification 	<ul style="list-style-type: none"> Tighten to specification.
<ul style="list-style-type: none"> Separator plate damaged 	<ul style="list-style-type: none"> Inspect for damage. If damaged, install a new separator plate.
<ul style="list-style-type: none"> Contamination 	<ul style="list-style-type: none"> Disassemble and clean.
<ul style="list-style-type: none"> Valves and springs damaged, misassembled, missing, stuck or bore damaged 	<ul style="list-style-type: none"> If damaged or parts are missing, install new main control assembly. If misassembled, reassemble correctly. DO NOT stone, file or sand valves. This removes the anodized finish and can result in further main control or transmission damage.
OD Planetary Assembly	
<ul style="list-style-type: none"> Planetary damaged 	<ul style="list-style-type: none"> Inspect for damage. Repair as necessary.
Direct One-Way Clutch	
<ul style="list-style-type: none"> Worn, damaged or assembled incorrectly 	<ul style="list-style-type: none"> Inspect for damage. Repair as necessary.
Low One-Way Clutch	
<ul style="list-style-type: none"> Worn, damaged or assembled incorrectly 	<ul style="list-style-type: none"> Inspect for damage. Repair as necessary.

Shift Concern: No 2nd Gear in Manual 2 Position

Possible Component	Reference/Action
217 — ELECTRICAL ROUTINE	
Powertrain Control System	
<ul style="list-style-type: none"> PCM, vehicle wiring harnesses, Shift Solenoids A, B, C, Pressure Control Solenoid B 	<ul style="list-style-type: none"> Carry out on-board diagnostic tests. Refer to the Powertrain Control/Emissions Diagnosis (PC/ED) manual for diagnosis and testing of the PCM.
	<ul style="list-style-type: none"> Go To Pinpoint Test A and Go To Pinpoint Test D.
	<ul style="list-style-type: none"> Repair as necessary. Clear DTCs, road test and carry out on-board diagnostic test again.
317 — HYDRAULIC/MECHANICAL ROUTINE	
Incorrect Pressures	
<ul style="list-style-type: none"> High/Low pressures 	<ul style="list-style-type: none"> Check pressure at Line and PC C taps.
	<ul style="list-style-type: none"> Carry out Line Pressure Test. Refer to the procedure in this section. Follow pressure diagnosis and repair.
Main Control	
<ul style="list-style-type: none"> Bolts not tightened to specification. 	<ul style="list-style-type: none"> Tighten to specification.
<ul style="list-style-type: none"> Separator plate damaged 	<ul style="list-style-type: none"> Inspect for damage. If damaged, install a new separator plate.
<ul style="list-style-type: none"> Contamination 	<ul style="list-style-type: none"> Disassemble and clean.
<ul style="list-style-type: none"> Valves and springs damaged, misassembled, missing, stuck, or bore damaged 	<ul style="list-style-type: none"> If damaged or parts are missing, install a new main control assembly. If misassembled, reassemble correctly. DO NOT stone, file or sand valves. This removes the anodized finish and can result in further main control or transmission damage.
OD Servo	

· Servo retaining ring damaged	· Inspect for damage. Repair as necessary.
· Seals (piston and cover) damaged	· Inspect for damage. Repair as necessary.
OD Band	
· Band damaged	· Inspect for damage. Repair as necessary.
· Servo worn or damaged	· Inspect for damage. Repair as necessary.
· Not adjusted correctly	· Inspect for damage. Repair as necessary.
Direct One-Way Clutch	
· Worn, damaged or assembled incorrectly	· Inspect for damage. Repair as necessary.
Low One-Way Clutch	
· Worn, damaged or assembled incorrectly	· Inspect for damage. Repair as necessary.

Torque Converter Operation Concerns: Does Not Apply

Possible Component	Reference/Action
240 — ELECTRICAL ROUTINE	
Powertrain Control System	
· PCM, vehicle wiring harnesses, Torque Converter Clutch (TCC) solenoid, Transmission Fluid Temperature (TFT) sensor	· Carry out on-board diagnostic tests. Refer to the Powertrain Control/Emissions Diagnosis (PC/ED) manual for diagnosis and testing of the PCM.
	· Go To Pinpoint Test A and Go To Pinpoint Test B .
	· Repair as necessary. Clear DTCs, road test and carry out on-board diagnostic test again.
340 — HYDRAULIC/MECHANICAL ROUTINE	
Incorrect Pressures	
· High/Low pressures	· Check pressure at Line and PC C taps.
	· Carry out Line Pressure Test. Follow pressure diagnosis and repair as required.
Main Control	
· Bolts not tightened to specification	· Tighten to specification.
· Separator plate damaged	· Inspect for damage. If damaged, install a new separator plate.
· Contamination	· Disassemble and clean.
· Valves and springs damaged, misassembled, missing, stuck, or bore damaged	· If damaged or parts are missing, install new main control assembly. If misassembled, reassemble correctly. DO NOT stone, file or sand valves. This removes the anodized finish and can result in further main control or transmission damage.
Fluid Pump Assembly	
· Bolts not tightened to specification	· Tighten bolts to specification.
· Gasket damaged	· Inspect or damage. If damaged, install a new fluid pump assembly.

<ul style="list-style-type: none"> • Porosity, cross leaks, ball missing, plugged hole 	<ul style="list-style-type: none"> • Inspect for damage. If damaged, install a new fluid pump assembly.
<ul style="list-style-type: none"> • Pump gears cracked and/or siezed 	<ul style="list-style-type: none"> • Inspect for damage. Install a new pump.
<ul style="list-style-type: none"> • Flow control valves, springs, or seal damaged, stuck or not assembled correctly 	<ul style="list-style-type: none"> • Inspect for damage. Install a new seal or flow control valve.
Torque Converter Assembly	
<ul style="list-style-type: none"> • Torque Converter internal failure preventing engagement, piston application 	<ul style="list-style-type: none"> • Remove transmission. Inspect for damage. Carry out Torque Converter checks. If the torque converter fails to pass the checks or is damaged, install a new or remanufactured torque converter.

Torque Converter Operation Concern: Always Applied/Stalls Vehicle

Possible Component	Reference/Action
241 — ELECTRICAL ROUTINE	
Powertrain Control System	
<ul style="list-style-type: none"> • PCM, vehicle wiring harnesses, Torque Converter Clutch (TCC) solenoid 	<ul style="list-style-type: none"> • Carry out on-board diagnostic tests. Refer to the Powertrain Control/Emissions Diagnosis (PC/ED) manual for diagnosis and testing of the PCM.
	<ul style="list-style-type: none"> • Go To Pinpoint Test A.
	<ul style="list-style-type: none"> • Repair as necessary. Clear DTCs, road test and carry out on-board diagnostic test again.
341 — HYDRAULIC/MECHANICAL ROUTINE	
Main Control	
<ul style="list-style-type: none"> • Bolts not tightened to specification 	<ul style="list-style-type: none"> • Tighten to specification.
<ul style="list-style-type: none"> • Separator plate damaged 	<ul style="list-style-type: none"> • Inspect for damage. If damaged, install a new separator plate.
<ul style="list-style-type: none"> • Contamination 	<ul style="list-style-type: none"> • Disassemble and clean.
<ul style="list-style-type: none"> • Valve and springs damaged, misassembled, missing, stuck, or bore damaged 	<ul style="list-style-type: none"> • If damaged or parts are missing, install new main control assembly. If misassembled, reassemble correctly. DO NOT stone, file or sand valves. This removes the anodized finish and can result in further main control or transmission damage.
<ul style="list-style-type: none"> • Low one-way clutch 	<ul style="list-style-type: none"> • Inspect for damage. Repair as necessary.
Torque Converter Assembly	
<ul style="list-style-type: none"> • Torque Converter internal failure preventing engagement, piston release 	<ul style="list-style-type: none"> • Remove transmission. Inspect for damage. Carry out Torque Converter checks. If the torque converter fails to pass the checks or is damaged, install a new or remanufactured torque converter.
Low One-Way Clutch	
<ul style="list-style-type: none"> • Worn, damaged or assembled incorrectly 	<ul style="list-style-type: none"> • Inspect for damage. Repair as necessary.

Torque Converter Operation Concern: Cycling/Shudder/Chatter

Possible Component	Reference/Action

242 — ELECTRICAL ROUTINE

Powertrain Control System	
<ul style="list-style-type: none"> PCM, vehicle wiring harnesses, Torque Converter Clutch (TCC) solenoid 	<ul style="list-style-type: none"> Carry out on-board diagnostic tests. Refer to the Powertrain Control/Emissions Diagnosis (PC/ED) manual for diagnosis and testing of the PCM.
	<ul style="list-style-type: none"> Go To Pinpoint Test A.
	<ul style="list-style-type: none"> Repair as necessary. Clear DTCs, road test and carry out on-board diagnosis test again.

342 — HYDRAULIC/MECHANICAL ROUTINE

Fluid	
<ul style="list-style-type: none"> Condition—contaminated, degraded 	<ul style="list-style-type: none"> Carry out Fluid Condition Check. Refer to the procedure in this section. If contaminated, locate source of contamination. If burnt, inspect mechanical bands, clutches. Repair as necessary. Change fluid. Carry out drain and refill procedure. Refer to Transmission Fluid Drain and Refill—Automated Equipment, Transmission Fluid Drain and Refill—Vehicles With Torque Converter Drain Plug or Transmission Fluid Drain and Refill—Vehicles Without Torque Converter Drain Plug in this section. Carry out fluid cooler and torque converter cleaning procedure. Refer to Section 307-02.
Main Control	
<ul style="list-style-type: none"> Bolts not tightened to specification 	<ul style="list-style-type: none"> Tighten to specification.
<ul style="list-style-type: none"> Separator plate damaged 	<ul style="list-style-type: none"> Inspect for damage. If damaged, install a new separator plate.
<ul style="list-style-type: none"> Contamination 	<ul style="list-style-type: none"> Disassemble and clean.
<ul style="list-style-type: none"> Valve and springs damaged, misassembled, missing, stuck, or bore damaged 	<ul style="list-style-type: none"> If damaged or parts are missing, install new main control assembly. If misassembled, reassemble correctly. DO NOT stone, file or sand valves. This removes the anodized finish and can result in further main control or transmission damage.
Torque Converter Assembly	
<ul style="list-style-type: none"> Torque converter internal leakage, clutch material damaged 	<ul style="list-style-type: none"> Remove transmission. Inspect for damage. Carry out torque converter checks, refer to procedures in this section. If torque converter fails to pass the checks or is damaged, install a new or remanufactured converter.

Other Concerns: Shift Lever Efforts High

Possible Component	Reference/Action
251 — ELECTRICAL ROUTINE	
Powertrain Control System	
<ul style="list-style-type: none"> PCM, vehicle wiring harnesses, digital TR sensor 	<ul style="list-style-type: none"> Carry out on-board diagnostic tests. Refer to the Powertrain Control/Emissions Diagnosis (PC/ED) manual for diagnosis and testing of the PCM.
	<ul style="list-style-type: none"> Go To Pinpoint Test C.
	<ul style="list-style-type: none"> Repair as required. Clear DTCs, road test and carry out on-board diagnostic test again.
351 — HYDRAULIC/MECHANICAL ROUTINE	

Shift Cable, Digital TR sensor	
<ul style="list-style-type: none"> • Cable system or digital TR sensor damaged, misaligned 	<ul style="list-style-type: none"> • Inspect and repair as required. For shift cable information, refer to Section 307-05. For digital TR information, refer to this section.
Main Control	
<ul style="list-style-type: none"> • Bolts not tightened to specification 	<ul style="list-style-type: none"> • Tighten to specification.
<ul style="list-style-type: none"> • Separator plate damaged 	<ul style="list-style-type: none"> • Inspect for damage. If damaged, install a new separator plate.
<ul style="list-style-type: none"> • Contamination 	<ul style="list-style-type: none"> • Disassemble and clean.
<ul style="list-style-type: none"> • Valve and springs damaged, misassembled, missing, stuck, or bore damaged 	<ul style="list-style-type: none"> • If damaged or parts are missing, install new main control assembly. If misassembled, reassemble correctly. DO NOT stone, file or sand valves. This removes the anodized finish and can result in further main control or transmission damage.
Case	
<ul style="list-style-type: none"> • Manual control lever assembly damage, manual valve inner lever pin bent, manual valve inner lever damaged, spring rod damaged 	<ul style="list-style-type: none"> • Inspect for damage. If damaged, install a new part.
<ul style="list-style-type: none"> • Manual valve lever shaft retaining pin damaged 	<ul style="list-style-type: none"> • Inspect for damage. If damaged, repair as necessary.

Other Concerns: External Leaks

Possible Component	Reference/Action
252 — ELECTRICAL ROUTINE	
Powertrain Control System	
<ul style="list-style-type: none"> • Output Shaft Speed (OSS) sensor, Intermediate Shaft Speed (ISS) sensor, Turbine Shaft Speed (TSS) sensor, digital TR sensor 	<ul style="list-style-type: none"> • Inspect for leakage. If areas around sensor show signs of leakage, install a new sensor O-ring seal. If area behind digital TR sensor shows signs of a leak, a new manual lever shaft seal may need to be installed.
352 — HYDRAULIC/MECHANICAL ROUTINE	
Fluid	
<ul style="list-style-type: none"> • Incorrect level 	<ul style="list-style-type: none"> • Adjust to correct level. Refer to the procedure in this section.
Case	
<ul style="list-style-type: none"> • Case vent damaged 	<ul style="list-style-type: none"> • Inspect for damage. If damaged, repair as necessary.
Seals/Gaskets	
<ul style="list-style-type: none"> • Leakage at gaskets, seals, etc. 	<ul style="list-style-type: none"> • Refer to Leakage Inspection and Fluid Leakage in the Torque Converter Area diagrams in this section for potential leak locations.
	<ul style="list-style-type: none"> • Remove all traces of lubricant on exposed surfaces of the transmission. Check vent for free breathing. Operate the vehicle at normal temperatures and carry out Leak Check Test procedures in this section. Repair as necessary.

Other Concern: Poor Vehicle Performance

Possible Component	Reference/Action

253 — ELECTRICAL ROUTINE

Powertrain Control System	
<ul style="list-style-type: none"> PCM, vehicle wiring harnesses, Shift Solenoids A, B, C, Pressure Control Solenoids A, B, C, Output Shaft Speed (OSS) sensor, Turbine Shaft Speed (TSS) sensor, Transmission Fluid Temperature (TFT) sensor, digital TR sensor 	<ul style="list-style-type: none"> Carry out on-board diagnostic tests. Refer to the Powertrain Control/Emissions Diagnosis (PC/ED) manual for diagnosis and testing of the PCM.
	<ul style="list-style-type: none"> Go To Pinpoint Test A, Go To Pinpoint Test B, Go To Pinpoint Test C, Go To Pinpoint Test D and Go To Pinpoint Test E.
	<ul style="list-style-type: none"> Repair as required. Clear DTCs, road test and carry out on-board diagnostic test again.

353 — HYDRAULIC/MECHANICAL ROUTINE

Fluid	
<ul style="list-style-type: none"> Incorrect level 	<ul style="list-style-type: none"> Adjust to correct level. Refer to the procedure in this section.
Input Shaft	
<ul style="list-style-type: none"> Damaged 	<ul style="list-style-type: none"> Inspect for damage. Repair as necessary.
Center Shaft Assembly	
<ul style="list-style-type: none"> Center shaft assembly or one-way clutch damaged 	<ul style="list-style-type: none"> Inspect for damage. Repair as necessary.
Forward Clutch Assembly	
<ul style="list-style-type: none"> Seals, piston damaged 	<ul style="list-style-type: none"> Inspect for damage. Repair as necessary.
<ul style="list-style-type: none"> Piston check ball damaged, missing, not seating, off location 	<ul style="list-style-type: none"> Inspect for mislocation, poor seating, damage. Install a new cylinder.
<ul style="list-style-type: none"> Friction elements damaged or worn 	<ul style="list-style-type: none"> Inspect for damage. Repair as necessary.
<ul style="list-style-type: none"> Return springs damaged 	<ul style="list-style-type: none"> Inspect for damage. Repair as necessary.
Intermediate Clutch Assembly	
<ul style="list-style-type: none"> Seals, piston damaged 	<ul style="list-style-type: none"> Inspect for damage. Repair as necessary.
<ul style="list-style-type: none"> Check ball damaged, missing, not seating, off location 	<ul style="list-style-type: none"> Inspect for mislocation, poor seating, damage. Install a new cylinder.
<ul style="list-style-type: none"> Feed tube or seal damaged 	<ul style="list-style-type: none"> Inspect for damage. Install a new feed tube.
<ul style="list-style-type: none"> Friction elements damaged or worn 	<ul style="list-style-type: none"> Inspect for damage. Repair as necessary.
<ul style="list-style-type: none"> Return springs damaged 	<ul style="list-style-type: none"> Inspect for damage. Repair as necessary.
Torque Converter Assembly	
<ul style="list-style-type: none"> Torque Converter one-way clutch slipping 	<ul style="list-style-type: none"> Carry out torque converter one-way clutch check as listed in this section. If one-way clutch fails the check, install a new or remanufactured torque converter.
<ul style="list-style-type: none"> Incorrect torque converter used in rebuild 	<ul style="list-style-type: none"> Inspect for correct torque converter assembly. If not correct, install the correct torque converter for this application.

Other Concern: Noise/Vibration—Forward or Reverse

Possible Component	Reference/Action

254 — ELECTRICAL ROUTINE

Powertrain Control System	
<ul style="list-style-type: none"> PCM, vehicle wiring harnesses, Torque Converter Clutch (TCC) solenoid, Pressure Control Solenoids A, B, C 	<ul style="list-style-type: none"> Carry out on-board diagnostic tests. Refer to the Powertrain Control/Emissions Diagnosis (PC/ED) manual for diagnosis and testing of the PCM.
	<ul style="list-style-type: none"> Go To Pinpoint Test A and Go To Pinpoint Test D.
	<ul style="list-style-type: none"> Repair as required. Clear DTCs, road test and carry out on-board diagnostic test again.

354 — HYDRAULIC/MECHANICAL ROUTINE

Fluid Pump Assembly	
<ul style="list-style-type: none"> Bolts not tightened to specification 	<ul style="list-style-type: none"> Tighten to specification.
<ul style="list-style-type: none"> Gasket damaged 	<ul style="list-style-type: none"> Inspect for damage. If damaged, install a new gasket.
<ul style="list-style-type: none"> Porosity, cross leaks, ball missing, plugged hole 	<ul style="list-style-type: none"> Inspect for damage. If damaged, repair as necessary.
<ul style="list-style-type: none"> Pump gears cracked and/or siezed 	<ul style="list-style-type: none"> Inspect for damage. Install a new pump.
<ul style="list-style-type: none"> Flow control valves, springs, or seal damaged, stuck or not assembled correctly 	<ul style="list-style-type: none"> Inspect for damage. Install a new seal or flow control valve.
Intermediate Clutch Assembly	
<ul style="list-style-type: none"> Seals, piston damaged 	<ul style="list-style-type: none"> Inspect for damage. Repair as necessary.
<ul style="list-style-type: none"> Check ball damaged, missing, not seating, off location 	<ul style="list-style-type: none"> Inspect for mislocation, poor seating, damage. Install a new cylinder.
<ul style="list-style-type: none"> Feed tube or seal damaged 	<ul style="list-style-type: none"> Inspect for damage. Install a new feed tube.
<ul style="list-style-type: none"> Friction elements damaged or worn 	<ul style="list-style-type: none"> Inspect for damage. Repair as necessary.
<ul style="list-style-type: none"> Return springs damaged 	<ul style="list-style-type: none"> Inspect for damage. Repair as necessary.
Low One-Way Clutch	
<ul style="list-style-type: none"> Worn, damaged or assembled incorrectly 	<ul style="list-style-type: none"> Inspect for damage. Repair as necessary.
Flexplate or Adapter Plate	
<ul style="list-style-type: none"> Damaged 	<ul style="list-style-type: none"> Inspect for damage. Repair as necessary.
<ul style="list-style-type: none"> Adapter Plate not aligned correctly 	<ul style="list-style-type: none"> Remove transmission and using special service tool and procedure in this section, align adapter plate.

Other Concern: Engine Will Not Crank

Possible Component	Reference/Action
255 — ELECTRICAL ROUTINE	
Powertrain Control System	
<ul style="list-style-type: none"> PCM, vehicle wiring harnesses, digital TR sensor 	<ul style="list-style-type: none"> Carry out on-board diagnostic tests. Refer to the Powertrain Control/Emissions Diagnosis (PC/ED) manual for diagnosis and testing of the PCM.
	<ul style="list-style-type: none"> Go To Pinpoint Test C.
	<ul style="list-style-type: none"> Repair as required. Clear DTCs, road test and carry out on-board diagnostic test again.
355 — HYDRAULIC/MECHANICAL ROUTINE	
Shift Cable/ Digital TR	

Sensor	<ul style="list-style-type: none"> Inspect and repair as required. For shift cable information, refer to Section 307-05. For digital TR information, refer to this section.
<ul style="list-style-type: none"> Cable system or digital TR Sensor damaged, misaligned 	
Fluid Pump Assembly	<ul style="list-style-type: none"> Inspect for damage. If damaged, install a new fluid pump assembly.
<ul style="list-style-type: none"> Seized 	
Flexplate or Adapter Plate	<ul style="list-style-type: none"> Inspect for damage. Repair as necessary.
<ul style="list-style-type: none"> Damaged 	

Other Concern: No Park Range

Possible Component	Reference/Action
256 — ELECTRICAL ROUTINE	
Powertrain Control System	
<ul style="list-style-type: none"> No electrical concerns 	
356 — HYDRAULIC/MECHANICAL ROUTINE	
Shift Cable/Digital TR sensor	<ul style="list-style-type: none"> Inspect and repair as required. For shift cable information, refer to Section 307-05. For digital TR information, refer to this section.
<ul style="list-style-type: none"> Cable system or digital TR sensor damaged, misaligned 	
Case	<ul style="list-style-type: none"> Inspect for damage. If damaged, repair as necessary.
<ul style="list-style-type: none"> Manual control lever assembly damage, manual valve inner lever pin bent, manual valve inner lever damaged, spring rod damaged 	
<ul style="list-style-type: none"> Manual valve lever shaft retaining pin damaged 	<ul style="list-style-type: none"> Inspect for damage. If damaged, repair as necessary.
Park System	<ul style="list-style-type: none"> Inspect for damage. If damaged, repair as necessary.
<ul style="list-style-type: none"> Park gear, parking pawl, parking pawl return spring, park or guide plate, parking actuating rod, parking pawl shaft, manual lever, manual lever detent spring damaged or misassembled 	
<ul style="list-style-type: none"> External linkages/brackets damaged 	<ul style="list-style-type: none"> Inspect for damage. If damaged, repair as necessary.

Other Concern: Transmission Overheating

Possible Component	Reference/Action
257 ELECTRICAL ROUTINE	
Powertrain Control System	<ul style="list-style-type: none"> Carry out on-board diagnostic tests. Refer to the Powertrain Control/Emissions Diagnosis (PC/ED) manual for diagnosis and testing of the PCM.
<ul style="list-style-type: none"> PCM, vehicle wiring harnesses, Torque Converter Clutch (TCC) solenoid, Pressure Control Solenoids A, B, C, Transmission Fluid Temperature (TFT) sensor 	
	<ul style="list-style-type: none"> Go To Pinpoint Test A, Go To Pinpoint Test B and Go To Pinpoint Test D.

	<ul style="list-style-type: none"> Repair as required. Clear DTCs, road test and carry out on-board diagnostic test again.
357 HYDRAULIC/MECHANICAL ROUTINE	
Fluid	
<ul style="list-style-type: none"> Incorrect level 	<ul style="list-style-type: none"> Adjust to correct level. Refer to the procedure in this section.
Incorrect Pressures	
<ul style="list-style-type: none"> High/low pressures 	<ul style="list-style-type: none"> Check pressure at line and PC C taps.
	<ul style="list-style-type: none"> Carry out Line Pressure Test. Refer to the procedure in this section. Follow pressure diagnosis and repair as required.
Main Control	
<ul style="list-style-type: none"> Bolts not tightened to specification 	<ul style="list-style-type: none"> Tighten to specification.
<ul style="list-style-type: none"> Separator plate damaged 	<ul style="list-style-type: none"> Inspect for damage. If damaged, install a new separator plate.
<ul style="list-style-type: none"> Contamination 	<ul style="list-style-type: none"> Disassemble and clean.
<ul style="list-style-type: none"> Valves and springs damaged, misassembled, missing, stuck, or bore damaged 	<ul style="list-style-type: none"> If damaged or parts are missing, install new main control assembly. If misassembled, reassemble correctly. DO NOT stone, file or sand valves. This removes the anodized finish and can result in further main control or transmission damage.
Fluid Pump Assembly	
<ul style="list-style-type: none"> Bolts not tightened to specification 	<ul style="list-style-type: none"> Tighten to specification.
<ul style="list-style-type: none"> Gasket damaged 	<ul style="list-style-type: none"> Inspect for damage. If damaged, install a new gasket.
<ul style="list-style-type: none"> Porosity, cross leaks, ball missing, plugged hole 	<ul style="list-style-type: none"> Inspect for damage. If damaged, repair as necessary.
<ul style="list-style-type: none"> Pump gears cracked and/or siezed 	<ul style="list-style-type: none"> Inspect for damage. Install a new pump.
<ul style="list-style-type: none"> Flow control valves, springs, or seal damaged, stuck or not assembled correctly 	<ul style="list-style-type: none"> Inspect for damage. Install a new seal or flow control valve.
Case	
<ul style="list-style-type: none"> Case vent damaged 	<ul style="list-style-type: none"> Inspect for damage. If damaged, repair as necessary.
Torque Converter Assembly	
<ul style="list-style-type: none"> Sized torque converter one-way clutch 	<ul style="list-style-type: none"> Remove transmission. Inspect for damage. Carry out torque converter checks. Refer to the procedures in this section. If torque converter fails to pass the checks or is damaged, install a new or remanufactured converter.
<ul style="list-style-type: none"> Excessive slip detected 	
Other	
<ul style="list-style-type: none"> Restriction in the transmission cooling system 	<ul style="list-style-type: none"> Refer to Section 307-02, Transmission Cooling for information and diagnosis of cooling issues.
<ul style="list-style-type: none"> Excessive trailer tow load 	<ul style="list-style-type: none"> Refer to owners guide for specifications on trailer towing.
<ul style="list-style-type: none"> Poor engine driveability concerns 	<ul style="list-style-type: none"> Check engine driveability concerns. Refer to Section 303-08.

Other Concern: No Engine Braking in Manual 3rd Position

Possible Component	Reference/Action
280 — ELECTRICAL ROUTINE	
Powertrain Control System	
<ul style="list-style-type: none"> PCM, vehicle wiring harnesses, shift solenoids A, B, C, Reverse Pressure (RP) switch, pressure control solenoids A, B 	<ul style="list-style-type: none"> Carry out on-board diagnostic tests. Refer to the Powertrain Control/Emissions Diagnosis (PC/ED) manual for diagnosis and testing of the PCM.
	<ul style="list-style-type: none"> Go To Pinpoint Test A , Go To Pinpoint Test D and Go To Pinpoint Test G .
	<ul style="list-style-type: none"> Repair as required. Clear DTCs, road test and carry out on-board diagnostic test again.
380 — HYDRAULIC/MECHANICAL ROUTINE	
Fluid	
<ul style="list-style-type: none"> Incorrect level 	<ul style="list-style-type: none"> Adjust to correct level. Refer to the procedure in this section.
Incorrect Pressures	
<ul style="list-style-type: none"> High/Low pressures 	<ul style="list-style-type: none"> Check pressure at Line and PC C taps.
	<ul style="list-style-type: none"> Carry out Line Pressure Test. Refer to the procedure in this section. Follow pressure diagnosis and repair as required.
Main Control	
<ul style="list-style-type: none"> Bolts not tightened to specification 	<ul style="list-style-type: none"> Tighten to specification.
<ul style="list-style-type: none"> Separator plate damaged 	<ul style="list-style-type: none"> Inspect for damage. If damaged, install a new separator plate.
<ul style="list-style-type: none"> Contamination 	<ul style="list-style-type: none"> Disassemble and clean.
<ul style="list-style-type: none"> Valves and springs damaged, misassembled, missing, stuck, or bore damaged 	<ul style="list-style-type: none"> If damaged or parts are missing, install new main control assembly. If misassembled, reassemble correctly. DO NOT stone, file or sand valves. This removes the anodized finish and can result in further main control or transmission damage.
Fluid Pump Assembly	
<ul style="list-style-type: none"> Bolts not tightened to specification 	<ul style="list-style-type: none"> Tighten to specification.
<ul style="list-style-type: none"> Gasket damaged 	<ul style="list-style-type: none"> Inspect for damage. If damaged, install a new gasket.
<ul style="list-style-type: none"> Porosity, cross leaks, ball missing, plugged hole 	<ul style="list-style-type: none"> Inspect for damage. If damaged, repair as necessary.
<ul style="list-style-type: none"> Pump gears cracked and/or siezed 	<ul style="list-style-type: none"> Inspect for damage. Install a new pump.
<ul style="list-style-type: none"> Flow control valves, springs, or seal damaged, stuck or not assembled correctly 	<ul style="list-style-type: none"> Inspect for damage. Install a new seal or flow control valve.
Coast Clutch Assembly	
<ul style="list-style-type: none"> Seals, piston damaged 	<ul style="list-style-type: none"> Inspect for damage. Repair as necessary.
<ul style="list-style-type: none"> Check ball damaged, missing, not seating, off location 	<ul style="list-style-type: none"> Inspect for mislocation, poor seating, damage. Install a new cylinder.
<ul style="list-style-type: none"> Friction elements damaged or worn 	<ul style="list-style-type: none"> Inspect for damage. Repair as necessary.

· Return springs damaged	· Inspect for damage. Repair as necessary.
Center Support	
· Screw not tightened to specification	· Tighten to specification.
· Seals rings or bearing damaged	· Inspect for damage. Repair as necessary.
· Outside diameter of case bore damage	· Inspect for damage. Repair as necessary.
· Support damaged or leaking	· Inspect for damage. Repair as necessary.
Intermediate Servo	
· Servo retaining ring damaged	· Inspect for damage. Repair as necessary.
· Seals (piston and cover) damaged	· Inspect for damage. Repair as necessary.
Intermediate Band	
· Band damaged	· Inspect for damage. Repair as necessary.
· Servo worn or damaged	· Inspect for damage. Repair as necessary.
· Not adjusted correctly	· Inspect for damage. Repair as necessary.
Intermediate Clutch Assembly	
· Seals, piston damaged	· Inspect for damage. Repair as necessary.
· Check ball damaged, missing, not seating, off location	· Inspect for mislocation, poor seating, damage. Install a new cylinder.
· Feed tube or seal damaged	· Inspect for damage. Install a new feed tube.
· Friction elements damaged or worn	· Inspect for damage. Repair as necessary.
· Return springs damaged	· Inspect for damage. Repair as necessary.
Low One-Way Clutch	
· Worn, damaged, or assembled incorrectly	· Inspect for damage. Repair as necessary.

Other Concern: No Engine Braking in Manual 4th (D4) Position

Possible Component	Reference/Action
281 — ELECTRICAL ROUTINE	
Powertrain Control System	
· PCM, vehicle wiring harnesses, Shift Solenoid D, Reverse Pressure (RP) switch, Pressure Control Solenoid B	· Carry out on-board diagnostic tests. Refer to the Powertrain Control/Emissions Diagnosis (PC/ED) manual for diagnosis and testing of the PCM.
	· Go To Pinpoint Test A , Go To Pinpoint Test D and Go To Pinpoint Test G .
	· Repair as required. Clear DTCs, road test and carry out on-board diagnostic test again.
381 — HYDRAULIC/MECHANICAL ROUTINE	
Fluid	
· Improper level	· Adjust to correct level. Refer to the procedure in this section.
Main Control	

• Bolts not tightened to specification	• Tighten to specification.
• Separator plate damaged	• Inspect for damage. If damaged, install a new separator plate.
• Contamination	• Disassemble and clean.
• Valves and springs damaged, misassembled, missing, stuck, or bore damaged	• If damaged or parts are missing, install new main control assembly. If misassembled, reassemble correctly. DO NOT stone, file or sand valves. This removes the anodized finish and can result in further main control or transmission damage.
Fluid Pump Assembly	
• Bolts not tightened to specification	• Tighten bolts to specification.
• Gasket damaged	• Inspect for damage. If damaged, install a new gasket.
• Porosity, cross leaks, ball missing, plugged hole	• Inspect for damage. If damaged, repair as necessary.
• Pump gears cracked and/or siezed	• Inspect for damage. Install a new pump.
• Flow control valves, springs, or seal damaged, stuck or not assembled correctly	• Inspect for damage. Install a new seal or flow control valve.
Coast Clutch Assembly	
• Seals, piston damaged	• Inspect for damage. Repair as necessary.
• Check ball damaged, missing, not seating, off location	• Inspect for mislocation, poor seating, damage. Install a new cylinder.
• Friction elements damaged or worn	• Inspect for damage. Repair as necessary.
• Return springs damaged	• Inspect for damage. Repair as necessary.
Forward Clutch Assembly	
• Seals, piston damaged	• Inspect for damage. Repair as necessary.
• Check ball damaged, missing, not seating, off location	• Inspect for mislocation, poor seating, damage. Install a new cylinder.
• Friction elements damaged or worn	• Inspect for damage. Repair as necessary.
• Return springs damaged	• Inspect for damage. Repair as necessary.

Other Concerns: No Engine Braking in Manual 2nd Position

Possible Component	Reference/Action
258 — ELECTRICAL ROUTINE	
Powertrain Control System	
• PCM, vehicle wiring harnesses, Shift Solenoids A, C, D, Pressure Control Solenoid A	• Carry out on-board diagnostic tests. Refer to the Powertrain Control/Emissions Diagnosis (PC/ED) manual for diagnosis and testing of the PCM.
	• Go To Pinpoint Test A and Go To Pinpoint Test D .
	• Repair as required. Clear DTCs, road test and carry out on-board diagnostic test again.
358 — HYDRAULIC/MECHANICAL ROUTINE	

Fluid	
· Incorrect level	· Adjust to correct level. Refer to the procedure in this section.
Incorrect Pressures	
· High/low pressures	· Check pressure at line and PC C taps.
	· Carry out Line Pressure Test. Refer to the procedure in this section. Follow pressure diagnosis and repair as required.
Reverse Servo	
· Servo retaining ring damaged	· Inspect for damage. Repair as necessary.
· Seals (piston and cover) damaged	· Inspect for damage. Repair as necessary.
Reverse Band	
· Band damaged	· Inspect for damage. Repair as necessary.
· Servo worn or damaged	· Inspect for damage. Repair as necessary.

Other Concern: No Engine Braking in Manual 1st Position

Possible Component	Reference/Action
259 — ELECTRICAL ROUTINE	
Powertrain Control System	
· PCM, vehicle wiring harnesses, Shift Solenoids A, C, D, Pressure Control Solenoids A, B	· Carry out on-board diagnostic tests. Refer to the Powertrain Control/Emissions Diagnosis (PC/ED) manual for diagnosis and testing of the PCM.
	· Carry out Pinpoints Tests A and D.
	· Repair as required. Clear DTCs, road test and carry out on-board diagnostic test again.
359 — HYDRAULIC/MECHANICAL ROUTINE	
Fluid	
· Incorrect level	· Adjust to correct level. Refer to procedure in this section.
Incorrect pressures	
· High/low pressures	· Check pressure at Line and PC C taps.
	· Carry out Line Pressure Test. Refer to the procedure in this section. Follow pressure diagnosis and repair as required.
Fluid Pump Assembly	
· Bolts not tightened to specification	· Tighten to specification.
· Gasket damaged	· Inspect for damage. If damaged, install a new gasket.
· Porosity, cross leaks, ball missing, plugged hole	· Inspect for damage. If damaged, repair as necessary.
· Pump gears cracked and/or siezed	· Inspect for damage. Install a new pump.
· Flow control valves, springs, or seal damaged, stuck or not assembled correctly	· Inspect for damage. Install a new seal or flow control valve.
Coast Clutch Assembly	
· Seals, piston damaged	· Inspect for damage. Repair as necessary.
· Check ball damaged, missing, not	· Inspect for mislocation, poor seating, damage. Install a

seating, off location	new cylinder.
· Friction elements damaged or worn	· Inspect for damage. Repair as necessary.
· Return springs damaged	· Inspect for damage. Repair as necessary.
Reverse Servo	
· Servo retaining ring damaged	· Inspect for damage. Repair as necessary.
· Seals (piston and cover) damaged	· Inspect for damage. Repair as necessary.
Reverse Band	
· Band damaged	· Inspect for damage. Repair as necessary.
· Servo worn or damaged	· Inspect for damage. Repair as necessary.

Other Concerns: Fluid Venting/Foaming

Possible Component	Reference/Action
261 — ELECTRICAL ROUTINE	
Powertrain Control System	
· No Electrical concerns	
361 — HYDRAULIC/MECHANICAL ROUTINE	
Fluid	
· Incorrect level	· Adjust to correct level. Refer to the procedure in this section.
· Condition	· Carry out Fluid Condition Check. Refer to the procedure in this section.
Fluid Pump Assembly	
· Bolts not tightened to specification	· Tighten bolts to specification.
· Gasket damaged	· Inspect for damage. If damaged, install a new gasket.
· Porosity, cross leaks, ball missing, plugged hole	· Inspect for damage. If damaged, repair as necessary.
· Pump gears cracked and/or siezed	· Inspect for damage. Install a new pump.
· Flow control valves, springs, or seal damaged, stuck or not assembled correctly	· Inspect for damage. Install a new seal or flow control valve.
Intermediate Servo	
· Servo retaining ring damaged	· Inspect for damage. Repair as necessary.
· Seals (piston and cover) damaged	· Inspect for damage. Repair as necessary.
Intermediate Band	
· Band damaged	· Inspect for damage. Repair as necessary.
· Servo worn or damaged	· Inspect for damage. Repair as necessary.
· Not adjusted correctly	· Inspect for damage. Repair as necessary.
Case	
· Case vent damaged	· Inspect for damage. If damaged, repair as necessary.
Other	
· Transmission overheating	· Refer to routine 257/357 in this section.

Other Concern: Vehicle Movement with Gear Selector in "N" Position

Possible Component	Reference/Action
262 — ELECTRICAL ROUTINE	
Powertrain Control System	
<ul style="list-style-type: none"> No Electrical concerns 	
362 — HYDRAULIC/MECHANICAL ROUTINE	
Fluid	
<ul style="list-style-type: none"> Incorrect level 	<ul style="list-style-type: none"> Adjust to correct level. Refer to the procedure in this section.
Incorrect pressures	
<ul style="list-style-type: none"> High/low pressures 	<ul style="list-style-type: none"> Check pressure at Line and PC C taps.
	<ul style="list-style-type: none"> Carry out Line Pressure Test. Refer to the procedure in this section. Follow pressure diagnosis and repair as required.

Other Concern: Slips/Chatters in Manual 1st Position

Possible Component	Reference/Action
263 — ELECTRICAL ROUTINE	
Powertrain Control System	
<ul style="list-style-type: none"> PCM, vehicle wiring harnesses, Pressure Control Solenoids A, B 	<ul style="list-style-type: none"> Carry out on-board diagnostic tests. Refer to the Powertrain Control/Emissions Diagnosis (PC/ED) manual for diagnosis and testing of the PCM.
	<ul style="list-style-type: none"> Go To Pinpoint Test D.
	<ul style="list-style-type: none"> Repair as required. Clear DTCs, road test and carry out on-board diagnostic test again.
363 — HYDRAULIC/MECHANICAL ROUTINE	
Fluid	
<ul style="list-style-type: none"> Incorrect level 	<ul style="list-style-type: none"> Adjust to the correct level. Refer to the procedure in this section.
<ul style="list-style-type: none"> Condition 	<ul style="list-style-type: none"> Carry out Fluid Condition Test. Refer to the procedure in this section.
Incorrect Pressures	
<ul style="list-style-type: none"> High/Low pressures 	<ul style="list-style-type: none"> Check pressure at Line and PC C taps.
	<ul style="list-style-type: none"> Carry out Line Pressure Test. Refer to the procedure in this section. Follow pressure diagnosis and repair as required.
Main Control	
<ul style="list-style-type: none"> Bolts not tightened to specification 	<ul style="list-style-type: none"> Tighten to specification.
<ul style="list-style-type: none"> Separator plate damaged 	<ul style="list-style-type: none"> Inspect for damage. If damaged, install a new separator plate.
<ul style="list-style-type: none"> Contamination 	<ul style="list-style-type: none"> Disassemble and clean.
<ul style="list-style-type: none"> Valves and springs damaged, misassembled, missing, stuck, or bore damaged 	<ul style="list-style-type: none"> If damaged or parts are missing, install new main control assembly. If misassembled, reassemble correctly. DO NOT stone, file or sand valves. This removes the anodized finish and can result in further main control or transmission damage.

Fluid Pump Assembly	
• Bolts not tightened to specification	• Tighten bolts to specification.
• Gasket damaged	• Inspect for damage. If damaged, install a new gasket.
• Porosity, cross leaks, ball missing, plugged hole	• Inspect for damage. If damaged, repair as necessary.
• Pump gears cracked and/or siezed	• Inspect for damage. Install a new pump.
• Flow control valves, springs, or seal damaged, stuck or not assembled correctly	• Inspect for damage. Install a new seal or flow control valve.
Forward Clutch Assembly	
• Seals, piston damaged	• Inspect for damage. Repair as necessary.
• Check ball damaged, missing, not seating, off location	• Inspect for mislocation, poor seating, damage. Install a new cylinder.
• Friction elements damaged or worn	• Inspect for damage. Repair as necessary.
• Return springs damaged	• Inspect for damage. Repair as necessary.
Reverse Servo	
• Servo retaining ring damaged	• Inspect for damage. Repair as necessary.
• Seals (piston and cover) damaged	• Inspect for damage. Repair as necessary.
Reverse Band	
• Band damaged	• Inspect for damage. Repair as necessary.
• Servo worn or damaged	• Inspect for damage. Repair as necessary.
Direct One-way Clutch	
• Worn, damaged or assembled incorrectly	• Inspect for damage. Repair as necessary.
Low One-way Clutch	
• Worn, damaged or assembled incorrectly	• Inspect for damage. Repair as necessary.

Other Concern: Slips/Chatters in Manual 2nd Position

Possible Component	Reference/Action
264 — ELECTRICAL ROUTINE	
Powertrain Control System	
• PCM, vehicle wiring harnesses, Pressure Control Solenoids A, B	• Carry out on-board diagnostic tests. Refer to the Powertrain Control/Emissions Diagnosis (PC/ED) manual for diagnosis and testing of the PCM.
	• Go To Pinpoint Test D.
	• Repair as required. Clear DTCs, road test and carry out on-board diagnostic test again.
364 — HYDRAULIC/MECHANICAL ROUTINE	

Fluid	
<ul style="list-style-type: none"> Incorrect level 	<ul style="list-style-type: none"> Adjust to the correct level. Refer to the procedure in this section.
<ul style="list-style-type: none"> Condition 	<ul style="list-style-type: none"> Carry out Fluid Condition Check. Refer to the procedure in this section.
Incorrect Pressures	
<ul style="list-style-type: none"> High/low pressures 	<ul style="list-style-type: none"> Check pressure at Line and PC C taps.
	<ul style="list-style-type: none"> Carry out Line Pressure Test. Refer to the procedure in this section. Follow pressure diagnosis and repair as required.
Fluid Pump Assembly	
<ul style="list-style-type: none"> Bolts not tightened to specification 	<ul style="list-style-type: none"> Tighten to specification.
<ul style="list-style-type: none"> Gasket damaged 	<ul style="list-style-type: none"> Inspect for damage. If damaged, install a new gasket.
<ul style="list-style-type: none"> Porosity, cross leaks, ball missing, plugged hole 	<ul style="list-style-type: none"> Inspect for damage. If damaged, repair as necessary.
<ul style="list-style-type: none"> Pump gears cracked and/or siezed 	<ul style="list-style-type: none"> Inspect for damage. Install a new pump.
<ul style="list-style-type: none"> Flow control valves, springs, or seal damaged, stuck or not assembled correctly 	<ul style="list-style-type: none"> Inspect for damage. Install a new seal or flow control valve.
OD Servo	
<ul style="list-style-type: none"> Servo retaining ring damaged 	<ul style="list-style-type: none"> Inspect for damage. Repair as necessary.
<ul style="list-style-type: none"> Seals (piston and cover) damaged 	<ul style="list-style-type: none"> Inspect for damage. Repair as necessary.
OD Band	
<ul style="list-style-type: none"> Band damaged 	<ul style="list-style-type: none"> Inspect for damage. Repair as necessary.
<ul style="list-style-type: none"> Servo worn or damaged 	<ul style="list-style-type: none"> Inspect for damage. Repair as necessary.
<ul style="list-style-type: none"> Not adjusted correctly 	<ul style="list-style-type: none"> Inspect for damage. Repair as necessary.
OD Planetary Assembly	
<ul style="list-style-type: none"> Planetary damaged 	<ul style="list-style-type: none"> Inspect for damage. Repair as necessary.
Forward Clutch Assembly	
<ul style="list-style-type: none"> Seals, piston damaged 	<ul style="list-style-type: none"> Inspect for damage. Repair as necessary.
<ul style="list-style-type: none"> Check ball damaged, missing, not seating, off location 	<ul style="list-style-type: none"> Inspect for mislocation, poor seating, damage. Install a new cylinder.
<ul style="list-style-type: none"> Friction elements damaged or worn 	<ul style="list-style-type: none"> Inspect for damage. Repair as necessary.
<ul style="list-style-type: none"> Return springs damaged 	<ul style="list-style-type: none"> Inspect for damage. Repair as necessary.
Reverse Servo	
<ul style="list-style-type: none"> Servo retaining ring damaged 	<ul style="list-style-type: none"> Inspect for damage. Repair as necessary.
<ul style="list-style-type: none"> Seals (piston and cover) damaged 	<ul style="list-style-type: none"> Inspect for damage. Repair as necessary.
Reverse Band	
<ul style="list-style-type: none"> Band damaged 	<ul style="list-style-type: none"> Inspect for damage. Repair as necessary.
<ul style="list-style-type: none"> Servo worn or damaged 	<ul style="list-style-type: none"> Inspect for damage. Repair as necessary.
Low One-way Clutch	
<ul style="list-style-type: none"> Worn, damaged or assembled 	<ul style="list-style-type: none"> Inspect for damage. Repair as necessary.

incorrectly

Other Concern: Slip/Chatters in Manual 3rd Position

Possible Component	Reference/Action
282 — ELECTRICAL ROUTINE	
Powertrain Control System	
<ul style="list-style-type: none">PCM, vehicle wiring harnesses, Pressure Control Solenoids A, B	<ul style="list-style-type: none">Carry out on-board diagnostic tests. Refer to the Powertrain Control/Emissions Diagnosis (PC/ED) manual for diagnosis and testing of the PCM.
	<ul style="list-style-type: none">Go To Pinpoint Test D.
	<ul style="list-style-type: none">Repair as required. Clear DTCs, road test and carry out on-board diagnostic test again.
382 — HYDRAULIC/MECHANICAL ROUTINE	
Fluid	
<ul style="list-style-type: none">Incorrect level	<ul style="list-style-type: none">Adjust to the correct level. Refer to the procedure in this section.
<ul style="list-style-type: none">Condition	<ul style="list-style-type: none">Carry out Fluid Condition Check. Refer to the procedure in this section.
Incorrect Pressures	
<ul style="list-style-type: none">High/Low pressures	<ul style="list-style-type: none">Check pressure at Line and PC C taps.
	<ul style="list-style-type: none">Carry out Line Pressure Test. Refer to the procedure in this section. Follow pressure diagnosis and repair as required.
Fluid Pump Assembly	
<ul style="list-style-type: none">Bolts not tightened to specification	<ul style="list-style-type: none">Tighten bolts to specification.
<ul style="list-style-type: none">Gasket damaged	<ul style="list-style-type: none">Inspect for damage. If damaged, install a new gasket.
<ul style="list-style-type: none">Porosity, cross leaks, ball missing, plugged hole	<ul style="list-style-type: none">Inspect for damage. If damaged, repair as necessary.
<ul style="list-style-type: none">Pump gears cracked and/or siezed	<ul style="list-style-type: none">Inspect for damage. Install a new pump.
<ul style="list-style-type: none">Flow control valves, springs, or seal damaged, stuck or not assembled correctly	<ul style="list-style-type: none">Inspect for damage. Install a new seal or flow control valve.
OD Servo	
<ul style="list-style-type: none">Servo retaining ring damaged	<ul style="list-style-type: none">Inspect for damaged. Repair as necessary.
<ul style="list-style-type: none">Seals (piston and cover) damaged	<ul style="list-style-type: none">Inspect for damage. Repair as necessary.
OD Band	
<ul style="list-style-type: none">Band damaged	<ul style="list-style-type: none">Inspect for damage. Repair as necessary.
<ul style="list-style-type: none">Servo worn or damaged	<ul style="list-style-type: none">Inspect for damage. Repair as necessary.
<ul style="list-style-type: none">Not adjusted correctly	<ul style="list-style-type: none">Inspect for damage. Repair as necessary.
Intermediate Servo	
<ul style="list-style-type: none">Servo retaining ring damaged	<ul style="list-style-type: none">Inspect for damage. Repair as necessary.
<ul style="list-style-type: none">Seals (piston and cover) damaged	<ul style="list-style-type: none">Inspect for damage. Repair as necessary.

Intermediate Band	
• Band damaged	• Inspect for damage. Repair as necessary.
• Servo worn or damaged	• Inspect for damage. Repair as necessary.
• Not adjusted correctly	• Inspect for damage. Repair as necessary.
Forward Clutch Assembly	
• Seals, piston damaged	• Inspect for damage. Repair as necessary.
• Check ball damaged, missing, not seating, off location	• Inspect for mislocation, poor seating, damage. Install a new cylinder.
• Friction elements damaged or worn	• Inspect for damage. Repair as necessary.
• Return springs damaged	• Inspect for damage. Repair as necessary.
Intermediate Clutch Assembly	
• Seals, piston damaged	• Inspect for damage. Repair as necessary.
• Check ball damaged, missing, not seating, off location	• Inspect for mislocation, poor seating, damage. Install a new cylinder.
• Feed tube or seal damaged	• Inspect for damage. Install a new feed tube.
• Friction elements damaged or worn	• Inspect for damage. Repair as necessary.
• Return springs damaged	• Inspect for damage. Repair as necessary.
Direct One-way Clutch	
• Worn, damaged or assembled incorrectly	• Inspect for damage. Repair as necessary.
Low One-way Clutch	
• Worn, damaged or assembled incorrectly	• Inspect for damage. Repair as necessary.

Other Concern: Engine Braking in ALL Gears

Possible Component	Reference/Action
283 — ELECTRICAL ROUTINE	
Powertrain Control System	
• PCM, vehicle wiring harnesses, Shift Solenoid D	• Carry out on-board diagnostic tests. Refer to the Powertrain Control/Emissions Diagnosis (PC/ED) manual for diagnosis and testing of the PCM.
	• Go To Pinpoint Test A .
	• Repair as required. Clear DTCs, road test and carry out on-board diagnostic test again.
383 — HYDRAULIC/MECHANICAL ROUTINE	
No Hydraulic/Mechanical Concerns	

Other Concern: No 2nd and 5th Gears

Possible Component	Reference/Action
284 — ELECTRICAL ROUTINE	

Powertrain Control System	
<ul style="list-style-type: none"> PCM, vehicle wiring harnesses, Pressure Control Solenoids A, B 	<ul style="list-style-type: none"> Carry out on-board diagnostic tests. Refer to the Powertrain Control/Emissions Diagnosis (PC/ED) manual for diagnosis and testing of the PCM.
	<ul style="list-style-type: none"> Go To Pinpoint Test D.
	<ul style="list-style-type: none"> Repair as required. Clear DTCs, road test and carry out on-board diagnostic test again.
384 — HYDRAULIC/MECHANICAL ROUTINE	
Intermediate Clutch Assembly	
<ul style="list-style-type: none"> Seals, piston damaged 	<ul style="list-style-type: none"> Inspect for damage. Repair as necessary.
<ul style="list-style-type: none"> Check ball damaged, missing, not seating, off location 	<ul style="list-style-type: none"> Inspect for mislocation, poor seating, damage. Install a new cylinder.
<ul style="list-style-type: none"> Feed tube or seal damaged 	<ul style="list-style-type: none"> Inspect for damage. Install a new feed tube.
<ul style="list-style-type: none"> Friction elements damaged or worn 	<ul style="list-style-type: none"> Inspect for damage. Repair as necessary.
<ul style="list-style-type: none"> Return springs damaged 	<ul style="list-style-type: none"> Inspect for damage. Repair as necessary.

Other Concern: No 3rd, 4th and 5th Gears

Possible Component	Reference/Action
285 — ELECTRICAL ROUTINE	
Powertrain Control System	
<ul style="list-style-type: none"> PCM, vehicle wiring harnesses, Pressure Control Solenoids A, B 	<ul style="list-style-type: none"> Carry out on-board diagnostic tests. Refer to the Powertrain Control/Emissions Diagnosis (PC/ED) manual for diagnosis and testing of the PCM.
	<ul style="list-style-type: none"> Go To Pinpoint Test D.
	<ul style="list-style-type: none"> Repair as required. Clear DTCs, road test and carry out on-board diagnostic test again.
385 — HYDRAULIC/MECHANICAL ROUTINE	
Fluid Pump Assembly	
<ul style="list-style-type: none"> Bolts not tightened to specification 	<ul style="list-style-type: none"> Tighten to specification.
<ul style="list-style-type: none"> Gasket damaged 	<ul style="list-style-type: none"> Inspect for damage. If damaged, install a new gasket.
<ul style="list-style-type: none"> Porosity, cross leaks, ball missing, plugged hole 	<ul style="list-style-type: none"> Inspect for damage. If damaged, repair as necessary.
<ul style="list-style-type: none"> Pump gears cracked and/or siezed 	<ul style="list-style-type: none"> Inspect for damage. Install a new pump.
<ul style="list-style-type: none"> Flow control valves, springs, or seal damaged, stuck or not assembled correctly 	<ul style="list-style-type: none"> Inspect for damage. Install a new seal or flow control valve.
OD Band	
<ul style="list-style-type: none"> Band damaged 	<ul style="list-style-type: none"> Inspect for damage. Repair as necessary.
<ul style="list-style-type: none"> Servo worn or damaged 	<ul style="list-style-type: none"> Inspect for damage. Repair as necessary.
<ul style="list-style-type: none"> Not adjusted correctly 	<ul style="list-style-type: none"> Inspect for damage. Repair as necessary.
OD Planetary Assembly	
<ul style="list-style-type: none"> Planetary damaged 	<ul style="list-style-type: none"> Inspect for damage. Repair as necessary.

Shift Concern: Harsh 1-2 Shift

Possible Component	Reference/Action
232 — ELECTRICAL ROUTINE	
Powertrain Control System	
<ul style="list-style-type: none"> PCM, vehicle wiring harnesses, Shift Control Solenoid C, Pressure Control Solenoids B, Turbine Shaft Speed (TSS) sensor, Digital TR sensor, Transmission Fluid Temperature (TFT) sensor 	<ul style="list-style-type: none"> Carry out on-board diagnostic tests. Refer to the Powertrain Control/Emissions Diagnosis (PC/ED) manual for diagnosis and testing of the PCM.
	<ul style="list-style-type: none"> Go To Pinpoint Test A, Go To Pinpoint Test B, Go To Pinpoint Test C, Go To Pinpoint Test D and Go To Pinpoint Test E.
	<ul style="list-style-type: none"> Repair as required. Clear DTCs, road test and carry out on-board diagnostic test again.
332 — HYDRAULIC/MECHANICAL ROUTINE	
Incorrect Pressures	
<ul style="list-style-type: none"> High/Low pressures 	<ul style="list-style-type: none"> Check pressure at Line and PC C taps.
	<ul style="list-style-type: none"> Carry out Line Pressure Test. Refer to the procedure in this section. Follow pressure diagnosis and repair as required.
Main Control	
<ul style="list-style-type: none"> Bolts not tightened to specification 	<ul style="list-style-type: none"> Tighten to specification.
<ul style="list-style-type: none"> Separator plate damaged 	<ul style="list-style-type: none"> Inspect for damage. If damaged, install a new separator plate.
<ul style="list-style-type: none"> Contamination 	<ul style="list-style-type: none"> Disassemble and clean.
<ul style="list-style-type: none"> Valves and springs damaged, misassembled, missing, stuck, or bore damaged 	<ul style="list-style-type: none"> If damaged or parts are missing, install new main control assembly. If misassembled, reassemble correctly. DO NOT stone, file or sand valves. This removes the anodized finish and can result in further main control or transmission damage.
OD Servo	
<ul style="list-style-type: none"> Servo retaining ring damaged 	<ul style="list-style-type: none"> Inspect for damage. Repair as necessary.
<ul style="list-style-type: none"> Seals (piston and cover) damaged 	<ul style="list-style-type: none"> Inspect for damage. Repair as necessary.
OD Band	
<ul style="list-style-type: none"> Band damaged 	<ul style="list-style-type: none"> Inspect for damage. Repair as necessary.
<ul style="list-style-type: none"> Servo worn or damaged 	<ul style="list-style-type: none"> Inspect for damage. Repair as necessary.
<ul style="list-style-type: none"> Not adjusted correctly 	<ul style="list-style-type: none"> Inspect for damage. Repair as necessary.
Direct Clutch Assembly	
<ul style="list-style-type: none"> Seals, piston damaged 	<ul style="list-style-type: none"> Inspect for damage. Repair as necessary.
<ul style="list-style-type: none"> Check ball damaged, missing, not seating, off location 	<ul style="list-style-type: none"> Inspect for mislocation, poor seating, damage. Install a new cylinder.
<ul style="list-style-type: none"> Friction elements damaged or worn 	<ul style="list-style-type: none"> Inspect for damage. Repair as necessary.
<ul style="list-style-type: none"> Return springs damaged 	<ul style="list-style-type: none"> Inspect for damage. Repair as necessary.
Intermediate Clutch Assembly	
<ul style="list-style-type: none"> Seals, piston damaged 	<ul style="list-style-type: none"> Inspect for damage. Repair as necessary.

<ul style="list-style-type: none"> • Check ball damaged, missing, not seating, off location 	<ul style="list-style-type: none"> • Inspect for mislocation, poor seating, damage. Install a new cylinder.
<ul style="list-style-type: none"> • Feed tube or seal damaged 	<ul style="list-style-type: none"> • Inspect for damage. Install a new feed tube.
<ul style="list-style-type: none"> • Friction elements damaged or worn 	<ul style="list-style-type: none"> • Inspect for damage. Repair as necessary.
<ul style="list-style-type: none"> • Return springs damaged 	<ul style="list-style-type: none"> • Inspect for damage. Repair as necessary.

Shift Concern: Harsh 2-3 Shift

Possible Component	Reference/Action
233 — ELECTRICAL ROUTINE	
Powertrain Control System	
<ul style="list-style-type: none"> • PCM, vehicle wiring harnesses, Shift Control Solenoid B, Pressure Control Solenoids A, Turbine Shaft Speed (TSS) sensor, Intermediate Shaft Speed (ISS) sensor, Digital TR sensor, Transmission Fluid Temperature (TFT) sensor 	<ul style="list-style-type: none"> • Carry out on-board diagnostic tests. Refer to the Powertrain Control/Emissions Diagnosis (PC/ED) manual for diagnosis and testing of the PCM.
	<ul style="list-style-type: none"> • Go To Pinpoint Test A, Go To Pinpoint Test B, Go To Pinpoint Test C, Go To Pinpoint Test D and Go To Pinpoint Test E.
	<ul style="list-style-type: none"> • Repair as required. Clear DTCs, road test and carry out on-board diagnostic test again.
333 — HYDRAULIC/MECHANICAL ROUTINE	
Incorrect Pressures	
<ul style="list-style-type: none"> • High/Low pressures 	<ul style="list-style-type: none"> • Check pressure at Line and PC C taps.
	<ul style="list-style-type: none"> • Carry out Line Pressure Test. Refer to the procedure in this section. Follow pressure diagnosis and repair as required.
Main Control	
<ul style="list-style-type: none"> • Bolts not tightened to specification 	<ul style="list-style-type: none"> • Tighten to specification.
<ul style="list-style-type: none"> • Separator plate damaged 	<ul style="list-style-type: none"> • Inspect for damage. If damaged, install a new separator plate.
<ul style="list-style-type: none"> • Contamination 	<ul style="list-style-type: none"> • Disassemble and clean.
<ul style="list-style-type: none"> • Valves and springs damaged, misassembled, missing, stuck, or bore damaged 	<ul style="list-style-type: none"> • If damaged or parts are missing, install new main control assembly. If misassembled, reassemble correctly. DO NOT stone, file or sand valves. This removes the anodized finish and can result in further main control or transmission damage.
Direct Clutch Assembly	
<ul style="list-style-type: none"> • Seals, piston damaged 	<ul style="list-style-type: none"> • Inspect for damage. Repair as necessary.
<ul style="list-style-type: none"> • Check ball damaged, missing, not seating, off location 	<ul style="list-style-type: none"> • Inspect for mislocation, poor seating, damage. Install a new cylinder.
<ul style="list-style-type: none"> • Friction elements damaged or worn 	<ul style="list-style-type: none"> • Inspect for damage. Repair as necessary.
<ul style="list-style-type: none"> • Return springs damaged 	<ul style="list-style-type: none"> • Inspect for damage. Repair as necessary.
Intermediate Clutch Assembly	
<ul style="list-style-type: none"> • Seals, piston damaged 	<ul style="list-style-type: none"> • Inspect for damage. Repair as necessary.
<ul style="list-style-type: none"> • Check ball damaged, missing, not seating, 	<ul style="list-style-type: none"> • Inspect for mislocation, poor seating, damage.

off location	Install a new cylinder.
· Feed tube or seal damaged	· Inspect for damage. Install a new feed tube.
· Friction elements damaged or worn	· Inspect for damage. Repair as necessary.
· Return springs damaged	· Inspect for damage. Repair as necessary.
Direct One-way Clutch	
· Worn, damaged or assembled incorrectly	· Inspect for damage. Repair as necessary.

Shift Concern: Harsh 3-4 Shift

Possible Component	Reference/Action
234 — ELECTRICAL ROUTINE	
Powertrain Control System	
· PCM, vehicle wiring harnesses, Shift Control Solenoid A, Pressure Control Solenoids C, Digital TR sensor, Transmission Fluid Temperature (TFT) sensor	· Carry out on-board diagnostic tests. Refer to the Powertrain Control/Emissions Diagnosis (PC/ED) manual for diagnosis and testing of the PCM.
	· Go To Pinpoint Test A , Go To Pinpoint Test B , Go To Pinpoint Test C and Go To Pinpoint Test D .
	· Repair as required. Clear DTCs, road test and carry out on-board diagnostic test again.
334 — HYDRAULIC/MECHANICAL ROUTINE	
Incorrect Pressures	
· High/low pressures	· Check pressure at Line and PC C taps.
	· Carry out Line Pressure Test. Refer to the procedure in this section. Follow pressure diagnosis and repair as necessary.
Main Control	
· Bolts not tightened to specification	· Tighten to specification.
· Separator plate damaged	· Inspect for damage. If damaged, install a new separator.
· Contamination	· Disassemble and clean.
· Valves and springs damaged, misassembled, missing, stuck, or bore damaged	· If damaged or parts are missing, install new main control assembly. If misassembled, reassemble correctly. DO NOT stone, file or sand valves. This removes the anodized finish and can result in further main control or transmission damage.
Center Support	
· Screws not tightened to specification	· Tighten to specification.
· Seal rings or bearing damaged	· Inspect for damage. Repair as necessary.
· Outside diameter of case bore damage	· Inspect for damage. Repair as necessary.
· Support damaged or leaking	· Inspect for damage. Repair as necessary.
Direct Clutch Assembly	
· Seals, piston damaged	· Inspect for damage. Repair as necessary.
· Check ball damaged, missing, not seating, off location	· Inspect for mislocation, poor seating, damage. Install a new cylinder.

· Friction elements damaged or worn	· Inspect for damage. Repair as necessary.
· Return springs damaged	· Inspect for damage. Repair as necessary.
Intermediate Clutch Assembly	
· Seals, piston damaged	· Inspect for damage. Repair as necessary.
· Check ball damaged, missing, not seating, off location	· Inspect for mislocation, poor seating, damage. Install a new cylinder.
· Feed tube or seal damaged	· Inspect for damage. Install a new feed tube.
· Friction elements damaged or worn	· Inspect for damage. Repair as necessary.
· Return springs damaged	· Inspect for damage. Repair as necessary.

Shift Concerns: Harsh 4-5 Shift

Possible Component	Reference/Action
274 — ELECTRICAL ROUTINE	
Powertrain Control System	
· PCM, vehicle wiring harnesses, Shift Solenoid C, Pressure Control Solenoid B, Turbine Shaft Speed (TSS) sensor, Digital TR sensor, Transmission Fluid Temperature (TFT) sensor	· Carry out on-board diagnostic tests. Refer to the Powertrain Control/Emissions Diagnosis (PC/ED) manual for diagnosis and testing of the PCM.
	· Go To Pinpoint Test A , Go To Pinpoint Test B , Go To Pinpoint Test C , Go To Pinpoint Test D and Go To Pinpoint Test E .
	· Repair as required. Clear DTCs, road test and carry out on-board diagnostic test again.
374 — HYDRAULIC/MECHANICAL ROUTINE	
Incorrect Pressures	
· High/Low pressures	· Check pressure at Line and PC C taps.
	· Carry out Line Pressure Test. Refer to the procedure in this section. Follow pressure diagnosis and repair as required.
Main Control	
· Bolts not tightened to specification	· Tighten to specification.
· Separator plate damaged	· Inspect for damage. If damaged, install a new separator.
· Contamination	· Disassemble and clean.
· Valves and springs damaged, misassembled, missing, stuck, or bore damaged	· If damaged or parts are missing, install new main control assembly. If misassembled, reassemble correctly. DO NOT stone, file or sand valves. This removes the anodized finish and can result in further main control or transmission damage.
OD Servo	
· Servo retaining ring damaged	· Inspect for damage. Repair as necessary.
· Seal (piston and cover) damaged	· Inspect for damage. Repair as necessary.
OD Band	
· Band damaged	· Inspect for damage. Repair as necessary.
· Servo worn or damaged	· Inspect for damage. Repair as necessary.

· Not adjusted correctly

· Inspect for damage. Repair as necessary.

Shift Concern: Harsh 5-4 Shift

Possible Component	Reference/Action
275 — ELECTRICAL ROUTINE	
Powertrain Control System	
<ul style="list-style-type: none"> · PCM, vehicle wiring harnesses, Shift Control Solenoid C, Pressure Control Solenoid C, Turbine Shaft Speed (TSS) sensor, Digital TR sensor, Transmission Fluid Temperature (TFT) sensor 	<ul style="list-style-type: none"> · Carry out on-board diagnostic tests. Refer to the Powertrain Control/Emissions Diagnosis (PC/ED) manual for diagnosis and testing of the PCM.
	<ul style="list-style-type: none"> · Go To Pinpoint Test A, Go To Pinpoint Test B, Go To Pinpoint Test C, Go To Pinpoint Test D and Go To Pinpoint Test E.
	<ul style="list-style-type: none"> · Repair as required. Clear DTCs, road test and carry out on-board diagnostic test again.
375 — HYDRAULIC/MECHANICAL ROUTINE	
Incorrect Pressures	
<ul style="list-style-type: none"> · High/low pressures 	<ul style="list-style-type: none"> · Check pressure at Line and PC C taps.
	<ul style="list-style-type: none"> · Carry out Line Pressure Test. Refer to the procedure in this section. Follow pressure diagnosis and repair as required.
Main Control	
<ul style="list-style-type: none"> · Bolts not tightened to specification 	<ul style="list-style-type: none"> · Tighten to specification.
<ul style="list-style-type: none"> · Separator plate damaged 	<ul style="list-style-type: none"> · Inspect for damage. If damaged, install a new separator plate.
<ul style="list-style-type: none"> · Contamination 	<ul style="list-style-type: none"> · Disassemble and clean.
<ul style="list-style-type: none"> · Valves and springs damaged, misassembled, missing, stuck, or bore damaged 	<ul style="list-style-type: none"> · If damaged or parts are missing, install new main control assembly. If misassembled, reassemble correctly. DO NOT stone, file or sand valves. This removes the anodized finish and can result in further main control or transmission damage.
Direct Clutch Assembly	
<ul style="list-style-type: none"> · Seals, piston damaged 	<ul style="list-style-type: none"> · Inspect for damage. Repair as necessary.
<ul style="list-style-type: none"> · Check ball damaged, missing, not seating, off location 	<ul style="list-style-type: none"> · Inspect for mislocation, poor seating, damage. Install a new cylinder.
<ul style="list-style-type: none"> · Friction elements damaged or worn 	<ul style="list-style-type: none"> · Inspect for damage. Repair as necessary.
<ul style="list-style-type: none"> · Return springs damaged 	<ul style="list-style-type: none"> · Inspect for damage. Repair as necessary.
Direct One-way Clutch	
<ul style="list-style-type: none"> · Worn, damaged or assembled incorrectly 	<ul style="list-style-type: none"> · Inspect for damage. Repair as necessary.

Shift Concern: Harsh 4-3 Shift

Possible Component	Reference/Action
235 — ELECTRICAL ROUTINE	
Powertrain Control System	

<ul style="list-style-type: none"> PCM, vehicle wiring harnesses, Shift Solenoid A, Pressure Control Solenoid A, Digital TR sensor, Transmission Fluid Temperature (TFT) sensor 	<ul style="list-style-type: none"> Carry out on-board diagnostic tests. Refer to the Powertrain Control/Emissions Diagnosis (PC/ED) manual for diagnosis and testing of the PCM.
	<ul style="list-style-type: none"> Go To Pinpoint Test A, Go To Pinpoint Test B, Go To Pinpoint Test C and Go To Pinpoint Test D.
	<ul style="list-style-type: none"> Repair as required. Clear DTCs, road test and carry out on-board diagnostic test again.
335 — HYDRAULIC/MECHANICAL ROUTINE	
Incorrect Pressures	
<ul style="list-style-type: none"> High/Low pressures 	<ul style="list-style-type: none"> Check pressure at Line and PC C taps.
	<ul style="list-style-type: none"> Carry out Line Pressure Test. Refer to the procedure in this section. Follow pressure diagnosis and repair as required.
Main Control	
<ul style="list-style-type: none"> Bolts not tightened to specification 	<ul style="list-style-type: none"> Tighten to specification.
<ul style="list-style-type: none"> Separator plate damaged 	<ul style="list-style-type: none"> Inspect for damage. If damaged, install a new separator plate.
<ul style="list-style-type: none"> Contamination 	<ul style="list-style-type: none"> Disassemble and clean.
<ul style="list-style-type: none"> Valves and springs damaged, misassembled, missing, stuck, or bore damaged 	<ul style="list-style-type: none"> If damaged or parts are missing, install new main control assembly. If misassembled, reassemble correctly. DO NOT stone, file or sand valves. This removes the anodized finish and can result in further main control or transmission damage.
Direct Clutch Assembly	
<ul style="list-style-type: none"> Seals, piston damaged 	<ul style="list-style-type: none"> Inspect for damage. Repair as necessary.
<ul style="list-style-type: none"> Check ball damaged, missing, not seating, off location 	<ul style="list-style-type: none"> Inspect for mislocation, poor seating, damage. Install a new cylinder.
<ul style="list-style-type: none"> Friction elements damaged or worn 	<ul style="list-style-type: none"> Inspect for damage. Repair as necessary.
<ul style="list-style-type: none"> Return springs damaged 	<ul style="list-style-type: none"> Inspect for damage. Repair as necessary.
Intermediate Clutch Assembly	
<ul style="list-style-type: none"> Seals, piston damaged 	<ul style="list-style-type: none"> Inspect for damage. Repair as necessary.
<ul style="list-style-type: none"> Check ball damaged, missing, not seating, off location 	<ul style="list-style-type: none"> Inspect for mislocation, poor seating, damage. Install a new cylinder.
<ul style="list-style-type: none"> Feed tube or seal damaged 	<ul style="list-style-type: none"> Inspect for damage. Install a new feed tube.
<ul style="list-style-type: none"> Friction elements damaged or worn 	<ul style="list-style-type: none"> Inspect for damage. Repair as necessary.
<ul style="list-style-type: none"> Return springs damaged 	<ul style="list-style-type: none"> Inspect for damage. Repair as necessary.

Shift Concern: Harsh 3-2 Shift

Possible Component	Reference/Action
236 — ELECTRICAL ROUTINE	
Powertrain Control System	
<ul style="list-style-type: none"> PCM, vehicle wiring harnesses, Shift Control Solenoid C, Pressure Control Solenoid B, Turbine Shaft Speed (TSS) sensor, Intermediate Shaft Speed (ISS) sensor, 	<ul style="list-style-type: none"> Carry out on-board diagnostic tests. Refer to the Powertrain Control/Emissions Diagnosis (PC/ED) manual for diagnosis and testing of the PCM.

Digital TR sensor, Transmission Fluid Temperature (TFT) sensor	
	<ul style="list-style-type: none"> • Go To Pinpoint Test A , Go To Pinpoint Test B , Go To Pinpoint Test C , Go To Pinpoint Test D and Go To Pinpoint Test E .
	<ul style="list-style-type: none"> • Repair as required. Clear DTCs, road test and carry out on-board diagnostic test again.
336 — HYDRAULIC/MECHANICAL ROUTINE	
Incorrect Pressures	
<ul style="list-style-type: none"> • High/Low pressures 	<ul style="list-style-type: none"> • Check pressure at Line and PC C taps.
	<ul style="list-style-type: none"> • Carry out Line Pressure Test. Refer to the procedure in this section. Follow pressure diagnosis and repair as required.
Main Control	
<ul style="list-style-type: none"> • Bolts not tightened to specification 	<ul style="list-style-type: none"> • Tighten to specification.
<ul style="list-style-type: none"> • Separator plate damaged 	<ul style="list-style-type: none"> • Inspect for damage. If damaged, install a new separator plate.
<ul style="list-style-type: none"> • Contamination 	<ul style="list-style-type: none"> • Disassemble and clean.
<ul style="list-style-type: none"> • Valves and springs damaged, misassembled, missing, stuck, or bore damaged 	<ul style="list-style-type: none"> • If damaged or parts are missing, install new main control assembly. If misassembled, reassemble correctly. DO NOT stone, file or sand valves. This removes the anodized finish and can result in further main control or transmission damage.
OD Servo	
<ul style="list-style-type: none"> • Servo retaining ring damaged 	<ul style="list-style-type: none"> • Inspect for damage. Repair as necessary.
<ul style="list-style-type: none"> • Seals (piston and cover) damaged 	<ul style="list-style-type: none"> • Inspect for damage. Repair as necessary.
OD Band	
<ul style="list-style-type: none"> • Band damaged 	<ul style="list-style-type: none"> • Inspect for damage. Repair as necessary.
<ul style="list-style-type: none"> • Servo worn or damaged 	<ul style="list-style-type: none"> • Inspect for damage. Repair as necessary.
<ul style="list-style-type: none"> • Not adjusted correctly 	<ul style="list-style-type: none"> • Inspect for damage. Repair as necessary.
Direct Clutch Assembly	
<ul style="list-style-type: none"> • Seals, piston damaged 	<ul style="list-style-type: none"> • Inspect for damage. Repair as necessary.
<ul style="list-style-type: none"> • Check ball damaged, missing, not seating, off location 	<ul style="list-style-type: none"> • Inspect for mislocation, poor seating, damage. Install a new cylinder.
<ul style="list-style-type: none"> • Friction elements damaged or worn 	<ul style="list-style-type: none"> • Inspect for damage. Repair as necessary.
<ul style="list-style-type: none"> • Return springs damaged 	<ul style="list-style-type: none"> • Inspect for damage. Repair as necessary.
Intermediate Clutch Assembly	
<ul style="list-style-type: none"> • Seals, piston damaged 	<ul style="list-style-type: none"> • Inspect for damage. Repair as necessary.
<ul style="list-style-type: none"> • Check ball damaged, missing, not seating, off location 	<ul style="list-style-type: none"> • Inspect for mislocation, poor seating, damage. Install a new cylinder.
<ul style="list-style-type: none"> • Feed tube or seal damaged 	<ul style="list-style-type: none"> • Inspect for damage. Install a new feed tube.
<ul style="list-style-type: none"> • Friction elements damaged 	<ul style="list-style-type: none"> • Inspect for damage. Repair as necessary.
<ul style="list-style-type: none"> • Return springs damaged 	<ul style="list-style-type: none"> • Inspect for damage. Repair as necessary.

Shift Concern: Harsh 2-1 Shift

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Possible Component	Reference/Action
237 — ELECTRICAL ROUTINE	
Powertrain Control System	
<ul style="list-style-type: none"> PCM, vehicle wiring harnesses, Shift Control Solenoid C, Pressure Control Solenoid B, Turbine Shaft Speed (TSS) sensor, Digital TR sensor, Transmission Fluid Temperature (TFT) sensor 	<ul style="list-style-type: none"> Carry out on-board diagnostic tests. Refer to the Powertrain Control/Emissions Diagnosis (PC/ED) manual for diagnosis and testing of the PCM.
	<ul style="list-style-type: none"> Go To Pinpoint Test A, Go To Pinpoint Test B, Go To Pinpoint Test C, Go To Pinpoint Test D and Go To Pinpoint Test E.
	<ul style="list-style-type: none"> Repair as required. Clear DTCs, road test and carry out on-board diagnostic test again.
337 — HYDRAULIC/MECHANICAL ROUTINE	
Incorrect Pressures	
<ul style="list-style-type: none"> High/Low pressures 	<ul style="list-style-type: none"> Check pressure at Line and PC C taps.
	<ul style="list-style-type: none"> Carry out Line Pressure Test. Refer to the procedure in this section. Follow pressure diagnosis and repair as required.
Main Control	
<ul style="list-style-type: none"> Bolts not tightened to specification 	<ul style="list-style-type: none"> Tighten to specification.
<ul style="list-style-type: none"> Separator plate damaged 	<ul style="list-style-type: none"> Inspect for damage. If damaged, install a new separator plate.
<ul style="list-style-type: none"> Contamination 	<ul style="list-style-type: none"> Disassemble and clean.
<ul style="list-style-type: none"> Valves and springs damaged, misassembled, missing, stuck, or bore damaged 	<ul style="list-style-type: none"> If damaged or parts are missing, install new main control assembly. If misassembled, reassemble correctly. DO NOT stone, file or sand valves. This removes the anodized finish and can result in further main control or transmission damage.
Direct Clutch Assembly	
<ul style="list-style-type: none"> Seals, piston damaged 	<ul style="list-style-type: none"> Inspect for damage. Repair as necessary.
<ul style="list-style-type: none"> Check ball damaged, missing, not seating, off location 	<ul style="list-style-type: none"> Inspect for mislocation, poor seating damage. Install a new cylinder.
<ul style="list-style-type: none"> Friction elements damaged or worn 	<ul style="list-style-type: none"> Inspect for damage. Repair as necessary.
<ul style="list-style-type: none"> Return springs damaged 	<ul style="list-style-type: none"> Inspect for damage. Repair as necessary.
Intermediate Clutch Assembly	
<ul style="list-style-type: none"> Seals, piston damaged 	<ul style="list-style-type: none"> Inspect for damage. Repair as necessary.
<ul style="list-style-type: none"> Check ball damaged, missing, not seating, off location 	<ul style="list-style-type: none"> Inspect for mislocation, poor seating damage. Install a new cylinder.
<ul style="list-style-type: none"> Feed tube or seal damaged 	<ul style="list-style-type: none"> Inspect for damage. Install a new feed tube.
<ul style="list-style-type: none"> Friction elements damaged or worn 	<ul style="list-style-type: none"> Inspect for damage. Repair as necessary.
<ul style="list-style-type: none"> Return springs damaged 	<ul style="list-style-type: none"> Inspect for damage. Repair as necessary.
Direct Clutch One-way Clutch	
<ul style="list-style-type: none"> Worn, damaged or assembled incorrectly 	<ul style="list-style-type: none"> Inspect for damage. Repair as necessary.

Shift Concern: No 1-2 Shift

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Possible Component	Reference/Action
220 — ELECTRICAL ROUTINE	
Powertrain Control System	
<ul style="list-style-type: none"> PCM, vehicle wiring harnesses, Shift Solenoid C, Pressure Control Solenoid B, Output Shaft Speed (OSS) sensor, Digital TR sensor, IAT sensor, VSS input 	<ul style="list-style-type: none"> Carry out on-board diagnostic tests. Refer to the Powertrain Control/Emissions Diagnosis (PC/ED) manual for diagnosis and testing of the PCM, IAT and VSS.
	<ul style="list-style-type: none"> Go To Pinpoint Test A, Go To Pinpoint Test C, Go To Pinpoint Test D and Go To Pinpoint Test E.
	<ul style="list-style-type: none"> Repair as required. Clear DTCs, road test and carry out on-board diagnostic test again.
320 — HYDRAULIC/MECHANICAL ROUTINE	
Fluid	
<ul style="list-style-type: none"> Incorrect level 	<ul style="list-style-type: none"> Adjust to correct level. Refer to the procedure in this section.
Incorrect Pressures	
<ul style="list-style-type: none"> High/Low pressures 	<ul style="list-style-type: none"> Check pressure at line and PC C taps. Carry out Line Pressure Test. Refer to the procedure in this section. Follow pressure diagnosis and repair as required.
Main Control	
<ul style="list-style-type: none"> Bolts not tightened to specification 	<ul style="list-style-type: none"> Tighten to specification.
<ul style="list-style-type: none"> Separator plate damaged 	<ul style="list-style-type: none"> Inspect for damage. If damaged, install a new separator plate.
<ul style="list-style-type: none"> Contamination 	<ul style="list-style-type: none"> Disassemble and clean.
<ul style="list-style-type: none"> Valves and springs damaged, misassembled, missing, stuck, or bore damaged 	<ul style="list-style-type: none"> If damaged or parts are missing, install new main control assembly. If misassembled, reassemble correctly. DO NOT stone, file or sand valves. This removes the anodized finish and can result in further main control or transmission damage.
OD Servo	
<ul style="list-style-type: none"> Servo retaining ring damaged 	<ul style="list-style-type: none"> Inspect for damage. Repair as necessary.
<ul style="list-style-type: none"> Seals (piston and cover) damaged 	<ul style="list-style-type: none"> Inspect for damage. Repair as necessary.
OD Band	
<ul style="list-style-type: none"> Band damaged 	<ul style="list-style-type: none"> Inspect for damage. Repair as necessary.
<ul style="list-style-type: none"> Servo worn or damaged 	<ul style="list-style-type: none"> Inspect for damage. Repair as necessary.
<ul style="list-style-type: none"> Not adjusted correctly 	<ul style="list-style-type: none"> Inspect for damage. Repair as necessary.
OD Planetary Assembly	
<ul style="list-style-type: none"> Planetary damaged 	<ul style="list-style-type: none"> Inspect for damage. Repair as necessary.
Forward Clutch Assembly	
<ul style="list-style-type: none"> Seals, piston damaged 	<ul style="list-style-type: none"> Inspect for damage. Repair as necessary.
<ul style="list-style-type: none"> Check ball damaged, missing, not seating, off location 	<ul style="list-style-type: none"> Inspect for mislocation, poor seating damage. Install a new cylinder.
<ul style="list-style-type: none"> Friction elements damaged or worn 	<ul style="list-style-type: none"> Inspect for damage. Repair as necessary.
<ul style="list-style-type: none"> Return springs damaged 	<ul style="list-style-type: none"> Inspect for damage. Repair as necessary.
Intermediate Clutch Assembly	
	<ul style="list-style-type: none"> Inspect for damage. Repair as necessary.

· Seals, piston damaged	
· Check ball damaged, missing, not seating, off location	· Inspect for mislocation, poor seating damage. Install a new cylinder.
· Feed tube or seal damaged	· Inspect for damage. Install a new feed tube.
· Friction elements damaged or worn	· Inspect for damage. Repair as necessary.
· Return springs damaged	· Inspect for damage. Repair as necessary.

Shift Concern: No 2-3 Shift

Possible Component	Reference/Action
221 — ELECTRICAL ROUTINE	
Powertrain Control System	
· PCM, vehicle wiring harnesses, Shift Solenoid B, Torque Converter Clutch (TCC) solenoid, Pressure Control Solenoid A, Output Shaft Speed (OSS) sensor, Digital TR sensor	· Carry out on-board diagnostic tests. Refer to the Powertrain Control/Emissions Diagnosis (PC/ED) manual for diagnosis and testing of the PCM.
	· Go To Pinpoint Test A , Go To Pinpoint Test C , Go To Pinpoint Test D and Go To Pinpoint Test E .
	· Repair as required. Clear DTCs, road test and carry out on-board diagnostic test again.
321 — HYDRAULIC/MECHANICAL ROUTINE	
Incorrect Pressures	
· High/low pressures	· Check pressure at Line and PC C taps.
	· Carry out Line Pressure Test. Refer to the procedure in this section. Follow pressure diagnosis and repair as required.
Main Control	
· Bolts not tightened to specification	· Tighten to specification.
· Separator plate damaged	· Inspect for damage. If damaged, install a new separator plate.
· Contamination	· Disassemble and clean.
· Valves and springs damaged, misassembled, missing, stuck, or bore damaged	· If damaged or parts are missing, install new main control assembly. If misassembled, reassemble correctly. DO NOT stone, file or sand valves. This removes the anodized finish and can result in further main control or transmission damage.
Forward Clutch Assembly	
· Seals, piston damaged	· Inspect for damage. Repair as necessary.
· Check ball, damaged, missing, not seating, off location	· Inspect for mislocation, poor seating, damage. Install a new cylinder.
· Friction elements damaged or worn	· Inspect for damage. Repair as necessary.
· Return springs damaged	· Inspect for damage. Repair as necessary.
Intermediate Clutch Assembly	
· Seals, piston damaged	· Inspect for damage. Repair as necessary.
· Check ball, damaged, missing, not seating, off location	· Inspect for mislocation, poor seating, damage. Install a new cylinder.

· Feed tube or seal damaged	· Inspect for damage. Install a new feed tube.
· Friction elements damaged or worn	· Inspect for damage. Repair as necessary.
· Return springs damaged	· Inspect for damage. Repair as necessary.
Intermediate One-way Clutch	
· Worn, damaged or assembled incorrectly	· Inspect for damage. Repair as necessary.

Shift Concern: No 3-4 Shift

Possible Component	Reference/Action
222 — ELECTRICAL ROUTINE	
Powertrain Control System	
· PCM, vehicle wiring harnesses, Shift Solenoid A, Pressure Control Solenoid C, Output Shaft Speed (OSS) sensor, Digital TR sensor	· Carry out on-board diagnostic tests. Refer to the Powertrain Control/Emissions Diagnosis (PC/ED) manual for diagnosis and testing of the PCM.
· Transmission Control Switch (TCS)	· Go To Pinpoint Test A , Go To Pinpoint Test C , Go To Pinpoint Test D and Go To Pinpoint Test E .
	· Repair as required. Clear DTCs, road test and carry out on-board diagnostic test again.
	· For TSC diagnosis, refer to External Controls in Section 307-05 .
322 — HYDRAULIC/MECHANICAL ROUTINE	
Incorrect Pressures	
· High/Low pressures	· Check pressure at Line and PC C taps.
	· Carry out Line Pressure Test. Refer to the procedure in this section. Follow pressure diagnosis and repair as necessary.
Main Control	
· Bolts not tightened to specification	· Tighten to specification.
· Separator plate damaged	· Inspect for damage. If damaged, install a new separator plate.
· Contamination	· Disassemble and clean.
· Valves and springs damaged, misassembled, missing, stuck, or bore damaged	· If damaged or parts are missing, install new main control assembly. If misassembled, reassemble correctly. DO NOT stone, file or sand valves. This removes the anodized finish and can result in further main control or transmission damage.
Center Support	
· Screws not tightened to specification	· Tighten to specification.
· Seal rings or bearing damaged	· Inspect for damage. Repair as necessary.
· Outside diameter of case bore damaged	· Inspect for damage. Repair as necessary.
· Support damaged or leaking	· Inspect for damage. Repair as necessary.
Direct Clutch Assembly	
· Seals, piston damaged	· Inspect for damage. Repair as necessary.

• Check ball damaged, missing, not seating, off location	• Inspect for mislocation, poor seating, damage. Install a new cylinder.
• Friction elements damaged or worn	• Inspect for damage. Repair as necessary.
• Return springs damaged	• Inspect for damage. Repair as necessary.
Forward Clutch Assembly	
• Seals, piston damaged	• Inspect for damage. Repair as necessary.
• Check ball damaged, missing, not seating, off location	• Inspect for mislocation, poor seating, damage. Install a new cylinder.
• Friction elements damaged or worn	• Inspect for damage. Repair as necessary.
• Return springs damaged	• Inspect for damage. Repair as necessary.
Intermediate Clutch Assembly	
• Seals, piston damaged	• Inspect for damage. Repair as necessary.
• Check ball damaged, missing, not seating, off location	• Inspect for mislocation, poor seating, damage. Install a new cylinder.
• Feed tube or seal damaged	• Inspect for damage. Install a new feed tube.
• Friction elements damaged or worn	• Inspect for damage. Repair as necessary.
• Return springs damaged	• Inspect for damage. Repair as necessary.

Shift Concern: No 4-5 Shift

Possible Component	Reference/Action
270 — ELECTRICAL ROUTINE	
Powertrain Control System	
• PCM, vehicle wiring harnesses, Shift Solenoid C, Pressure Control Solenoid B, Output Shaft Speed (OSS) sensor, Digital TR sensor	• Carry out on-board diagnostic tests. Refer to the Powertrain Control/Emissions Diagnosis (PC/ED) manual for diagnosis and testing of the PCM.
• Transmission Control Switch (TCS)	• Go To Pinpoint Test A , Go To Pinpoint Test C , Go To Pinpoint Test D and Go To Pinpoint Test E .
	• Repair as required. Clear DTCs, road test and carry out on-board diagnostic test again.
	• For TSC diagnosis, refer to Section 307-05 .
370 — HYDRAULIC/MECHANICAL ROUTINE	
Incorrect Pressures	
• High/Low pressures	• Check pressure at Line and PC C taps.
	• Carry out Line Pressure Test. Refer to the procedure in this section. Follow pressure diagnosis and repair as required.
Main Control	
• Bolts not tightened to specification	• Tighten to specification.
• Separator plate damaged	• Inspect for damage. If damaged, install a new separator plate.
• Contamination	• Disassemble and clean.
• Valves and springs damaged, misassembled, missing, stuck, or bore damaged	• If damaged or parts are missing, install new main control assembly. If misassembled, reassemble correctly. DO NOT stone, file or sand valves. This removes the anodized finish and can result in further main control or

	transmission damage.
OD Servo	
· Servo retaining ring damaged	· Inspect for damage. Repair as necessary.
· Seals (piston and cover) damaged	· Inspect for damage. Repair as necessary.
OD Band	
· Band damaged	· Inspect for damage. Repair as necessary.
· Servo worn or damaged	· Inspect for damage. Repair as necessary.
· Not adjusted correctly	· Inspect for damage. Repair as necessary.

Shift Concern: No 5-4 Shift

Possible Component	Reference/Action
271 — ELECTRICAL ROUTINE	
Powertrain Control System	
· PCM, vehicle wiring harnesses, Shift Solenoid C, Pressure Control Solenoid C, Output Shaft Speed (OSS) sensor, Digital TR sensor	· Carry out on-board diagnostic tests. Refer to the Powertrain Control/Emissions Diagnosis (PC/ED) manual for diagnosis and testing of the PCM.
· Transmission Control Switch (TCS)	· Go To Pinpoint Test A , Go To Pinpoint Test C , Go To Pinpoint Test D and Go To Pinpoint Test E .
	· Repair as required. Clear DTCs, road test and carry out on-board diagnostic test again.
	· For TCS diagnosis, refer to Section 307-05 .
371 — HYDRAULIC/MECHANICAL ROUTINE	
Incorrect Pressures	
· High/Low pressures	· Check pressure at Line and PC C taps.
	· Carry out Line Pressure Test. Refer to the procedure in this section. Follow pressure diagnosis and repair as required.
Main Control	
· Bolts not tightened to specification	· Tighten to specification.
· Separator plate damaged	· Inspect for damage. If damaged, install a new separator plate.
· Contamination	· Disassemble and clean.
· Valves and springs damaged, misassembled, missing, stuck, or bore damaged	· If damaged or parts are missing, install new main control assembly. If misassembled, reassemble correctly. DO NOT stone, file or sand valves. This removes the anodized finish and can result in further main control or transmission damage.
Direct Clutch Assembly	
· Seals, piston damaged	· Inspect for damage. Repair as necessary.
· Check ball damaged, missing, not seating, off location	· Inspect for mislocation, poor seating, damage. Install a new cylinder.
· Friction elements damaged or worn	· Inspect for damage. Repair as necessary.
· Return springs damaged	· Inspect for damage. Repair as necessary.

Shift Concern: No 4-3 Shift

Possible Component	Reference/Action
223 — ELECTRICAL ROUTINE	
Powertrain Control System	
<ul style="list-style-type: none"> PCM, vehicle wiring harnesses, Shift Solenoid A, Pressure Control Solenoid A, Output Shaft Speed (OSS) sensor, Digital TR sensor 	<ul style="list-style-type: none"> Carry out on-board diagnostic tests. Refer to the Powertrain Control/Emissions Diagnosis (PC/ED) manual for diagnosis and testing of the PCM.
<ul style="list-style-type: none"> Transmission Control Switch (TCS) 	<ul style="list-style-type: none"> Go To Pinpoint Test A , Go To Pinpoint Test C , Go To Pinpoint Test D and Go To Pinpoint Test E .
	<ul style="list-style-type: none"> Repair as required. Clear DTCs, road test and carry out on-board diagnostic test again.
	<ul style="list-style-type: none"> For TCS diagnosis, refer to Section 307-05 .
323 — HYDRAULIC/MECHANICAL ROUTINE	
Incorrect Pressures	
<ul style="list-style-type: none"> High/Low pressures 	<ul style="list-style-type: none"> Check pressure at Line and PC C taps.
	<ul style="list-style-type: none"> Carry out Line Pressure Test. Refer to the procedure in this section. Follow pressure diagnosis and repair as necessary.
Main Control	
<ul style="list-style-type: none"> Bolts not tightened to specification 	<ul style="list-style-type: none"> Tighten to specification.
<ul style="list-style-type: none"> Separator plate damaged 	<ul style="list-style-type: none"> Inspect for damage. If damaged, install a new separator plate.
<ul style="list-style-type: none"> Contamination 	<ul style="list-style-type: none"> Disassemble and clean.
<ul style="list-style-type: none"> Valves and springs damaged, misassembled, missing, stuck, or bore damaged 	<ul style="list-style-type: none"> If damaged or parts are missing, install new main control assembly. If misassembled, reassemble correctly. DO NOT stone, file or sand valves. This removes the anodized finish and can result in further main control or transmission damage.
Forward Clutch Assembly	
<ul style="list-style-type: none"> Seals, piston damaged 	<ul style="list-style-type: none"> Inspect for damage. Repair as necessary.
<ul style="list-style-type: none"> Check ball damaged, missing, not seating, off location 	<ul style="list-style-type: none"> Inspect for mislocation, poor seating, damage. Install a new cylinder.
<ul style="list-style-type: none"> Friction elements damaged or worn 	<ul style="list-style-type: none"> Inspect for damage. Repair as necessary.
<ul style="list-style-type: none"> Return springs damaged 	<ul style="list-style-type: none"> Inspect for damage. Repair as necessary.
Intermediate Clutch Assembly	
<ul style="list-style-type: none"> Seals, piston damaged 	<ul style="list-style-type: none"> Inspect for damage. Repair as necessary.
<ul style="list-style-type: none"> Check ball damaged, missing, not seating, off location 	<ul style="list-style-type: none"> Inspect for mislocation, poor seating, damage. Install a new cylinder.
<ul style="list-style-type: none"> Feed tube or seal damaged 	<ul style="list-style-type: none"> Inspect for damage. Install a new feed tube.
<ul style="list-style-type: none"> Friction elements damaged or worn 	<ul style="list-style-type: none"> Inspect for damage. Repair as necessary.
<ul style="list-style-type: none"> Return springs damaged 	<ul style="list-style-type: none"> Inspect for damage. Repair as necessary.

Shift Concern: No 3-2 Shift

Possible Component	Reference/Action

224 — ELECTRICAL ROUTINE

Powertrain Control System	
<ul style="list-style-type: none"> PCM, vehicle wiring harnesses, Shift Solenoid C, Pressure Control Solenoid B, Output Shaft Speed (OSS) sensor, Digital TR sensor 	<ul style="list-style-type: none"> Carry out on-board diagnostic tests. Refer to the Powertrain Control/Emissions Diagnosis (PC/ED) manual for diagnosis and testing of the PCM.
	<ul style="list-style-type: none"> Go To Pinpoint Test A, Go To Pinpoint Test C, Go To Pinpoint Test D and Go To Pinpoint Test E.
	<ul style="list-style-type: none"> Repair as required. Clear DTCs, road test and carry out on-board diagnostic test again.

324 — HYDRAULIC/MECHANICAL ROUTINE

Incorrect Pressures	
<ul style="list-style-type: none"> High/low pressures 	<ul style="list-style-type: none"> Check pressure at Line and PC C taps.
	<ul style="list-style-type: none"> Carry out Line Pressure Test. Refer to the procedure in this section. Follow pressure diagnosis and repair as necessary.
Main Control	
<ul style="list-style-type: none"> Bolts not tightened to specification 	<ul style="list-style-type: none"> Tighten to specification.
<ul style="list-style-type: none"> Separator plate damaged 	<ul style="list-style-type: none"> Inspect for damage. If damaged, install a new separator plate.
<ul style="list-style-type: none"> Contamination 	<ul style="list-style-type: none"> Disassemble and clean.
<ul style="list-style-type: none"> Valves and springs damaged, misassembled, missing, stuck, or bore damaged 	<ul style="list-style-type: none"> If damaged or parts are missing, install new main control assembly. If misassembled, reassemble correctly. DO NOT stone, file or sand valves. This removes the anodized finish and can result in further main control or transmission damage.
OD Servo	
<ul style="list-style-type: none"> Servo retaining ring damaged 	<ul style="list-style-type: none"> Inspect for damage. Repair as necessary.
<ul style="list-style-type: none"> Seals (piston and cover) damaged 	<ul style="list-style-type: none"> Inspect for damage. Repair as necessary.
OD Band	
<ul style="list-style-type: none"> Band damaged 	<ul style="list-style-type: none"> Inspect for damage. Repair as necessary.
<ul style="list-style-type: none"> Servo worn or damaged 	<ul style="list-style-type: none"> Inspect for damage. Repair as necessary.
<ul style="list-style-type: none"> Not adjusted correctly 	<ul style="list-style-type: none"> Inspect for damage. Repair as necessary.
Forward Clutch Assembly	
<ul style="list-style-type: none"> Seals, piston damaged 	<ul style="list-style-type: none"> Inspect for damage. Repair as necessary.
<ul style="list-style-type: none"> Check ball damaged, missing, not seating, off location 	<ul style="list-style-type: none"> Inspect for mislocation, poor seating, damage. Install a new cylinder.
<ul style="list-style-type: none"> Friction elements damaged or worn 	<ul style="list-style-type: none"> Inspect for damage. Repair as necessary.
<ul style="list-style-type: none"> Return springs damaged 	<ul style="list-style-type: none"> Inspect for damage. Repair as necessary.
Intermediate Clutch Assembly	
<ul style="list-style-type: none"> Seals, piston damaged 	<ul style="list-style-type: none"> Inspect for damage. Repair as necessary.
<ul style="list-style-type: none"> Check ball damaged, missing, not seating, off location 	<ul style="list-style-type: none"> Inspect for mislocation, poor seating, damage. Install a new cylinder.
<ul style="list-style-type: none"> Feed tube or seal damaged 	<ul style="list-style-type: none"> Inspect for damage. Install a new feed tube.
<ul style="list-style-type: none"> Friction elements damaged or worn 	<ul style="list-style-type: none"> Inspect for damage. Repair as necessary.
<ul style="list-style-type: none"> Return springs damaged 	<ul style="list-style-type: none"> Inspect for damage. Repair as necessary.

Shift Concern: No 2-1 Shift

Possible Component	Reference/Action
225 — ELECTRICAL ROUTINE	
Powertrain Control System	
<ul style="list-style-type: none"> PCM, vehicle wiring harnesses, Shift Solenoid C, Pressure Control Solenoid B, Output Shaft Speed (OSS) sensor, Digital TR sensor 	<ul style="list-style-type: none"> Carry out on-board diagnostic tests. Refer to the Powertrain Control/Emissions Diagnosis (PC/ED) manual for diagnosis and testing of the PCM.
	<ul style="list-style-type: none"> Go To Pinpoint Test A, Go To Pinpoint Test C, Go To Pinpoint Test D and Go To Pinpoint Test E.
	<ul style="list-style-type: none"> Repair as required. Clear DTCs, road test and carry out on-board diagnostic test again.
325 — HYDRAULIC/MECHANICAL ROUTINE	
Incorrect Pressures	
<ul style="list-style-type: none"> High/Low pressures 	<ul style="list-style-type: none"> Check pressure at Line and PC C taps.
	<ul style="list-style-type: none"> Carry out Line Pressure Test. Refer to the procedure in this section. Follow pressure diagnosis and repair as required.
Main Control	
<ul style="list-style-type: none"> Bolts not tightened to specification 	<ul style="list-style-type: none"> Tighten to specification.
<ul style="list-style-type: none"> Separator plate damaged 	<ul style="list-style-type: none"> Inspect for damage. If damaged, install a new separator plate.
<ul style="list-style-type: none"> Contamination 	<ul style="list-style-type: none"> Disassemble and clean.
<ul style="list-style-type: none"> Valves and springs damaged, misassembled, missing, stuck, or bore damaged 	<ul style="list-style-type: none"> If damaged or parts are missing, install new main control assembly. If misassembled, reassemble correctly. DO NOT stone, file or sand valves. This removes the anodized finish and can result in further main control or transmission damage.
Forward Clutch Assembly	
<ul style="list-style-type: none"> Seals, piston damaged 	<ul style="list-style-type: none"> Inspect for damage. Repair as necessary.
<ul style="list-style-type: none"> Check ball damaged, missing, not seating, off location 	<ul style="list-style-type: none"> Inspect for mislocation, poor seating, damage. Install a new cylinder.
<ul style="list-style-type: none"> Friction elements damaged or worn 	<ul style="list-style-type: none"> Inspect for damage. Repair as necessary.
<ul style="list-style-type: none"> Return springs damaged 	<ul style="list-style-type: none"> Inspect for damage. Repair as necessary.
Intermediate Clutch Assembly	
<ul style="list-style-type: none"> Seals, piston damaged 	<ul style="list-style-type: none"> Inspect for damage. Repair as necessary.
<ul style="list-style-type: none"> Check ball damaged, missing, not seating, off location 	<ul style="list-style-type: none"> Inspect for mislocation, poor seating, damage. Install a new cylinder.
<ul style="list-style-type: none"> Feed tube or seal damaged 	<ul style="list-style-type: none"> Inspect for damage. Install a new feed tube.
<ul style="list-style-type: none"> Friction elements damaged or worn 	<ul style="list-style-type: none"> Inspect for damage. Repair as necessary.
<ul style="list-style-type: none"> Return springs damaged 	<ul style="list-style-type: none"> Inspect for damage. Repair as necessary.

Shift Concern: Soft/Slipping 1-2 Shift

Possible Component	Reference/Action

226 — ELECTRICAL ROUTINE

Powertrain Control System	
<ul style="list-style-type: none"> PCM, vehicle wiring harnesses, Shift Solenoid C, Pressure Control Solenoid B, Transmission Fluid Temperature (TFT) sensor, IAT sensor, VSS input 	<ul style="list-style-type: none"> Carry out on-board diagnostic tests. Refer to the Powertrain Control/Emissions Diagnosis (PC/ED) manual for diagnosis and testing of the PCM.
	<ul style="list-style-type: none"> Go To Pinpoint Test A, Go To Pinpoint Test B and Go To Pinpoint Test D.
	<ul style="list-style-type: none"> Repair as required. Clear DTCs, road test and carry out on-board diagnostic test again.

326 — HYDRAULIC/MECHANICAL ROUTINE

Fluid	
<ul style="list-style-type: none"> Incorrect level 	<ul style="list-style-type: none"> Adjust to correct level. Refer to the procedure in this section.
<ul style="list-style-type: none"> Condition 	<ul style="list-style-type: none"> Carry out Fluid Condition Check. Refer to the procedure in this section.
Incorrect Pressures	
<ul style="list-style-type: none"> High/Low pressures 	<ul style="list-style-type: none"> Check pressure at Line and PC C taps.
	<ul style="list-style-type: none"> Carry out Line Pressure Test. Refer to the procedure in this section. Follow pressure diagnosis and repair as necessary.
Main Control	
<ul style="list-style-type: none"> Bolts not tightened to specification 	<ul style="list-style-type: none"> Tighten to specification.
<ul style="list-style-type: none"> Separator plate damaged 	<ul style="list-style-type: none"> Inspect for damage. If damaged, install a new separator plate.
<ul style="list-style-type: none"> Contamination 	<ul style="list-style-type: none"> Disassemble and clean.
<ul style="list-style-type: none"> Valve and springs damaged, misassembled, missing, stuck, or bore damaged 	<ul style="list-style-type: none"> If damaged or parts are missing, install new main control assembly. If misassembled, reassemble correctly. DO NOT stone, file or sand valves. This removes the anodized finish and can result in further main control or transmission damage.
OD Servo	
<ul style="list-style-type: none"> Servo retaining ring damaged 	<ul style="list-style-type: none"> Inspect for damage. Repair as necessary.
<ul style="list-style-type: none"> Seals (piston and cover) damaged 	<ul style="list-style-type: none"> Inspect for damage. Repair as necessary.
OD Band	
<ul style="list-style-type: none"> Band damaged 	<ul style="list-style-type: none"> Inspect for damage. Repair as necessary.
<ul style="list-style-type: none"> Servo worn or damaged 	<ul style="list-style-type: none"> Inspect for damage. Repair as necessary.
<ul style="list-style-type: none"> Not adjusted correctly 	<ul style="list-style-type: none"> Inspect for damage. Repair as necessary.

Shift Concern: Soft/Slipping 2-3 Shift

Possible Component	Reference/Action
227 — ELECTRICAL ROUTINE	
Powertrain Control System	
<ul style="list-style-type: none"> PCM, vehicle wiring harnesses, Shift Solenoid A, Pressure Control Solenoid A, Intermediate Shaft Speed (ISS) 	<ul style="list-style-type: none"> Carry out on-board diagnostic tests. Refer to the Powertrain Control/Emissions Diagnosis (PC/ED) manual for diagnosis and testing of the PCM.

sensor, Transmission Fluid Temperature (TFT) sensor	
	<ul style="list-style-type: none"> • Go To Pinpoint Test A , Go To Pinpoint Test B , Go To Pinpoint Test D and Go To Pinpoint Test E .
	<ul style="list-style-type: none"> • Repair as required. Clear DTCs, road test and carry out on-board diagnostic test again.
327 — HYDRAULIC/MECHANICAL ROUTINE	
Incorrect Pressures	
<ul style="list-style-type: none"> • High/Low pressures 	<ul style="list-style-type: none"> • Check pressure at Line and PC C taps.
	<ul style="list-style-type: none"> • Carry out Line Pressure Test. Refer to the procedure in this section. Follow pressure diagnosis and repair as required.
Main Control	
<ul style="list-style-type: none"> • Bolts not tightened to specification 	<ul style="list-style-type: none"> • Tighten to specification.
<ul style="list-style-type: none"> • Separator plate damaged 	<ul style="list-style-type: none"> • Inspect for damage. If damaged, install a new separator plate.
<ul style="list-style-type: none"> • Contamination 	<ul style="list-style-type: none"> • Disassemble and clean.
<ul style="list-style-type: none"> • Valves and springs damaged, misassembled, missing, stuck, or bore damaged 	<ul style="list-style-type: none"> • If damaged or parts are missing, install new main control assembly. If misassembled, reassemble correctly. DO NOT stone, file or sand valves. This removes the anodized finish and can result in further main control or transmission damage.
Intermediate Servo	
<ul style="list-style-type: none"> • Servo retaining ring damaged 	<ul style="list-style-type: none"> • Inspect for damage. Repair as necessary.
<ul style="list-style-type: none"> • Seals (piston and cover) damaged 	<ul style="list-style-type: none"> • Inspect for mislocation, poor seating, damage. Install a new cylinder.
Intermediate Band	
<ul style="list-style-type: none"> • Band damaged 	<ul style="list-style-type: none"> • Inspect for damage. Repair as necessary.
<ul style="list-style-type: none"> • Servo worn or damaged 	<ul style="list-style-type: none"> • Inspect for damage. Repair as necessary.
<ul style="list-style-type: none"> • Not adjusted correctly 	<ul style="list-style-type: none"> • Inspect for damage. Repair as necessary.
Intermediate Clutch Assembly	
<ul style="list-style-type: none"> • Seals, piston damaged 	<ul style="list-style-type: none"> • Inspect for damage. Repair as necessary.
<ul style="list-style-type: none"> • Check ball damaged, missing, not seating, off location 	<ul style="list-style-type: none"> • Inspect for mislocation, poor seating, damage. Install a new cylinder.
<ul style="list-style-type: none"> • Feed tube or seal damaged 	<ul style="list-style-type: none"> • Inspect for damage. Install a new feed tube.
<ul style="list-style-type: none"> • Friction elements damaged or worn 	<ul style="list-style-type: none"> • Inspect for damage. Repair as necessary.
<ul style="list-style-type: none"> • Return springs damaged 	<ul style="list-style-type: none"> • Inspect for damage. Repair as necessary.
Direct One-Way Clutch	
<ul style="list-style-type: none"> • Worn, damaged or assembled incorrectly 	<ul style="list-style-type: none"> • Inspect for damage. Repair as necessary.

Shift Concern: Soft/Slipping 3-4 Shift

Possible Component	Reference/Action
228 — ELECTRICAL ROUTINE	
Powertrain Control System	

<ul style="list-style-type: none"> PCM, vehicle wiring harnesses, Shift Solenoid A, Pressure Control Solenoid C, Transmission Fluid Temperature (TFT) sensor 	<ul style="list-style-type: none"> Carry out on-board diagnostic tests. Refer to the Powertrain Control/Emissions Diagnosis (PC/ED) manual for diagnosis and testing of the PCM.
	<ul style="list-style-type: none"> Go To Pinpoint Test A, Go To Pinpoint Test B and Go To Pinpoint Test E.
	<ul style="list-style-type: none"> Repair as required. Clear DTCs, road test and carry out on-board diagnostic test again.
328 — HYDRAULIC/MECHANICAL ROUTINE	
Incorrect Pressures	
<ul style="list-style-type: none"> High/Low pressures 	<ul style="list-style-type: none"> Check pressure at Line and PC C taps.
	<ul style="list-style-type: none"> Carry out Line Pressure Test. Refer to the procedure in this section. Follow pressure diagnosis and repair as required.
Main Control	
<ul style="list-style-type: none"> Bolts not tightened to specification 	<ul style="list-style-type: none"> Tighten to specification.
<ul style="list-style-type: none"> Separator plate damaged 	<ul style="list-style-type: none"> Inspect for damage. If damaged, install a new separator plate.
<ul style="list-style-type: none"> Contamination 	<ul style="list-style-type: none"> Disassemble and clean.
<ul style="list-style-type: none"> Valves and springs damaged, misassembled, missing, stuck, or bore damaged 	<ul style="list-style-type: none"> If damaged or parts are missing, install new main control assembly. If misassembled, reassemble correctly. DO NOT stone, file or sand valves. This removes the anodized finish and can result in further main control or transmission damage.
Center Support	
<ul style="list-style-type: none"> Screw not tightened to specification 	<ul style="list-style-type: none"> Tighten to specification.
<ul style="list-style-type: none"> Seal rings or bearing damaged 	<ul style="list-style-type: none"> Inspect for damage. Repair as necessary.
<ul style="list-style-type: none"> Outside diameter of case bore damage 	<ul style="list-style-type: none"> Inspect for damage. Repair as necessary.
<ul style="list-style-type: none"> Support damaged or leaking 	<ul style="list-style-type: none"> Inspect for damage. Repair as necessary.
Direct Clutch Assembly	
<ul style="list-style-type: none"> Seals, piston damaged 	<ul style="list-style-type: none"> Inspect for damage. Repair as necessary.
<ul style="list-style-type: none"> Check ball damaged, missing, not seating, off location 	<ul style="list-style-type: none"> Inspect for mislocation, poor seating, damage. Install a new cylinder.
<ul style="list-style-type: none"> Friction elements damaged or worn 	<ul style="list-style-type: none"> Inspect for damage. Repair as necessary.
<ul style="list-style-type: none"> Return springs damaged 	<ul style="list-style-type: none"> Inspect for damage. Repair as necessary.

Shift Concern: Soft/Slipping 4-5 Shift

Possible Component	Reference/Action
272 — ELECTRICAL ROUTINE	
Powertrain Control System	
<ul style="list-style-type: none"> PCM, vehicle wiring harnesses, Shift Solenoid C, Pressure Control Solenoid B, Transmission Fluid Temperature (TFT) sensor 	<ul style="list-style-type: none"> Carry out on-board diagnostic tests. Refer to the Powertrain Control/Emissions Diagnosis (PC/ED) manual for diagnosis and testing of the PCM.

	<ul style="list-style-type: none"> • Go To Pinpoint Test A , Go To Pinpoint Test B and Go To Pinpoint Test D .
	<ul style="list-style-type: none"> • Repair as required. Clear DTCs, road test and carry out on-board diagnostic test again.
372 — HYDRAULIC/MECHANICAL ROUTINE	
Incorrect Pressures	
<ul style="list-style-type: none"> • High/Low pressures 	<ul style="list-style-type: none"> • Check pressure at Line and PC C taps.
	<ul style="list-style-type: none"> • Carry out Line Pressure Test. Refer to the procedure in this section. Follow pressure diagnosis and repair as required.
Main Control	
<ul style="list-style-type: none"> • Bolts not tightened to specification 	<ul style="list-style-type: none"> • Tighten to specification.
<ul style="list-style-type: none"> • Separator plate damaged 	<ul style="list-style-type: none"> • Inspect for damage. If damaged, install a new separator plate.
<ul style="list-style-type: none"> • Contamination 	<ul style="list-style-type: none"> • Disassemble and clean.
<ul style="list-style-type: none"> • Valves and springs damaged, misassembled, missing, stuck, or bore damaged 	<ul style="list-style-type: none"> • If damaged or parts are missing, install new main control assembly. If misassembled, reassemble correctly. DO NOT stone, file or sand valves. This removes the anodized finish and can result in further main control or transmission damage.
OD Servo	
<ul style="list-style-type: none"> • Servo retaining ring damaged 	<ul style="list-style-type: none"> • Inspect for damage. Repair as necessary.
<ul style="list-style-type: none"> • Seals (piston and cover) damaged 	<ul style="list-style-type: none"> • Inspect for damage. Repair as necessary.
OD Band	
<ul style="list-style-type: none"> • Band damaged 	<ul style="list-style-type: none"> • Inspect for damage. Repair as necessary.
<ul style="list-style-type: none"> • Servo worn or damaged 	<ul style="list-style-type: none"> • Inspect for damage. Repair as necessary.
<ul style="list-style-type: none"> • Not adjusted correctly 	<ul style="list-style-type: none"> • Inspect for damage. Repair as necessary.

Shift Concern: Feel — Soft/Slipping 5-4 Shift

Possible Component	Reference/Action
273 — ELECTRICAL ROUTINE	
Powertrain Control System	
<ul style="list-style-type: none"> • PCM, vehicle wiring harnesses, Shift Solenoid C, Pressure Control Solenoid C, Transmission Fluid Temperature (TFT) sensor 	<ul style="list-style-type: none"> • Carry out on-board diagnostic tests. Refer to the Powertrain Control/Emissions Diagnosis (PC/ED) manual for diagnosis and testing of the PCM.
	<ul style="list-style-type: none"> • Go To Pinpoint Test A , Go To Pinpoint Test B and Go To Pinpoint Test D .
	<ul style="list-style-type: none"> • Repair as required. Clear DTCs, road test and carry out on-board diagnostic test again.
373 — HYDRAULIC/MECHANICAL ROUTINE	
Incorrect Pressures	
<ul style="list-style-type: none"> • High/Low pressures 	<ul style="list-style-type: none"> • Check pressure at Line and PC C taps.
	<ul style="list-style-type: none"> • Carry out Line Pressure Test. Refer to the procedure in this section. Follow pressure diagnosis and repair as required.
Main Control	

· Bolts not tightened to specification	· Tighten to specification.
· Separator plate damaged	· Inspect for damage. If damaged, install a new separator plate.
· Contamination	· Disassemble and clean.
· Valves and springs damaged, misassembled, missing, stuck, or bore damaged	· If damaged or parts are missing, install new main control assembly. If misassembled, reassemble correctly. DO NOT stone, file or sand valves. This removes the anodized finish and can result in further main control or transmission damage.
Direct Clutch Assembly	
· Seals, piston damaged	· Inspect for damage. Repair as necessary.
· Check ball damaged, missing, not seating, off location	· Inspect for mislocation, poor seating, damage. Install a new cylinder.
· Friction elements damaged or worn	· Inspect for damage. Repair as necessary.
· Return springs damaged	· Inspect for damage. Repair as necessary.
Direct One-Way Clutch	
· Worn, damaged or assembled incorrectly	· Inspect for damage. Repair as necessary.

Shift Concern: Feel — Soft/Slipping 4-3 Shift

Possible Component	Reference/Action
229 — ELECTRICAL ROUTINE	
Powertrain Control System	
· PCM, vehicle wiring harnesses, Shift Solenoid A, Pressure Control Solenoid A, Transmission Fluid Temperature (TFT) sensor	· Carry out on-board diagnostic tests. Refer to the Powertrain Control/Emissions Diagnosis (PC/ED) manual for diagnosis and testing of the PCM.
	· Go To Pinpoint Test A , Go To Pinpoint Test B and Go To Pinpoint Test D .
	· Repair as required. Clear DTCs, road test and carry out on-board diagnostic test again.
329 — HYDRAULIC/MECHANICAL ROUTINE	
Incorrect Pressures	
· High/Low pressures	· Check pressure at Line and PC C taps.
	· Carry out Line Pressure Test. Refer to the procedure in this section. Follow pressure diagnosis and repair as required.
Main Control	
· Bolts not tightened to specification	· Tighten to specification.
· Separator plate damaged	· Inspect for damage. If damaged, install a new separator plate.
· Contamination	· Disassemble and clean.
· Valves and springs damaged, misassembled, missing, stuck, or bore damaged	· If damaged or parts are missing, install new main control assembly. If misassembled, reassemble correctly. DO NOT stone, file or sand valves. This removes the anodized finish and can result in further main control or transmission damage.

Intermediate Clutch Assembly	
• Seals, piston damaged	• Inspect for damage. Repair as necessary.
• Check ball damaged, missing, not seating, off location	• Inspect for mislocation, poor seating, damage. Install a new cylinder.
• Feed tube or seal damaged	• Inspect for damage. Install a new feed tube.
• Friction elements damaged or worn	• Inspect for damage. Repair as necessary.
• Return springs damaged	• Inspect for damage. Repair as necessary.

Shift Concern: Soft/Slipping 3-2 Shift

Possible Component	Reference/Action
230 — ELECTRICAL ROUTINE	
Powertrain Control System	
• PCM, vehicle wiring harnesses, Shift Solenoid C, Pressure Control Solenoid B, Intermediate Shaft Speed (ISS) sensor, Transmission Fluid Temperature (TFT) sensor	• Carry out on-board diagnostic tests. Refer to the Powertrain Control/Emissions Diagnosis (PC/ED) manual for diagnosis and testing of the PCM.
	• Go To Pinpoint Test A , Go To Pinpoint Test B , Go To Pinpoint Test D and Go To Pinpoint Test E .
	• Repair as required. Clear DTCs, road test and carry out on-board diagnostic test again.
330 — HYDRAULIC/MECHANICAL ROUTINE	
Incorrect Pressures	
• High/Low pressures	• Check pressure at Line and PC C taps.
	• Carry out Line Pressure Test. Refer to the procedure in this section. Follow pressure diagnosis and repair as required.
Main Control	
• Bolts not tightened to specification	• Tighten to specification.
• Separator plate damaged	• Inspect for damage. If damaged, install a new separator plate.
• Contamination	• Disassemble and clean.
• Valves and springs damaged, misassembled, missing, stuck, or bore damaged	• If damaged or parts are missing, install new main control assembly. If misassembled, reassemble correctly. DO NOT stone, file or sand valves. This removes the anodized finish and can result in further main control or transmission damage.
OD Servo	
• Servo retaining ring damaged	• Inspect for damage. Repair as necessary.
• Seals (piston and cover) damaged	• Inspect for damage. Repair as necessary.
OD Band	
• Band damaged	• Inspect for damage. Repair as necessary.
• Servo worn or damaged	• Inspect for damage. Repair as necessary.
• Not adjusted correctly	• Inspect for damage. Repair as necessary.
Direct One-Way Clutch	

· Worn, damaged or assembled incorrectly





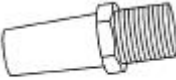
· Inspect for damage. Repair as necessary.

Shift Concern: Feel — Soft/Slipping 2-1 Shift

Possible Component	Reference/Action
231 — ELECTRICAL ROUTINE	
Powertrain Control System	
<ul style="list-style-type: none"> · PCM, vehicle wiring harnesses, Shift Solenoid C, Pressure Control Solenoid B, Transmission Fluid Temperature (TFT) sensor 	<ul style="list-style-type: none"> · Carry out on-board diagnostic tests. Refer to the Powertrain Control/Emissions Diagnosis (PC/ED) manual for diagnosis and testing of the PCM.
	<ul style="list-style-type: none"> · Go To Pinpoint Test A , Go To Pinpoint Test B and Go To Pinpoint Test D .
	<ul style="list-style-type: none"> · Repair as required. Clear DTCs, road test and carry out on-board diagnostic test again.
331 — HYDRAULIC/MECHANICAL ROUTINE	
Incorrect Pressures	
<ul style="list-style-type: none"> · High/Low pressures 	<ul style="list-style-type: none"> · Check pressure at Line and PC C taps.
	<ul style="list-style-type: none"> · Carry out Line Pressure Test. Refer to the procedure in this section. Follow pressure diagnosis and repair as required.
Main Control	
<ul style="list-style-type: none"> · Bolts not tightened to specification 	<ul style="list-style-type: none"> · Tighten to specification.
<ul style="list-style-type: none"> · Separator plate damaged 	<ul style="list-style-type: none"> · Inspect for damage. If damaged, install a new separator plate.
<ul style="list-style-type: none"> · Contamination 	<ul style="list-style-type: none"> · Disassemble and clean.
<ul style="list-style-type: none"> · Valves and springs damaged, misassembled, missing, stuck, or bore damaged 	<ul style="list-style-type: none"> · If damaged or parts are missing, install new main control assembly. If misassembled, reassemble correctly. DO NOT stone, file or sand valves. This removes the anodized finish and can result in further main control or transmission damage.

Transmission Fluid Level Check

Special Tool(s)

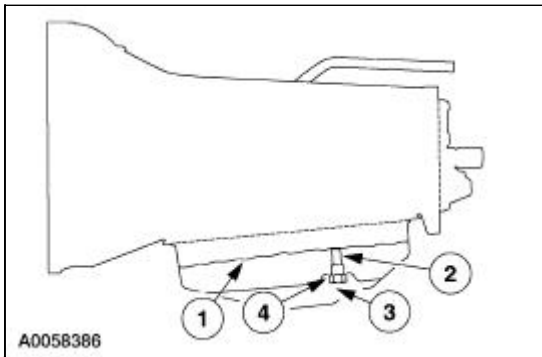
 ST2467-A	Rubber Tip Air Nozzle 100-D009 (D93L-7000-A)
 ST1269-A	Vacuum Pump Kit 416-D002 (D95L-7559-A)
 ST2715-A	Fluid Transporter / Evacuator / Injector 307-D465
 ST2332-A	Worldwide Diagnostic System (WDS) 418-F224 New Generation Star (NGS) Tester 418-F205 or equivalent scan tool
 ST2581-A	Adapter, Fluid Level and Fill Plug 307-437

Material

Item	Specification
MERCON® V Automatic Transmission Fluid XT-5-QM	MERCON® V

Fluid Fill Reference

NOTE: Left side of case is shown.

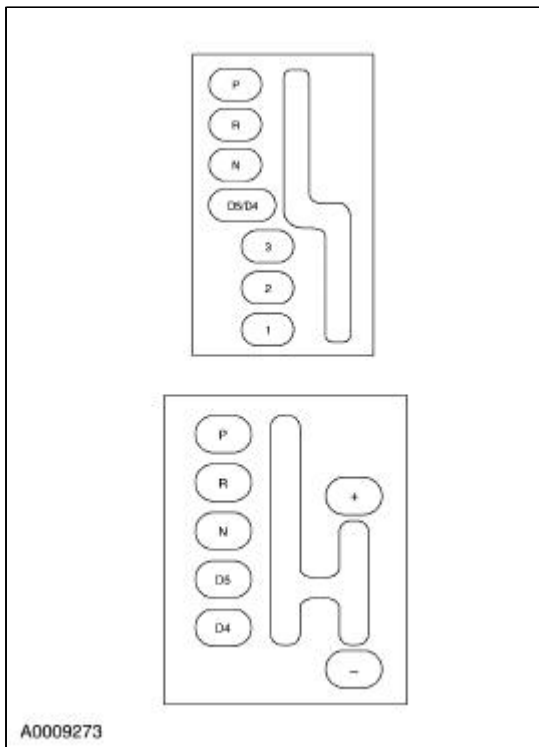


Item	Part Number	Description
1	—	Fluid level
2	7A010	Fluid level tube
3	W704999-S309	Fluid level and fill plug (small) (in-vehicle)
4	7A010	Fluid drain plug (large)

1. Using the scan tool (WDS), monitor the transmission fluid temperature (TFT) using PID: TFT.
2. Start the vehicle.
3. **NOTE:** Engine idle speed is approximately 650 rpm.

While proceeding with this procedure, run the engine until the transmission fluid temperature is between 27°C - 49°C (80°F - 120°F).

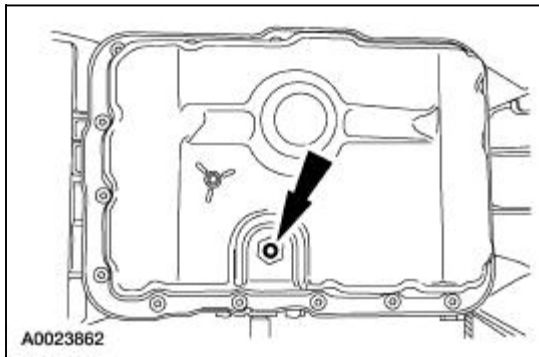
4. Move the range selector lever slowly through each gear, stopping in each position and allowing the transmission to engage.



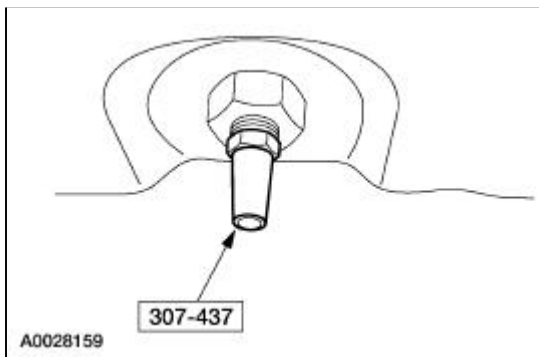
5. Place the range selector lever in the PARK position.
6. With the engine running, position the vehicle on a hoist and set it as close to level as possible.

For additional information, refer to [Section 100-02](#).

7. Hold the larger drain plug with a wrench and remove the small (center) fluid level indicating plug using a 3/16-inch Allen key.

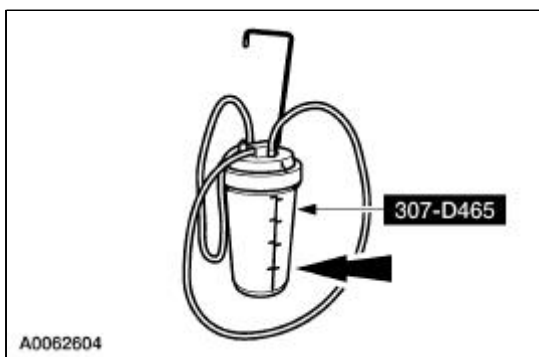


8. Install the special tool into the pan.

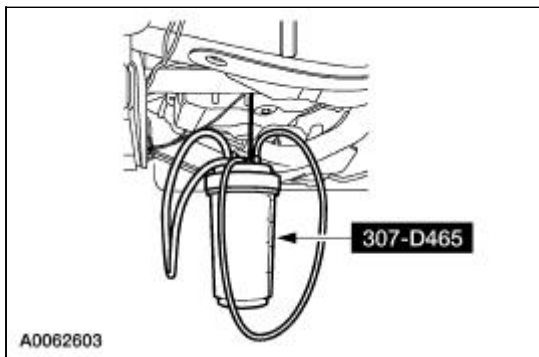


9. **NOTE:** Prior to filling the special tool with clean transmission fluid, make sure that the canister is clean.

Fill the special tool with clean automatic transmission fluid.

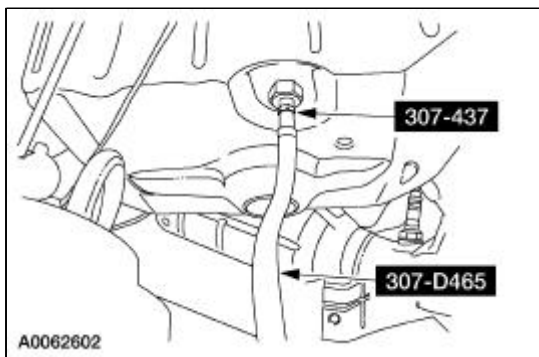


10. Hang the special tool under the vehicle. Position it upright and close to the transmission.

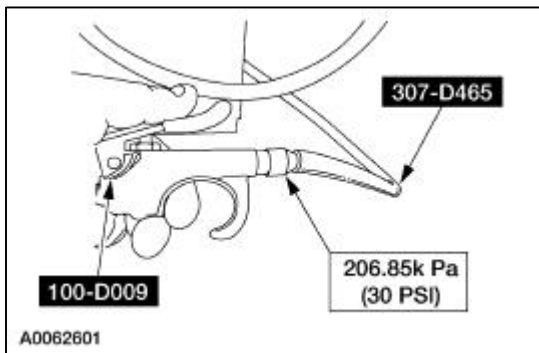


11. Connect the special tools.

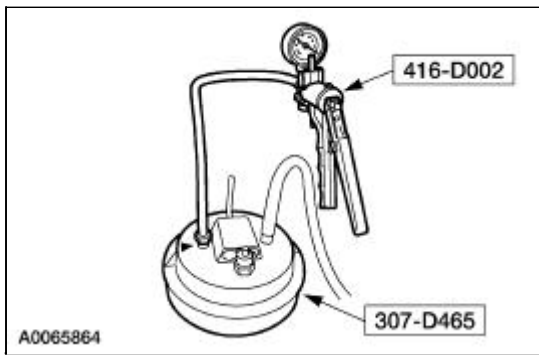
- Connect the open end of the fluid hose from the Fluid Transporter/Evacuator/Injector to the Fluid Level and Fill Plug Adapter at the bottom of the transmission fluid pan.



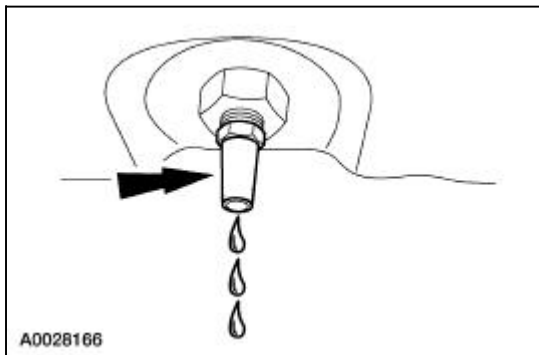
12. Apply a maximum of 206.85 kPa (30 psi) to the open end of the vacuum/pressure hose from the special tool. Fluid will immediately start flowing out of the special tool into the transmission fluid pan.



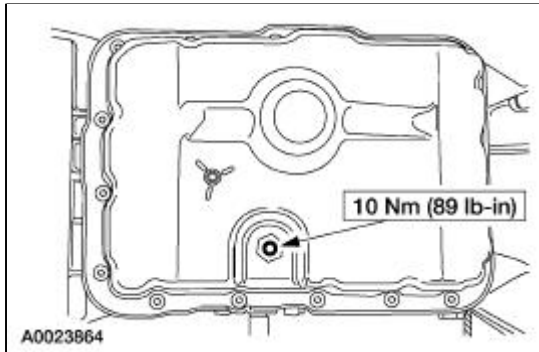
13. Add one pint of transmission fluid into the fluid pan. Stop the process by releasing the air pressure and removing the air nozzle from the end of the hose.
14. Inspect the fluid level in the special tool. If the fluid drains back into the canister, the transmission is full. If no fluid drains back, more fluid will need to be added. Repeat steps 12 and 13.
15. Once the transmission is full, place a hand vacuum pump on the open end of the vacuum/pressure hose of the special tool and apply vacuum to the system. This will pull out any extra fluid trapped in the system and direct it into the container.



16. Allow the fluid to drain. Make sure that the fluid temperature is between 27°C - 49°C (80°F - 120°F). When the fluid comes out as a thin stream or drip, the fluid is at the correct level.



17. Reinstall the small (center) fluid level indicating plug using a 3/16-inch Allen key.




18. Check the operation of the transmission by moving the range selector lever slowly through each gear, stopping in each position and allowing the transmission to engage.
-

Transmission Fluid Cooler — Backflushing and Cleaning

For additional information, refer to [Section 307-02](#).

Transmission Fluid Drain and Refill —Automated Equipment


Special Tool(s)

 ST2654-A	Automatic Transmission Flush and Fill Machine 211-00018
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Material

Item	Specification
MERCON® V Automatic Transmission Fluid XT-5-QM	MERCON®V

Draining

 **CAUTION:** Use only clean automatic transmission fluid. Do not use any supplemental transmission fluid additives, treatments or cleaning agents. The use of these materials can affect the operation of the transmission, resulting in internal component failure.

 **CAUTION:** Always refer to the instructions supplied with the flush and fill machine.

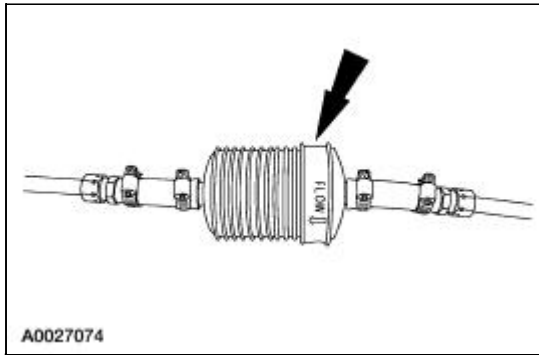
NOTE: This is a new procedure for draining and adding transmission fluid using a suitable transmission flush and fill machine.

1. Position the vehicle on a hoist. Place in PARK. For additional information, refer to [Section 100-02](#).
2. Use a suitable flush and fill machine to change the fluid.
3. When connecting the flush and fill machine, connect the machine to the fluid cooler tube after the fluid cooler on the cooler return tube. This will help remove any foreign material trapped in the fluid coolers.
4. Carry out the fluid exchange process.

Refill

1. Use only clean automatic transmission fluid.
2. Once the fluid exchange has been completed, disconnect the flush and fill machine. Reconnect any disconnected fluid cooler tubes.
3. **NOTE:** If the vehicle is equipped with an in-line fluid filter, install a new in-line fluid filter (XC3Z-7B155-BA).




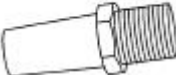
Install a new in-line transmission fluid filter.



4. Lower the vehicle. For additional information, refer to [Section 100-02](#).
 5. With the engine running and the transmission at normal operating temperature 66-77°C (150-170°F), check and adjust the transmission fluid level and check for any leaks. If fluid is needed, add fluid in increments of 0.24 liter (0.5 pint) until the correct level is achieved (fluid should be in the cross-hatched area of the fluid level indicator).
 6. Carry out the fluid level check. For additional information, refer to [Transmission Fluid Level Check](#) in this section.
-

Transmission Fluid Drain and Refill — Vehicles With Torque Converter Drain Plug

Special Tool(s)

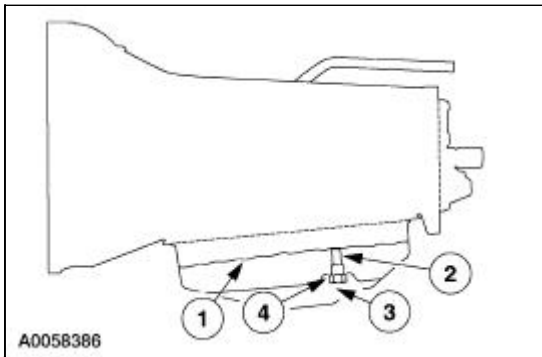
 ST2467-A	Rubber Tip Air Nozzle 100-D009 (D93L-7000-A)
 ST1289-A	Vacuum Pump Kit 416-D002 (D95L-7559-A)
 ST2715-A	Fluid Transporter / Evacuator / Injector 307-D465
 ST2581-A	Adapter, Fluid Level and Fill Plug 307-437

Material

Item	Specification
MERCON® V Automatic Transmission Fluid XT-5-QM	MERCON® V

Fluid Fill Reference

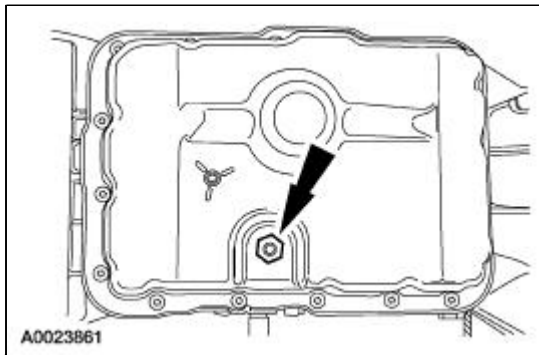
NOTE: Left side of case is shown.



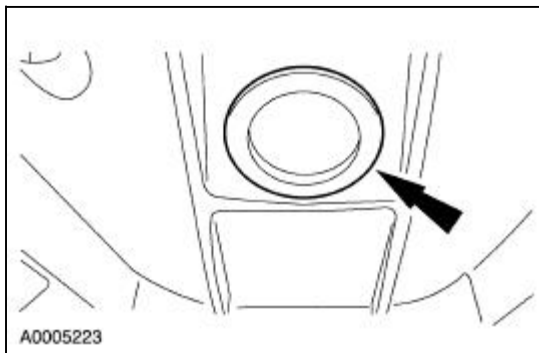
Item	Part Number	Description
1	—	Fluid level
2	7A010	Fluid level tube
3	W704999-S309	Fluid level and fill plug (small) (in-vehicle)
4	7A010	Fluid drain plug (large)

Draining

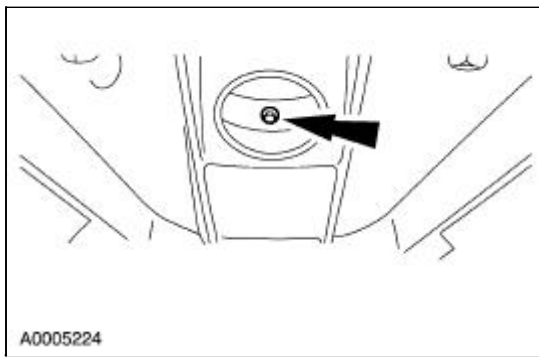
1. With the vehicle in PARK, position it on a hoist. Set the vehicle as close to level as possible. For additional information, refer to [Section 100-02](#).
2. Remove the drain plug (large plug) and allow the fluid to drain.



3. Remove the converter housing plug.

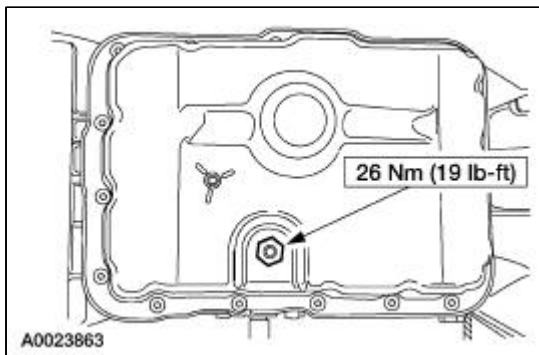


4. Remove and discard the drain plug.

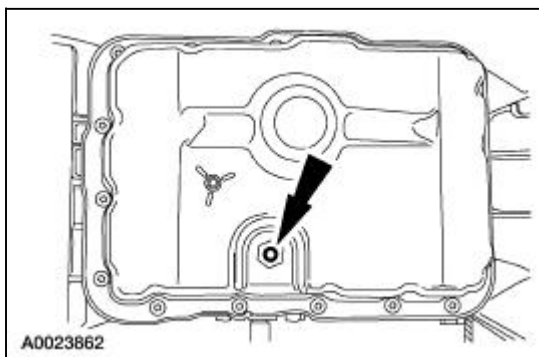


Refill

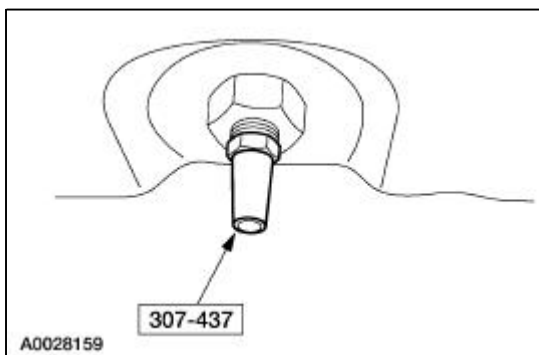
1. Install the fluid drain plug.



2. Hold the larger drain plug with a wrench and remove the small (center) fluid level indicating plug using a 3/16-inch Allen key.



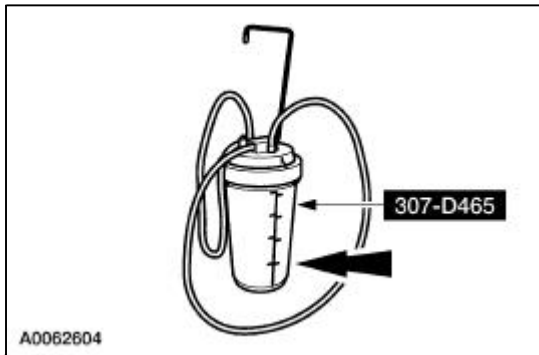
3. Install the special tool into the pan.



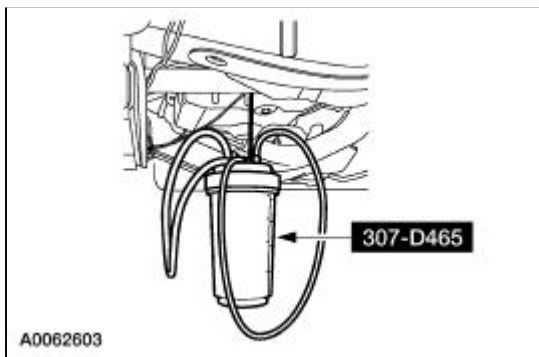
4. **NOTE:** Prior to filling the special tool with clean transmission fluid, make sure that the canister is

clean.

Fill the special tool with clean automatic transmission fluid.

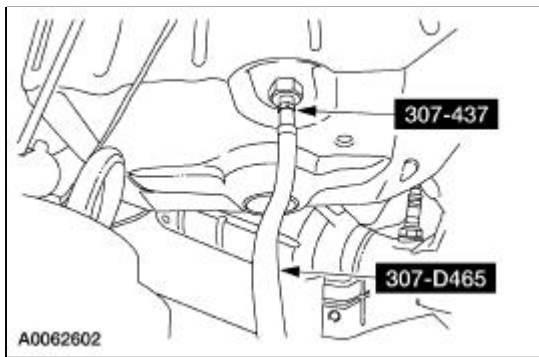


5. Hang the special tool under the vehicle, upright and close to the transmission.

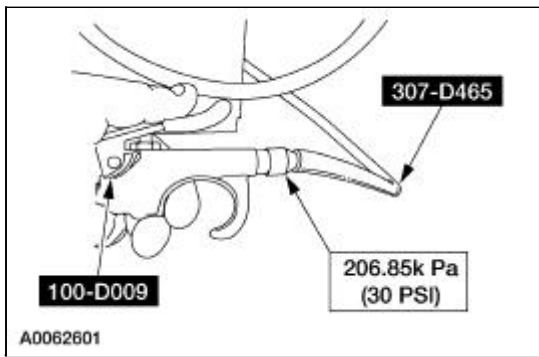


6. Connect the special tools.

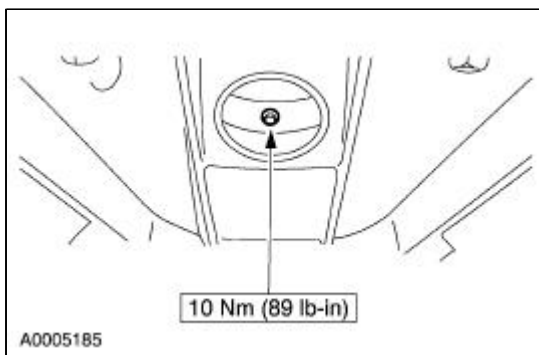
- Connect the open end of the fluid hose from the Fluid Transporter/Evacuator/Injector to the Fluid Level and Fill Plug Adapter at the bottom of the transmission fluid pan.



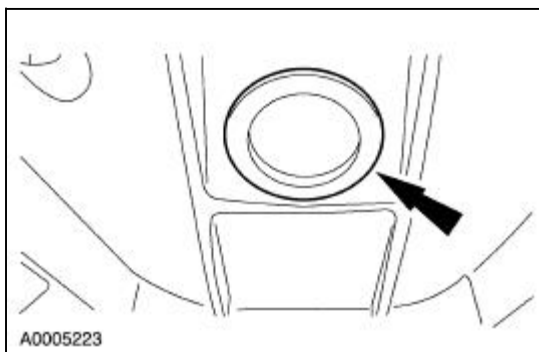
7. Apply a maximum of 206.85 kPa (30 psi) to the open end of the vacuum/pressure hose from the special tool. Fluid will immediately start flowing out of the special tool into the transmission fluid pan.



8. Add two or three quarts of transmission fluid into the fluid pan. Stop the process by releasing the air pressure and removing the air nozzle from the end of the hose.
9. Install a new torque converter drain plug to prevent any leakage.



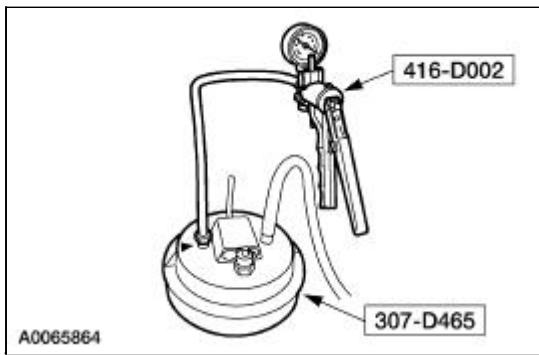
10. Install the converter housing access plug.



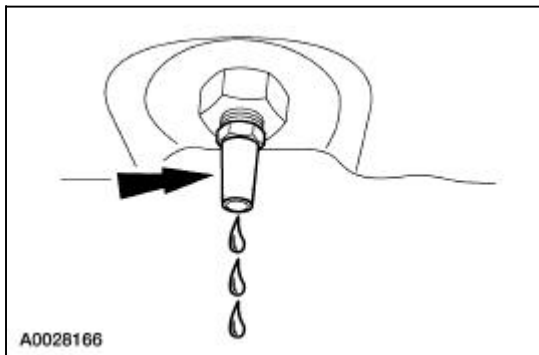
11. **NOTE:** Engine idle speed is approximately 650 rpm.

Start and run the engine until the transmission fluid temperature is between 27°C - 49°C (80°F - 120°F).

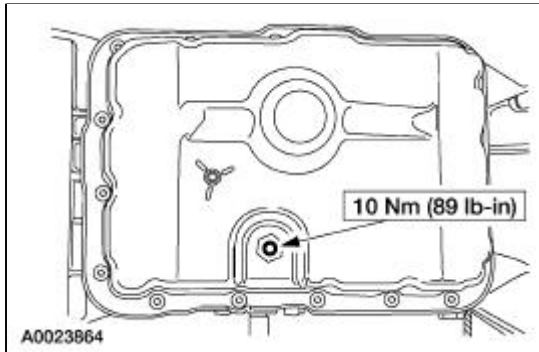
12. Inspect the fluid level in the special tool. If the fluid drains back into the canister, the transmission is full. If no fluid drains back, more fluid will need to be added. Repeat steps 11 and 12.
13. Once the transmission is full, place a hand vacuum pump on the open end of the hose of the special tool and apply vacuum to the system. This will pull any extra fluid trapped in the system and direct it into the container.



14. Allow the fluid to drain. When the fluid comes out as a thin stream or drip, the fluid is at the correct level.




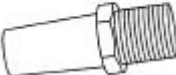


15. Reinstall the small (center) fluid level indicating plug using a 3/16-inch Allen key.



Transmission Fluid Drain and Refill — Vehicles Without Torque Converter Drain Plug

Special Tool(s)

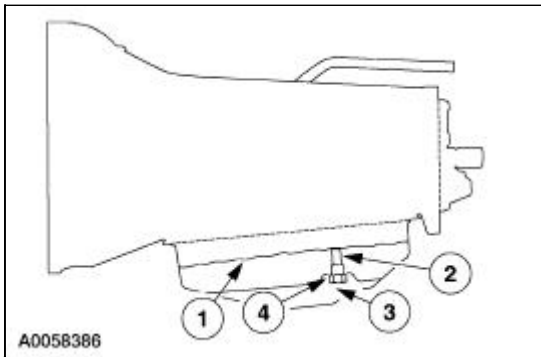
 ST2467-A	Rubber Tip Air Nozzle 100-D009 (D93L-7000-A)
 ST1289-A	Vacuum Pump Kit 416-D002 (D95L-7559-A)
 ST2715-A	Fluid Transporter / Evacuator / Injector 307-D465
 ST2581-A	Adapter, Fluid Level and Fill Plug 307-437

Material

Item	Specification
MERCON® V Automatic Transmission Fluid XT-5-QM	MERCON® V

Fluid Fill Reference

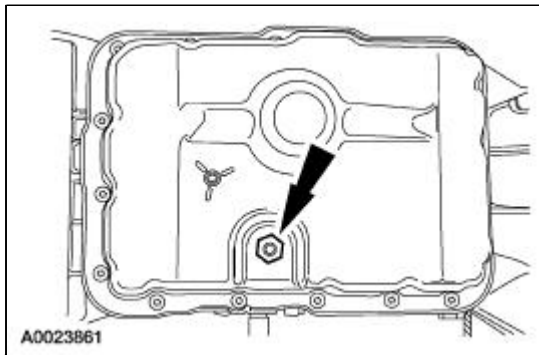
NOTE: Left side of case is shown.



Item	Part Number	Description
1	—	Fluid level
2	7A010	Fluid level tube
3	W704999-S309	Fluid level and fill plug (small) (in-vehicle)
4	7A010	Fluid drain plug (large)

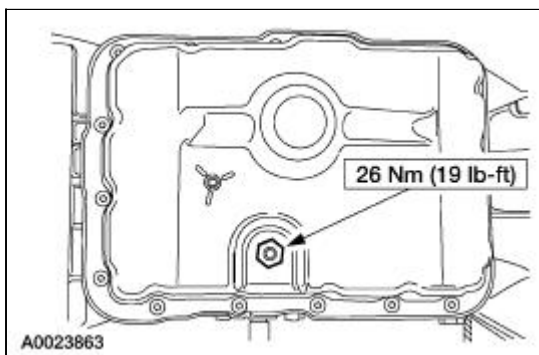
Draining

1. With the vehicle in PARK, position it on a hoist. Set the vehicle as close to level as possible. For additional information, refer to [Section 100-02](#).
2. Remove the drain plug (large plug) and allow the fluid to drain.

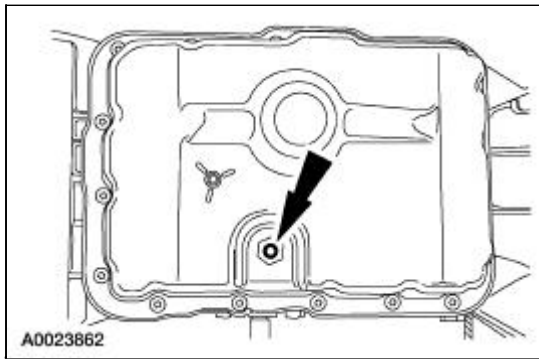


Refill

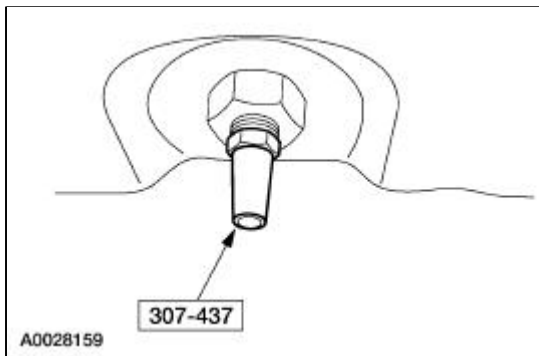
1. Install the fluid drain plug.



2. Hold the larger drain plug with a wrench and remove the small (center) fluid level indicating plug using a 3/16-inch Allen key.

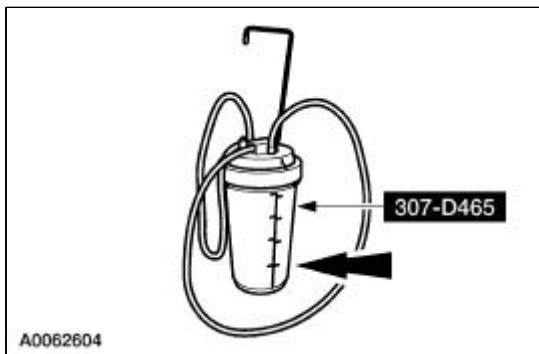


3. Install the special tool into the pan.

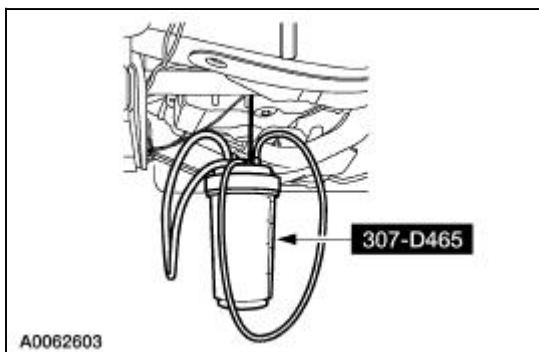


4. **NOTE:** Prior to filling the special tool with clean transmission fluid, make sure that the canister is clean.

Fill the special tool with clean automatic transmission fluid.

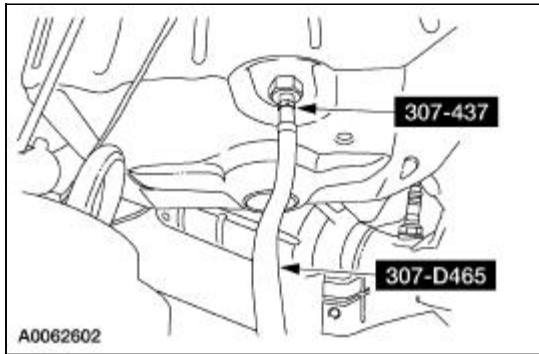


5. Hang the special tool under the vehicle, upright and close to the transmission.

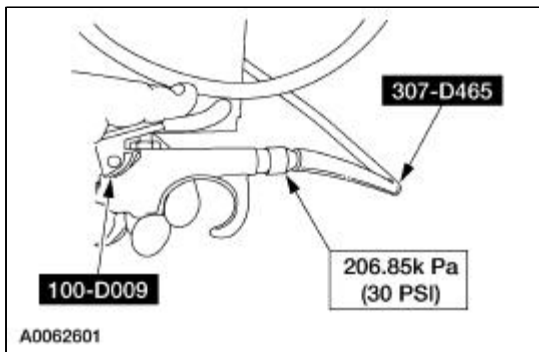


6. Connect the special tools.

- Connect the open end of the fluid hose from the Fluid Transporter/Evacuator/Injector to the Fluid Level and Fill Plug Adapter at the bottom of the transmission fluid pan.



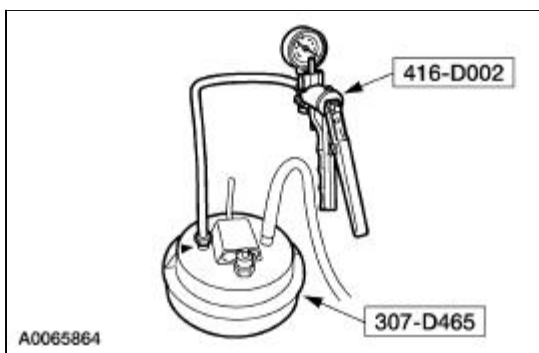
7. Apply a maximum of 206.85 kPa (30 psi) to the open end of the vacuum/pressure hose from the special tool. Fluid will immediately start flowing out of the special tool into the transmission fluid pan.



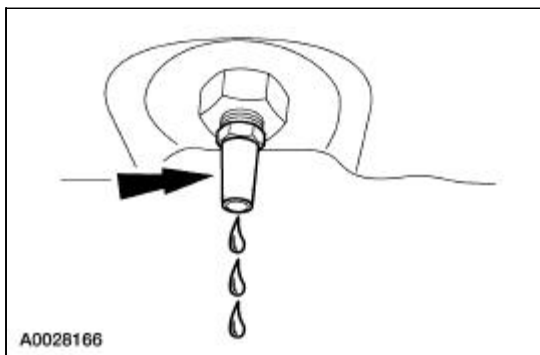
8. Add two or three quarts of transmission fluid into the fluid pan. Stop the process by releasing the air pressure and removing the air nozzle from the end of the hose.
9. **NOTE:** Engine idle speed is approximately 650 rpm.

Start and run the engine until the transmission fluid temperature is between 27°C - 49°C (80°F - 120°F).

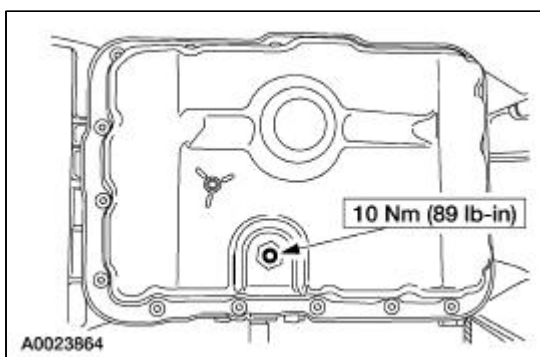
10. Inspect the fluid level in the special tool. If the fluid drains back into the canister, the transmission is full. If no fluid drains back, more fluid will need to be added. Repeat steps 9 and 10.
11. Once the transmission is full, place a hand vacuum pump on the open end of the hose of the special tool and apply vacuum to the system. This will pull any extra fluid trapped in the system and direct it into the container.



12. Allow the fluid to drain. When the fluid comes out as a thin stream or drip, the fluid is at the correct level.




13. Reinstall the small (center) fluid level indicating plug using a 3/16-inch Allen key.




Transmission Range (TR) Sensor Adjustment

Special Tool(s)

 ST1633-A	Alignment Gauge, TR Sensor 307-351 (T97L-70010-A)
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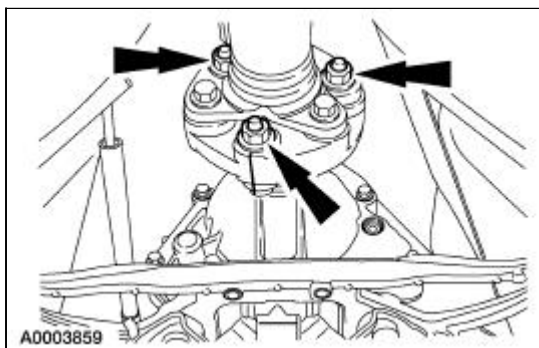
Material

Item	Specification
Threadlock 262 E2FZ-19554-B	WSK-M2G351-A6

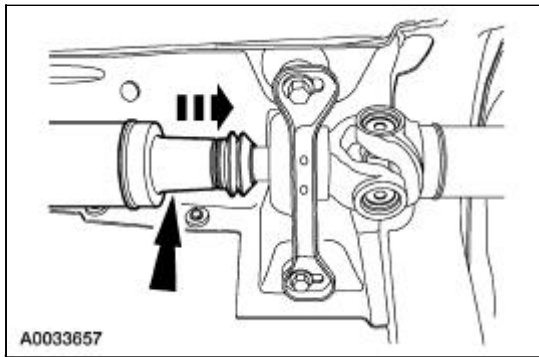
1. Position the vehicle on a hoist. Place in NEUTRAL. For additional information, refer to [Section 100-02](#).
2. Remove the exhaust heat shield. For additional information, refer to [Section 309-00](#).
3.  **CAUTION:** Index-mark (color paint) the bolts, washers, nuts, and the flex coupling to the transmission flange and the pinion flange to assure assembly in the exact location from which they were removed. Components not assembled in their original locations can cause driveshaft imbalance.


 **CAUTION:** Do not remove the bolts retaining the flex coupling to the driveshaft.

Index-mark the front driveshaft pinion flange. Remove the three nuts, washers and bolts.



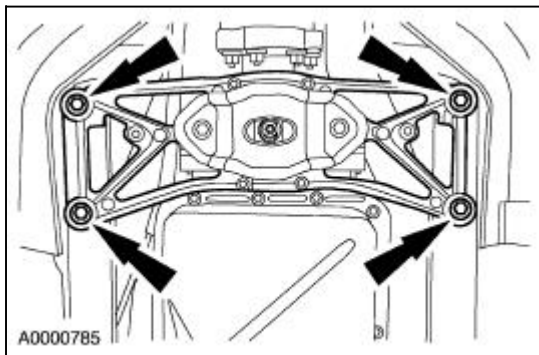
4. Slide the front shaft assembly rearward and support.



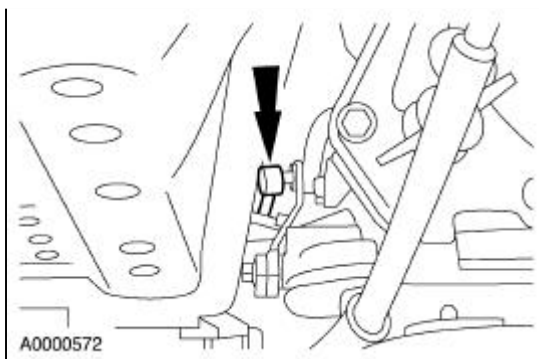
5.  **WARNING: Secure the transmission to the transmission jack with a safety chain. Failure to follow these instructions can result in personal injury.**

Support the transmission with a transmission jack.

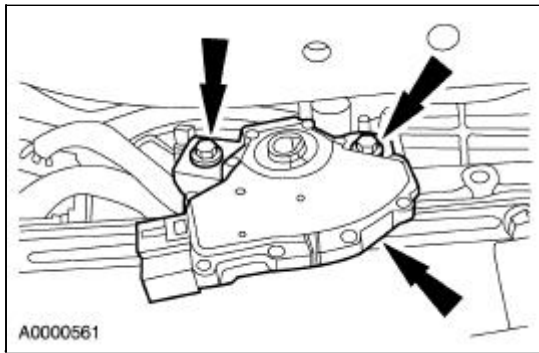
6. Remove the transmission mount and lower the transmission enough to gain access to the digital TR sensor.



7. Disconnect the shift cable.



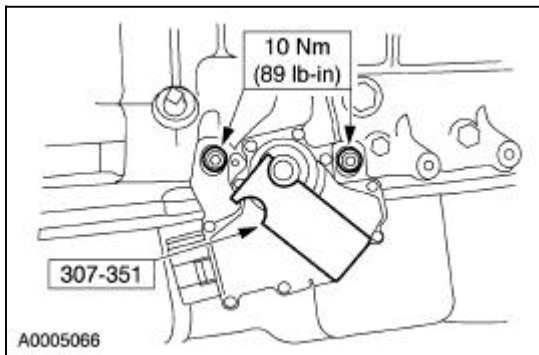
8. Loosen the digital TR sensor screws.



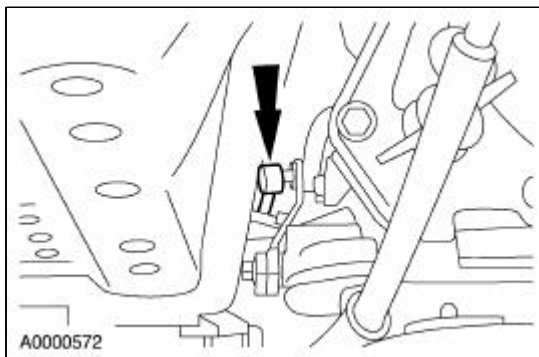
9.  **CAUTION:** Tightening one screw before tightening the other can cause the sensor to bind or become damaged.

NOTE: The manual lever must be in the NEUTRAL position.

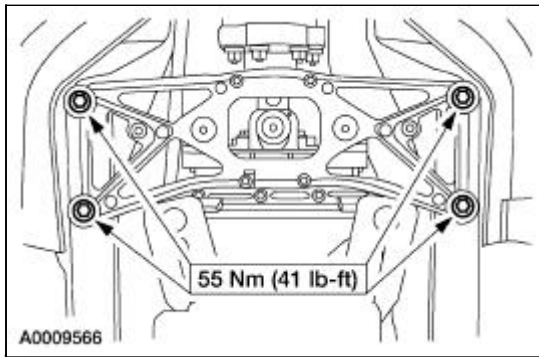
Using the special tool, align the digital TR sensor and tighten the screws in an alternating sequence.



10. Connect the shift cable.

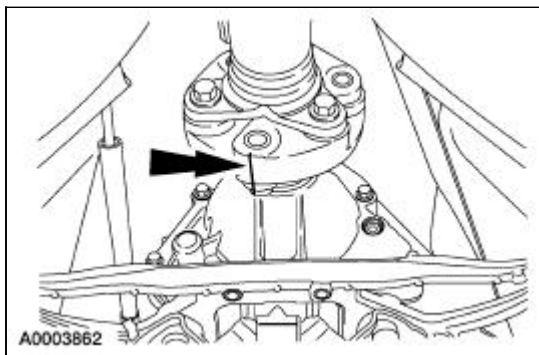



11. Install the rear transmission support and remove the transmission jack.



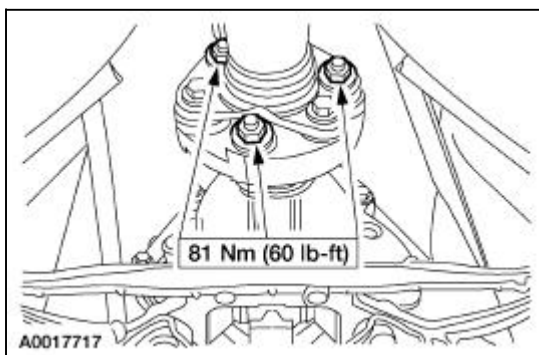
12.  **CAUTION: Align the index marks or driveshaft imbalance can occur.**

Align the index marks made during removal and position the driveshaft on the transmission flange.



13.  **CAUTION: Install the bolts, washers and nuts in their original positions or driveshaft imbalance can occur. Install the driveshaft flex coupling bolts with the head of the bolt seated against the flange, and the nuts seated against the flex coupling.**

Install the bolts, washers and nuts. Coat the nut and bolt threads with threadlock sealer.



14. Install the exhaust heat shield. For additional information, refer to [Section 309-00](#).
15. Lower the vehicle.
-

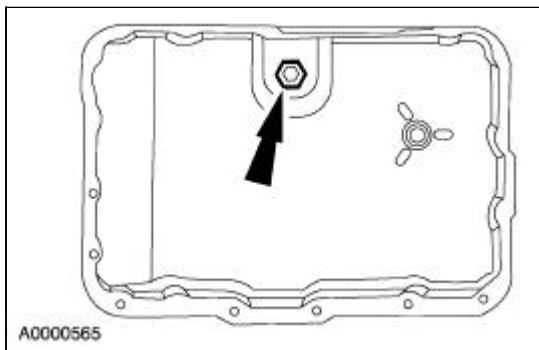
Fluid Pan, Gasket and Filter

Material

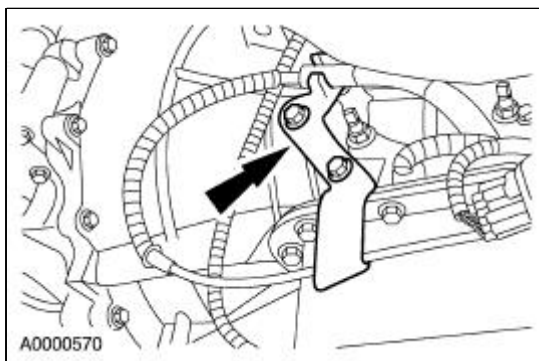
Item	Specification
MERCON® V Automatic Transmission Fluid XT-5-QM, XT-5-DM	MERCON® V

Removal

1. Raise and support the vehicle. For additional information, refer to [Section 100-02](#).
2. Place a drain pan under the transmission fluid pan.
3. Remove the drain plug and drain the fluid.

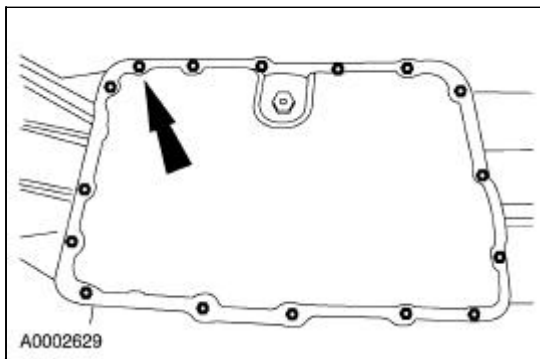


4. Remove the bracket.

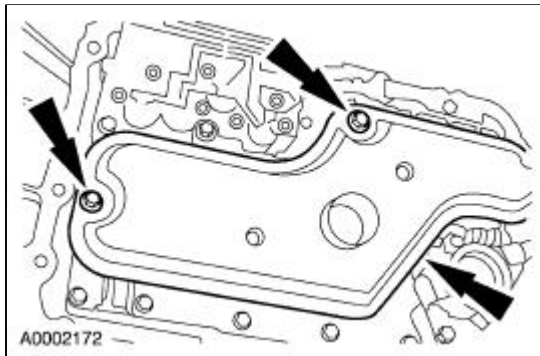


5. **NOTE:** The transmission fluid pan gasket is reusable, clean and inspect for damage; if not damaged, the gasket should be reused.

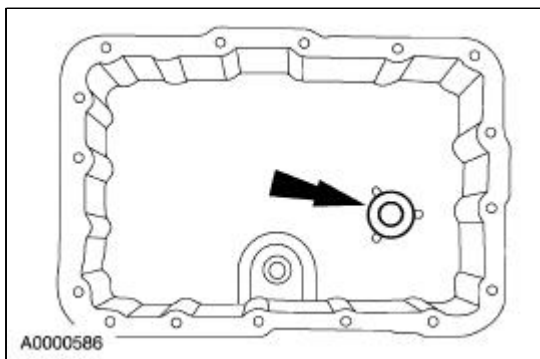
Remove the fluid pan and gasket.



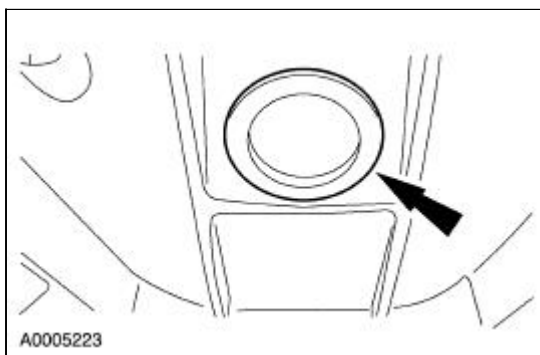
6. Remove and discard the transmission fluid filter.



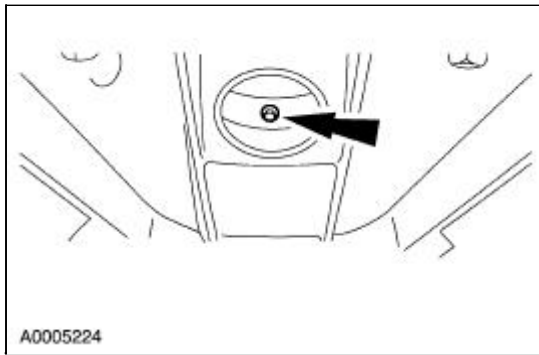
7. Clean and inspect the transmission fluid pan and magnet.



8. Remove the converter housing plug.



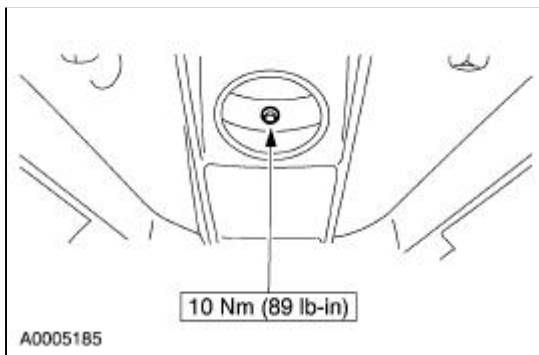
9. Remove the drain plug.



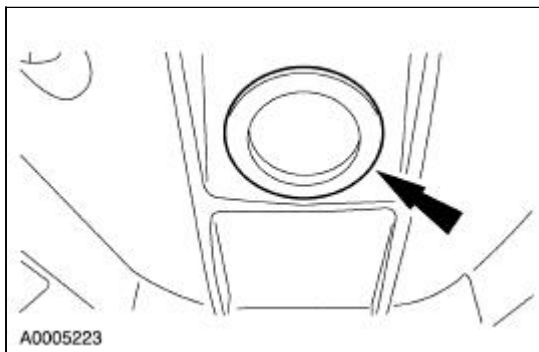
Installation

1. **NOTE:** A new converter drain plug must be used to prevent leakage.

Install the drain plug.



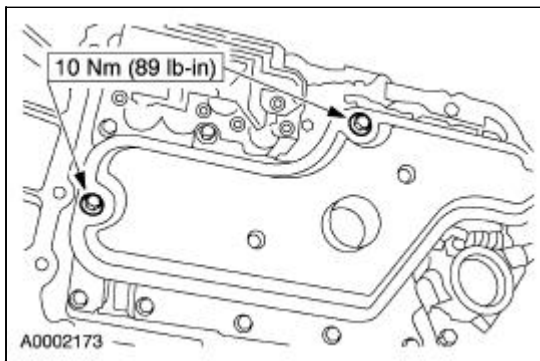
2. Install the converter housing access plug.



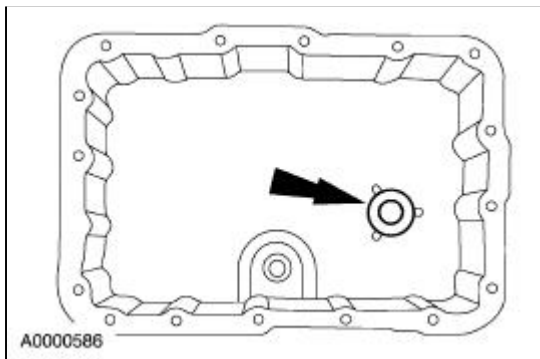
3.  **CAUTION:** Lubricate the fluid filter O-ring seals with clean automatic transmission fluid or seals may be damaged.

NOTE: Make sure that the fluid filter O-ring seals are correctly seated on the filter.

Lubricate the seals and install the transmission fluid filter.

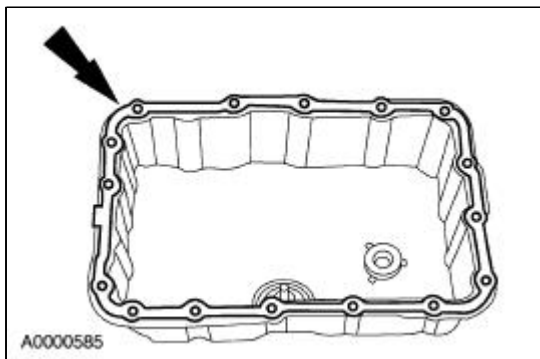


4. Install the oil pan magnet in the transmission fluid pan.

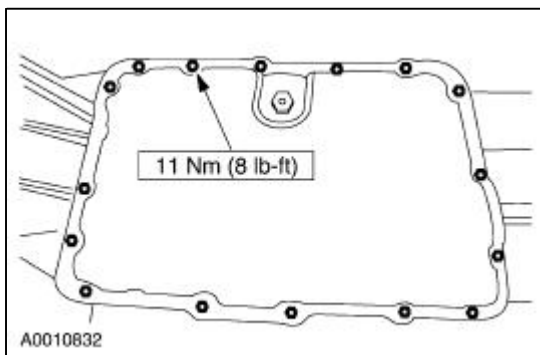


5. **NOTE:** The transmission fluid pan gasket is reusable, clean and inspect for damage; if not damaged, the gasket should be reused.

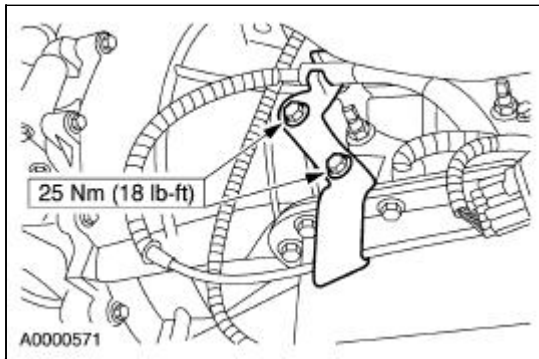
Install the transmission fluid pan and gasket and loosely install the screws.



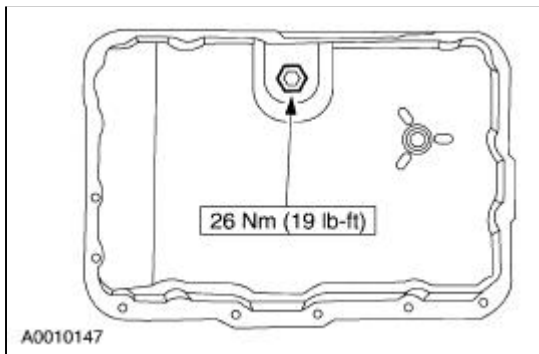
6. Using a crisscross sequence, tighten the screws.



7. Install the shifter cable bracket.



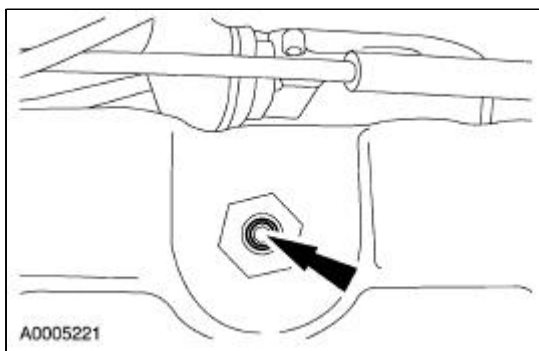
8. Install the drain plug.



9. **NOTE:** It will be necessary to hold the drain plug (larger plug) with a wrench when removing the fluid level indicator plug.

NOTE: Use 3/16 inch Allen key to remove the fluid level indicator plug.


Remove the fluid level indicator plug.



10. Carry out fluid level check. For additional information, refer to [Transmission Fluid Level Check](#) in this section.
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Main Control —Valve Body

Special Tool(s)

 ST1639-A	Aligner, Valve Body 307-334 (T95L-70010-C) (2 req'd)
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Material

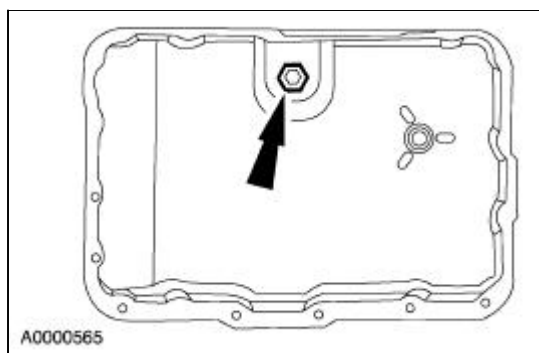
Item	Specification
MERCON® V Automatic Transmission Fluid XT-5-QM, XT-5-DM	MERCON® V

Removal

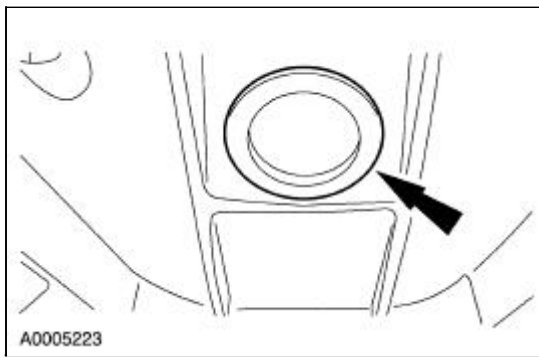
1. **NOTE:** When the battery is disconnected or a new battery installed, certain transmission operating parameters can be lost. The powertrain control module (PCM) must relearn these parameters. During this learning process, you may experience slightly firm shifts, delayed, or early shifts. This operation is considered normal and will not affect the function of the transmission. Normal operation will return once these parameters are stored by the PCM.

Disconnect the battery ground cable. For additional information, refer to [Section 414-01](#).

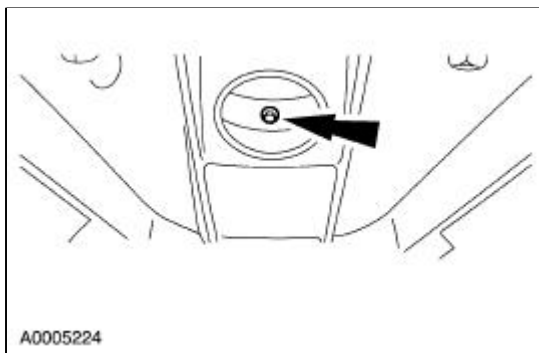
2. Raise and support the vehicle. For additional information, refer to [Section 100-02](#).
3. Drain the transmission fluid.



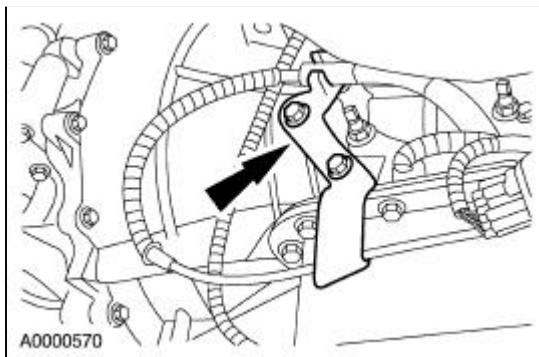
4. Remove the converter housing plug.



5. Remove the drain plug.

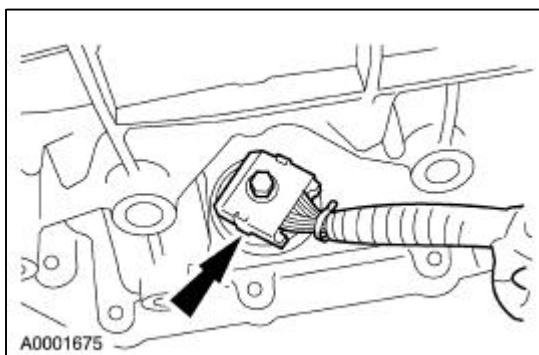


6. Remove the shifter cable bracket.

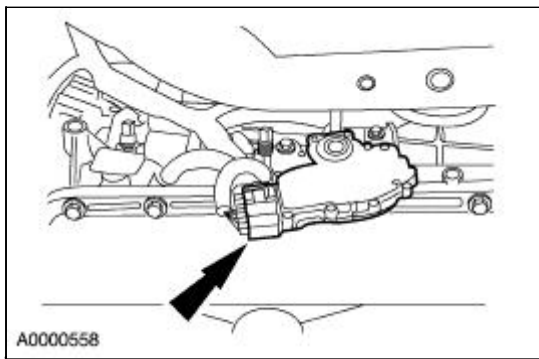


7. **NOTE:** Clean the area around connector to prevent contamination of the solenoid body connector.

Disconnect the transmission connector.

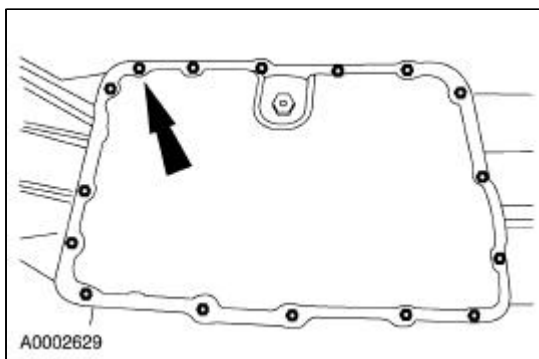


8. Disconnect the digital transmission range (TR) sensor connector.

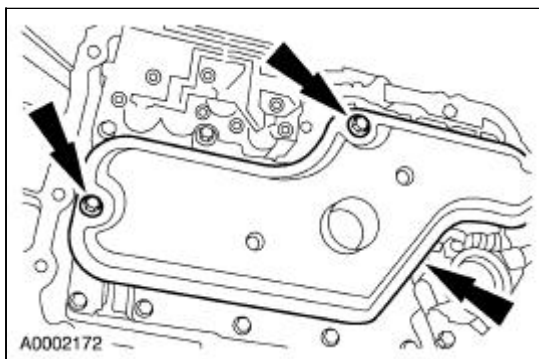


9. **NOTE:** The transmission fluid pan gasket is reusable. Clean and inspect for damage. If not damaged, the gasket should be reused.

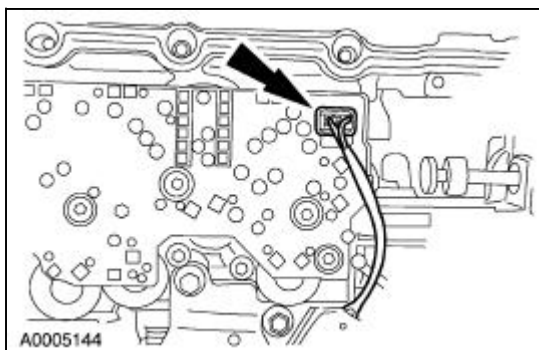
Remove the transmission fluid pan and gasket.



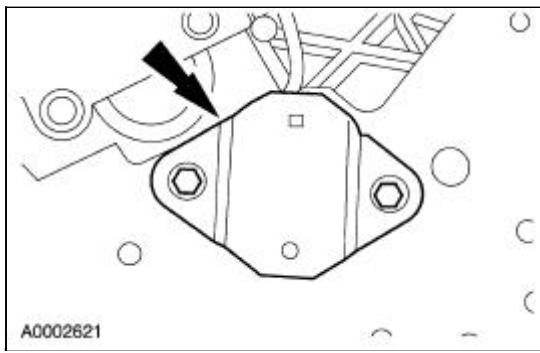
10. Remove the transmission fluid filter.



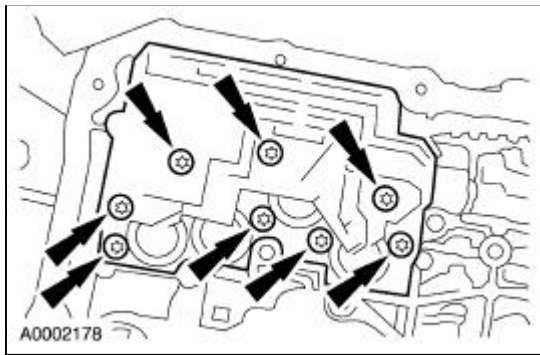
11. Disconnect the reverse pressure switch connector.



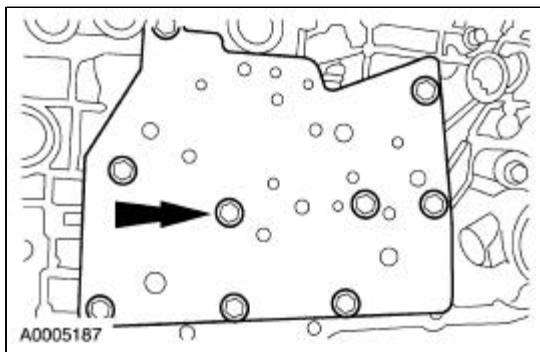
12. Remove the reverse pressure switch and discard.



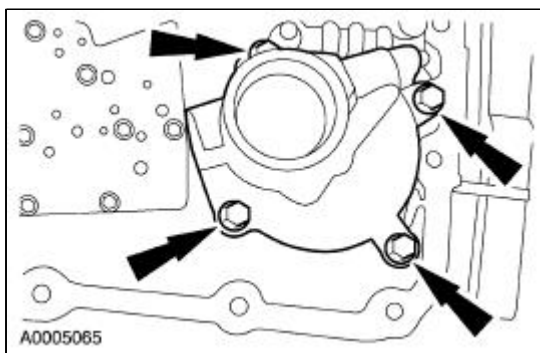
13. Remove the solenoid body.



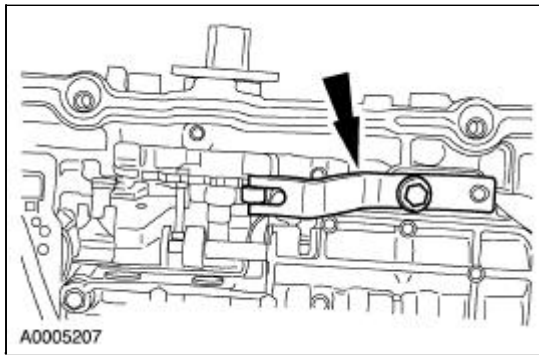
14. Remove the valve body cover plate and gasket.



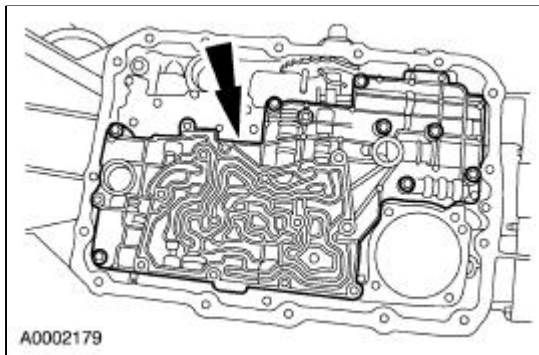
15. Remove the reverse servo.



16. Remove the manual control valve detent spring.

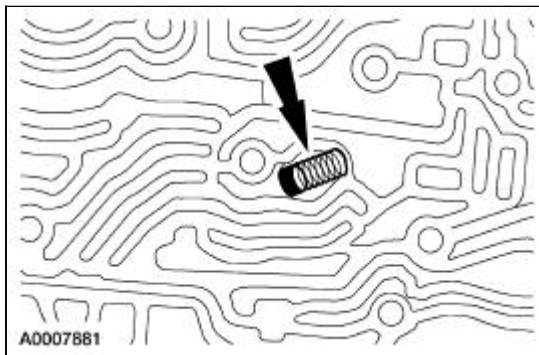


17. Remove the main control valve body, separator plate and gasket.




18. **NOTE:** The intermediate clutch spring and seal will fall out of the case.

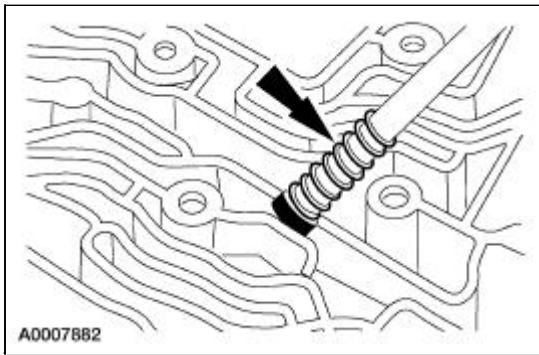
Remove the intermediate clutch spring and seal.



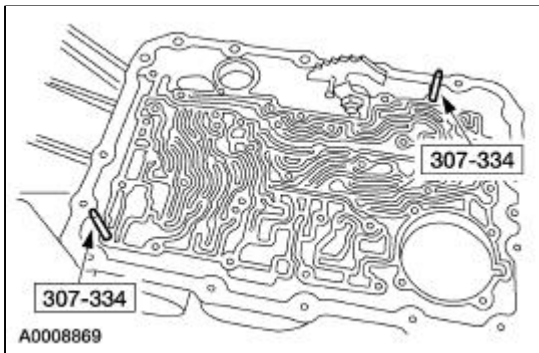
Installation

1.  **CAUTION:** The intermediate clutch fluid inlet tube seal and spring must be correctly seated in the case. Failure to correctly seat the inlet tube seal and spring will cause an internal fluid leak and transmission damage.

Using a drift punch, correctly install and seat the intermediate clutch fluid inlet tube seal and spring into the case.

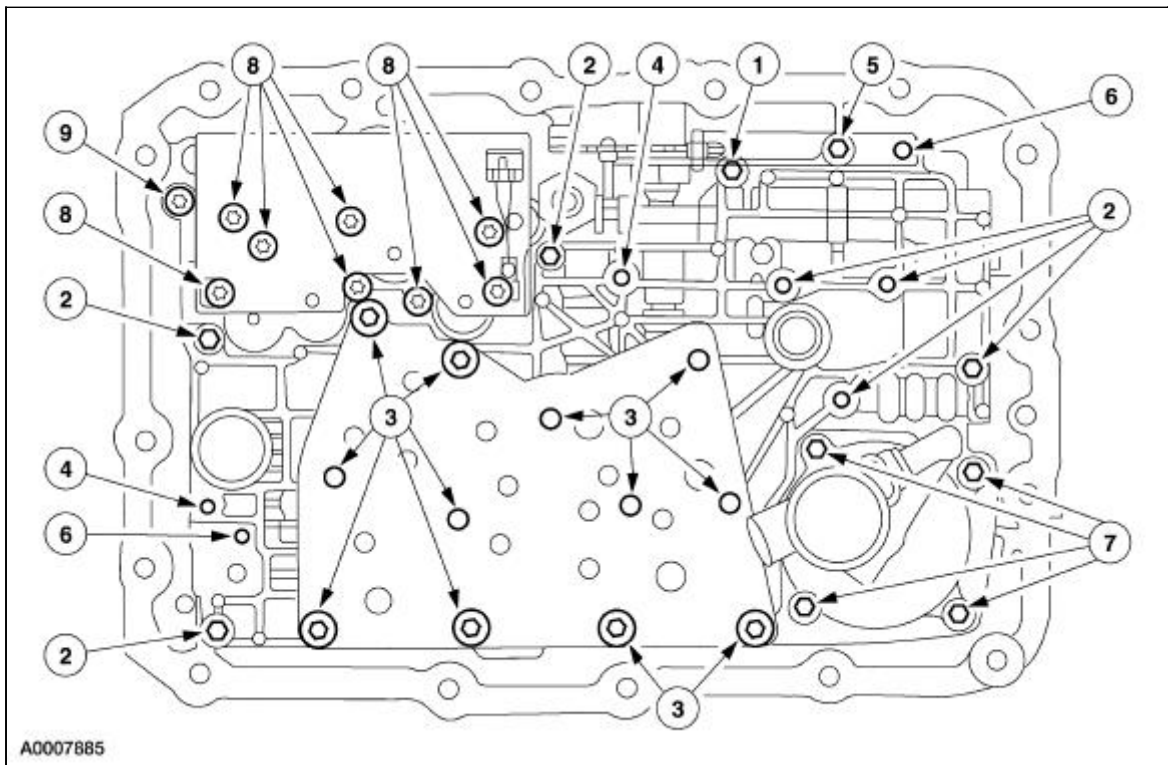


2. Install the special tools into the transmission case.

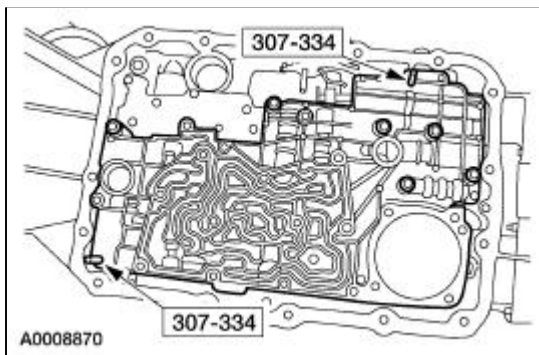


3. Refer to the following chart for bolt locations:

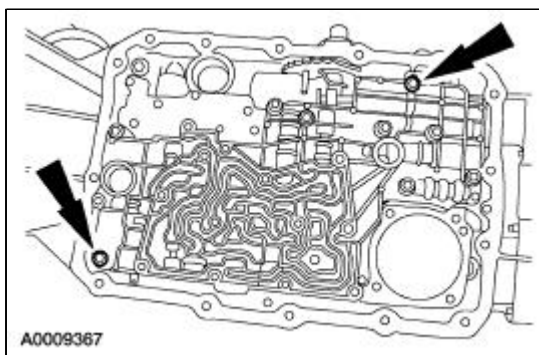
Item	Part Number	Part Name	Size
1	W702791-S300	Hex bolt	M6 X 27
2	W500103-S1300	Hex bolt	M6 X 45
3	W703133-S1300	Hex bolt	M6 X 52
4	W705559-S300	Hex bolt	M6 X 82.2
5	W500100-S300	Hex bolt	M6 X 30
6	W701099-S1430	Cap int lob screw	M6 X 20
7	W703135-S1300	Hex bolt	M6 X 70
8	W703189-S1430	Cap int lob 8	M6 X 63
9	W702921-S430	Cap int lob 8	M6 X 25



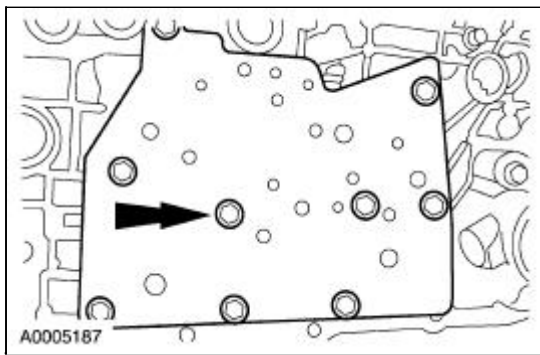
4. Install the main control valve body and loosely install the screws.



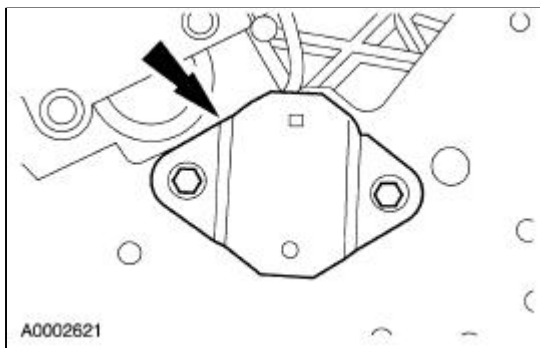
5. Remove the special tools and loosely install the screws.



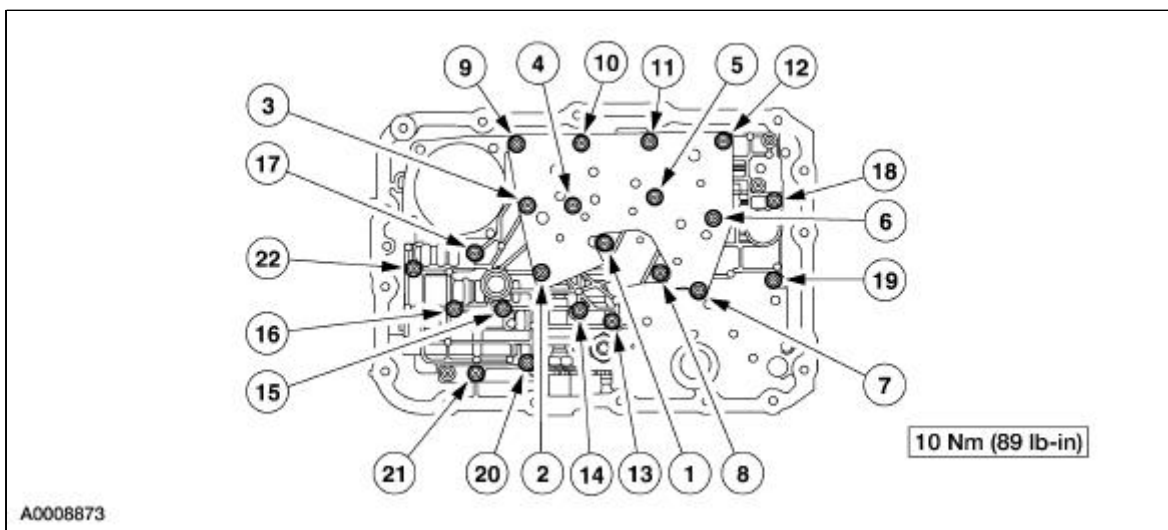
6. Install the valve body cover plate and gasket and loosely install the screws.



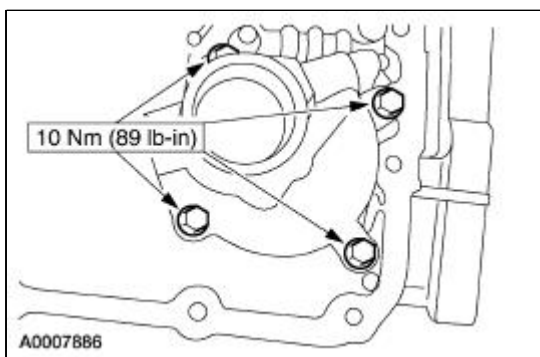
7. Install the reverse pressure switch and loosely install the screws.



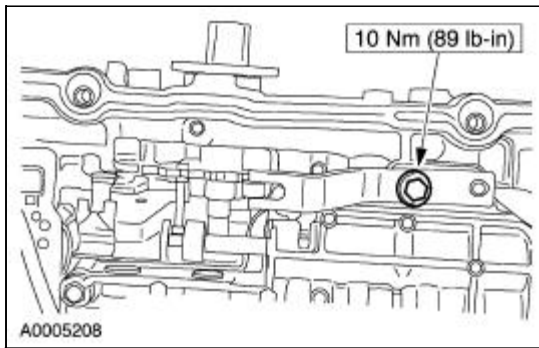
8. Tighten the screws in the sequence shown.



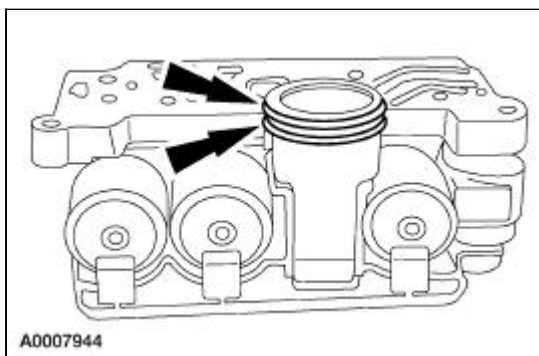
9. Install the reverse servo, using a crisscross pattern to tighten the bolts.




10. Install the manual control valve detent spring.

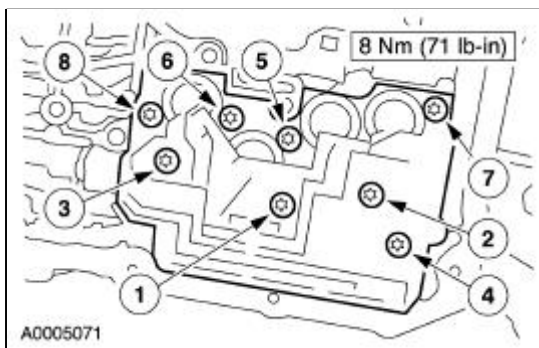


11. Install new O-ring seals on the solenoid body connector. Lubricate the O-ring seals with clean automatic transmission fluid.

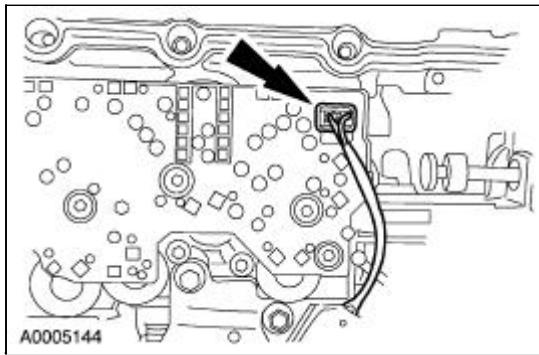


12.  **CAUTION:** Inspect the transmission case bore to make sure it is free of foreign material and not damaged. If it is damaged, transmission leak may occur.

Install the solenoid body. Tighten the bolts in sequence shown.



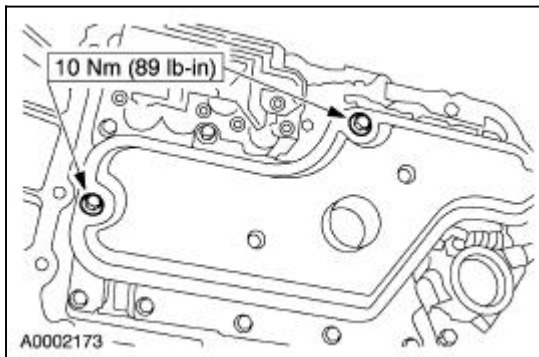
13. Connect the reverse pressure switch connector.



14.  **CAUTION:** Lubricate the fluid filter O-ring seals with clean automatic transmission fluid or seals can be damaged.

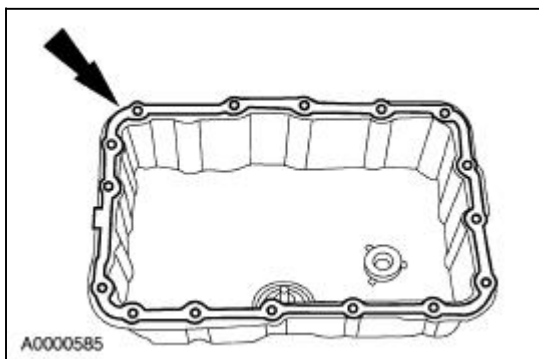
NOTE: Make sure that the fluid filter O-ring seals are correctly seated on the filter.

Lubricate the seals and install the transmission fluid filter.

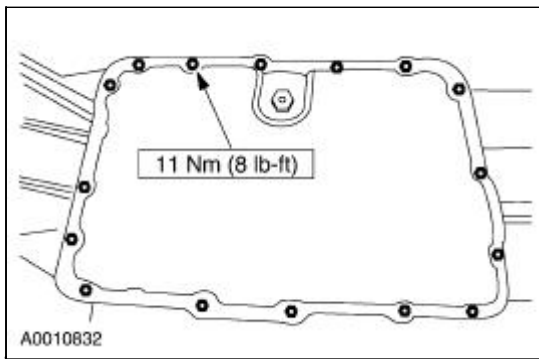


15. **NOTE:** The transmission fluid pan gasket is reusable. Clean and inspect for damage. If not damaged, the gasket should be reused.

Install the transmission fluid pan and gasket and loosely install the screws.

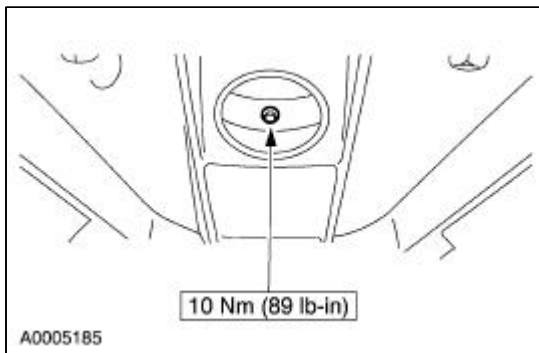


16. Using a crisscross sequence, tighten the screws.

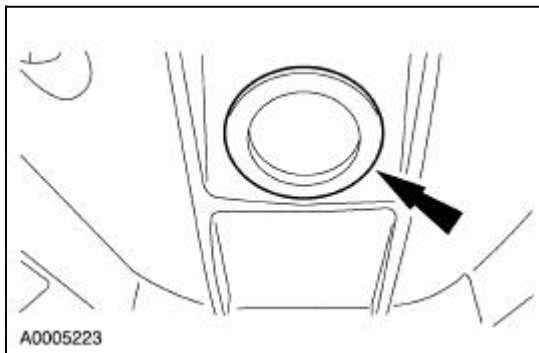


17. **NOTE:** A new converter drain plug must be used to prevent leakage.

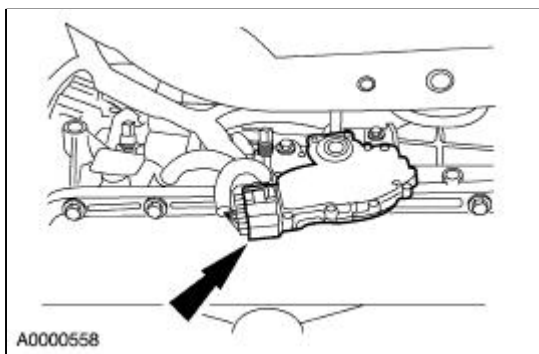
Install the drain plug.




18. Install the converter housing access plug.



19. Reconnect the digital TR sensor connector.



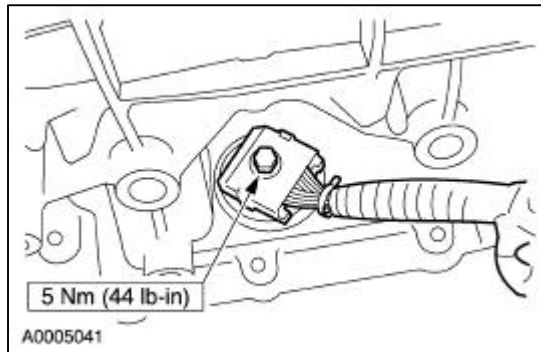
20.  **CAUTION:** Damage to the solenoid body assembly can result if the screw is tightened above specification.

NOTE: Always install new O-ring seals on vehicle harness connector.

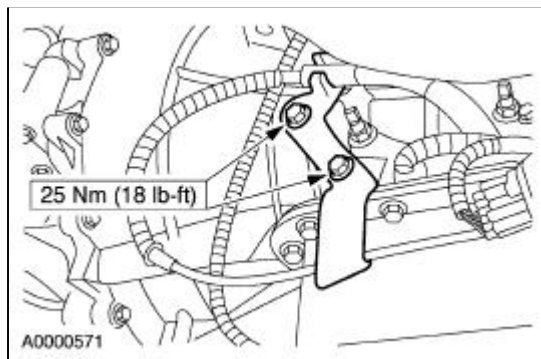
NOTE: Clean the area around connector to prevent contamination of the solenoid body connector.

NOTE: Use petroleum jelly to lubricate the O-ring seals to aid in the installation process.

Install and lubricate new O-ring seals on the transmission connector and connect the connector.



21. Install the shift cable bracket.




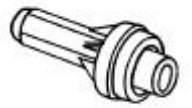

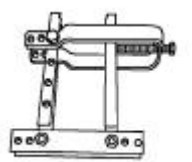


22. Lower the vehicle.
23. **NOTE:** When the battery is disconnected or a new battery installed, certain transmission operating parameters can be lost. The powertrain control module (PCM) must relearn these parameters. During this learning process, you may experience slightly firm shifts, delayed, or early shifts. This operation is considered normal and will not affect the function of the transmission. Normal operation will return once these parameters are stored by the PCM.

Connect the battery ground cable. For additional information, refer to [Section 414-01](#).

24. Fill the transmission to the correct fluid level and check for correct transmission operation. For additional information, refer to [Transmission Fluid Level Check](#) in this section.
-

Extension Housing Seal

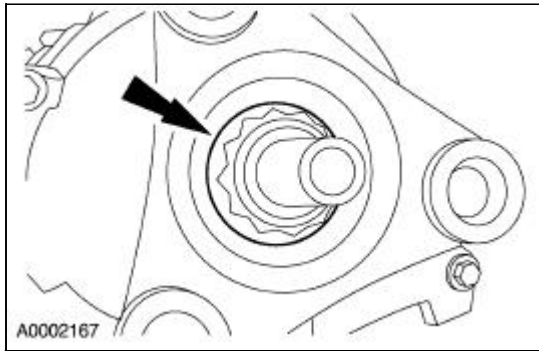
Special Tool(s)

 ST2415-A	Remover, Output Flange 307-408
 ST1791-A	Installer, Transmission Extension Housing Fluid Seal 307-038 (T74P-77052-A)
 ST1185-A	Slide Hammer 100-001 (T50T-100-A)
 ST1758-A	Remover, Torque Converter Fluid Seal 307-309 (T94P-77001-BH)
 ST2416-A	Installer, Output Shaft Flange 307-404
 ST2440-A	Installer, Drive Pinion Flange 205-479

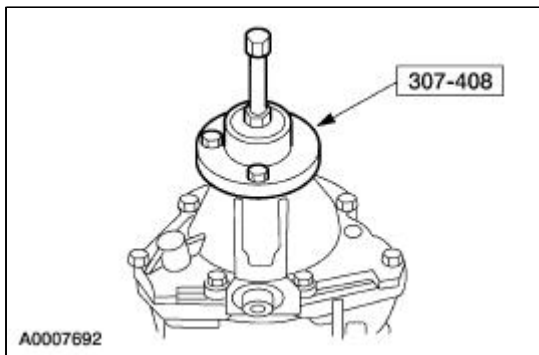
Removal

1. Raise and support the vehicle. For additional information, refer to [Section 100-02](#).
2. Remove the exhaust. For additional information, refer to [Section 309-00](#).
3. Remove the driveshaft. For additional information, refer to [Section 205-01](#).

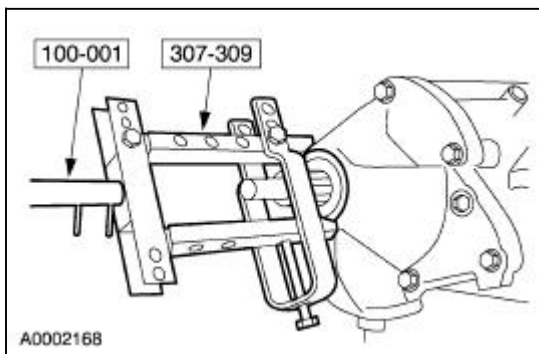
4. Remove the nut and discard.



5. Using the special tool, remove the output flange.

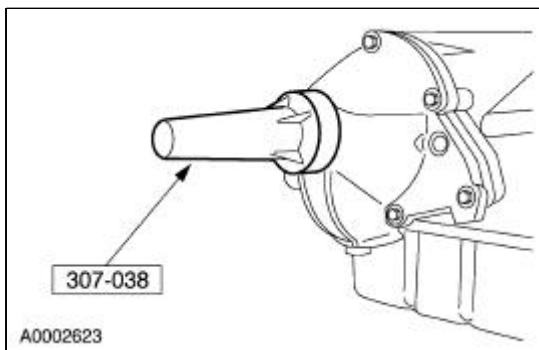


6. Using the special tools, remove the extension housing seal.

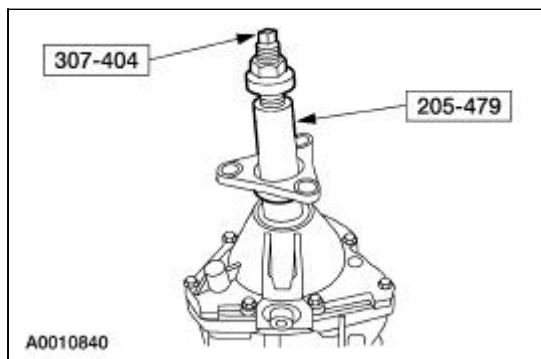


Installation

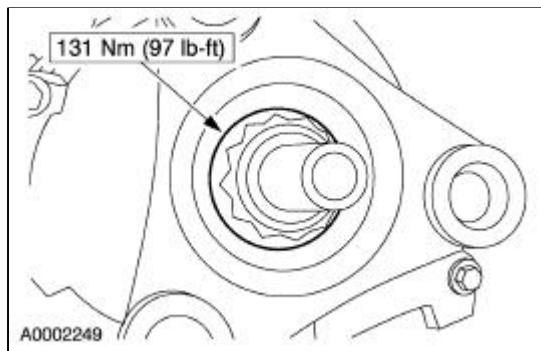
1. Using the special tool, install the extension housing seal.



2. Using the special tools, install the output flange.






3. Install a new nut.




4. Install the driveshaft. For additional information, refer to [Section 205-01](#).
 5. Install the exhaust. For additional information, refer to [Section 309-00](#).
 6. Fill the transmission to the correct fluid level and check for correct transmission operation. For additional information, refer to [Transmission Fluid Level Check](#) in this section.
-

Extension Housing Gasket

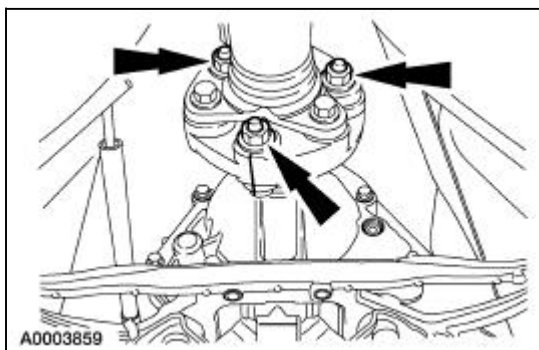
Special Tool(s)

 ST2415-A	Remover, Output Flange 307-408
 ST2416-A	Installer, Output Shaft Flange 307-404
 ST2440-A	Installer, Drive Pinion Flange 205-479

Removal

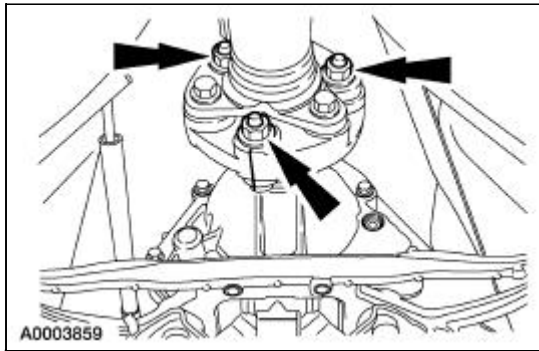
1. Raise and support the vehicle. For additional information, refer to [Section 100-02](#).
2. Remove the exhaust heat shield. For additional information, refer to [Section 309-00](#).
3.  **CAUTION:** Index-mark (color paint) the bolts, washers, nuts, and the flex coupling to the transmission flange and the pinion flange to make sure they are installed in the same location. Components not assembled in their original locations can cause driveshaft imbalance.

Index-mark the front driveshaft pinion flange.

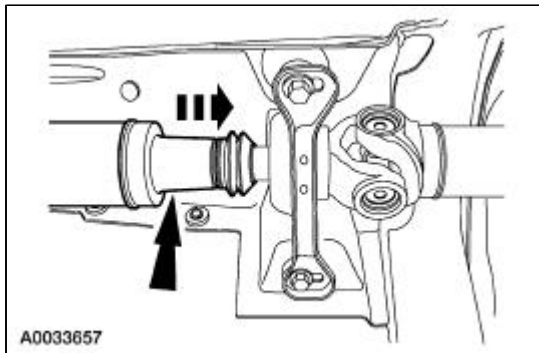


4.  **CAUTION:** Do not remove the bolts retaining the flex coupling to the driveshaft.

Remove the three nuts, washers and bolts.

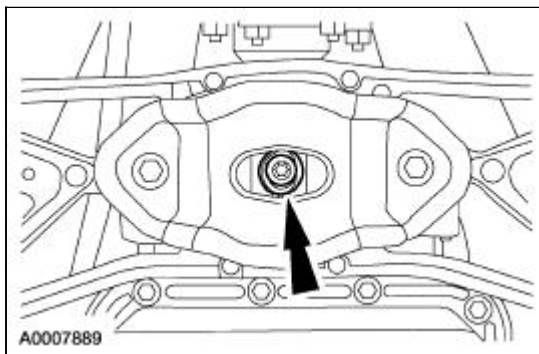


5. Slide the front portion of the driveshaft toward the rear of the vehicle.

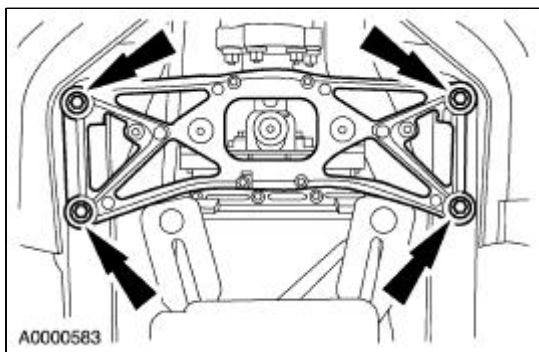


6. Support the transmission with a transmission jack.

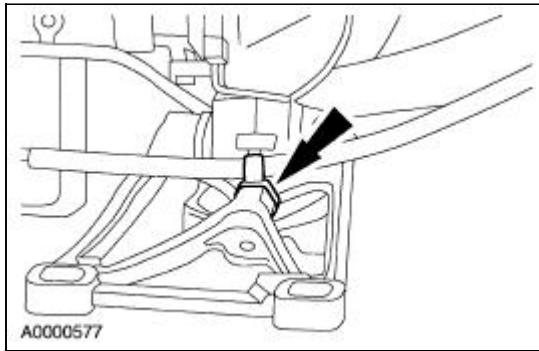
7. Remove the bolt.



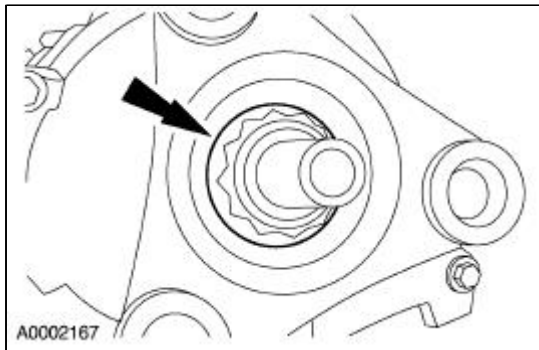
8. Remove the bolts.



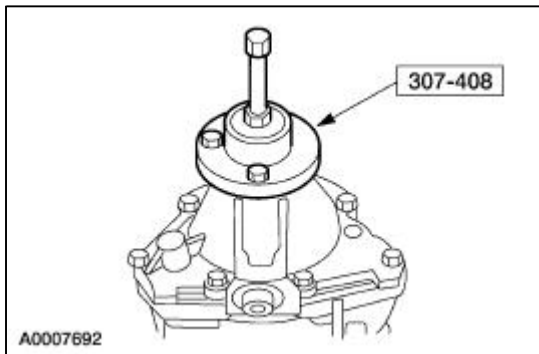
9. Disconnect the shift cable.



10. Remove the nut and discard.

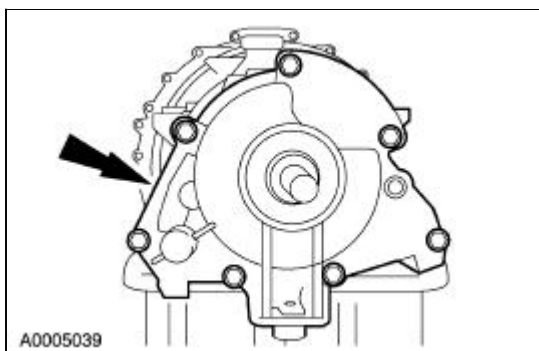


11. Using the special tool, remove the output flange.

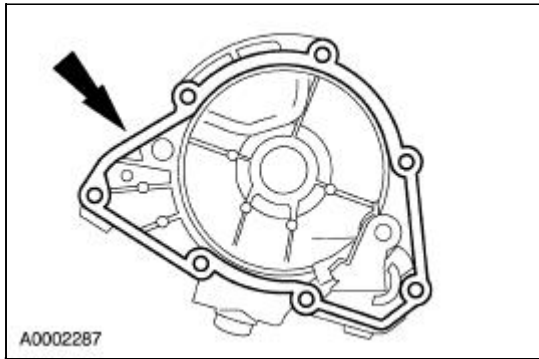


12.  **CAUTION:** The parking pawl, parking pawl return spring and parking pawl shaft could fall out during removal of the extension housing.

Remove the extension housing.

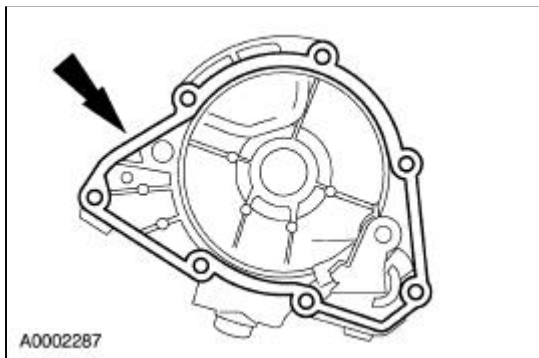


13. Remove and discard the extension housing gasket.



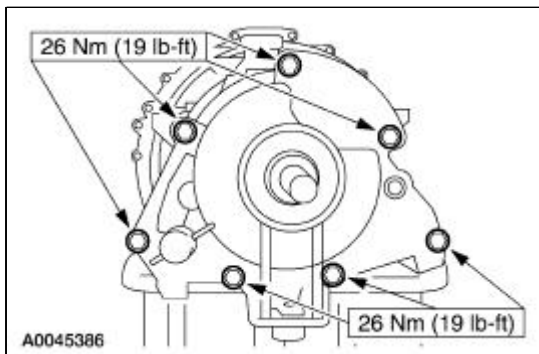
Installation

1. Clean the extension housing and install new extension housing gasket. Make sure that the park pawl is installed correctly.

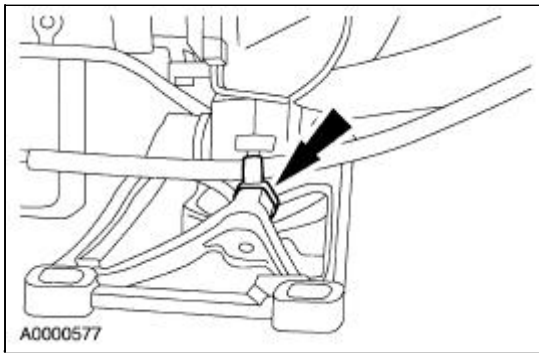


2.  **CAUTION:** Make sure the parking lever actuating rod is correctly seated into the case parking rod guide cup.

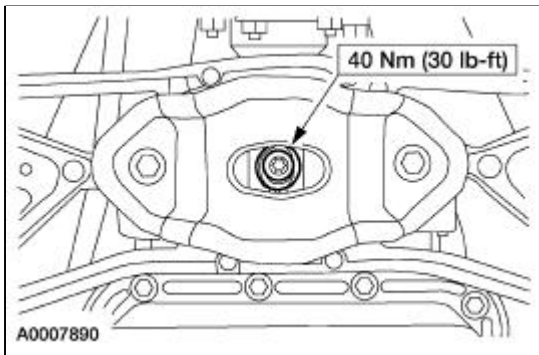
Install the extension housing.



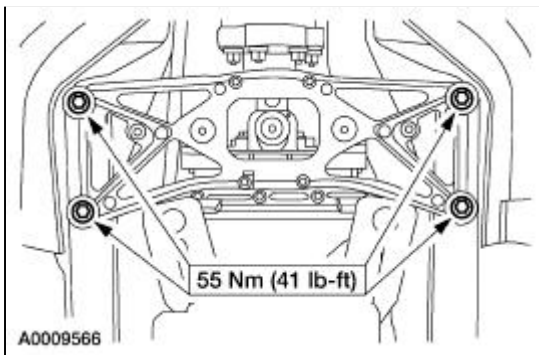
3. Install the shift cable.



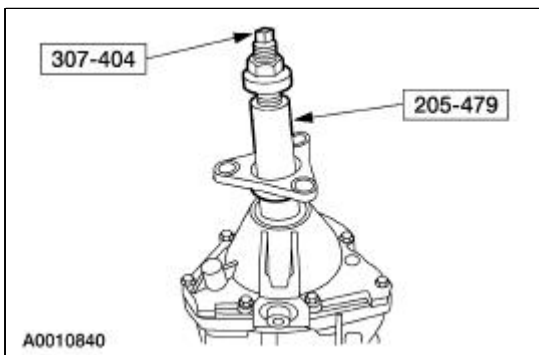
4. Install the rear mount.



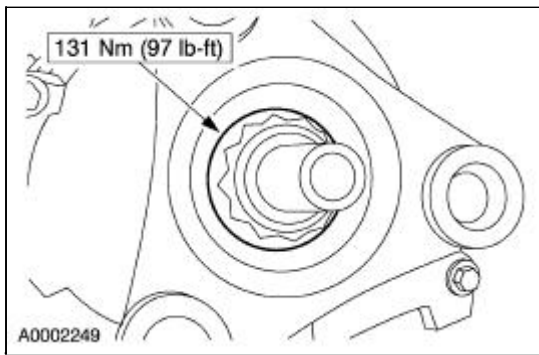
5. Install the rear mount.



6. Using the special tools, install the output flange.

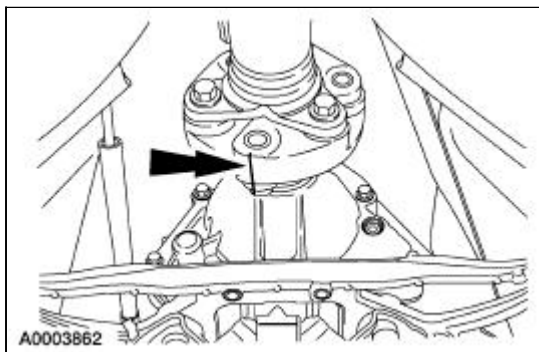



7. Install a new nut.



8.  **CAUTION: Align the index marks or driveshaft imbalance can occur.**

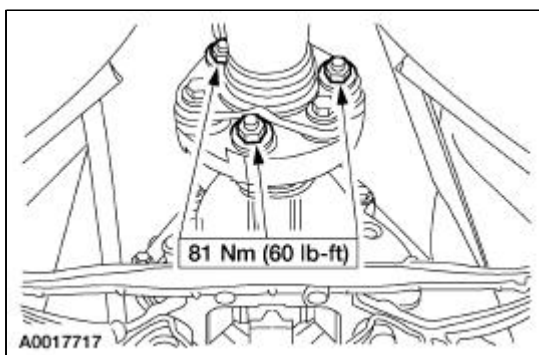
Align the index marks on the pinion flange made during removal and position the driveshaft in place.



9.  **CAUTION: Install the bolts, washers and nuts in their original positions or driveshaft imbalance can occur. Install the driveshaft flex coupling bolts with the head of the bolt seated against the flange, and the nuts seated against the flex coupling. Install the short bolts in the front and the long bolts in the rear.**

Install the bolts, washers and nuts.

- Coat the nut and bolt threads with threadlock sealer.



10. Install the exhaust heat shield. For additional information, refer to [Section 309-00](#).
11. Fill the transmission to the correct fluid level and check for correct transmission operation. For additional information, refer to [Transmission Fluid Level Check](#) in this section.
-

Solenoid Body Assembly

Material

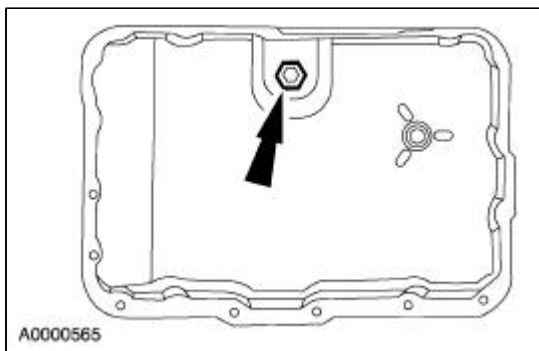
Item	Specification
MERCON® V Automatic Transmission Fluid XT-5-QM	MERCON® V

Removal

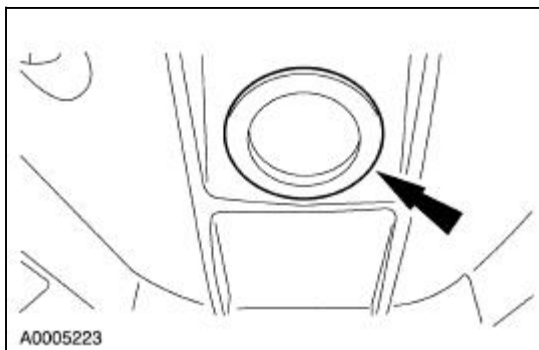
1. **NOTE:** When the battery is disconnected or a new battery installed, certain transmission operating parameters can be lost. The powertrain control module (PCM) must relearn these parameters. During this learning process, you may experience slightly firm shifts, delayed, or early shifts. This operation is considered normal and will not affect the function of the transmission. Normal operation will return once these parameters are stored by the PCM.

Disconnect the battery ground cable. For additional information, refer to [Section 414-01](#).

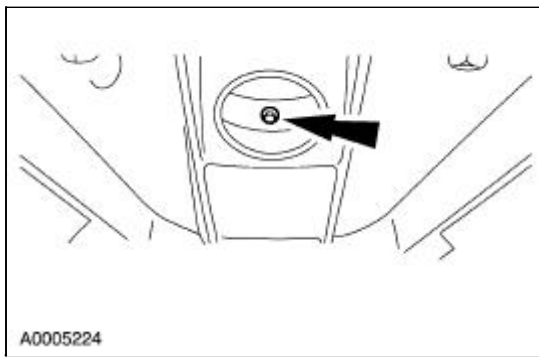
2. Raise and support the vehicle. For additional information, refer to [Section 100-02](#).
3. Drain the transmission fluid.



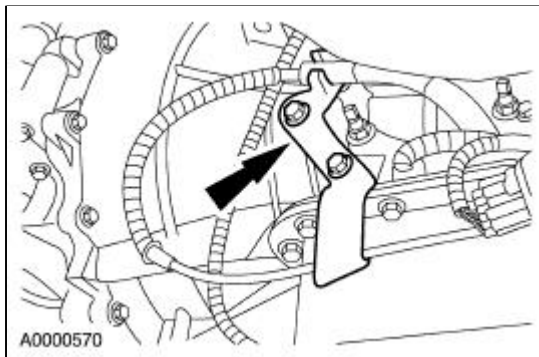
4. Remove the converter housing plug.



5. Remove the drain plug.

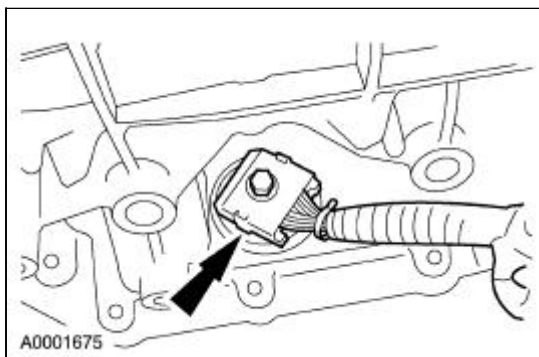


6. Remove the shift cable bracket.

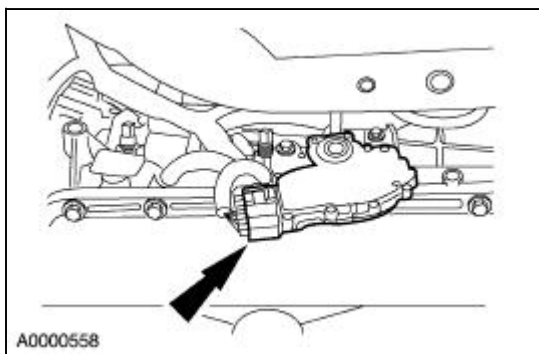


7. **NOTE:** Clean the area around connector to prevent contamination of the solenoid body connector.

Disconnect the transmission connector.



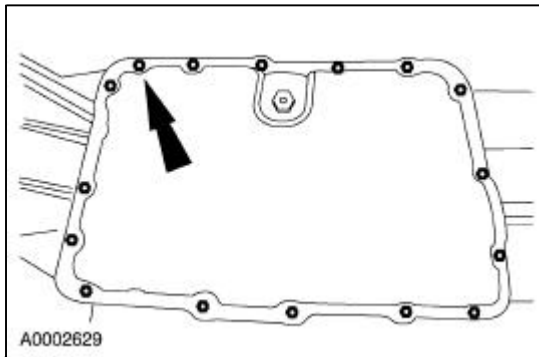
8. Disconnect the digital transmission range (TR) sensor connector.



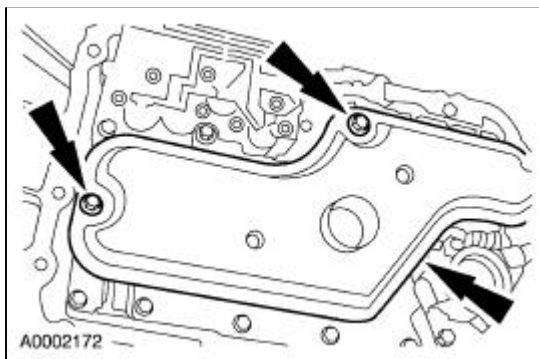
9. **NOTE:** The transmission fluid pan gasket is reusable. Clean and inspect for damage. If not

damaged, the gasket should be reused.

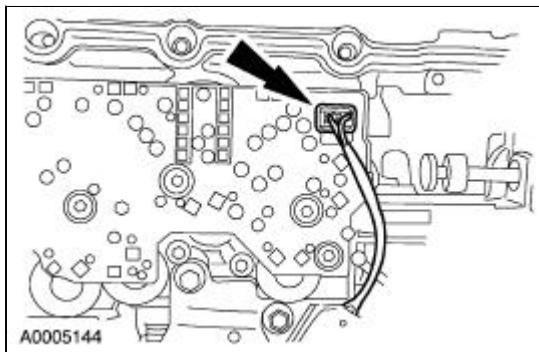
Remove the transmission fluid pan and gasket.



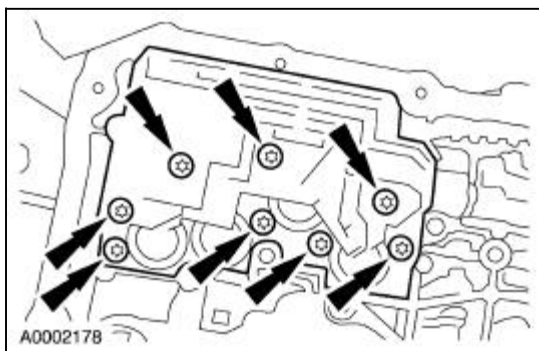
10. Remove the transmission fluid filter.



11. Disconnect the reverse pressure switch connector.

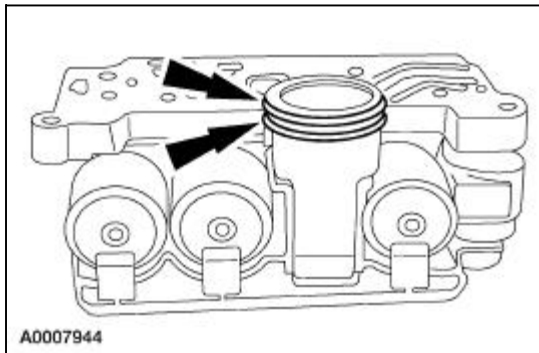



12. Remove the solenoid body.



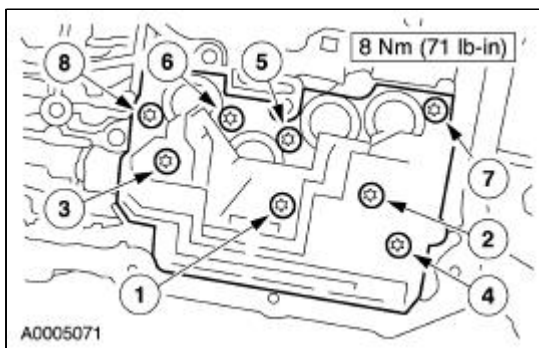
Installation

1. Install new O-ring seals on the solenoid body connector. Lubricate the O-ring seals with clean automatic transmission fluid.

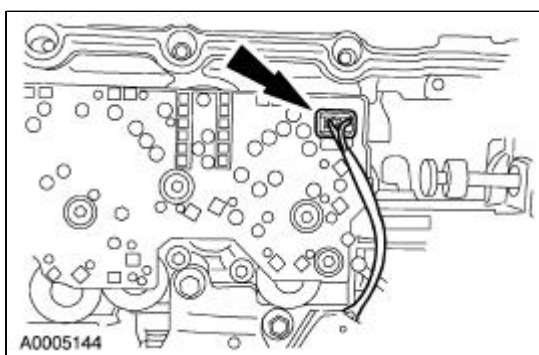


2.  **CAUTION:** Inspect the transmission case bore to make sure it is free of foreign material and not damaged. If damaged, a transmission leak can result.

Install the solenoid body. Tighten the bolts in sequence shown.



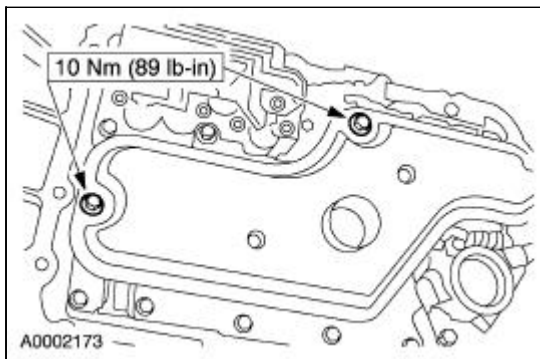
3. Connect the reverse pressure switch connector.



4.  **CAUTION:** Lubricate the fluid filter O-ring seals with clean automatic transmission fluid or seals may be damaged.

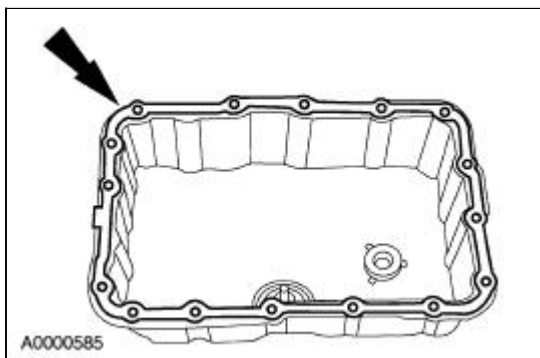
NOTE: Make sure that the fluid filter O-ring seals are correctly seated on the filter.

Lubricate the seals and install the transmission fluid filter.

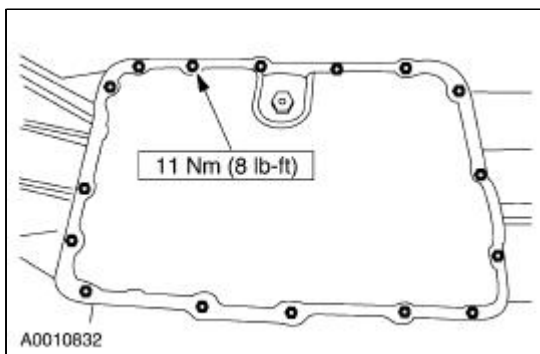


5. **NOTE:** The transmission fluid pan gasket is reusable. Clean and inspect for damage. If not damaged, the gasket should be reused.

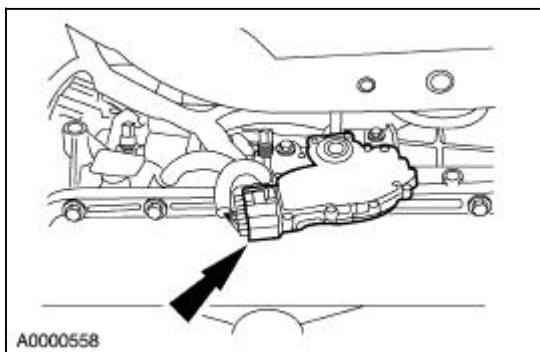
Install the transmission fluid pan and gasket and loosely install the screws.



6. Using a crisscross sequence, tighten the screws.

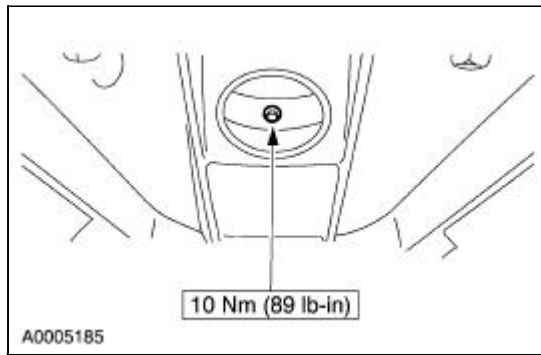


7. Reconnect the digital TR sensor connector.

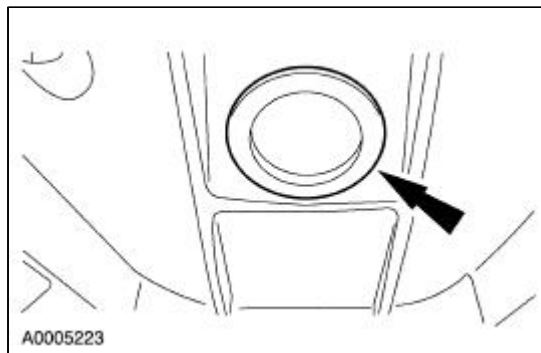



8. **NOTE:** A new converter drain plug must be used to prevent leakage.

Install the drain plug.



9. Install the converter housing access plug.



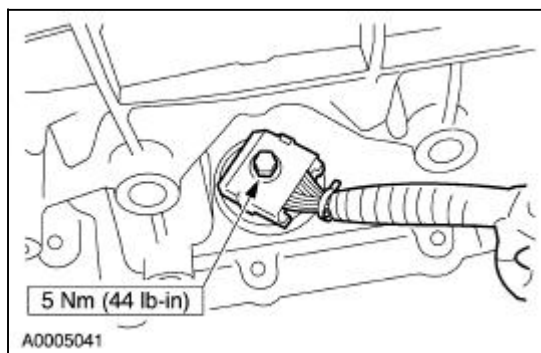
10.  **CAUTION:** Damage to the solenoid body assembly can result if the screw is tightened above the specification.

NOTE: Always install new O-ring seals on vehicle harness connector.

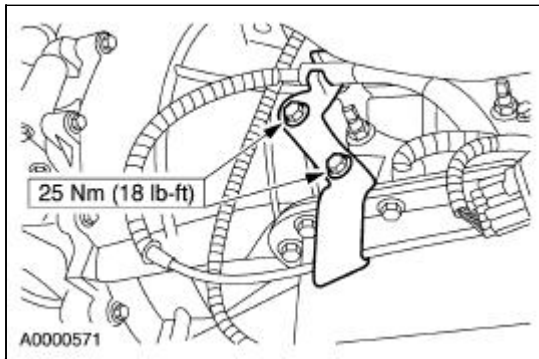
NOTE: Clean the area around connector to prevent contamination of the solenoid body connector.

NOTE: Use petroleum jelly to lubricate the O-ring seals to aid in the installation process.

Install and lubricate new O-ring seals on the transmission connector and connect the connector.



11. Install the shift cable bracket.



12. **NOTE:** When the battery is disconnected or a new battery installed, certain transmission operating parameters can be lost. The powertrain control module (PCM) must relearn these parameters. During this learning process, you may experience slightly firm shifts, delayed, or early shifts. This operation is considered normal and will not affect the function of the transmission. Normal operation will return once these parameters are stored by the PCM.

Connect the battery ground cable. For additional information, refer to [Section 414-01](#).

13. Fill the transmission to the correct fluid level and check for correct transmission operation. For additional information, refer to [Transmission Fluid Level Check](#) in this section.
-

Digital Transmission Range (TR) Sensor

Special Tool(s)

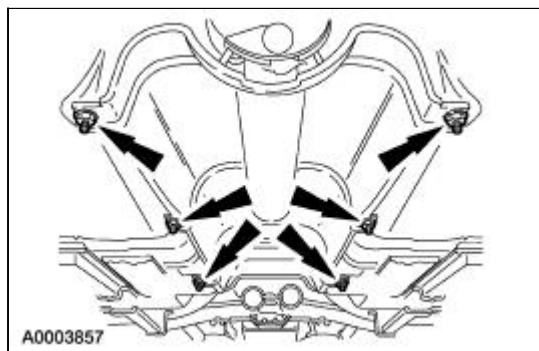
 ST1633-A	Alignment Gauge, TR Sensor 307-351 (T97L-70010-A)
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Material

Item	Specification
Premium Long Life Grease XG-1-C	ESA-M1C75-B
Threadlock and Sealer E2FZ-19554-B	WSK-M2G351-A6

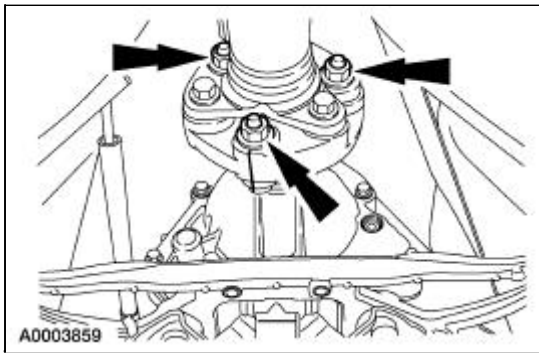
Removal

1. Raise and support the vehicle. For additional information, refer to [Section 100-02](#).
2. Remove the three-way catalytic converter. For additional information, refer to [Section 309-00](#).
3. Remove the eight retainers and the heat shield.

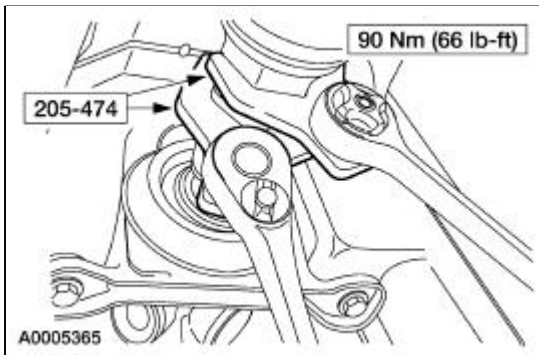



4.  **CAUTION:** Index-mark (color paint) the bolts, washers, nuts, and the flex coupling to the transmission flange and the pinion flange to assure assembly in the exact same location. Components not assembled in their original locations can cause driveshaft imbalance.

Index-mark the components.



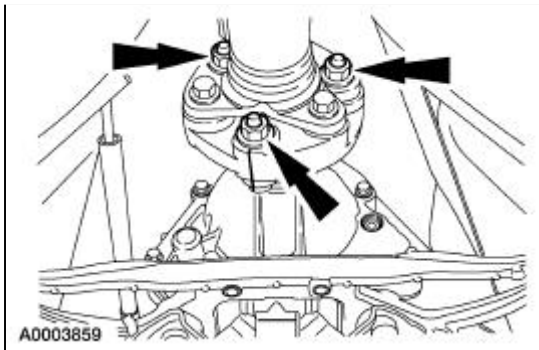
- Using the special tools, loosen the nut.



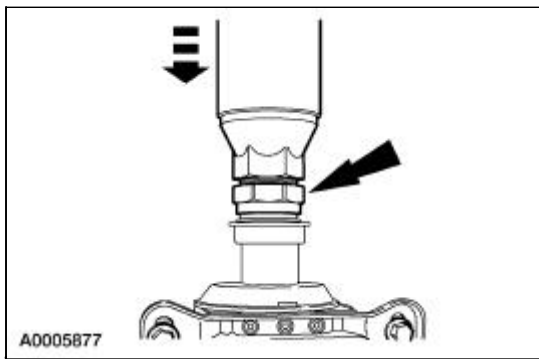
-  **CAUTION:** Do not remove the bolts retaining the flex coupling to the driveshaft.


NOTE: The bolt heads are serrated. Hold the bolt and loosen the nut.

Remove the three nuts, washers and bolts.



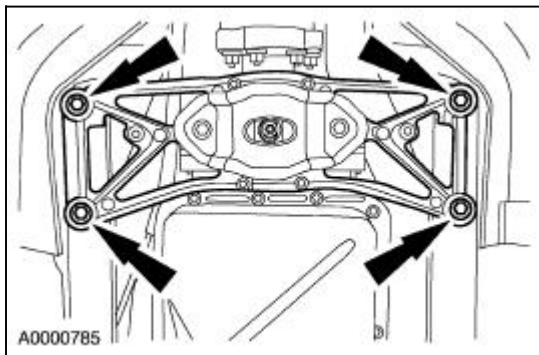
- Slide the front shaft assembly rearward and support.
 - Tighten the nut to prevent separation of the front and rear shaft assemblies.



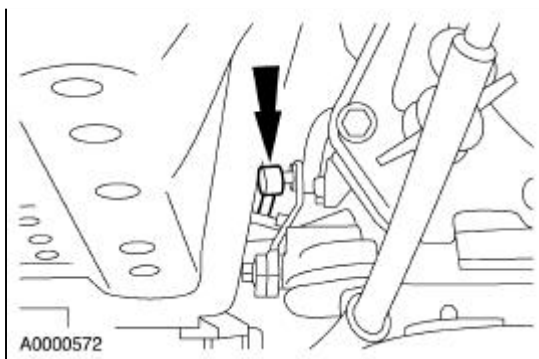
8.  **WARNING: Secure the transmission to the transmission jack with a safety chain.**
Failure to follow these instructions may result in personal injury.

Support the transmission with a transmission jack.

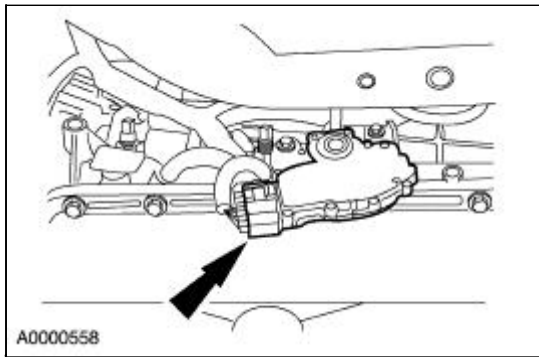
9. Remove the transmission mount and lower the transmission enough to gain access to the digital transmission range (TR) sensor.



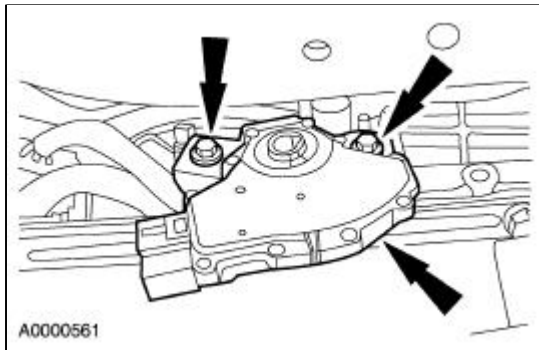
10. Disconnect the shift cable.



11. Disconnect the digital TR sensor connector.



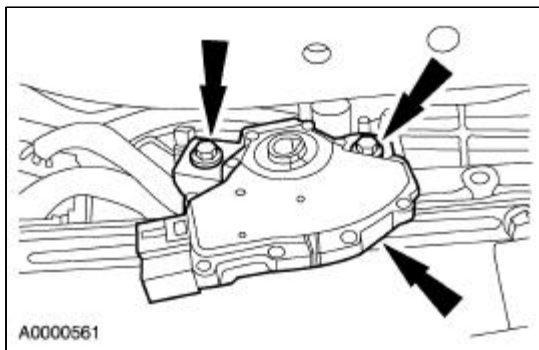
12. Remove the digital TR sensor.



Installation

1.  **CAUTION:** The digital transmission range sensor must fit flush against the boss on the case to prevent damage to the sensor.

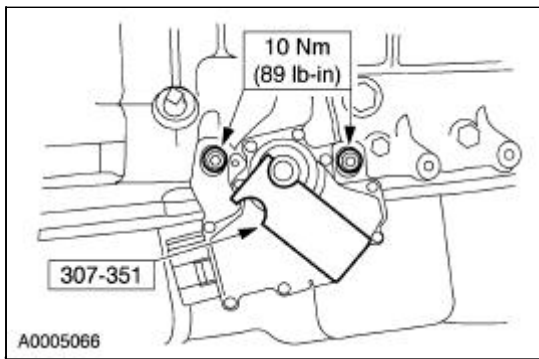
Install the digital TR sensor and loosely install the screws.



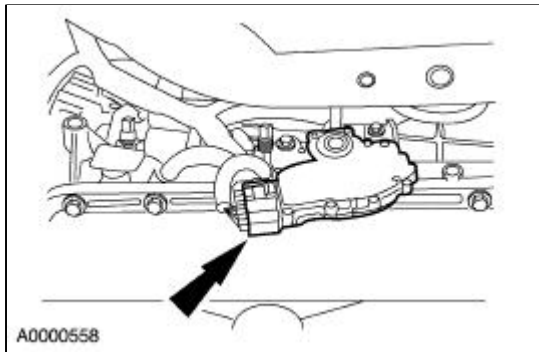
2.  **CAUTION:** Tightening one screw before tightening the other may cause the sensor to bind or become damaged.

NOTE: The manual lever must be in the Neutral position.

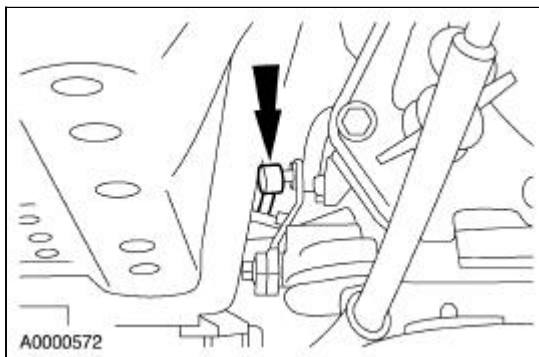
Using the special tool, align the digital TR sensor and tighten the screws in an alternating sequence.



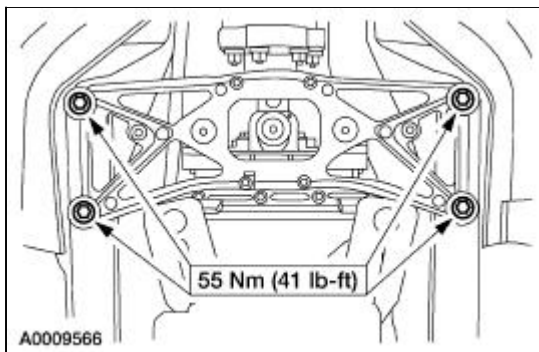
3. Reconnect the digital TR sensor connector.



4. Connect the shift cable.

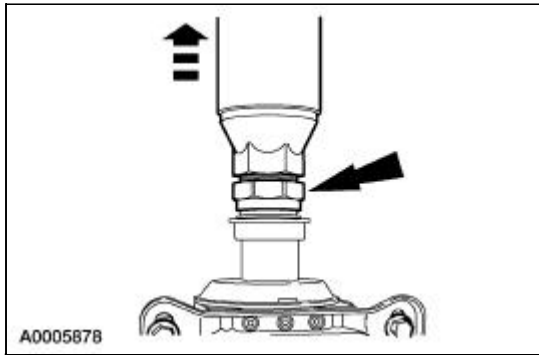


5. Install the rear mount.



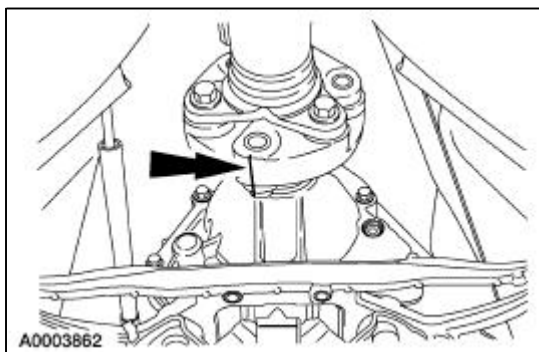
6. Verify that the shift cable is adjusted. For additional information, refer to [Section 307-05](#).
7. Add one gram of grease to both alignment bushing cavities.


- Loosen the nut and slide the front shaft assembly forward.



-  **CAUTION: Align the index marks or driveshaft imbalance can occur.**

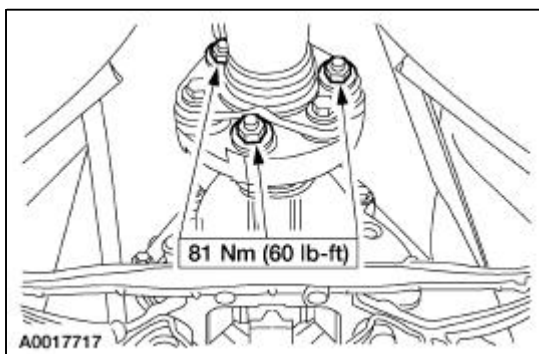
Align index marks and position the alignment bushing on the transmission flange piloting system.



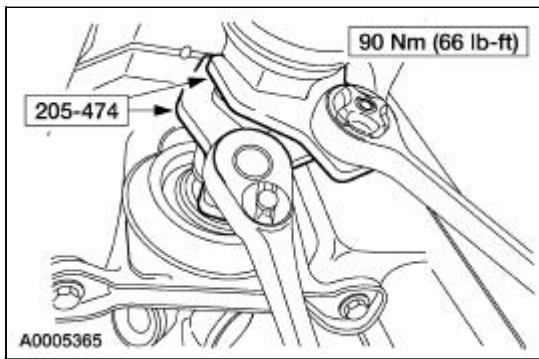
-  **CAUTION: Install the bolts, washers and nuts in their original positions or driveshaft imbalance can occur. Install the driveshaft flex coupling bolts with the head of the bolt seated against the flange, and the nuts seated against the flex coupling. Install the short bolts in the front and the long bolts in the rear.**

NOTE: The bolt heads are serrated. Hold the bolt and tighten the nut.

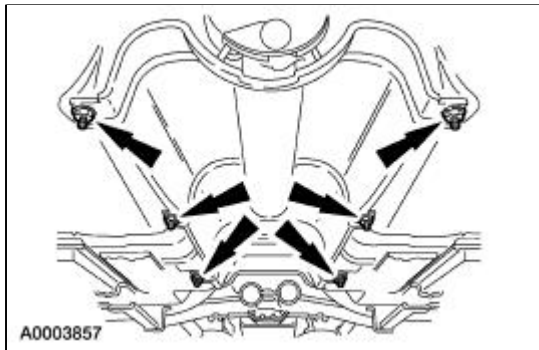
Install the bolts, washers and nuts. Coat the nut and bolt threads with threadlock sealer.



- Using the special tools, tighten the nut.



12. Install the heat shield.



13. Install the three-way catalytic converter. For additional information, refer to [Section 309-00](#).
 14. Lower the vehicle.
-

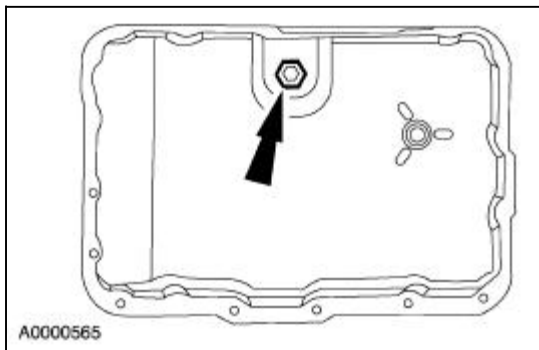
Reverse Servo Assembly

Material

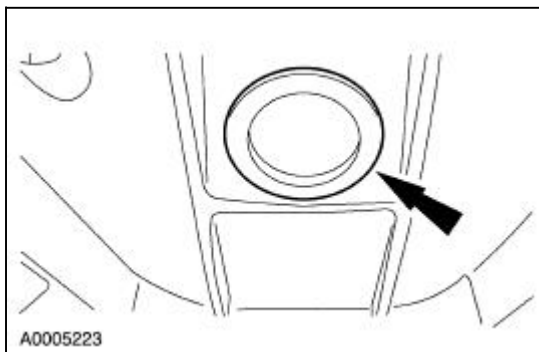
Item	Specification
MERCON® V Automatic Transmission Fluid XT-5-QM, XT-5-DM	MERCON® V

Removal

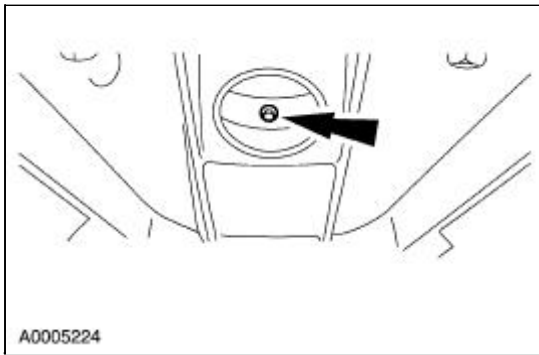
1. Raise and support the vehicle. For additional information, refer to [Section 100-02](#).
2. Drain the transmission fluid.



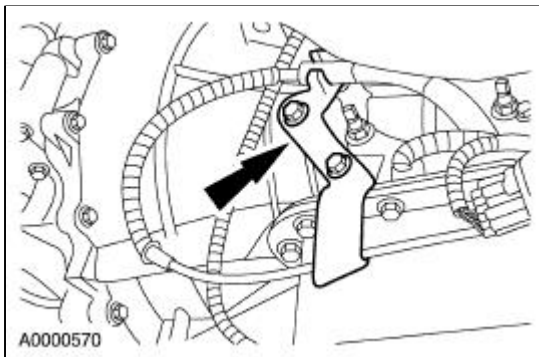
3. Remove the converter housing plug.



4. Remove the drain plug.

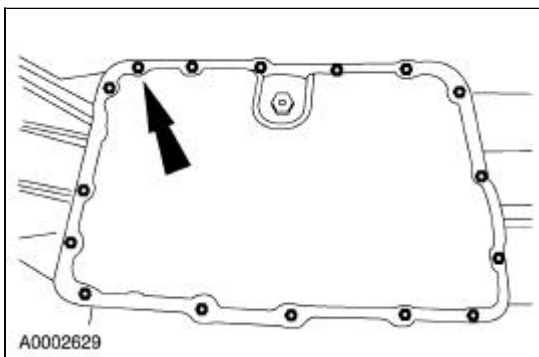


5. Remove the shift cable bracket.

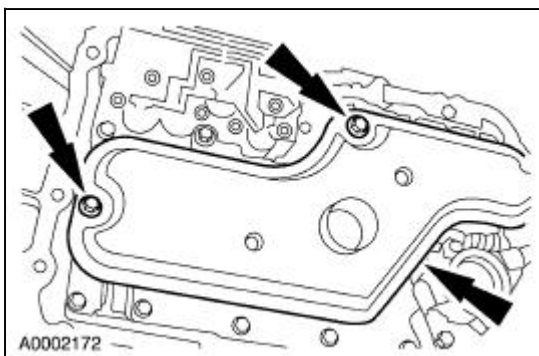


6. **NOTE:** The transmission fluid pan gasket is reusable, clean and inspect for damage; if not damaged, the gasket should be reused.

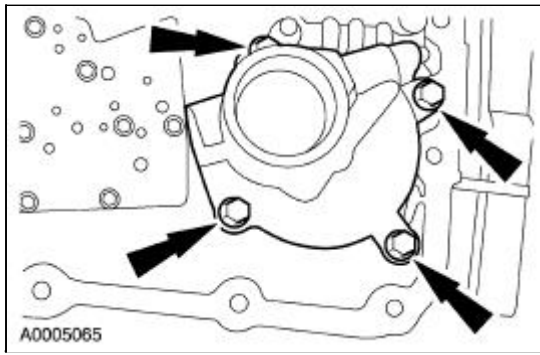
Remove the transmission fluid pan and gasket.



7. Remove the transmission fluid filter.

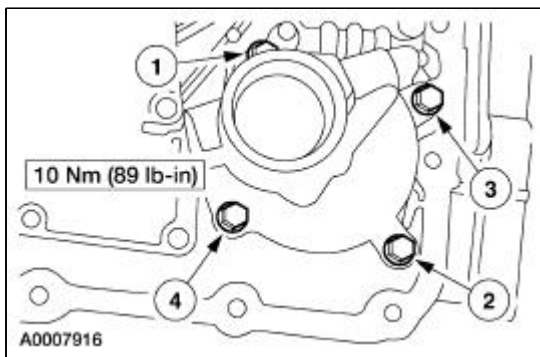


8. Remove the reverse servo.



Installation

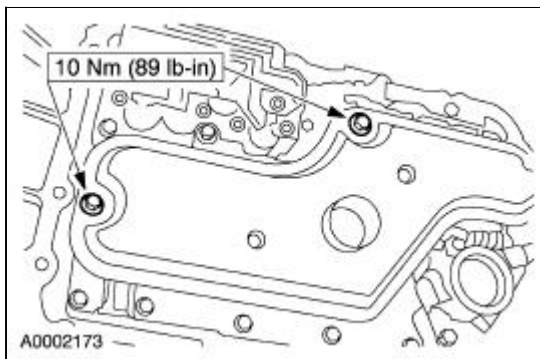
1. Install the reverse servo.
 - Install the bolts in the sequence shown.



2.  **CAUTION:** Lubricate the fluid filter O-ring seals with clean automatic transmission fluid or seals may be damaged.

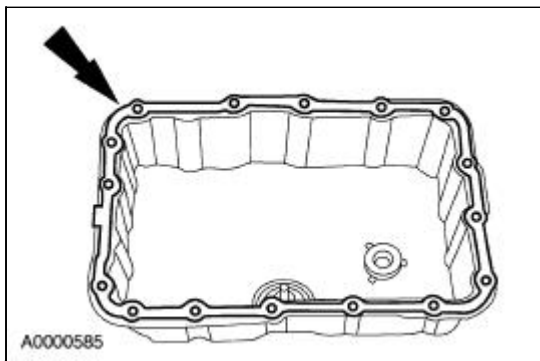
NOTE: Make sure that the fluid filter O-ring seals are correctly seated on the filter.

Lubricate the seals and install the transmission fluid filter.

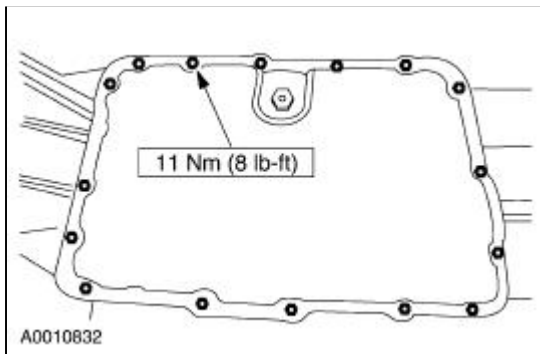


3. **NOTE:** The transmission fluid pan gasket is reusable, clean and inspect for damage; if not damaged, the gasket should be reused.

Install the transmission fluid pan and gasket and loosely install the screws.

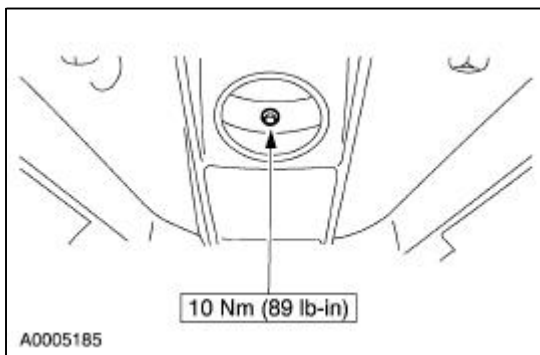


- Using a crisscross sequence, tighten the screws.

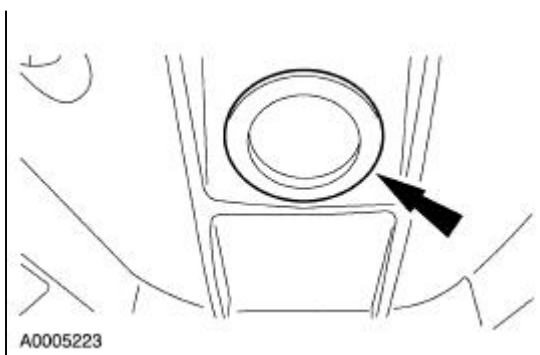


- NOTE:** A new converter drain plug must be used to prevent leakage.

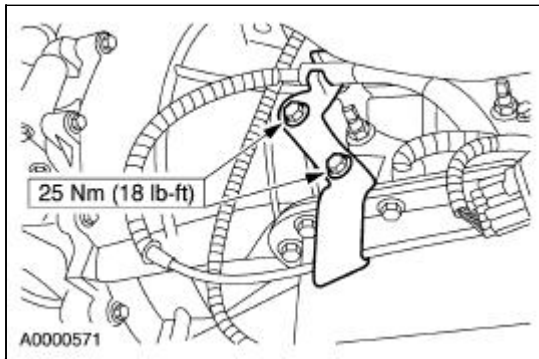
Install the drain plug.



- Install the converter housing access plug.




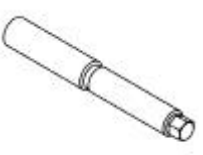
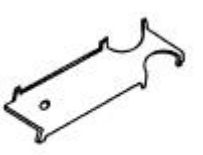

- Install the shift cable bracket.



8. Lower the vehicle.
 9. Fill the transmission to the correct fluid level and check for correct transmission operation. For additional information, refer to [Transmission Fluid Level Check](#) in this section.
-

Park System

Special Tool(s)

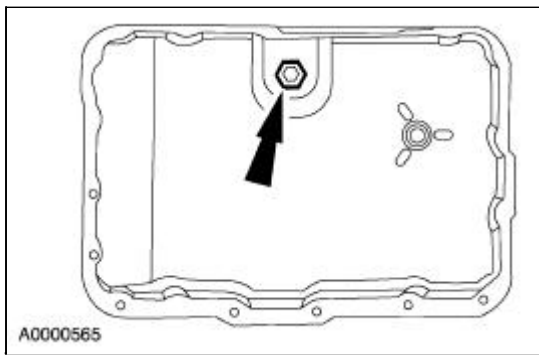
 <p>ST2415-A</p>	Remover, Output Flange 307-408
 <p>ST2416-A</p>	Installer, Output Shaft Flange 307-404
 <p>ST1633-A</p>	Alignment Gauge, TR Sensor 307-351 (T97L-70010-A)
 <p>ST2440-A</p>	Installer, Drive Pinion Flange 205-479

Material

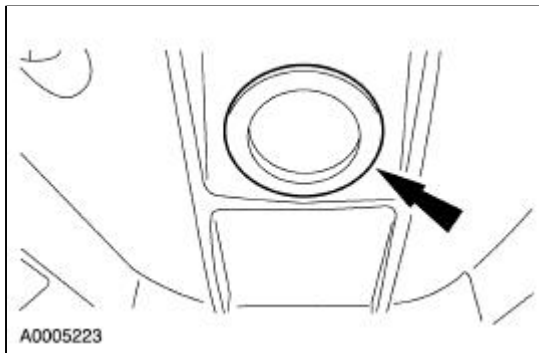
Item	Specification
MERCON® V Automatic Transmission Fluid XT-5-QM, XT-5-DM	MERCON® V

Removal

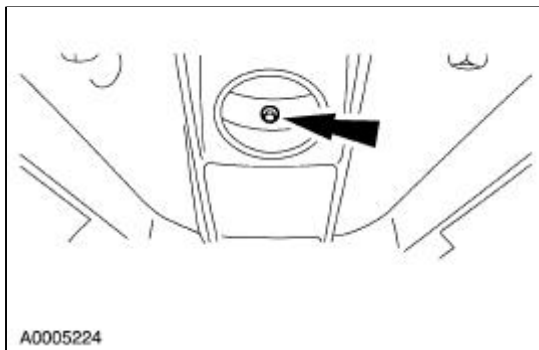
1. Raise and support the vehicle. For additional information, refer to [Section 100-02](#).
2. Drain the transmission fluid.




3. Remove the converter housing plug.



4. Remove the drain plug.

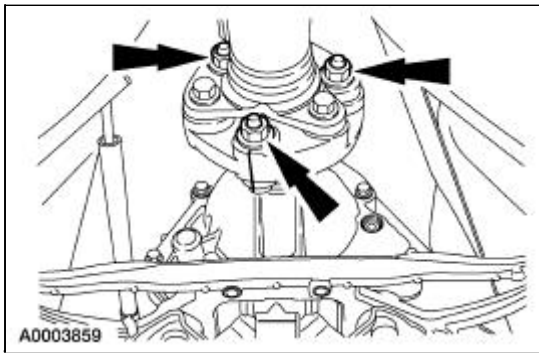


5. Remove the exhaust heat shield. For additional information, refer to [Section 309-00](#).

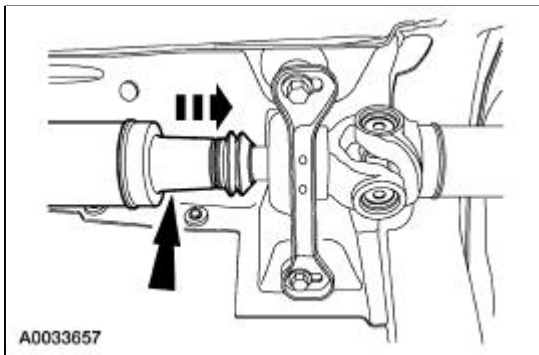
6.  **CAUTION:** Index-mark (color paint) the bolts, washers, nuts, and the flex coupling to the transmission flange and the pinion flange to make sure they are installed in the same location. Components not assembled in their original locations can cause driveshaft imbalance.


 **CAUTION:** Do not remove the bolts retaining the flex coupling to the driveshaft.

Index-mark the front driveshaft pinion flange. Remove the three nuts, washers and bolts.



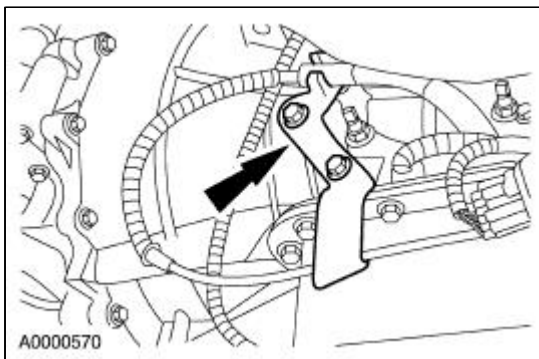
7. Slide the front portion of the driveshaft toward the rear of the vehicle.



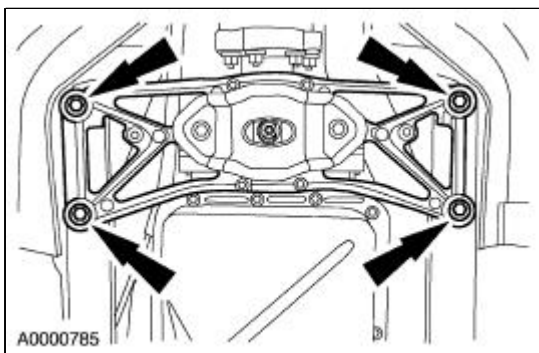
8.  **WARNING:** Secure the transmission to the transmission jack with a safety chain. Failure to follow these instructions may result in personal injury.

Support the transmission with a transmission jack.

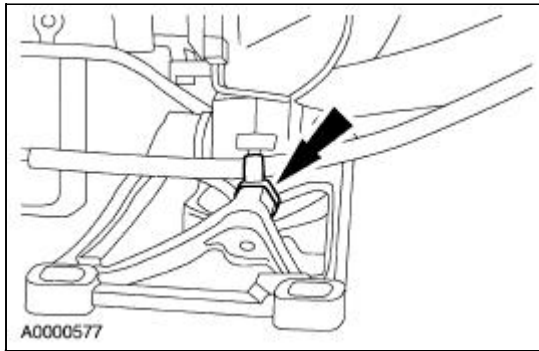
9. Remove the shift cable bracket.



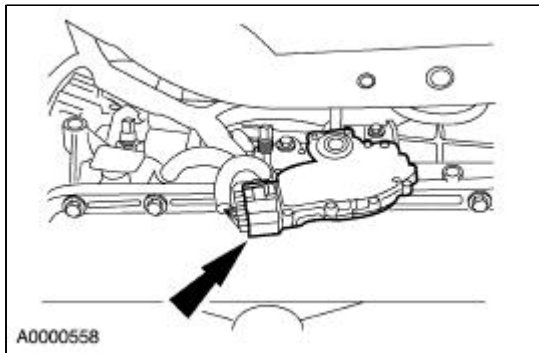
10. Remove the transmission mount.



11. Disconnect the shift cable.

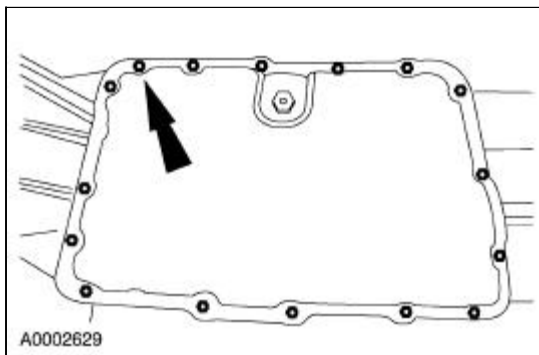


12. Disconnect the digital transmission range (TR) sensor connector.

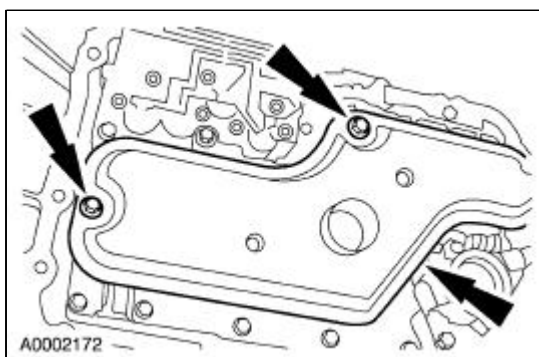


13. **NOTE:** The transmission fluid pan gasket is reusable, clean and inspect for damage; if not damaged, the gasket should be reused.

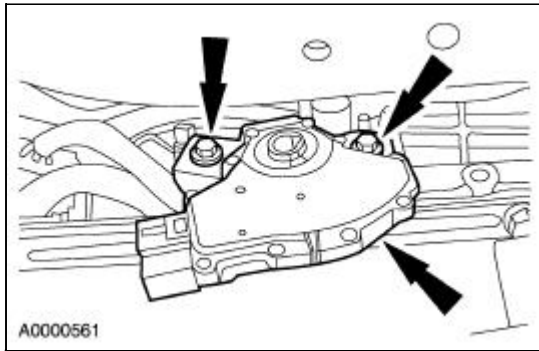
Remove the transmission fluid pan and gasket.



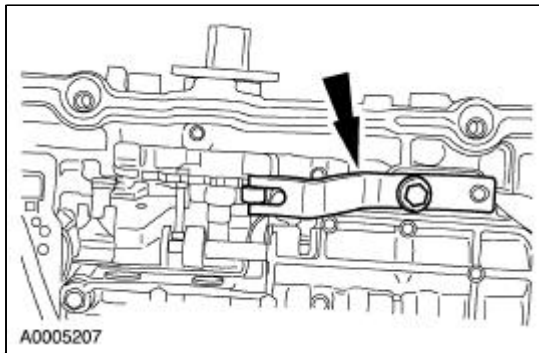
14. Remove the transmission fluid filter.



15. Remove the digital TR sensor.

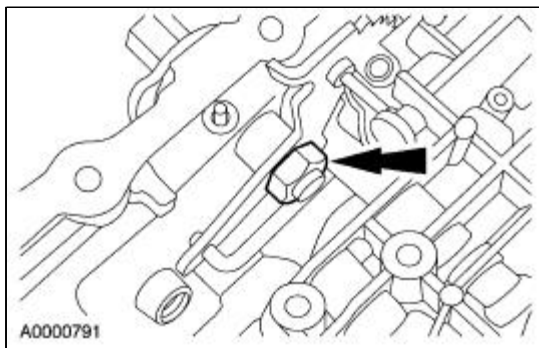


16. Remove the manual control valve detent spring.

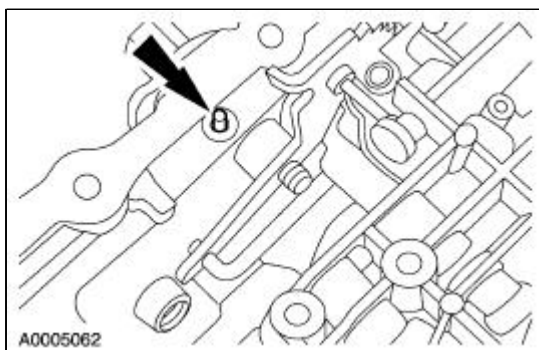


17.  **CAUTION:** To avoid damage, make sure the wrench does not strike the manual valve inner lever pin.

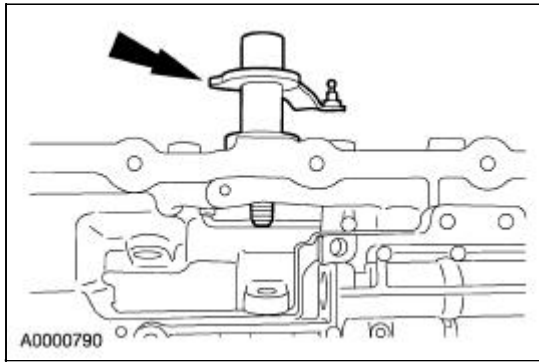
Remove the nut.



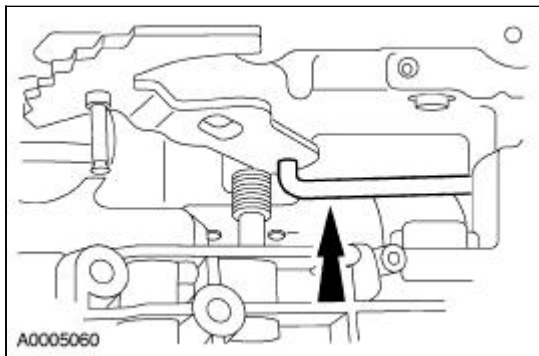
18. Remove the manual lever shaft retaining pin.



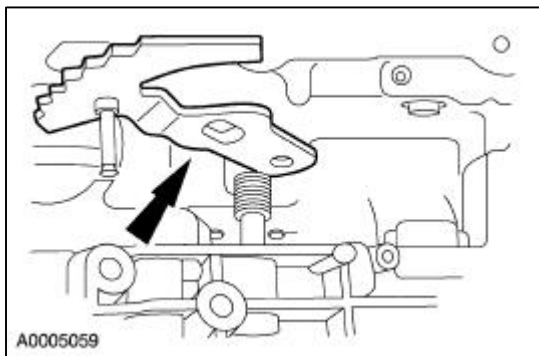
19. Partially remove the manual control lever shaft.



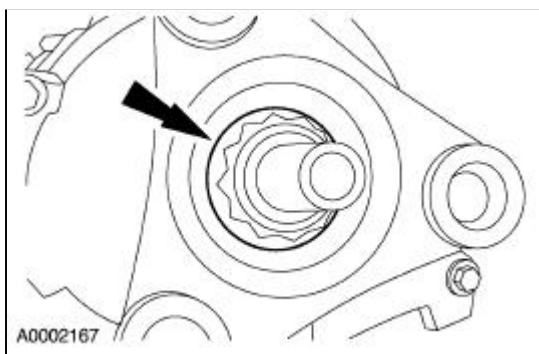
20. Disconnect the manual valve inner lever from the parking lever actuating rod.



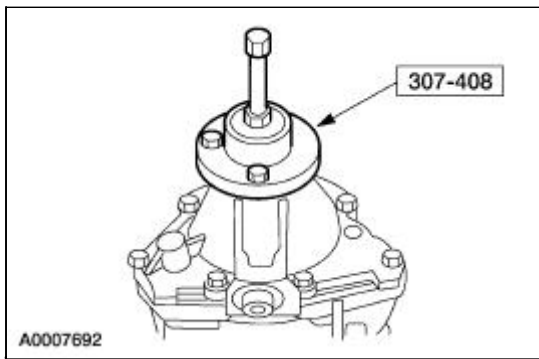
21. Remove the manual valve inner lever.



22. Remove the nut and discard.



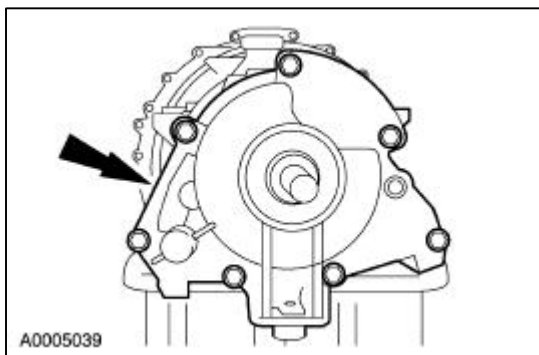
23. Using the special tool, remove the output shaft flange.



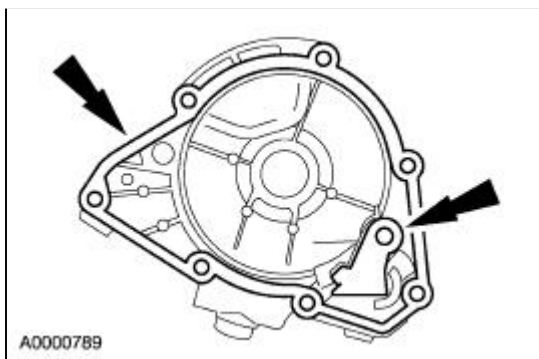
24. **NOTE:** If damage is found to the parking gear, the transmission must be removed and disassembled.

NOTE: The parking pawl, parking pawl return spring and parking pawl shaft may fall out during removal of the extension housing.

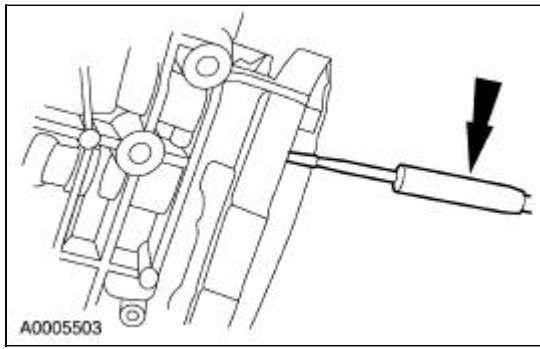
Remove the extension housing.



25. Remove and discard the gasket. Inspect the parking pawl, parking pawl return spring, and the parking pawl shaft. Discard components if damaged or worn.

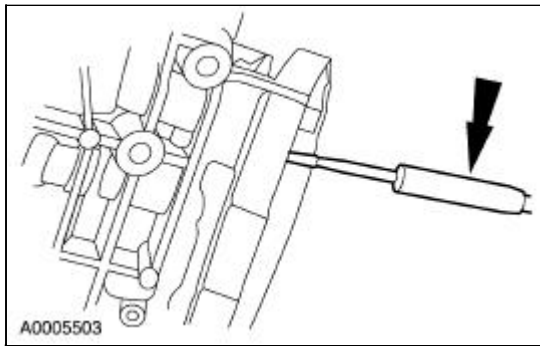


26. Remove the parking lever actuating rod.

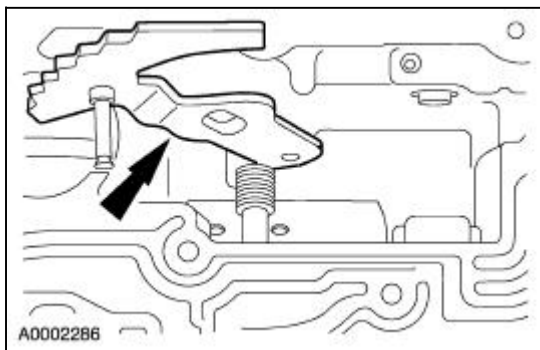


Installation

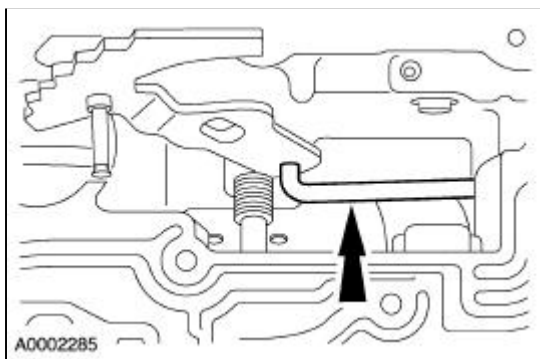
1. Install the parking lever actuating rod.



2. Install the manual control lever.

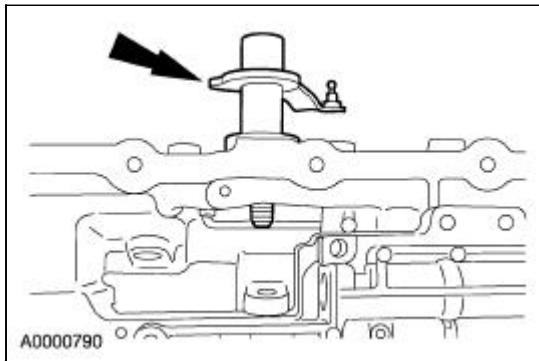


3. Assemble the manual valve inner lever and parking lever actuating rod as shown.

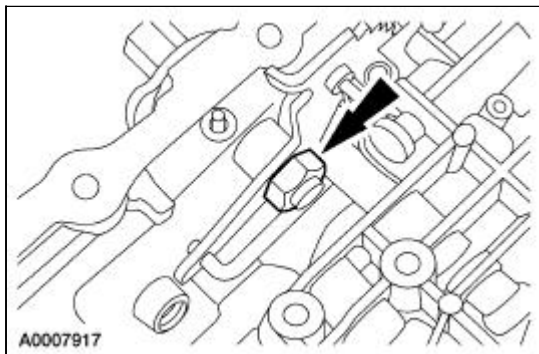


4.  **CAUTION:** Align the flats on the manual valve inner lever with the flats on the manual control lever shaft.

Align the flats of the manual inner lever with the flats on the manual control lever shaft. Install the manual valve inner lever and parking lever actuating rod onto the manual control lever shaft.



5. Install the manual valve inner lever onto the manual shaft and loosely install the nut.

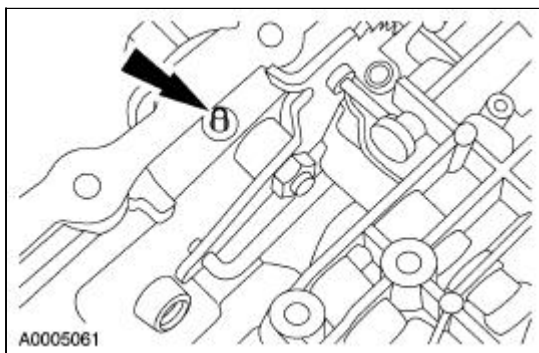


6.  **CAUTION:** Use care not to damage the fluid pan rail surface when installing the retaining pin.

NOTE: Align the manual control lever shaft alignment groove with the manual control lever shaft spring pin bore in the transmission case.

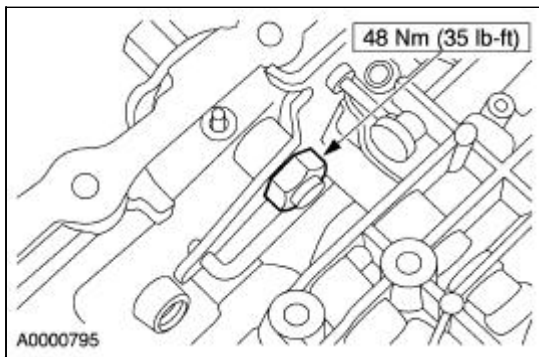
Install the manual control lever shaft spring pin.

- Tap the manual control lever shaft spring pin into the transmission case.

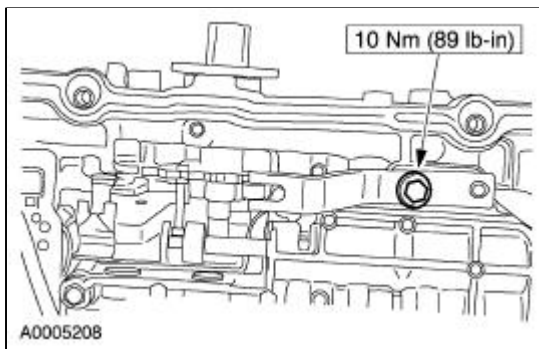


7.  **CAUTION:** To avoid damage, do not allow the wrench to strike the manual valve inner lever pin.

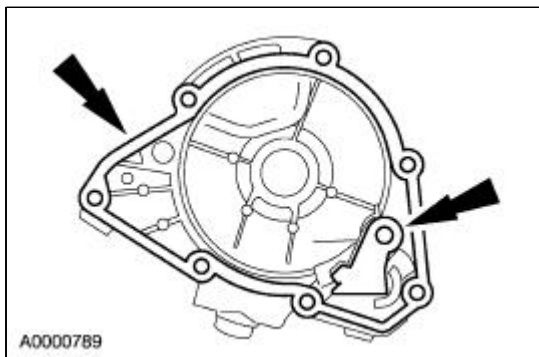
Tighten the nut.



8. Install the manual valve detent spring.

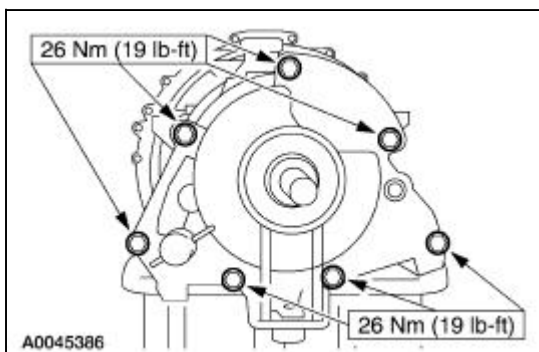


9. Clean the extension housing and install a new extension housing gasket. Make sure that the parking pawl is correctly installed.



10.  **CAUTION:** Make sure the parking lever actuating rod is correctly seated into the case parking rod guide cup.

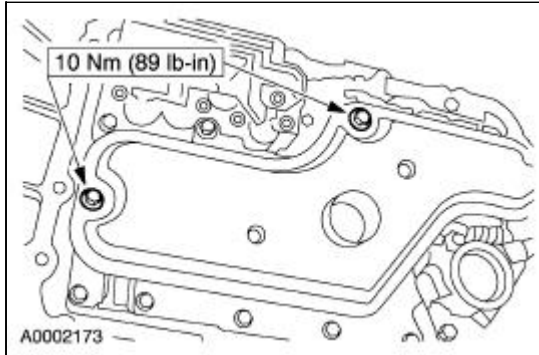
Install the extension housing.



11.  **CAUTION:** Lubricate the fluid filter O-ring seals with clean automatic transmission fluid or seals may be damaged.

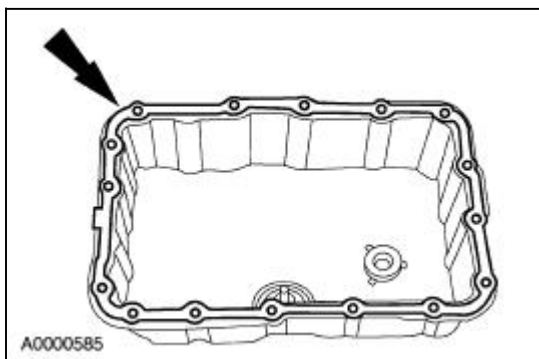
NOTE: Make sure that the fluid filter O-ring seals are correctly seated on the filter.

Lubricate the seals and install the transmission fluid filter.

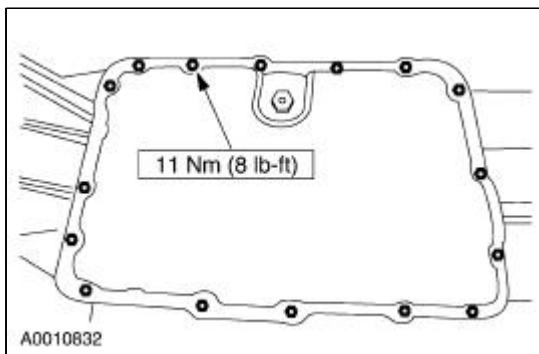



12. **NOTE:** The transmission fluid pan gasket is reusable, clean and inspect for damage; if not damaged, the gasket should be reused.

Install the transmission fluid pan and gasket and loosely install the screws.

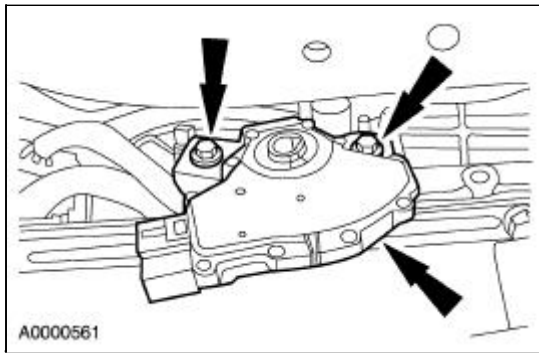


13. Using a crisscross sequence, tighten the screws.



14.  **CAUTION:** The digital transmission range sensor must fit flush against the boss on the case to prevent damage to the sensor.

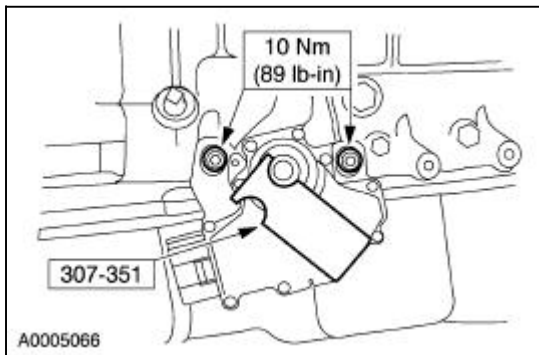
Install the digital TR sensor and loosely install the screws.



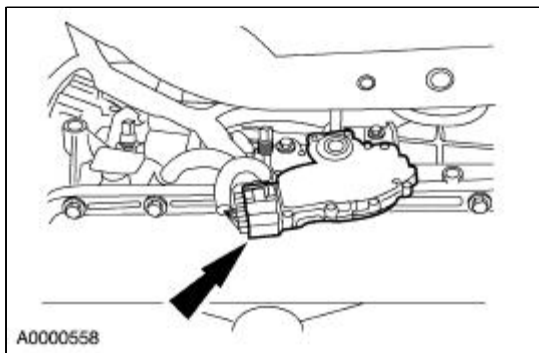
15.  **CAUTION:** Tightening one screw before tightening the other may cause the sensor to bind or become damaged.

NOTE: The manual lever must be in the Neutral position.

Using the special tool, align the digital TR sensor and tighten the screws in an alternating sequence.

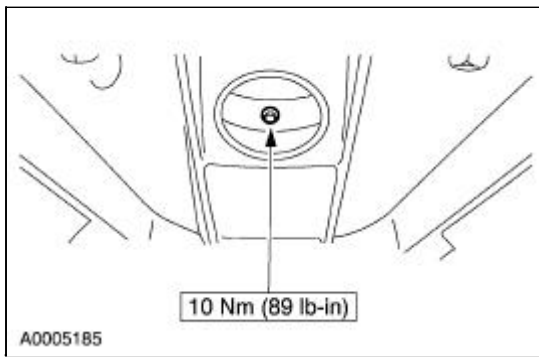


16. Reconnect the digital TR sensor connector.

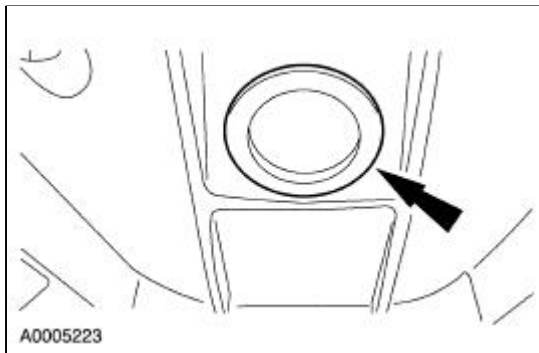


17. **NOTE:** A new converter drain plug must be used to prevent leakage.

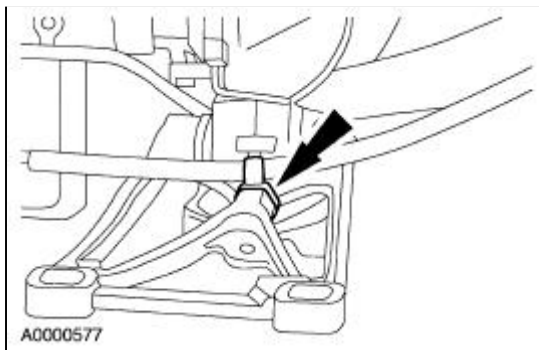
Install the drain plug.



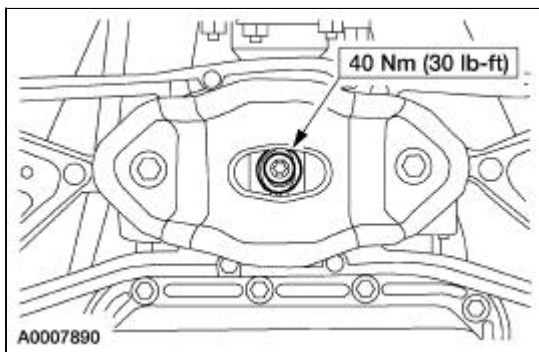
18. Install the converter housing access plug.



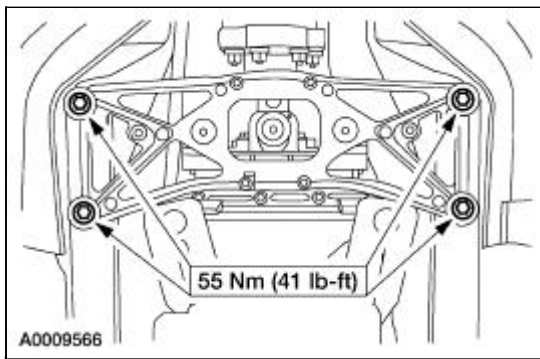
19. Install the shift cable.



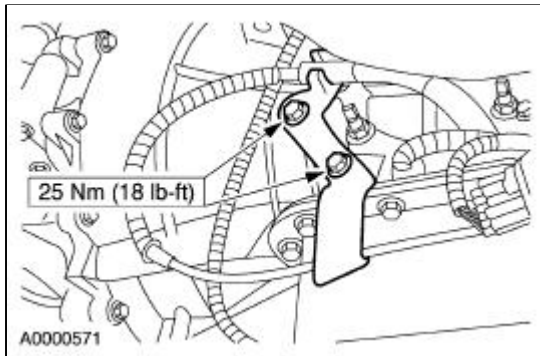
20. Install the rear mount.



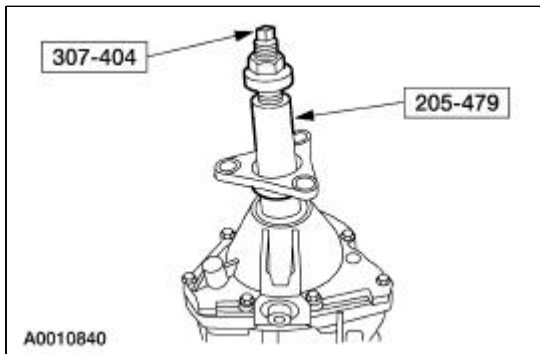
21. Install the rear mount.



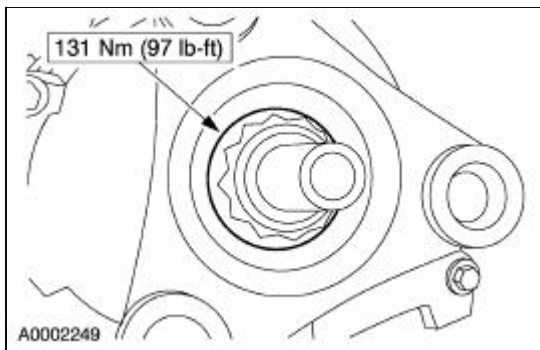
22. Install the shift cable bracket.



23. Using the special tools, install the output flange.

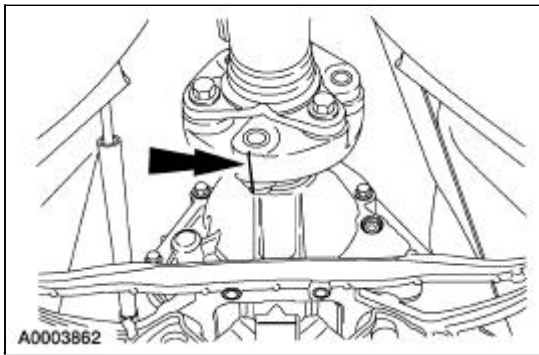



24. Install a new nut.



25.  **CAUTION: Align the index marks or driveshaft imbalance can occur.**

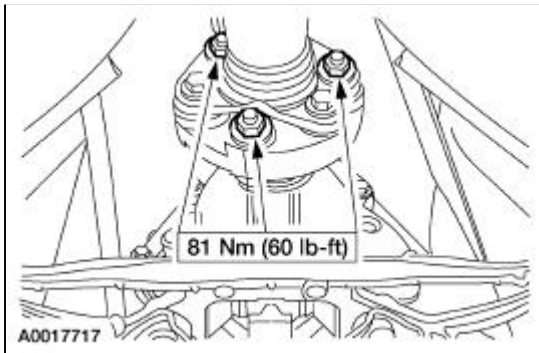
Align the index marks on the pinion flange made during removal and position the driveshaft in place.



26.  **CAUTION:** Install the bolts, washers and nuts in their original positions or driveshaft imbalance can occur. Install the driveshaft flex coupling bolts with the head of the bolt seated against the flange, and the nuts seated against the flex coupling. Install the short bolts in the front and the long bolts in the rear.

Install the bolts, washers and nuts.

- Coat the nut and bolt threads with threadlock sealer.

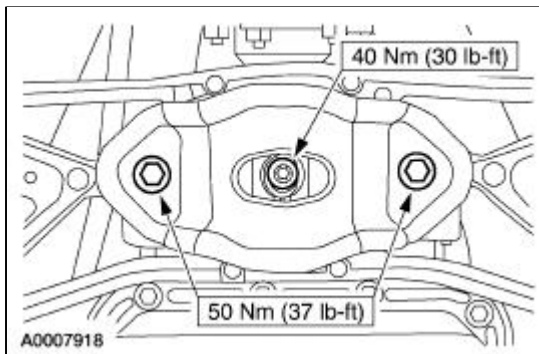


27. Install the exhaust heat shield. For additional information, refer to [Section 309-00](#).
28. Fill the transmission to the correct fluid level and check for correct transmission operation. For additional information, refer to [Transmission Fluid Level Check](#) in this section.
-

Transmission Support Insulator

Removal and Installation

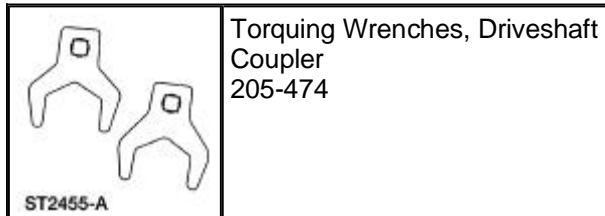
1. Raise and support the vehicle. For additional information, refer to [Section 100-02](#).
2. Support the transmission with a transmission jack.
3. Remove the bolts.



4. To install, reverse the removal procedure.
-

Transmission

Special Tool(s)

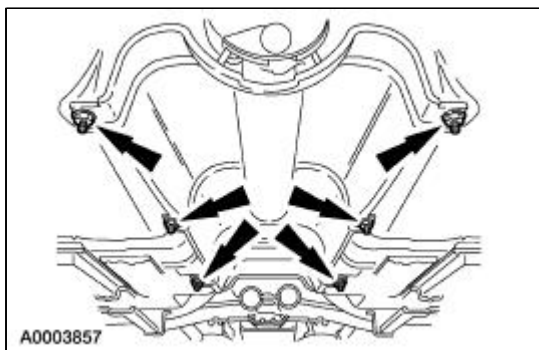


NOTE: If the transmission is to be removed for a period of time, support the engine with a safety stand and a wood block.

1. **NOTE:** When the battery is disconnected or a new battery installed, certain transmission operating parameters can be lost. The powertrain control module (PCM) must relearn these parameters. During this learning process, you may experience slightly firm shifts, delayed, or early shifts. This operation is considered normal and will not affect the function of the transmission. Normal operation will return once these parameters are stored by the PCM.

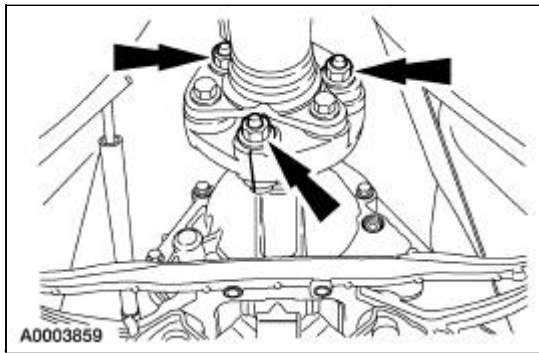
Disconnect the battery ground cable. For additional information, refer to [Section 414-01](#).

2. Raise and support the vehicle. For additional information, refer to [Section 100-02](#).
3. Remove the three-way catalytic converter. For additional information, refer to [Section 309-00](#).
4. Remove the eight retainers and the heat shield.

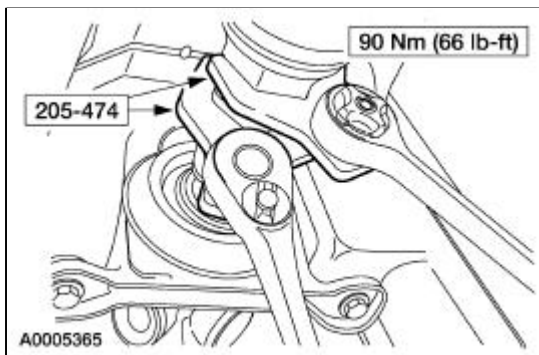


5. **CAUTION:** Index-mark (color paint) the bolts, washers, nuts, and the flex coupling to the transmission flange and the pinion flange to make sure they are installed in the same location. Components not assembled in their original locations can cause driveshaft imbalance.

Index-mark the components.



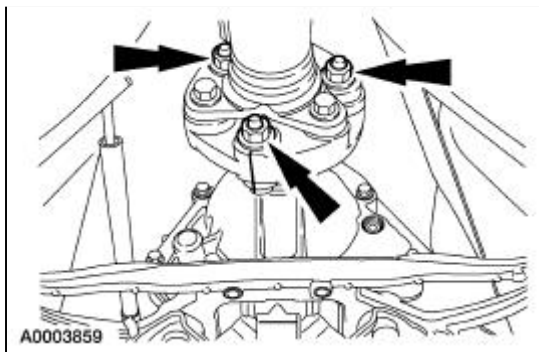
- Using the special tools, loosen the nut.



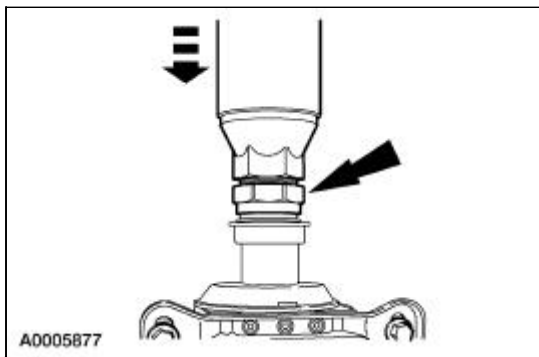
-  **CAUTION:** Do not remove the bolts retaining the flex coupling to the driveshaft.

NOTE: The bolt heads are serrated. Hold the bolt and loosen the nut.


Remove the three nuts, washers and bolts.



- Slide the front shaft assembly rearward and support.
 - Tighten the nut to prevent separation of the front and rear shaft assemblies.

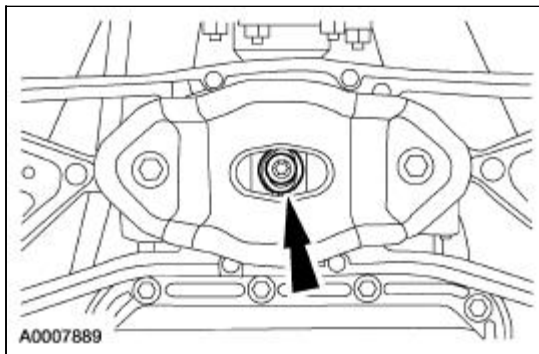


9. If transmission disassembly is necessary, drain the transmission fluid. For additional information, refer to [Transmission Fluid Drain and Refill—Automated Equipment](#), [Transmission Fluid Drain and Refill—Vehicles With Torque Converter Drain Plug](#) or [Transmission Fluid Drain and Refill—Vehicles Without Torque Converter Drain Plug](#) in this section.

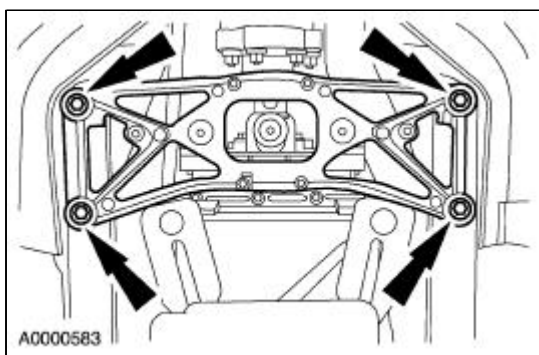
10.  **WARNING: Secure the transmission to the transmission jack with a safety chain. Failure to follow these instructions can result in personal injury.**

Support the transmission with a transmission jack.

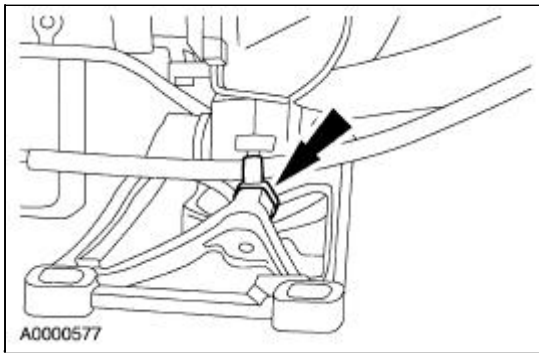
11. Remove the transmission mount.



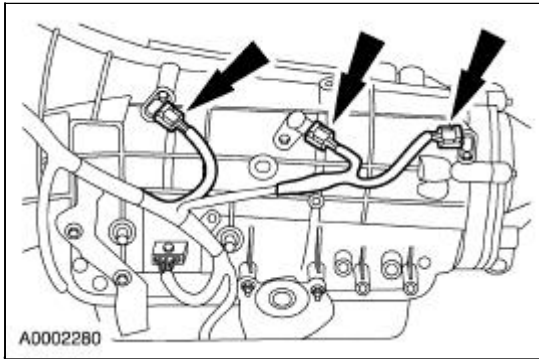
12. Remove the transmission mount.



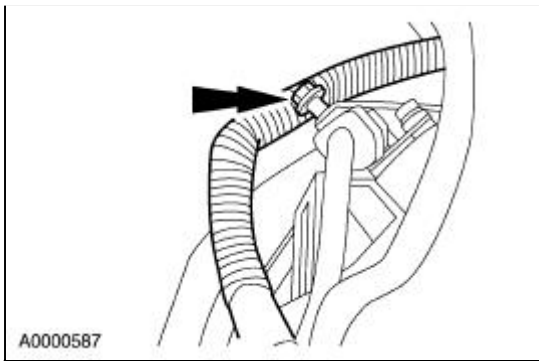
13. Disconnect the shift cable.



14. Lower the transmission enough to gain access to the sensors. Disconnect the turbine shaft speed (TSS) sensor, output shaft speed (OSS) sensor and intermediate shaft speed (ISS) sensor electrical connectors.

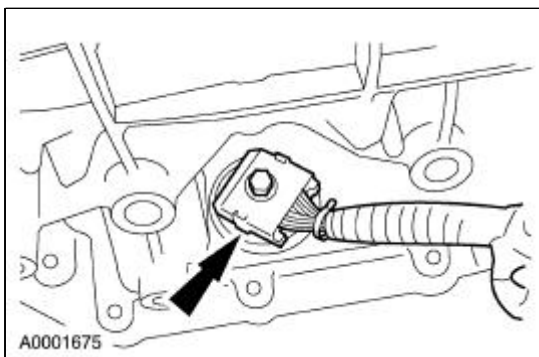


15. Remove the screw from the harness.

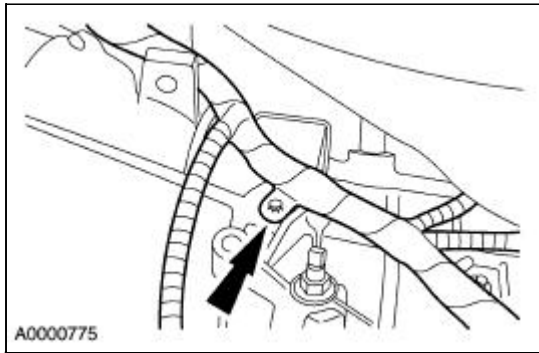


16. **NOTE:** Clean the area around connector to prevent contamination of the solenoid body connector.

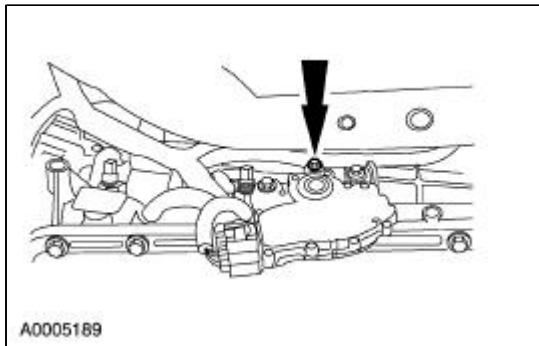
Disconnect the transmission connector.



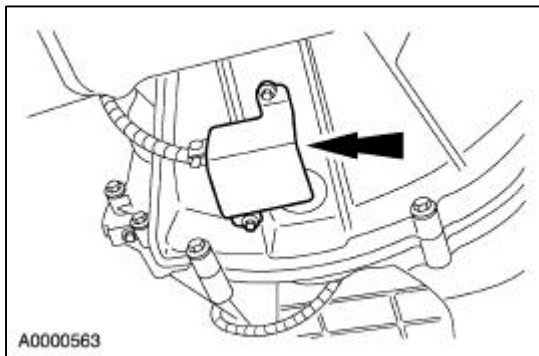
17. Disconnect the harness retainer.



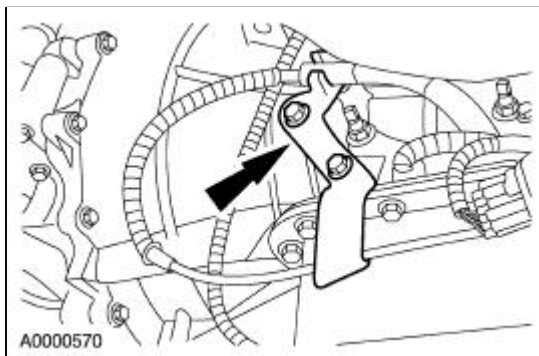
18. Disconnect the harness retainer.



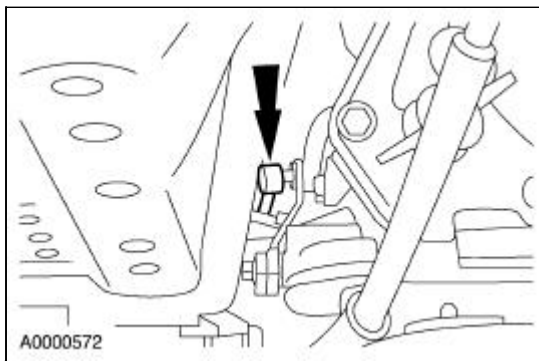
19. Remove the heated oxygen sensor (HO2S) connector.



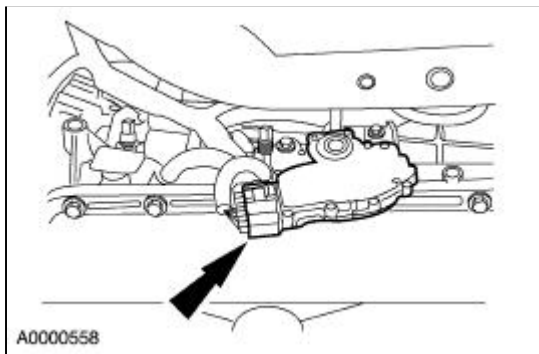
20. Remove the shifter cable bracket.



21. Disconnect the shifter cable from the manual lever.

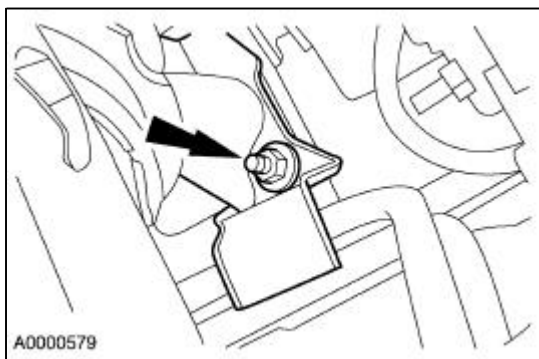


22. Disconnect the digital transmission range (TR) sensor connector.



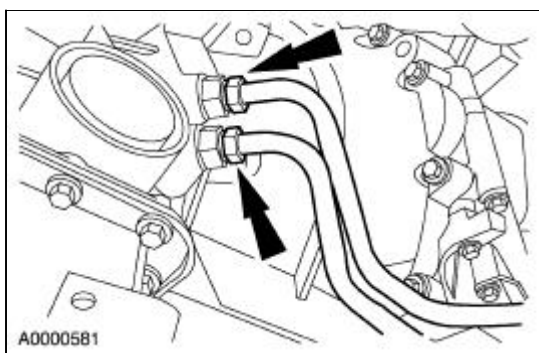
23. **NOTE:** V8 application shown; V6 application similar.

Disconnect the transmission cooler line bracket.

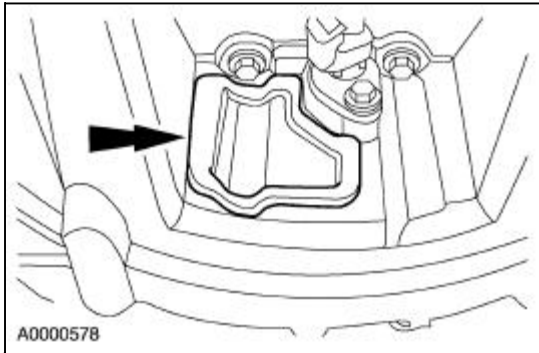


24.  **CAUTION: Do not damage the cooler tubes.**

Disconnect the transmission cooler tubes.

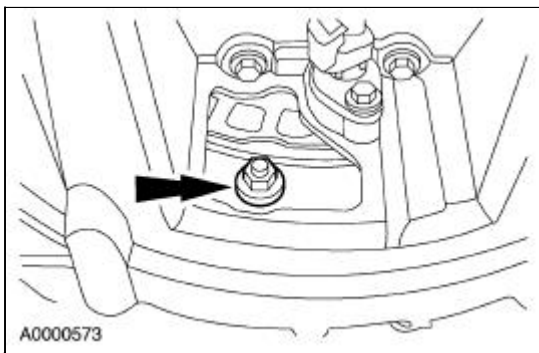


25. On 3.0L engines only, remove the starter motor. For additional information, refer to [Section 303-06](#).
26. Remove the access cover.

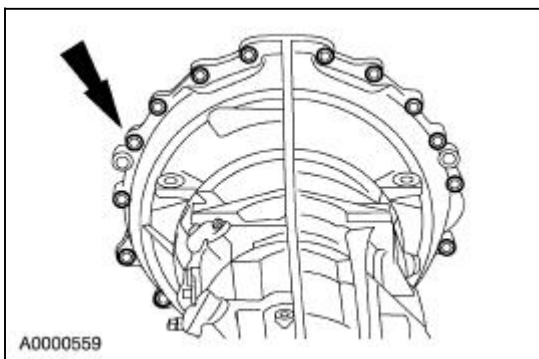


27. **NOTE:** Make an identifying mark on the nut, stud and adapter plate to allow for correct installation.

Remove the nuts.



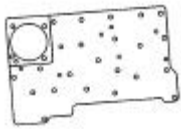

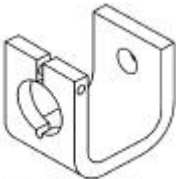




28. Remove the bolts.


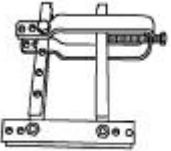
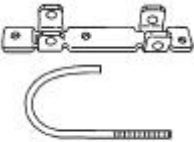

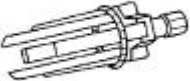


29. Lower the transmission from the vehicle.
 30. Backflush and clean the transmission fluid cooler. For additional information, refer to [Section 307-02](#).
-

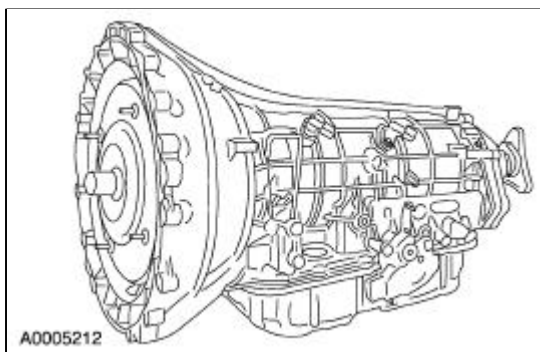
Transmission

Special Tool(s)

 ST2408-A	Air Test Plate, Transmission 307-405
 ST2417-A	Remover, Input Shaft Oil Seal 308-375
 ST2418-A	Remover, Transmission Fluid Pump 307-397
 ST2424-A	Compressor, Cushion Spring 307-401
 ST1104-B	Retaining Ring Pliers 307-343 (T95P-77001-AHR)
 ST2415-A	Remover, Output Flange 307-408
 ST1186-A	Holding Fixture, Transmission 307-003 (T57L-500-B)
	Slide Hammer 100-001 (T50T-100-A)

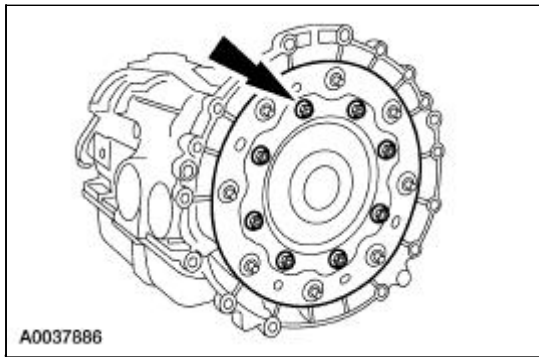
 <p>ST1185-A</p>	
 <p>ST1758-A</p>	<p>Remover, Torque Converter Fluid Seal 307-309 (T94P-77001-BH)</p>
 <p>ST2393-A</p>	<p>Compressor, Servo Cover 307-402</p>
 <p>ST1631-A</p>	<p>Handle, Torque Converter 307-091 (T81P-7902-C)</p>
 <p>ST1213-A</p>	<p>Remover, Bushing 307-001 (TOOL-1175-AC) or equivalent</p>

1. Place the transmission on a workbench.



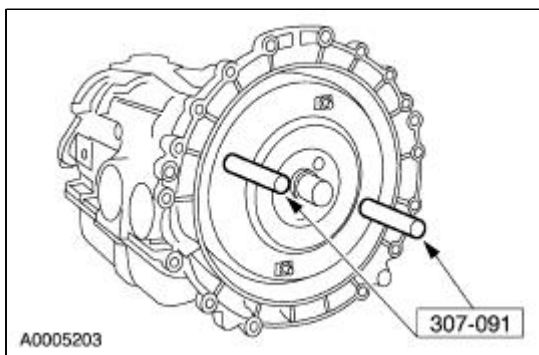
2. If vehicle is equipped, remove the torque converter adapter plate assembly.
3. **NOTE:** Make an identifying mark on the nut, stud, and adapter plate to allow for correct installation.

If the vehicle is equipped and installation of a new or remanufactured torque converter is necessary, remove the torque converter adapter plate.



4.  **WARNING:** The torque converter is heavy, especially when full of fluid.

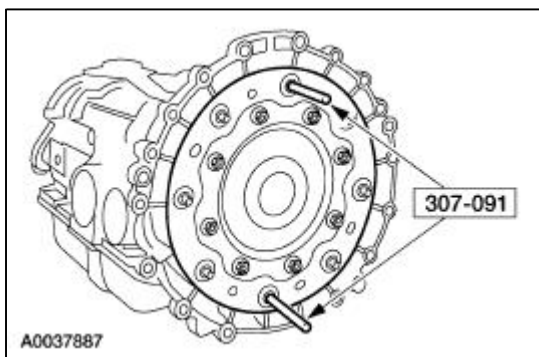
Using the special tools, remove the torque converter.



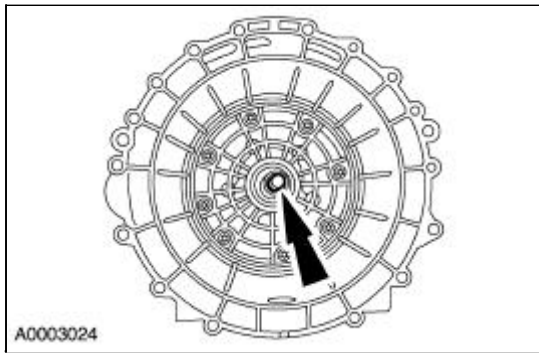
5.  **WARNING:** The torque converter is heavy, especially when full of fluid.

NOTE: If not installing a new torque converter leave the adapter bolted to the torque.

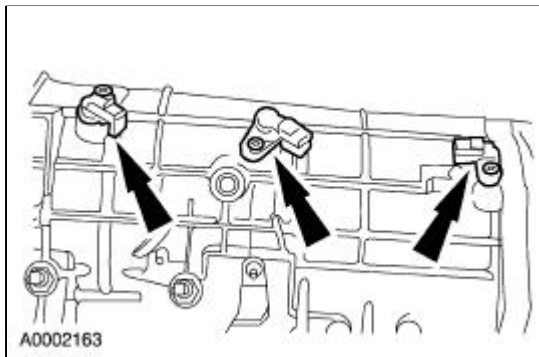
Using the special tools, remove the torque converter and adapter plate as an assembly.



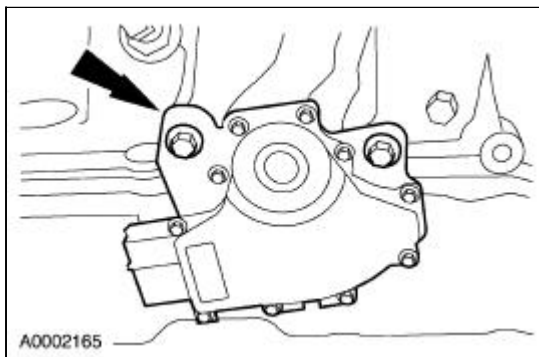
6. Remove the input shaft.



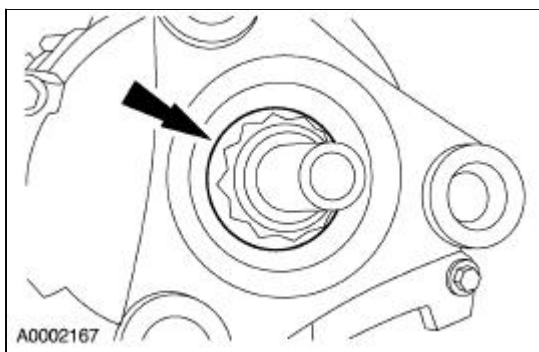
7. Remove the sensors.



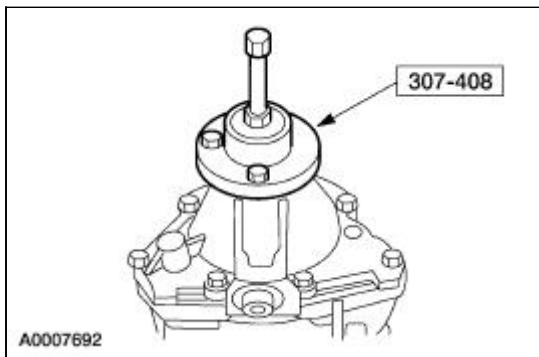
8. Remove the digital transmission range (TR) sensor.



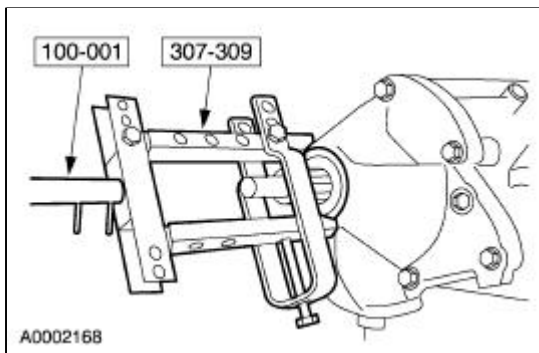
9. Remove and discard the nut.



10. Using the special tool, remove the output shaft flange.

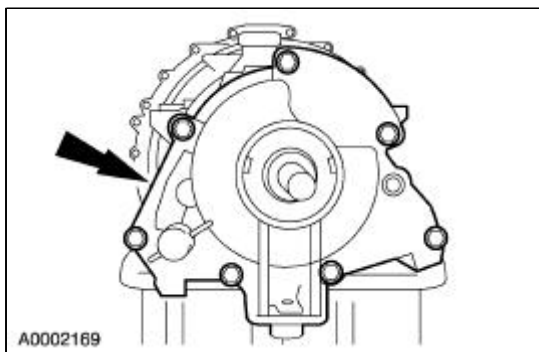


11. Using the special tools, remove the extension housing seal.

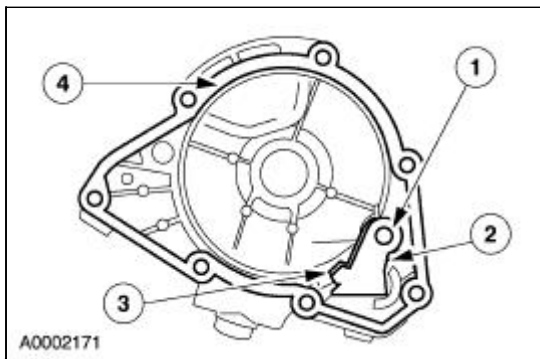


12.  **CAUTION:** The parking pawl, parking pawl return spring and parking pawl shaft could fall out during removal of the extension housing.

Remove the extension housing.

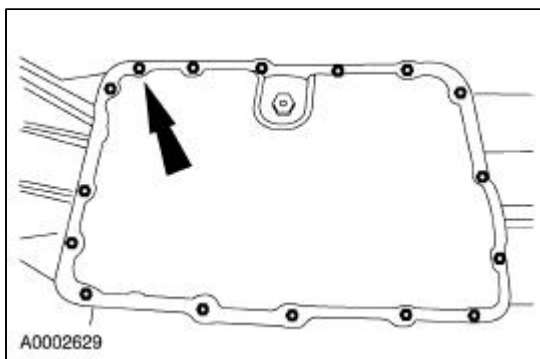


13. Remove the parking pawl assembly and discard the gasket.
 1. Remove the parking pawl shaft.
 2. Remove the parking pawl.
 3. Remove the parking pawl return spring.
 4. Remove and discard the gasket.

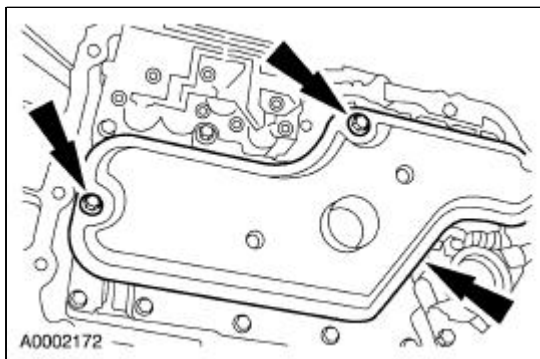


14. **NOTE:** The transmission fluid pan gasket is reusable. Clean and inspect the gasket for damage. If not damaged, the gasket should be reused.

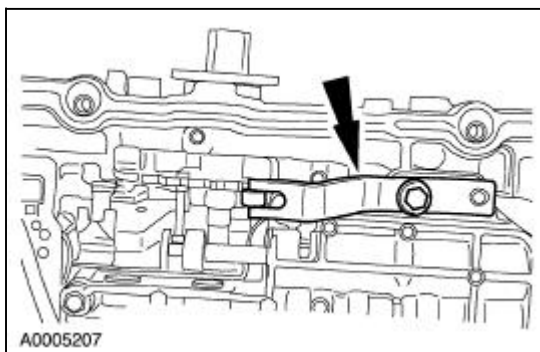
Remove the transmission fluid pan and gasket.



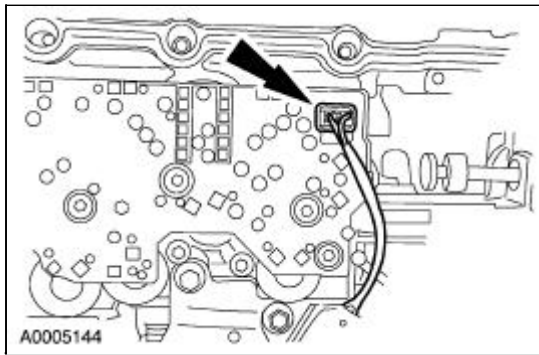
15. Remove the transmission fluid filter and discard.



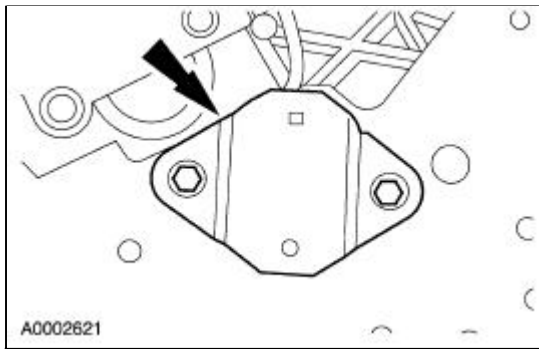
16. Remove the manual control valve detent spring.



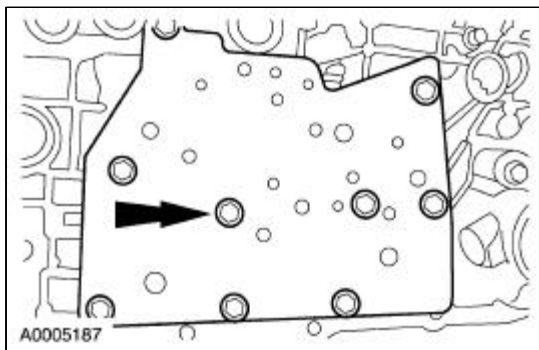
17. Disconnect the reverse pressure switch connector.



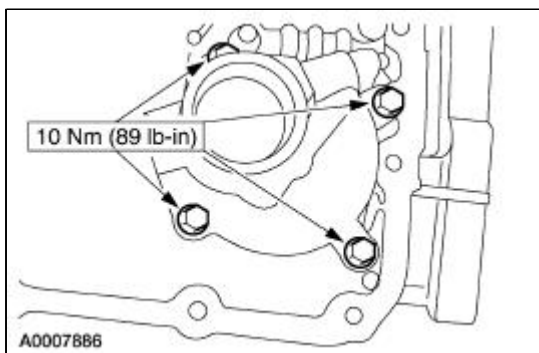
18. Remove the reverse pressure switch and discard.



19. Remove the valve body cover plate and gasket. Discard the gasket.

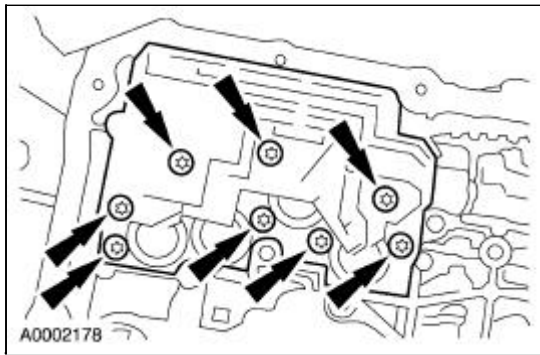


20. Remove the reverse servo assembly.

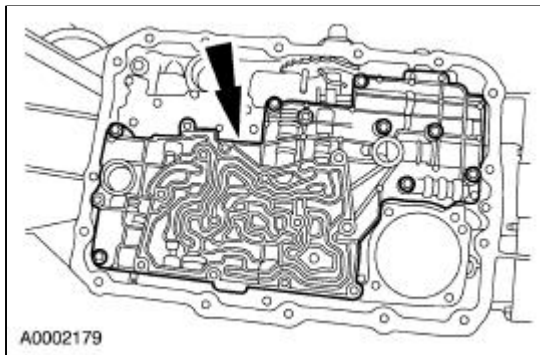


21.  **CAUTION: Do not damage solenoid body connector pins.**

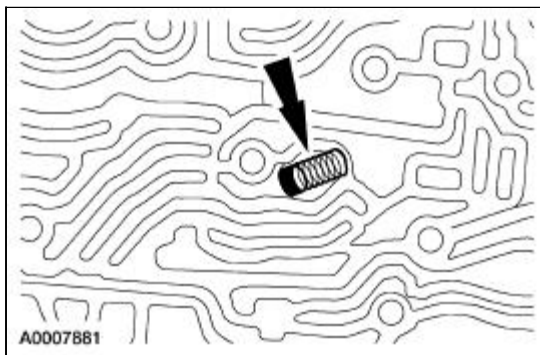
Remove the solenoid body assembly by lifting on the body and pushing the connector from the other side of the case.



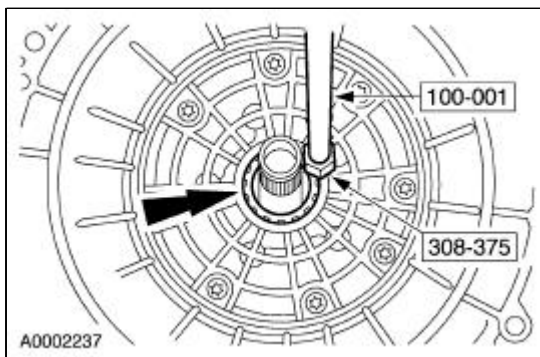
22. Remove the main control valve body, separator plate, and gasket.



23. Remove the intermediate clutch spring and seal.



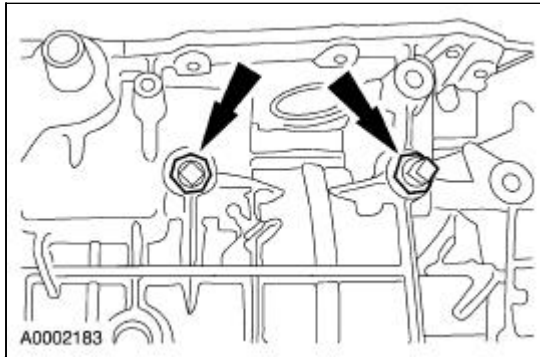
24. Using the special tools, remove the converter hub seal.



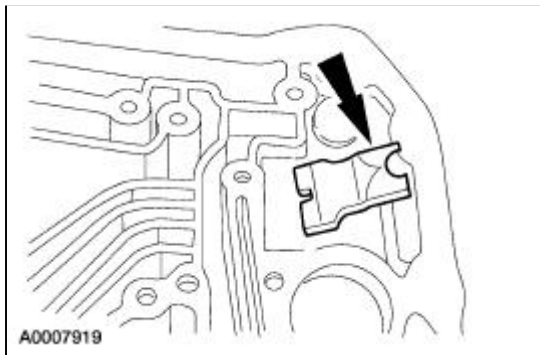
25.  **CAUTION:** Failure to loosen the OD band adjusting screw prior to pump removal may cause damage to the pump and OD band.

 **CAUTION: Throw the locknuts away. The locknuts are not reusable for assembly.**

Remove the locknuts, and loosen the OD band adjusting screw.

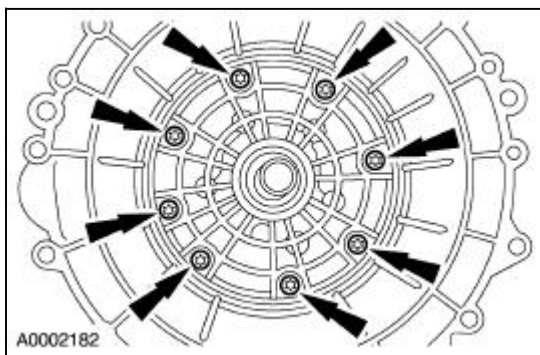


26. Remove the OD anchor strut.

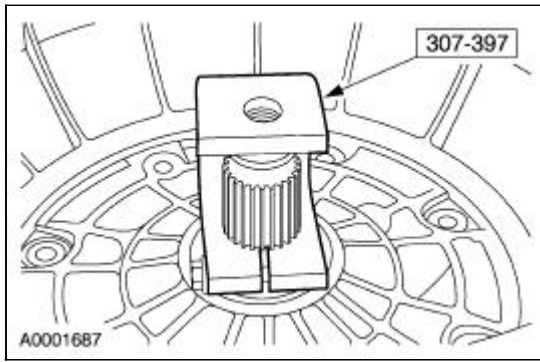


27.  **CAUTION: The screws are not reusable for assembly. Discard the screws. If the screws are reused the housing may become separated from the transmission.**

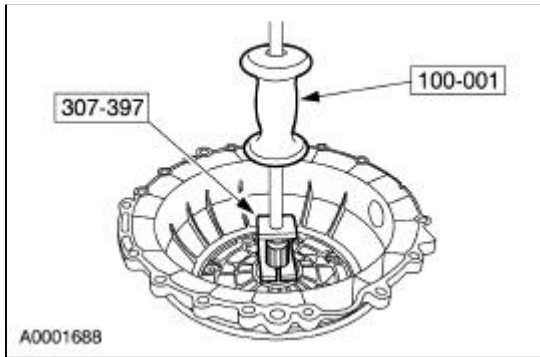
Remove and discard the screws.



28. Install the special tool.

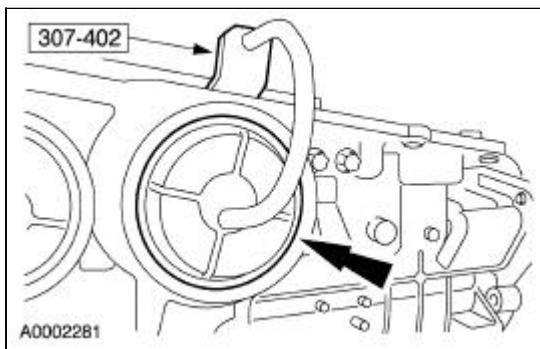


29. Using the special tools, remove the pump.

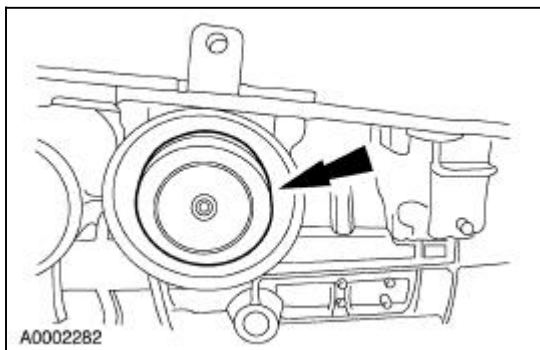


30.  **CAUTION: Servo cover is under spring tension.**

Using the special tool, remove the intermediate servo cover retaining ring and cover.

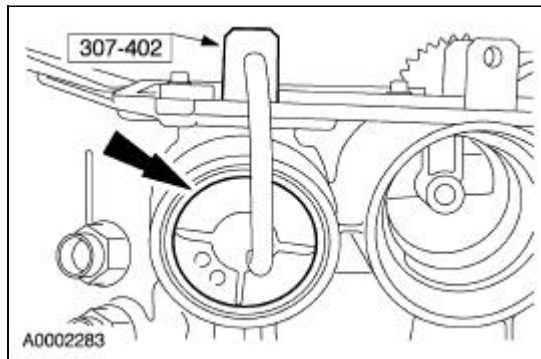


31. Remove the intermediate band servo piston and spring.

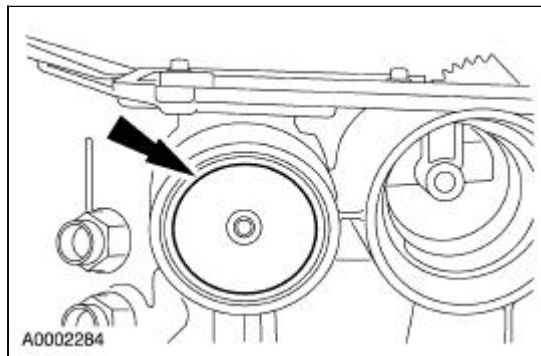


32.  **CAUTION: Servo cover is under spring tension.**

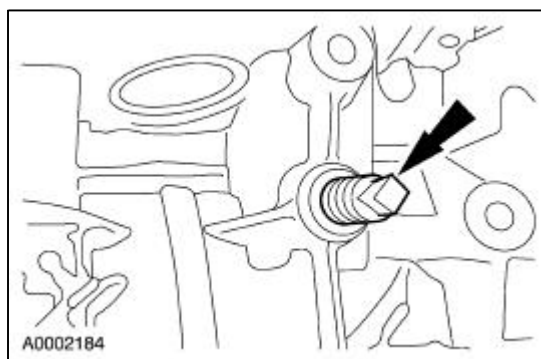
Using the special tool, remove the overdrive servo cover retaining ring and cover.



33. Remove the front band servo piston and spring.

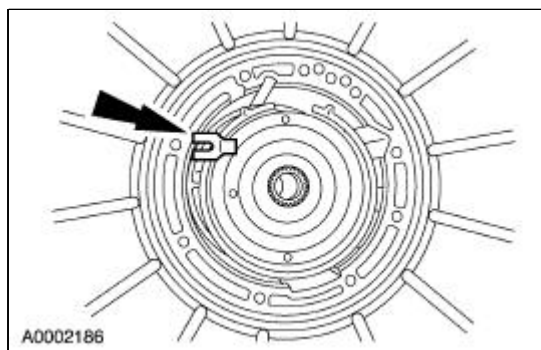


34. Remove the screw.

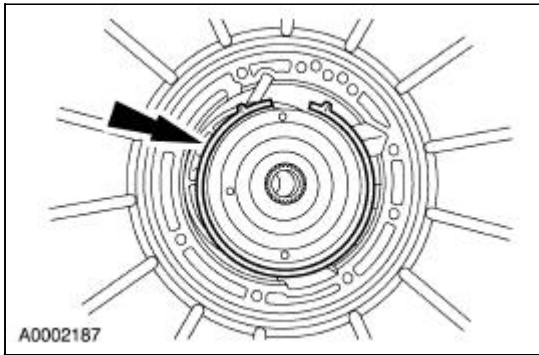


35. **NOTE:** Tag and identify parts for reassembly.

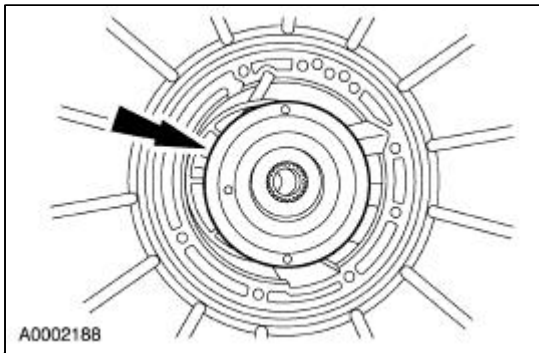
Compress the overdrive band and remove the apply strut.




36. Remove the overdrive band.



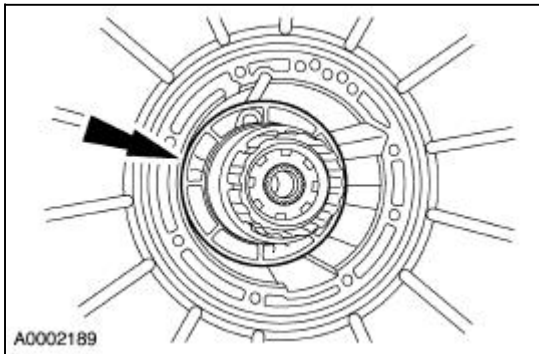
37. Remove the overdrive brake and coast clutch drum.



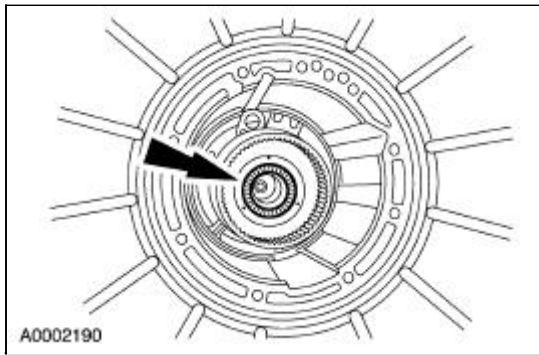
38.  **CAUTION: Do not bend trigger wheel.**

NOTE: The No. 2 thrust bearing is in this assembly.

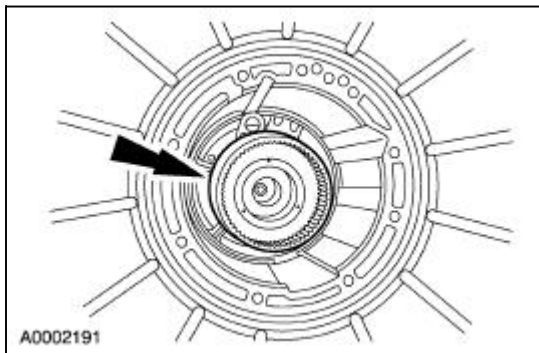
Remove the planetary gear overdrive carrier.



39. Remove the overdrive planet thrust bearing (No. 2).

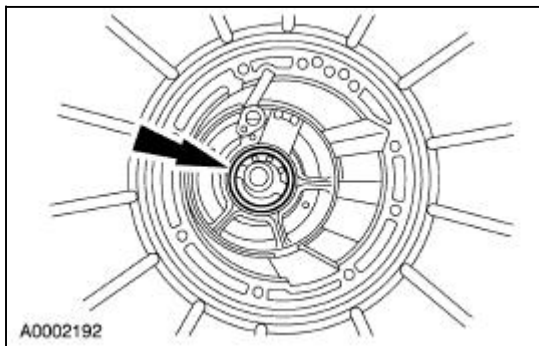


40. Remove the overdrive ring gear, overdrive one-way clutch assembly, and center shaft as an assembly.



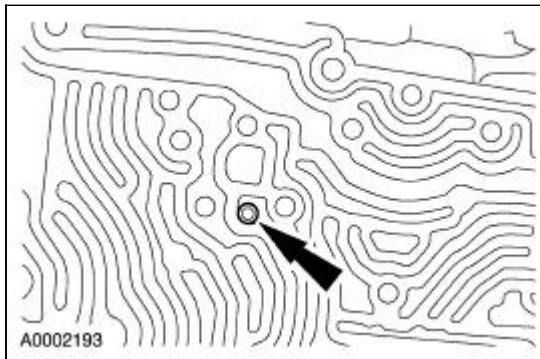
41. **NOTE:** Tag and identify the center shaft thrust bearing (No. 3) for assembly.

Remove the No. 3 center shaft thrust bearing.

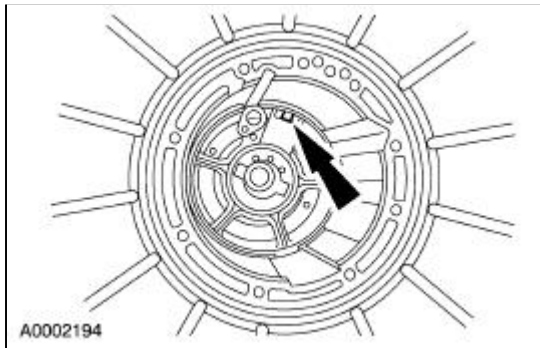


42.  **CAUTION:** The center support locknut could fall into the remaining assembly if not removed.

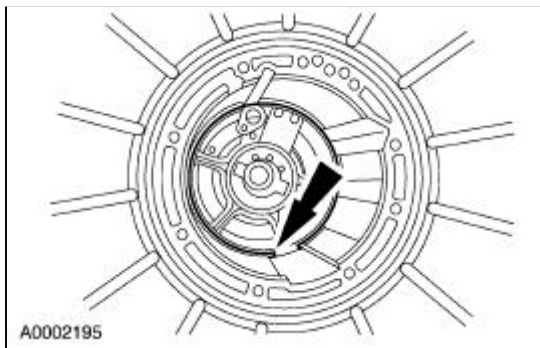
Remove the screw.



43. Remove the locknut and cage.

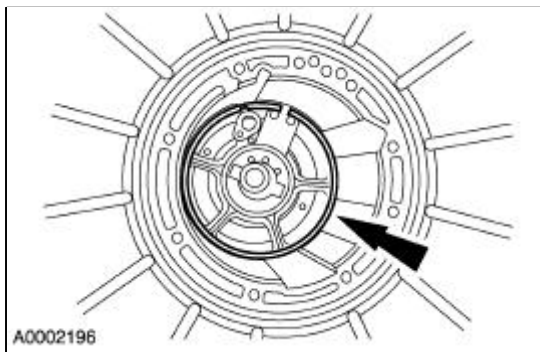


44. Remove the center support retaining ring.



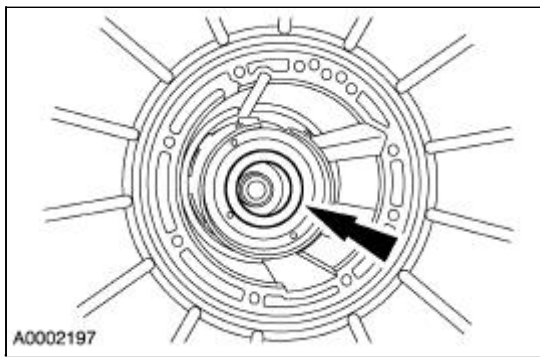
45. **NOTE:** When removing the center support, pull evenly around the center support web.

Remove the center support.

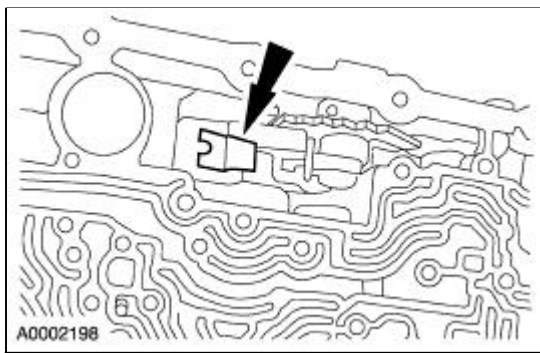



46. **NOTE:** Tag and identify the No. 4 intermediate brake drum thrust bearing.

Remove the intermediate brake drum thrust bearing (No. 4).

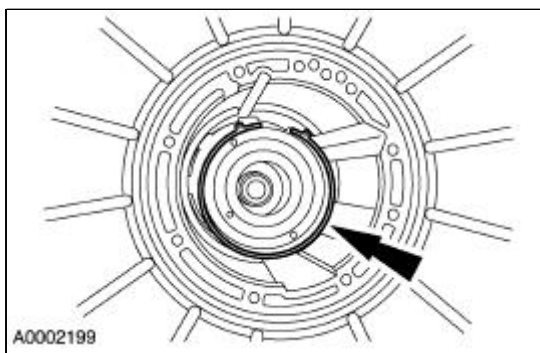


47. Remove the intermediate band anchor strut.

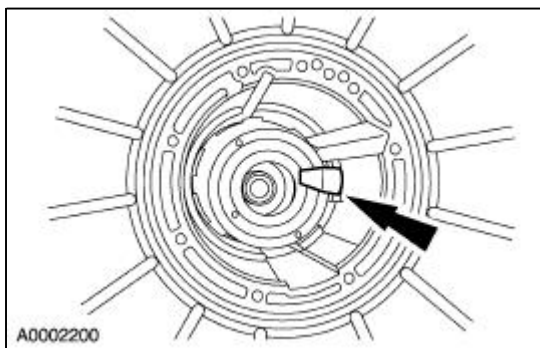


48.  **CAUTION:** Identify the anchor and apply ends of the intermediate band.

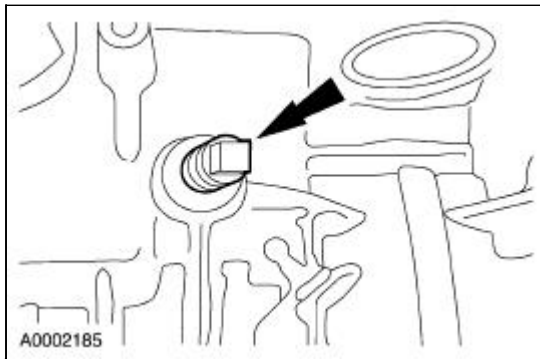
Remove the intermediate band.



49. Remove the intermediate band apply strut.

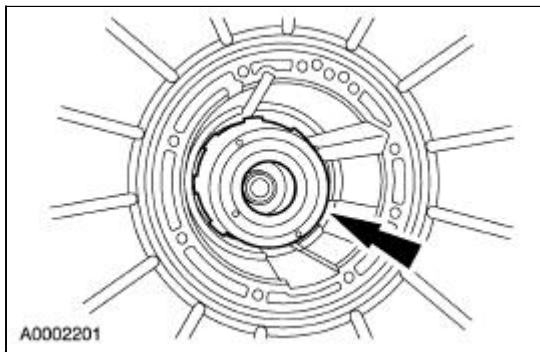


50. Remove the screw.

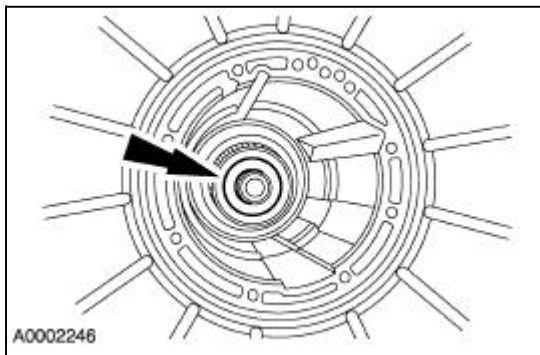


51. **NOTE:** The No. 5 forward clutch cylinder thrust bearing may come out with the intermediate brake and direct clutch drum.

Remove the direct clutch drum.

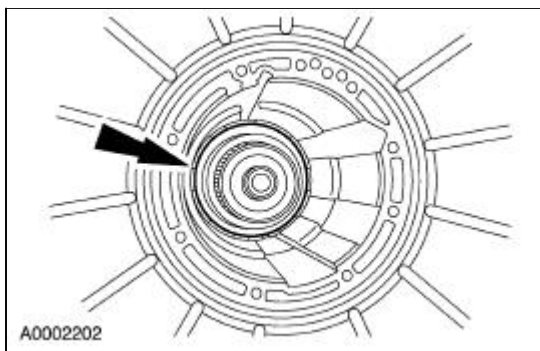


52. Remove the No. 5 forward clutch cylinder thrust bearing, tag and identify.



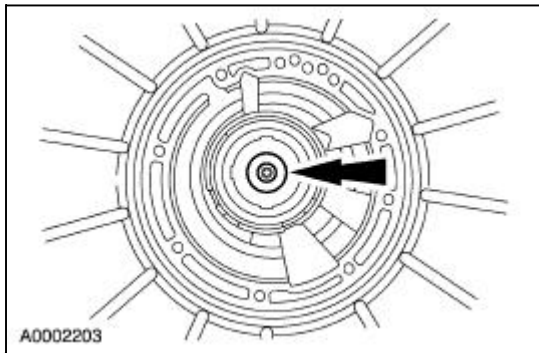
53. **NOTE:** The No. 6A thrust bearing may come out with the cylinder. Tag for reassembly.

Remove the forward clutch cylinder.



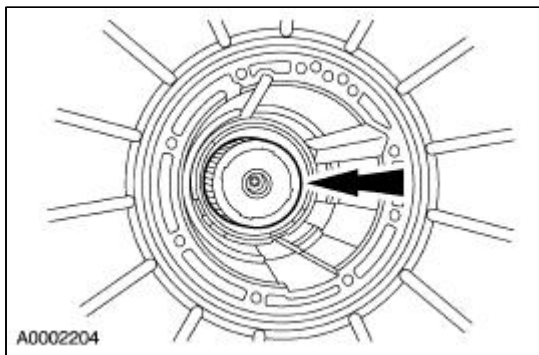
54. **NOTE:** The No. 6A forward ring gear hub thrust bearing may have come out with the forward clutch cylinder.

Remove the No. 6A forward ring gear hub thrust bearing.

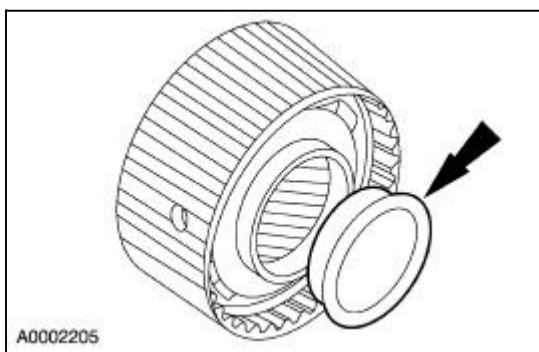


55. **NOTE:** The No. 7 forward planet thrust bearing may come out with the forward ring gear and hub assembly.

Remove the forward ring gear and hub as an assembly.

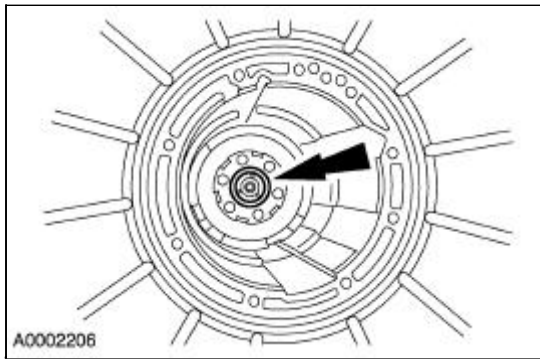


56. Remove the No. 6B forward clutch thrust washer from the forward ring gear hub.

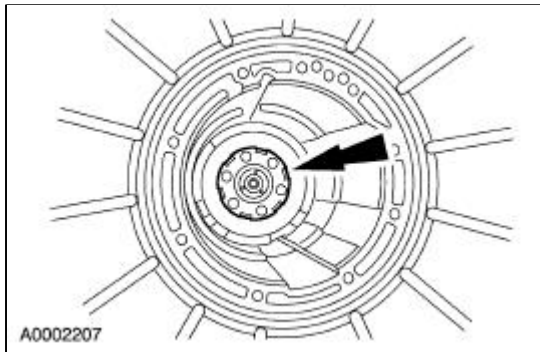


57. **NOTE:** The No. 7 forward planet thrust bearing may come out with the forward ring gear and hub assembly.

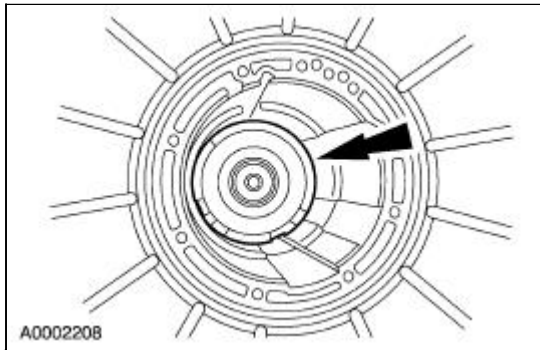
Remove the No. 7 forward planet thrust bearing.



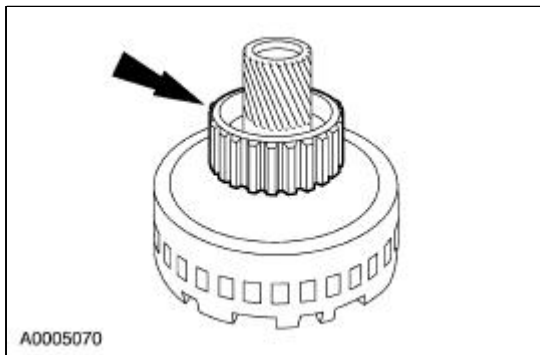
58. Remove the forward planetary assembly.



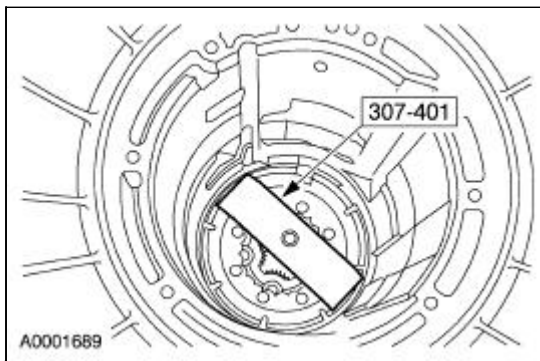
59. Remove the input shell and sun gear assembly.



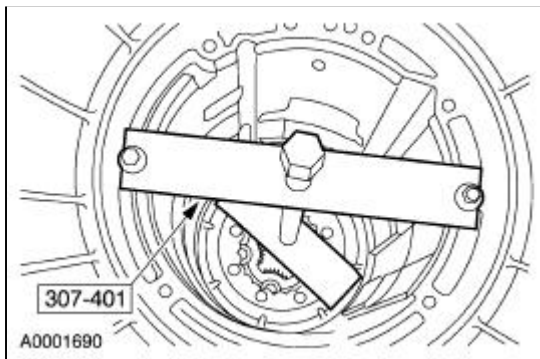
60. Rotate the intermediate one-way clutch sprag and race to disassemble.



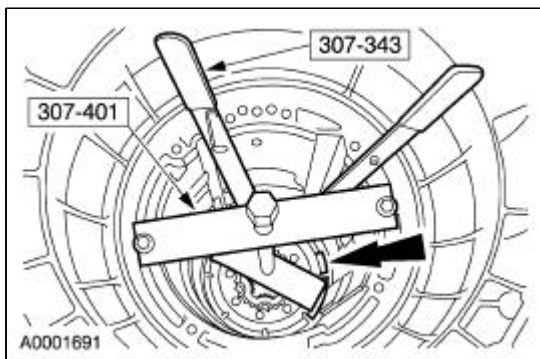
61. Install the special tool.



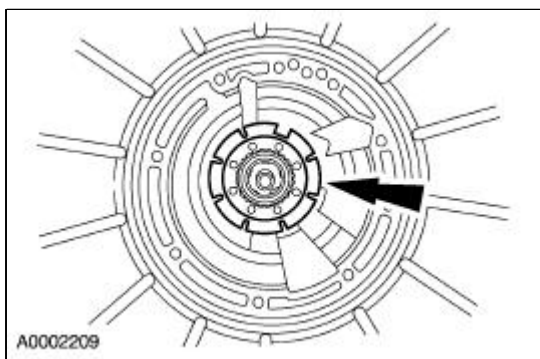
62. Install the special tool.



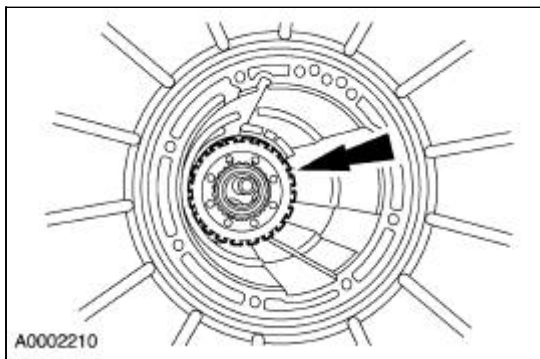
63. Using the special tools, remove the intermediate clutch retaining ring.



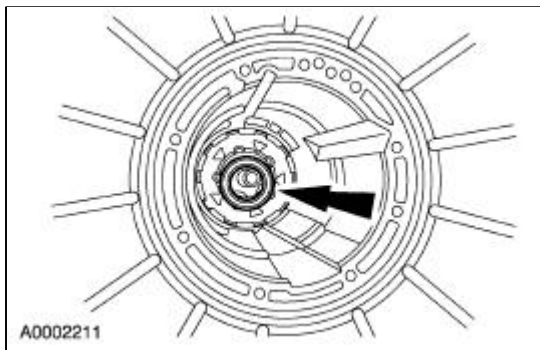
64. Remove the intermediate clutch housing and piston assembly.



65. Remove the intermediate clutch piston spring, clutch plates, and cylinder as an assembly.

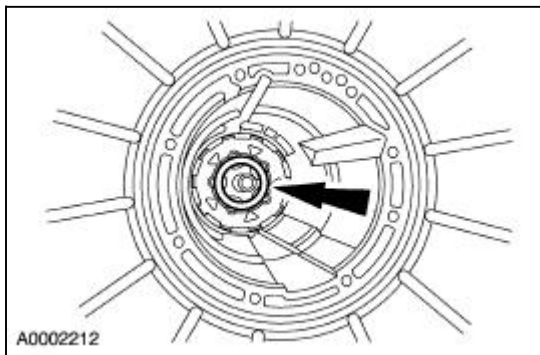


66. Remove the low and reverse gear spacer.

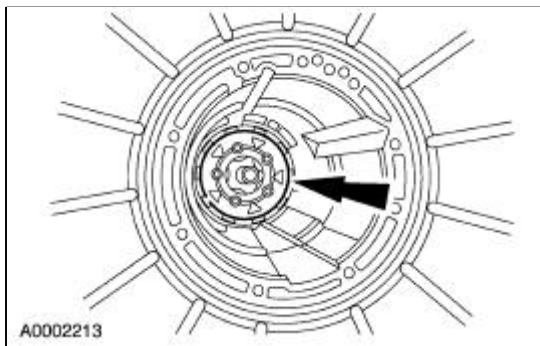


67. **NOTE:** Tag and identify the No. 8 low/reverse planetary carrier thrust bearing.

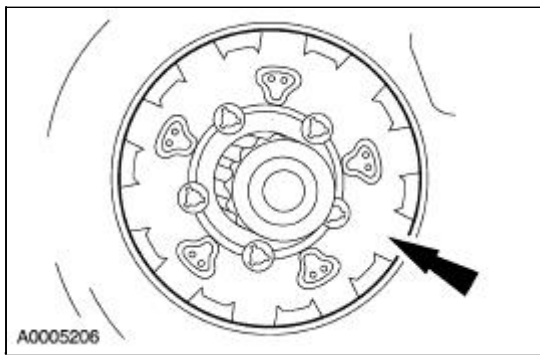
Remove the thrust bearing.



68. Remove the retaining ring.

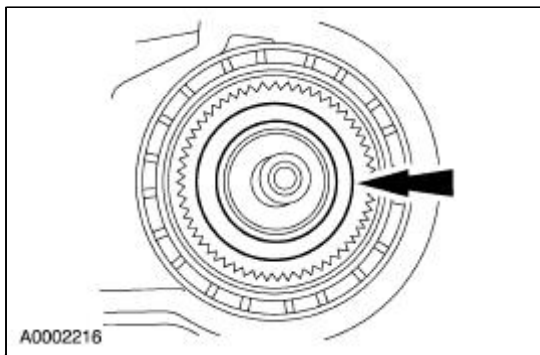


69. Remove low/reverse planetary assembly.



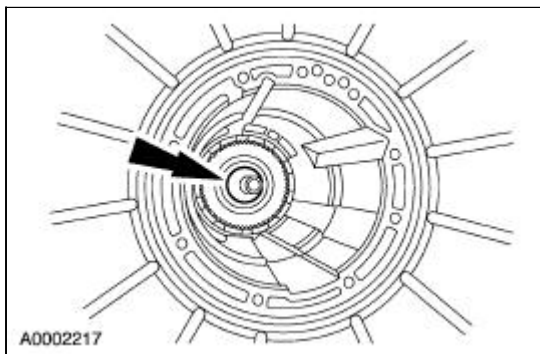
70. **NOTE:** Tag and identify the No. 9 low/reverse planetary carrier thrust bearing.

Remove the thrust bearing.



71. **NOTE:** Use slots located around the outside of the sleeve.

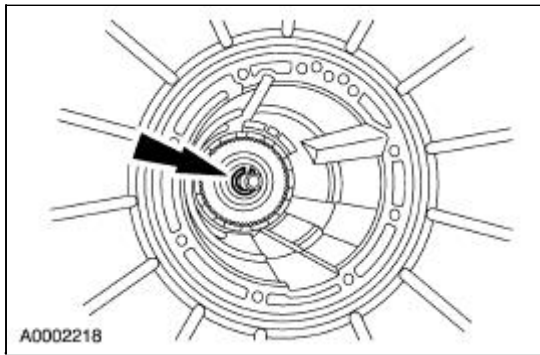
Using a small pick, remove the output shaft sleeve.



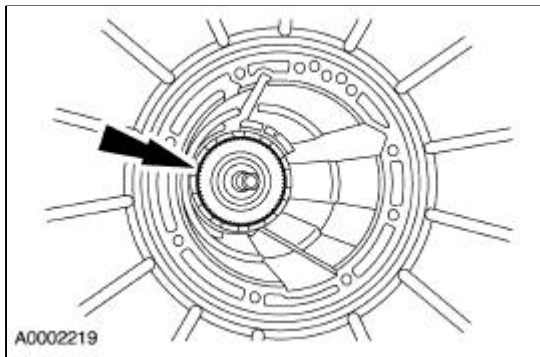
72. **⚠ WARNING:** The output shaft may fall out after removing the snap ring. Failure to follow these instructions may result in personal injury.

⚠ CAUTION: Discard the output shaft retaining ring. A new retaining ring must be used for assembly.

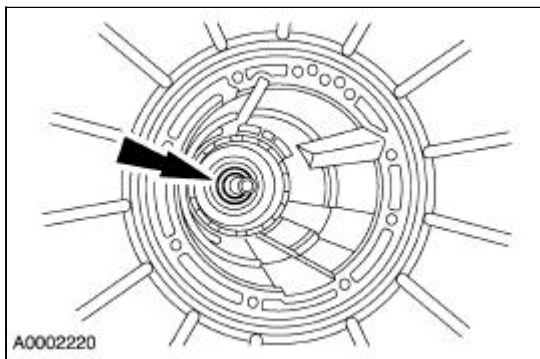
While holding the output shaft remove and discard the output shaft retaining ring.



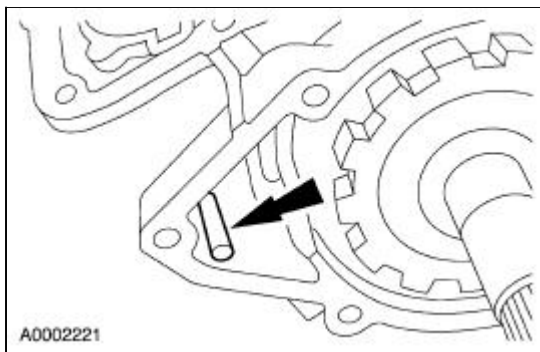
73. Remove the output shaft ring gear and hub.



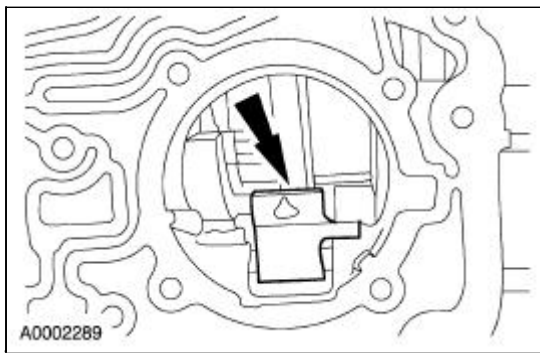
74. Remove the No. 10 low intermediate sun gear bearing.



75. Remove the reverse band actuating lever shaft.

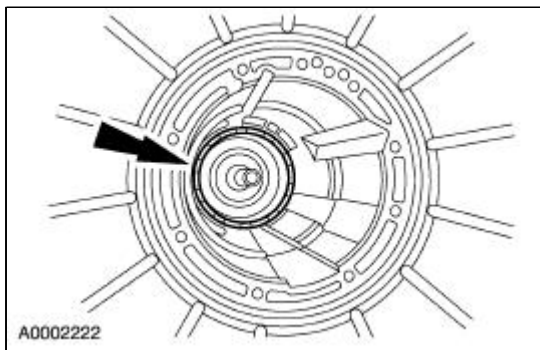


76. Remove the reverse band actuating lever assembly.

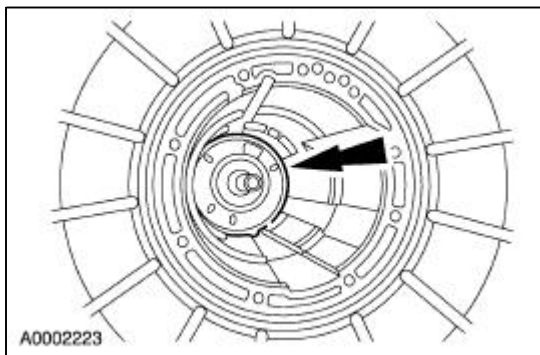


77. **NOTE:** The inner race of the rear one-way clutch is not removable. It is repaired in the case.

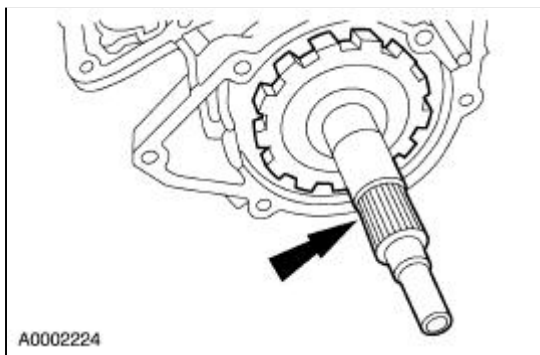
Remove the low/reverse brake drum and one-way clutch assembly by rotating it clockwise.



78. Remove the reverse band.

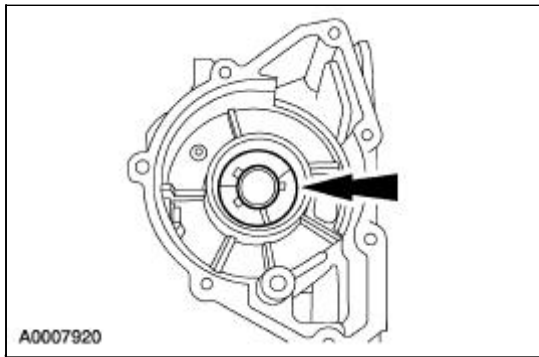


79. Remove the output shaft and park gear.



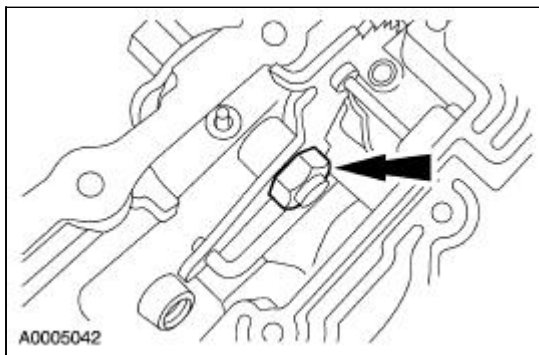
80. **NOTE:** Tag and identify the No. 11 output shaft thrust washer.

Remove the output shaft thrust washer.

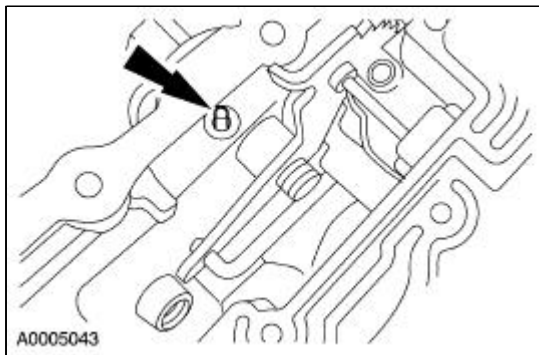


81.  **CAUTION:** To avoid damage, make sure the wrench does not strike the manual valve inner lever pin.

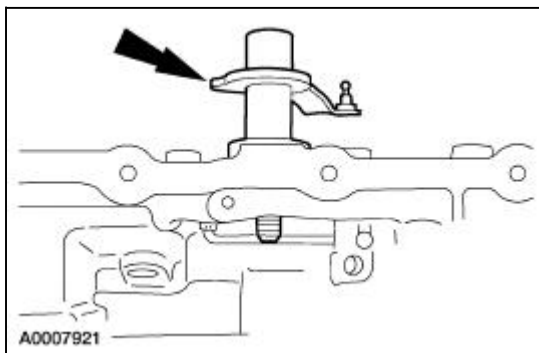
Remove the nut.



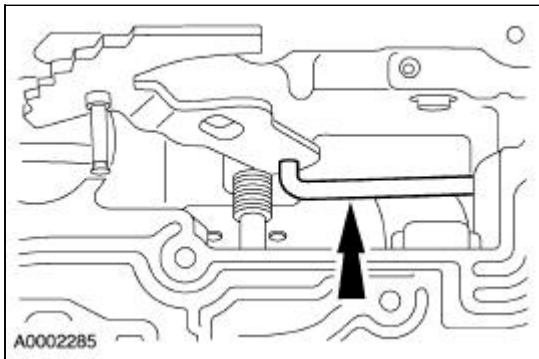
82. Remove the manual lever shaft retaining pin.



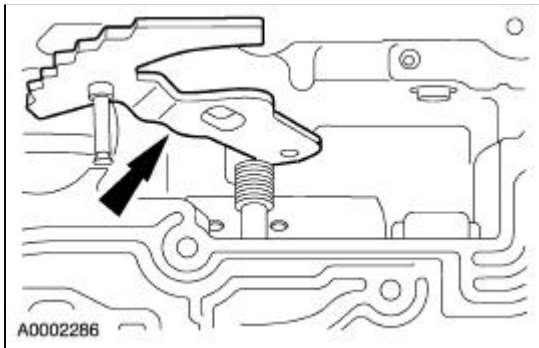
83. Remove the manual control lever shaft.



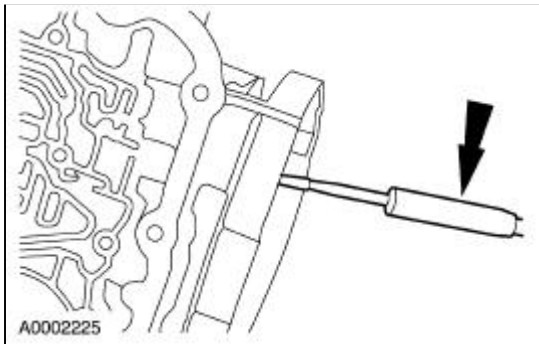
84. Disconnect the manual valve inner lever from the parking lever actuating rod.



85. Remove the manual valve inner lever.

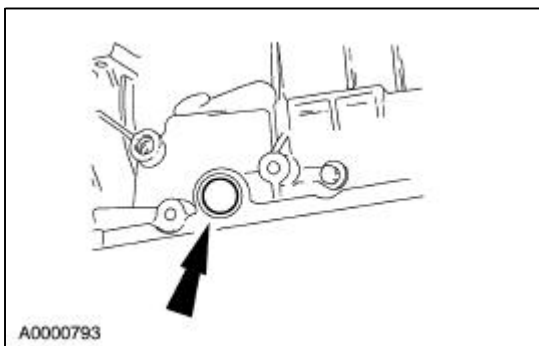


86. Remove the parking lever actuating rod.




87.  **CAUTION: Do not damage the bore.**

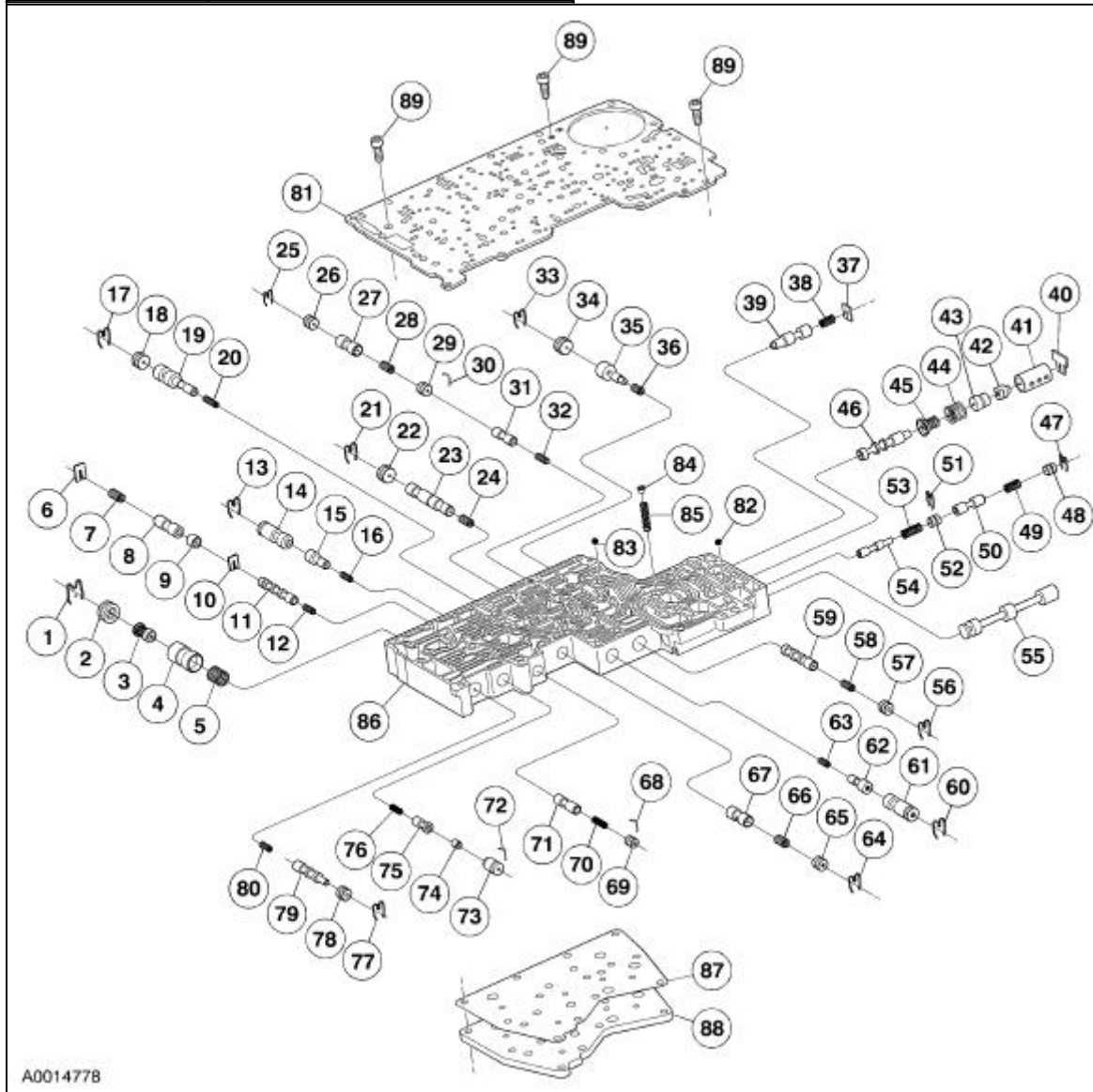
Remove the manual control lever seal.



Main Control Valve Body

Special Tool(s)

	Aligner, Valve Body 307-334 (T95L-70010-C) (2 req'd.)
ST1639-A	



Item	Part Number	Description
1	7F445	Clip — retainer
2	7D374	Plug — retainer
3	7M094	Valve assembly— thermo

4	7L367	Valve — fluid cooler bypass
5	7M116	Spring — fluid cooler bypass
6	7E336	Plate
7	7G489	Spring — coast clutch control
8	7G490	Valve — coast clutch control
9	7G490	Valve — coast clutch control
10	7E336	Plate
11	7M189	Valve — overdrive servo control
12	7M193	Spring — overdrive servo control valve
13	7M445	Clip — retainer
14	7D374	Plug — retainer
15	7M095	Valve — modulator
16	7M104	Spring — modulator valve
17	7F445	Plug — retainer
18	7D374	Clip — retainer
19	7F259	Valve — 4-3 ISR downshift control
20	7F260	Spring — 4-3 ISR control valve
21	7F445	Plug — retainer
22	7D374	Clip — retainer
23	7M188	Valve — 4-3 pre-stroke intermediate band control
24	7G289	Spring — 4-3 pre-stroke intermediate band control valve
25	7F445	Clip — retainer
26	7D374	Plug — retainer
27	7G317	Valve — reverse engagement
28	7D312	Spring — reverse engagement valve
29	7D374	Plug — retainer
30	7D335	Retainer — wire
31	7M187	Valve — high clutch control
32	7M192	Spring — high clutch control valve
33	7F445	Clip — retainer
34	7D374	Plug — retainer
35	7M095	Valve — reverse modulator
36	7M104	Spring — reverse modulator valve
37	7E336	Plate
38	7M191	Spring — rear servo control valve
39	7M098	Valve — rear servo control
40	7E336	Plate
41	7D002	Sleeve
42	7D003	Valve — booster
43	7D003	Valve — booster

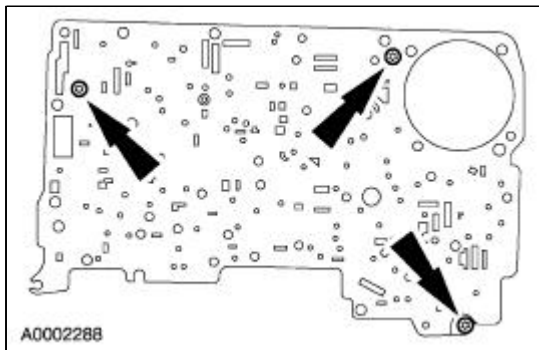
44	7A270	Spring — outer
45	7H149	Spring and retainer assembly
46	7C388	Valve — main regulator
47	7F445	Retainer — clip
48	7D374	Retainer — plug
49	7L317	Spring — reverse inhibition valve
50	7L316	Valve — reverse inhibition
51	7E445	Retainer — clip
52	7D374	Retainer — plug
53	7G411	Spring — solenoid regulator valve
54	7G473	Valve — solenoid regulator
55	7340	Valve — manual
56	7F445	Retainer — clip
57	7D374	Retainer — plug
58	7M099	Spring — select valve
59	7M186	Spring — select
60	7F445	Retainer — clip
61	7D374	Retainer — plug
62	7M095	Valve — modulator
63	7M104	Spring — modulator valve
64	7F445	Retainer — clip
65	7D374	Retainer — plug
66	7G312	Spring — forward engagement control valve
67	7D317	Valve — forward engagement control
68	7E335	Retainer — wire
69	7D374	Retainer — plug
70	7M190	Spring — back pressure
71	7M185	Valve — converter clutch back pressure
72	7E335	Retainer — wire
73	7D002	Sleeve — converter clutch modulator control
74	7M184	Valve — converter clutch modulator control
75	7G307	Valve — converter clutch modulator
76	7G316	Spring — converter clutch modulator control
77	7F445	Retainer — clip
78	7D374	Retainer — plug
79	7L318	Valve — converter clutch control
80	7L490	Spring — converter clutch control valve
81	7Z490	Plate assembly — main control valve body separator
82	7E195	Ball — lubrication check
83	7E195	Ball — shuttle valve
84	7E368	Valve — limit

85	7E340	Spring — limit valve
86	7A101	Body — control valve lower
87	7H173	Gasket — valve body cover plate
88	7C034	Plate — valve body cover
89	W701099-S1430	Screw — separator plate

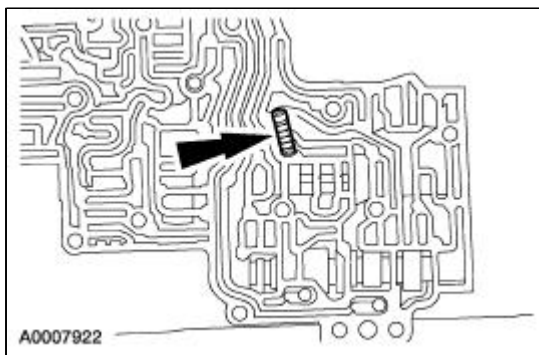
Disassembly

1. **NOTE:** The valve body separator plate has a bonded gasket.

Remove the valve body separator plate.

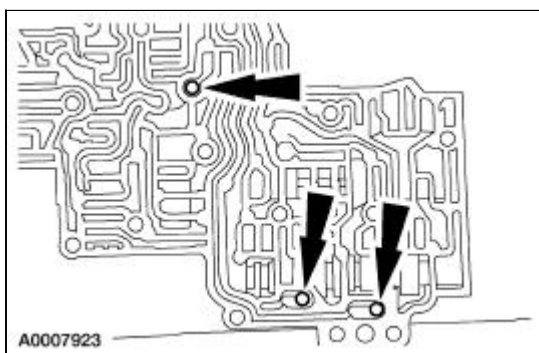


2. Remove the pressure control limit relief valve and spring.



3. **NOTE:** Some early production transmissions will have three check balls and some late production transmissions will only have two check balls.

Remove the check balls.



4. **NOTE:** Refer to the disassembled view.

Disassemble the main control valve body.

Assembly

1.  **CAUTION: Do not lose parts when cleaning or repairing.**

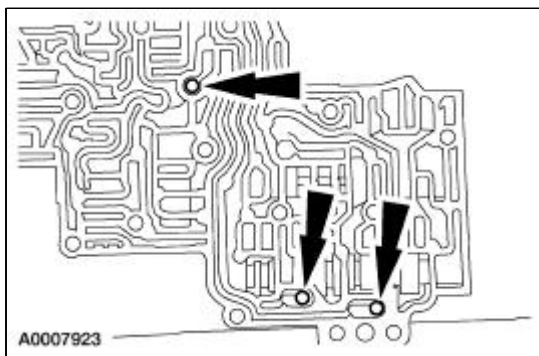
Thoroughly clean all parts in solvent and blow dry with moisture-free compressed air.

2.  **CAUTION: Do not stone, file, or sand the valves. This will remove the anodized finish and may result in further main control or transmission damage.**

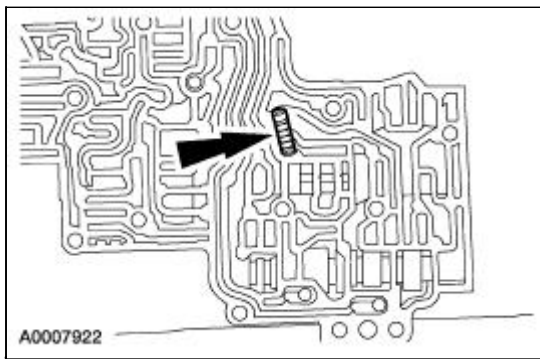
After cleaning the main control valve body, carry out the following.

- Inspect all valve and plug bores for scoring or burrs.
 - Check all fluid passages for obstructions.
 - Inspect all valves and plugs for burrs.
 - Inspect all mating surfaces for burrs or distortion.
 - Inspect all springs for distortion.
 - Check all valves and plugs for free movement in their respective bores.
 - Valves and plugs, when dry, must fall from their own weight into their respective bores.
 - Roll the manual valve on a flat surface to check for a bent condition.
3. Assemble the main control valve body.
 4. **NOTE:** Some early production transmissions will have three check balls and some late production transmissions will only have two check balls.

Install the main control valve body check balls.

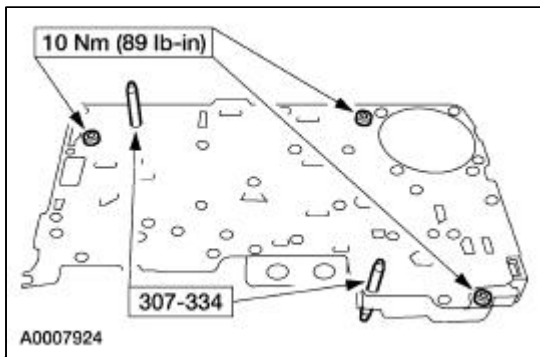


5. Install the pressure control limit relief valve and spring.



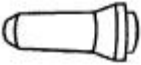



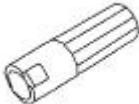


6. **NOTE:** Use a new valve body separator plate for main control valve body installation.


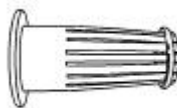
Using the special tools, install the main control valve body separator plate.



Fluid Pump

Special Tool(s)

 <p>ST1833-A</p>	<p>Installer, Torque Converter Fluid Seal 307-349 (T97T-77000-A)</p>
 <p>ST1817-A</p>	<p>Alignment Set, Fluid Pump 307-S039 (T74P-77103-X)</p>
 <p>ST2532-A</p>	<p>Alignment Gauge, Transmission Fluid Pump 307-431</p>
 <p>ST2533-A</p>	<p>Alignment Gauge, Transmission Fluid Pump 307-432</p>
 <p>ST1826-A</p>	<p>Sizer, Piston Seal 307-338 (T95L-70010-G)</p>
 <p>ST2419-A</p>	<p>Alignment Pins, Transmission Fluid Pump 307-398</p>
 <p>ST2684-A</p>	<p>Transmission Fluid Pump Seal Aligner 307-451/1</p>
	<p>Transmission Fluid Pump Seal Sizer 307-451/2</p>

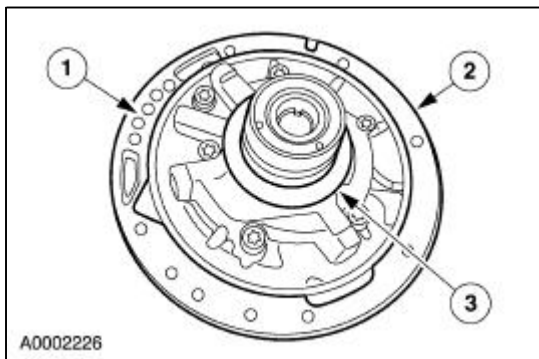
 ST2685-A	
 ST2686-A	Transmission Fluid Pump Seal Installer 307-451/3

Material

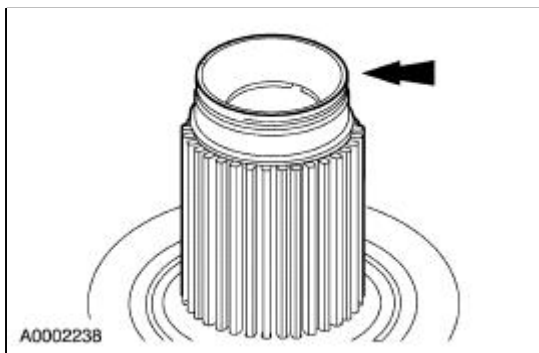
Item	Specification
MERCON® V Automatic Transmission Fluid XT-5-QM	MERCON® V

Disassembly

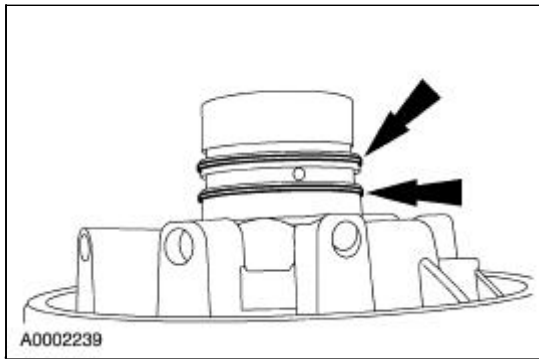
1. Remove the fluid pump gasket, fluid pump seal ring, and the No.1 thrust washer.
 1. Remove and discard the fluid pump gasket.
 2. Remove and discard the fluid pump seal ring (square cut).
 3. Remove and tag the No.1 thrust washer.



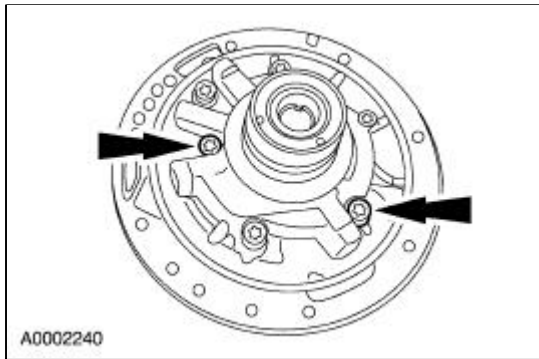
2. Remove the fluid pump support seal ring.



3. Remove the seal rings.



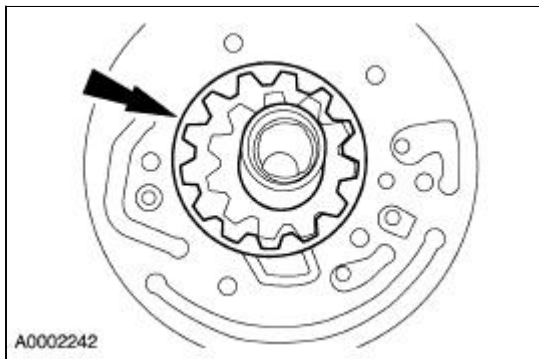
4. Remove the fluid pump housing.



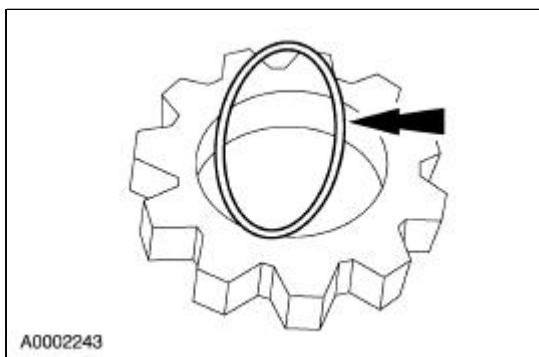
5. **NOTE:** A rough casting on the pump surface crescent is not a flaw.

NOTE: The fluid pump gears are part of the pump assembly and are not repaired separately.

Remove the fluid pump gears.

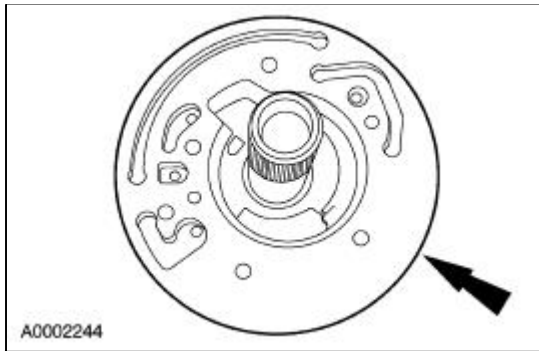


6. Remove the drive gear O-ring seal and discard. Inspect the fluid pump gears for cracks and scoring.

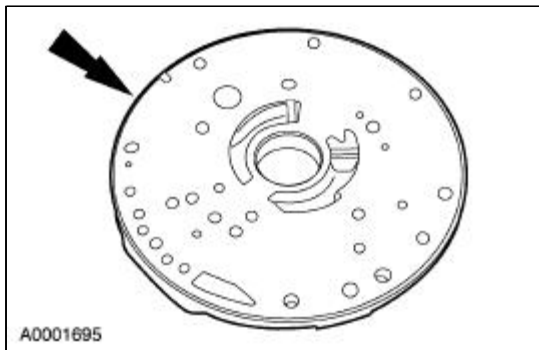


7. Inspect the overdrive pump.

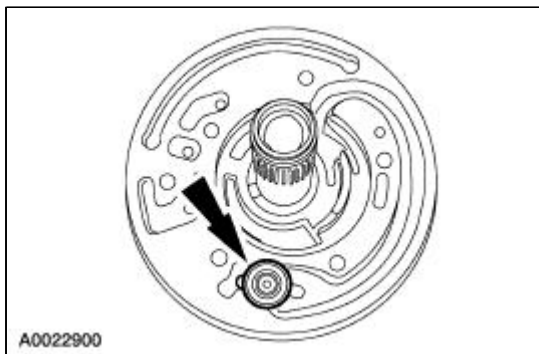
- Inspect the overdrive pump support gear pockets for scoring and wear.
- Clean and inspect the overdrive and rear input shaft bushings.



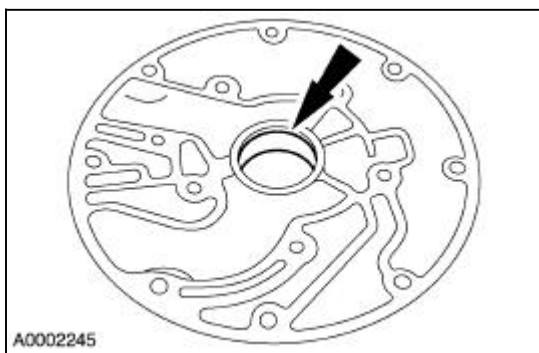
8. Inspect the fluid pump adapter plate for scoring and wear.



9. Remove the valve.



10. Inspect the fluid pump to converter housing bushing.



Assembly

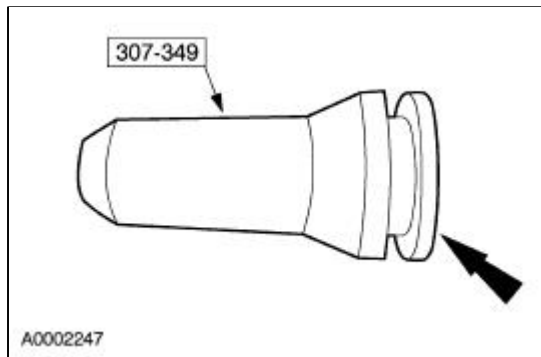
1. **NOTE:** Minor burrs and scoring may be removed with crocus cloth. If damage is found, install a new assembly.

Inspect the fluid pump components for the following:

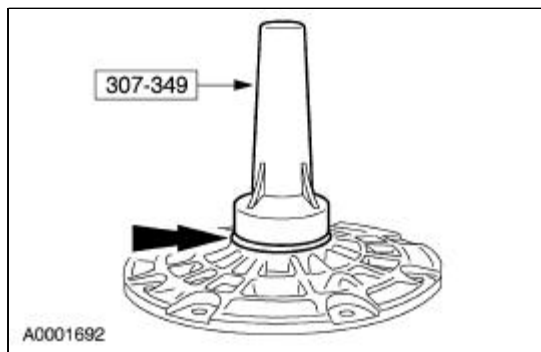
- Pump body and case for burrs.
- Fluid passages for obstructions.

2. **NOTE:** Check and make sure that the garter spring in the seal has not popped off of the converter hub seal.

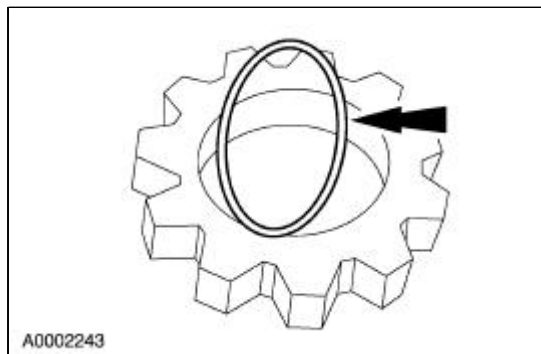
Install a new seal onto the special tool.



3. Using the special tool, install the converter hub seal.

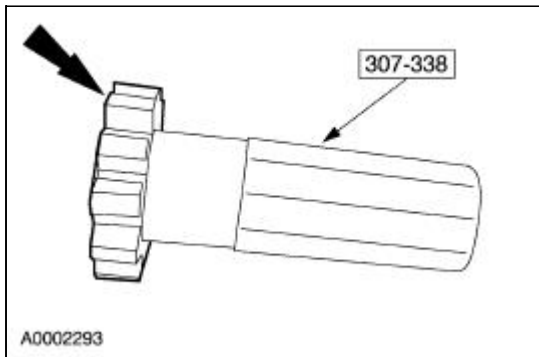


4. Install a new O-ring seal in fluid pump drive gear.



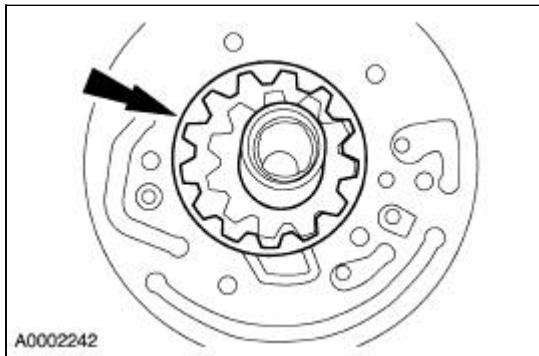
5.  **CAUTION:** Lubricate the special tool with multi-purpose grease.

Using the special tool, seat the O-ring seal in the pump gear.

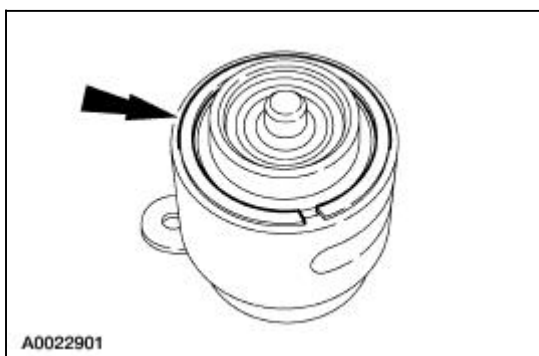


6.  **CAUTION:** The chamber on the inside edge of the small gear must be up when in the pump housing gear pocket. The dimple on the larger gear must be down when in the pump housing gear pocket.

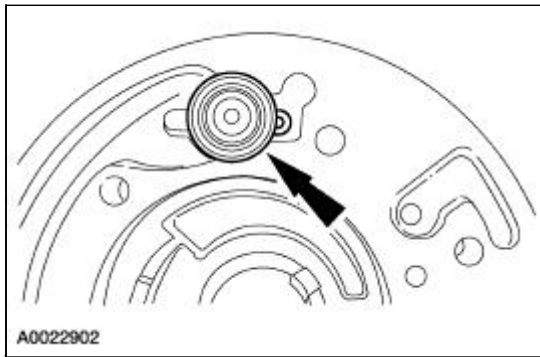
Install the pump gears into the fluid pump housing. Apply multi-purpose grease to pump gear to prevent scoring at start-up.



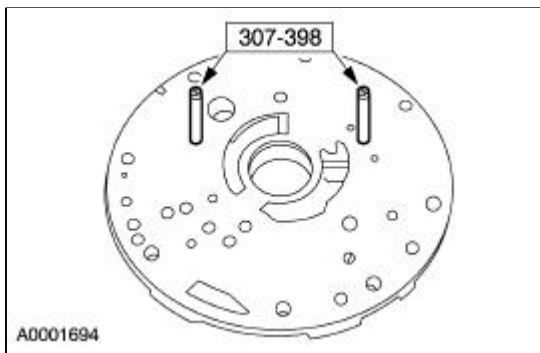
7. Install a new seal on the valve.



8. Install the valve.

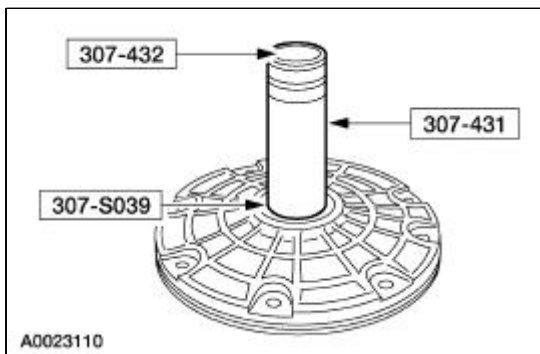


9. First install the fluid pump adapter plate and then the alignment pins in their correct locations.

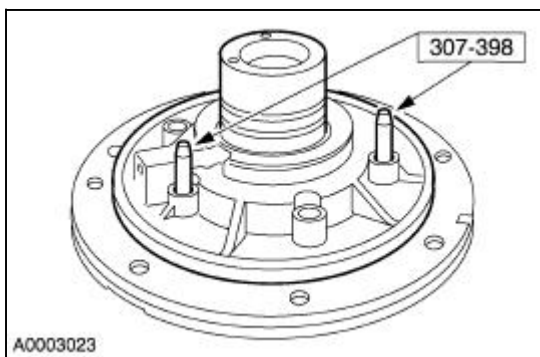


10. **⚠ CAUTION: The special tools must be used to correctly align the pump with the adapter plate to reduce gear noise, bushing failure and leakage.**

Using the special tool, align the fluid pump to the adapter plate.

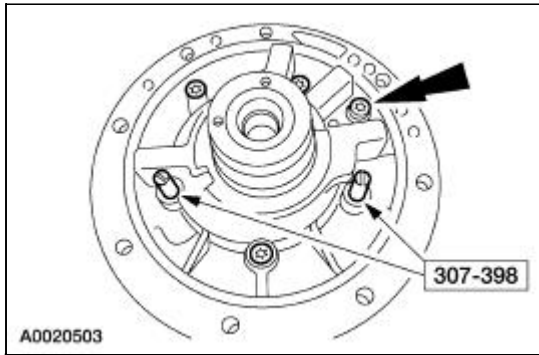


11. Using the special tools, assemble the pump.

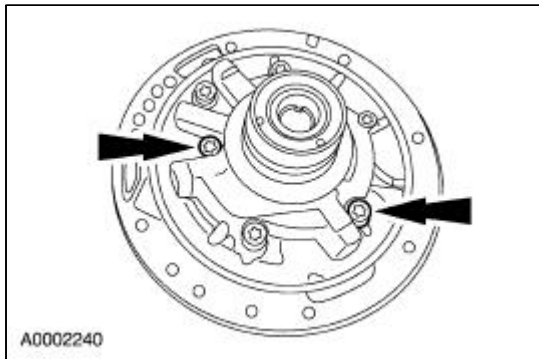


12. Loosely install the fluid pump housing screws in their correct locations and remove the special

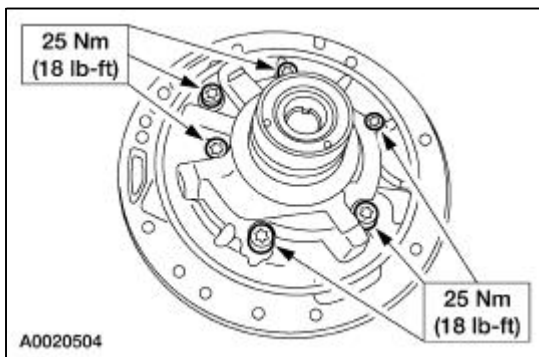
tools.



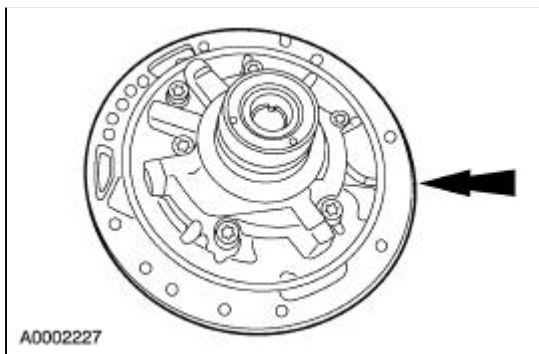
13. Install the two remaining screws.



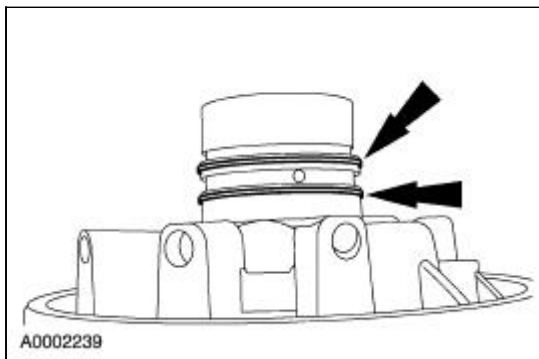
14. Tighten all of the fluid pump screws in a star pattern.



15. Install a new fluid pump seal ring.

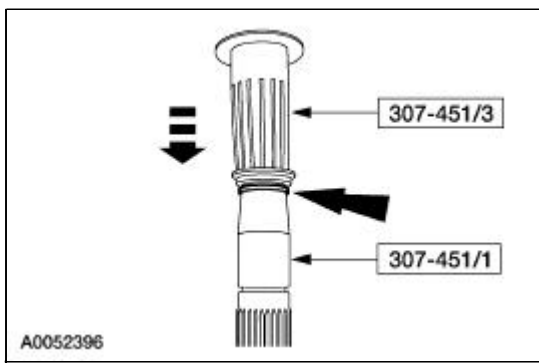


16. Install new seal rings.



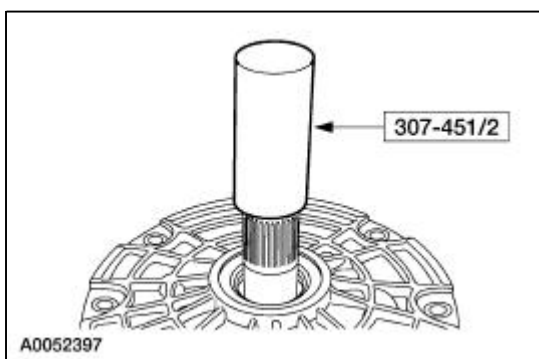
17. **⚠ CAUTION: Be careful not to overstretch the seal ring past the seal ring groove. Damage to the seal will occur.**

Using the special tools, install the fluid pump seal ring.



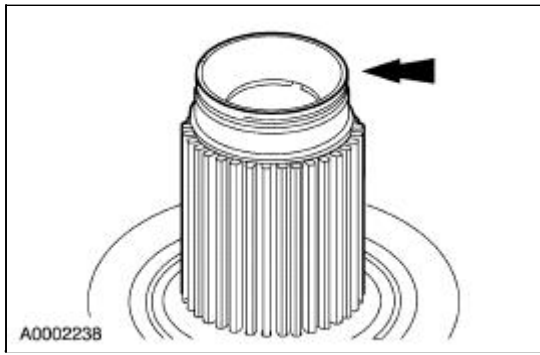
18. **⚠ CAUTION: Failure to correctly size the seal will damage the seal when the torque converter is installed.**

Using the special tool, size the seal to the correct size. Leave the special tool on the seal for two minutes to obtain the correct seal size.





19. **⚠ CAUTION: Verify correct seal installation. Make sure seal grooves are clean and free of burrs.**

Install the seal.



Overdrive Brake and Coast Clutch Drum Assembly

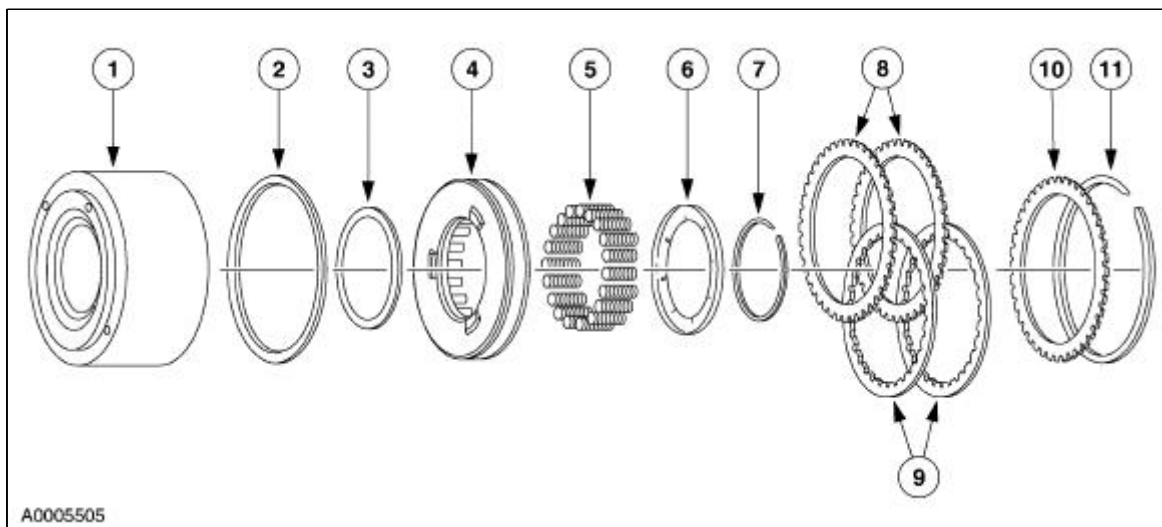
Special Tool(s)

 <p>ST1190-A</p>	Compressor, Clutch Spring 307-015 (T65L-77515-A)
 <p>ST2431-A</p>	Protector, Piston Seal 307-049 (T74P-77404-A)

Material

Item	Specification
MERCON® V Automatic Transmission Fluid XT-5-QM, XT-5-DM	MERCON® V

Overdrive Brake and Coast Clutch Drum Assembly

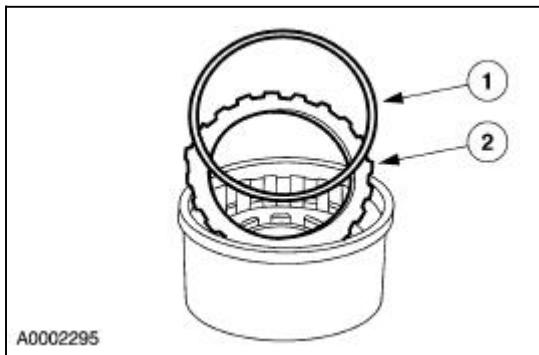


Item	Part Number	Description
1	7L669	Overdrive brake and coast clutch drum
2	7A548	Direct and overdrive piston outer seal ring
3	7D404	Direct and overdrive piston inner seal ring
4	7A262	Direct and overdrive clutch piston
5	7A480	Direct and overdrive piston spring (20 req'd)

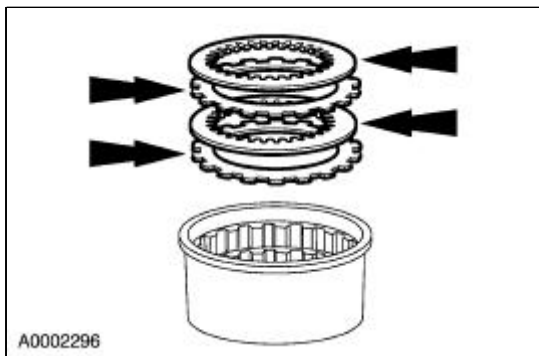
6	7A527	Direct/coast clutch piston spring retainer
7	E860125-S	Retaining ring
8	7B442	Coast clutch external plate — steel (2 Req'd)
9	7B164	Coast clutch internal plate — friction (2 Req'd)
10	7B066	Direct/coast clutch pressure plate
11	E860126S/129S	Retaining ring (select fit)

Disassembly

1. Remove the coast clutch pressure plate.
 1. Remove the coast clutch retaining ring.
 2. Remove the coast clutch pressure plate.



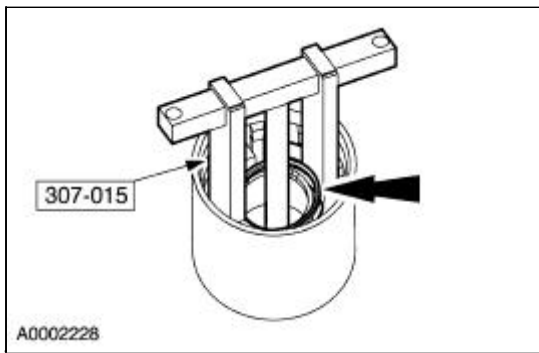
2. Remove the coast clutch disc pack.
 - Inspect for wear, install a new pack as necessary.



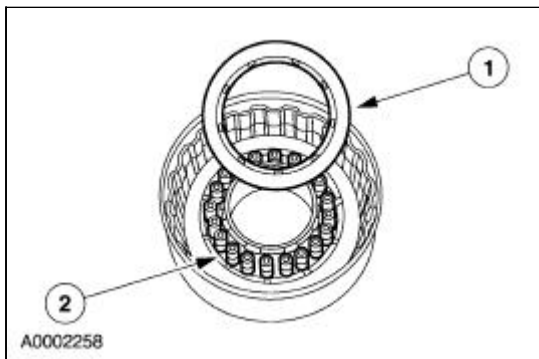
3.  **WARNING:** Use caution when releasing tool pressure on the rear clutch piston spring. Failure to follow these instructions may result in personal injury.


 **CAUTION:** Do not fully compress the special tool or damage to the spring retainer may occur.

Using the special tool, remove the coast clutch piston retaining ring.



4. Relieve the coast clutch spring tension and remove the special tool.
5. Remove the coast clutch piston springs.
 1. Remove the coast clutch piston retainer.
 2. Remove the clutch piston springs.



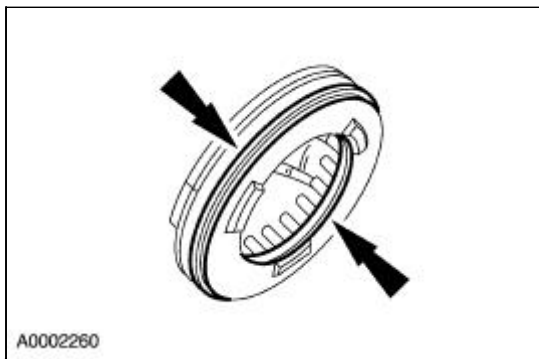
6.  **WARNING: Air pressure must not exceed 138 kPa (20 psi). Wear safety glasses when using compressed air, and make sure the drum is facing down as shown. Failure to follow these instructions may result in personal injury.**

Remove the coast clutch piston.

- Apply air pressure to the hole in the drum to remove the coast clutch piston while blocking the other hole with a finger.



7. Remove the coast clutch piston inner seal and the coast clutch piston outer seal.
 - Clean and install a new seal as necessary.

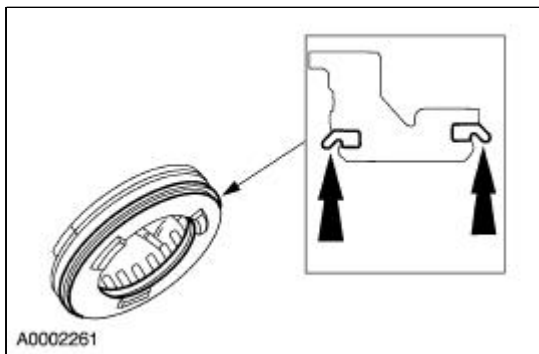


Assembly

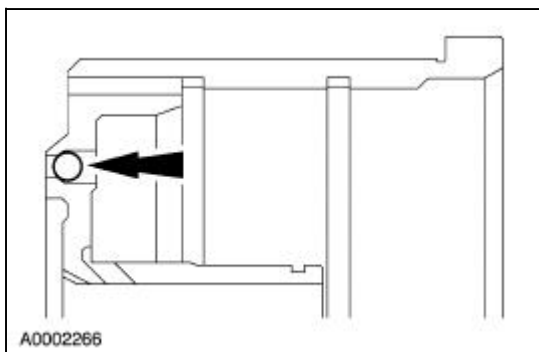
1. Inspect the coast clutch components for damage or wear. Install new components as necessary.
 - Inspect the drum band surface, bushing, and thrust surfaces for damage.
 - Inspect the clutch piston bore, and piston.
 - Check the fluid passages for obstructions. All fluid passages must be clean and free of obstructions.
 - Inspect the clutch plates for damage.
 - Inspect the clutch springs.

2.  **CAUTION: The lip seals must be positioned as shown. Care must be taken to prevent rollover of the lip seal.**

Install the new coast clutch piston inner and outer seal.

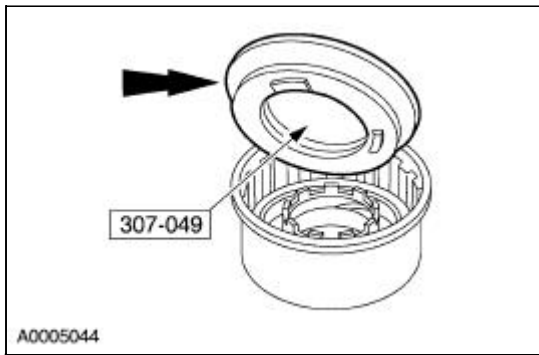


3. Verify the check ball is free to move.

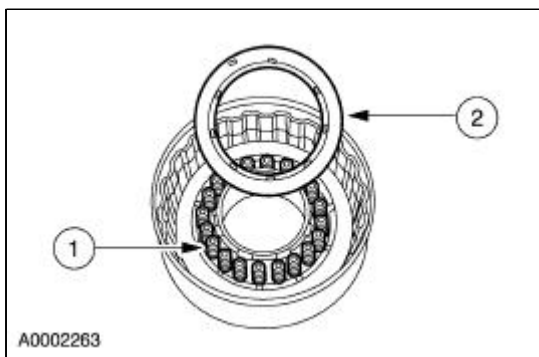



4.  **CAUTION: Care must be taken to prevent damage to the seals during installation.**

Using the special tool, install the coast clutch piston.

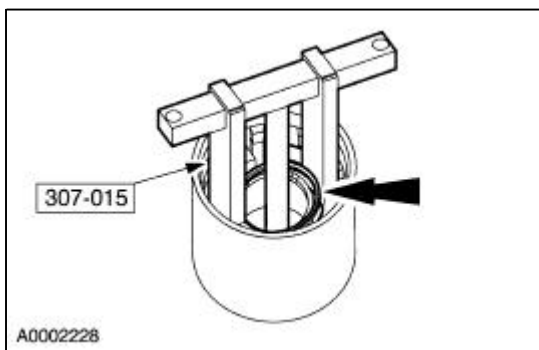


5. Install the coast clutch piston springs.
 1. Install the coast clutch piston springs.
 2. Install the coast clutch spring retainer.



6.  **CAUTION: Do not fully compress the special tool or damage to the coast clutch piston spring retainer may occur.**

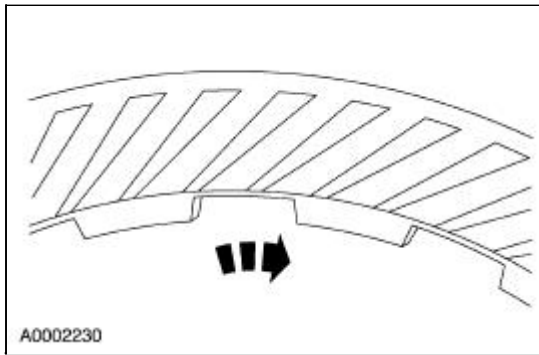
Using the special tool, install the coast clutch piston spring retainer ring.



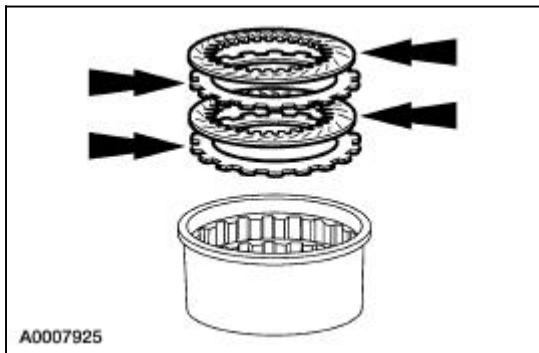
7.  **CAUTION: Coast clutch friction plates are directional and must be installed with grooves clockwise (I.D. to O.D.). The word "TOP" should face up.**

 **CAUTION: If new clutch plates are being used, they should be soaked in clean automatic transmission fluid for at least 30 minutes before assembly.**

When installing friction plates, the word "TOP" should face up. If reusing plates, grooves must be installed clockwise. Install the coast clutch disc pack.



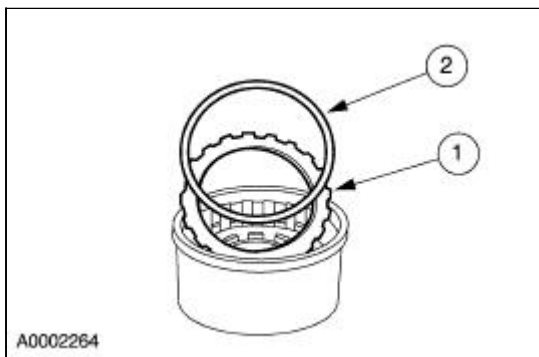
8. Install the two steel clutch plates and two friction clutch plates in alternating order starting with a steel clutch plate.




9.  **CAUTION: The retaining ring is select fit.**

Install the coast clutch pressure plate.

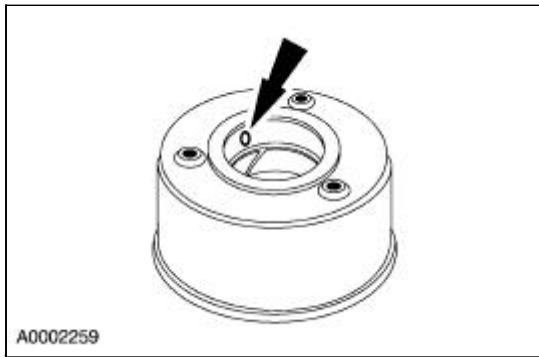
1. Install the coast clutch pressure plate.
2. Install the original coast clutch retaining ring.



10.  **WARNING: Air pressure must not exceed 138 kPa (20 psi). Wear safety glasses when using compressed air, and make sure drum is facing down as shown. Failure to follow these instructions may result in personal injury.**

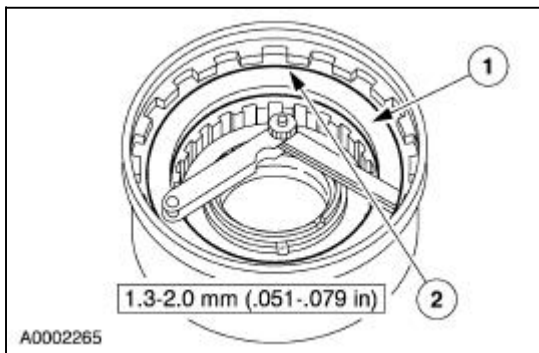
Air check the assembly.

- Apply air pressure to the hole in the drum while blocking the other hole with a finger.





11. Check the coast clutch disc pack free play.
 1. Push down on the coast pressure plate.
 2. Check clearance between the coast clutch retaining ring and coast pressure plate. Clearance should be 1.3-2.0 mm (.051-.079 in). If clearance is not within the specification, install a correct coast clutch retaining ring that will provide the correct free play adjustment.

Part Number	Thickness		Diameter	
	mm	In	mm	In
E860126-S	1.37	.0539	130.1	5.122
E860127-S	1.73	.0681	130.1	5.122
E860128-S	2.08	.0819	130.1	5.122
E860129-S	2.44	.0961	130.1	5.122



Direct Clutch Drum Assembly

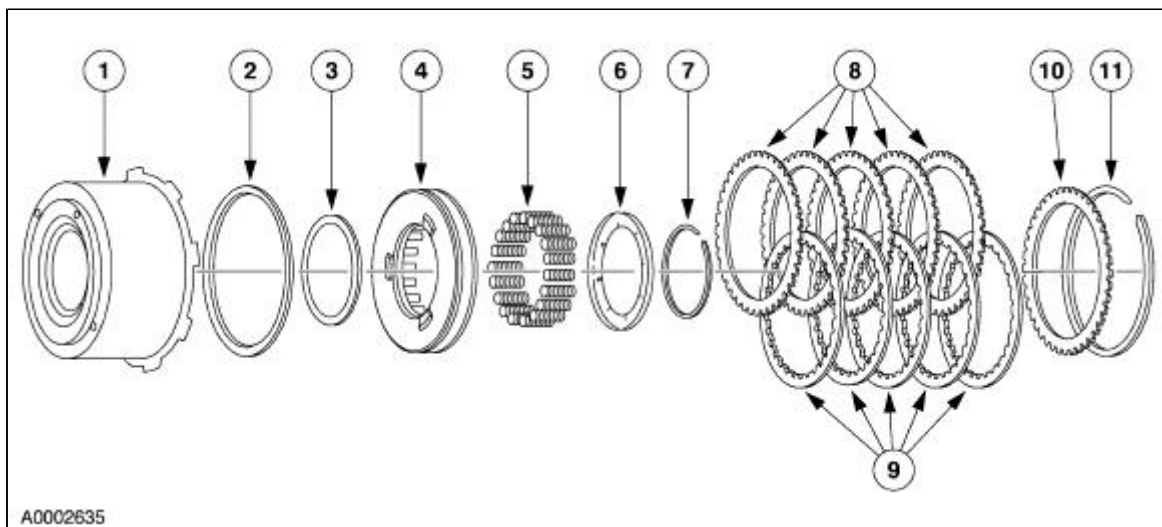
Special Tool(s)

 <p>ST1190-A</p>	Compressor, Clutch Spring 307-015 (T65L-77515-A)
 <p>ST2431-A</p>	Protector, Piston Seal 307-049 (T74P-77404-A)

Material

Item	Specification
MERCON® V Automatic Transmission Fluid XT-5-QM, XT-5-DM	MERCON® V

Direct Clutch Drum Assembly

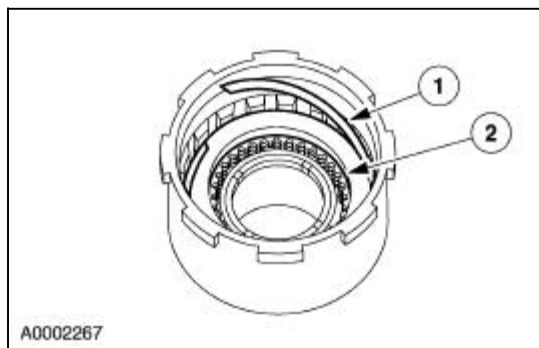


Item	Part Number	Description
1	7D044	Intermediate brake drum assembly
2	7A548	Direct and overdrive piston outer seal ring
3	7D404	Direct and overdrive piston inner seal ring
4	7A262	Direct and overdrive clutch piston
5	7A480	Direct and overdrive piston spring (20 req'd)

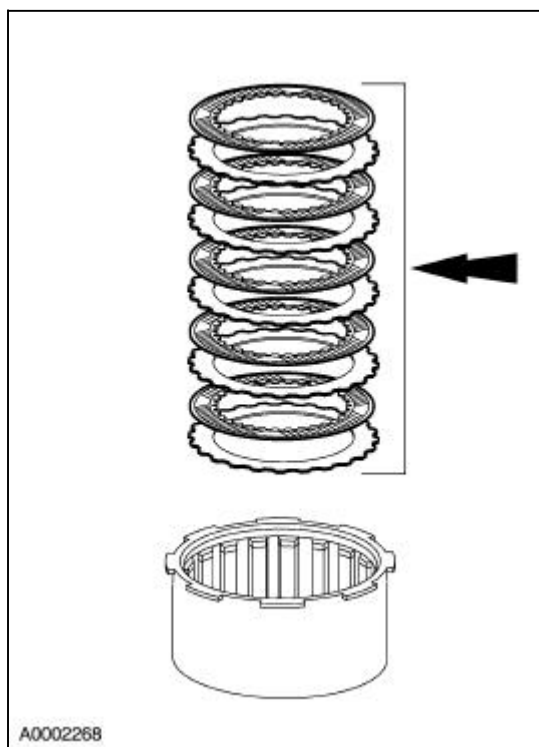
6	7A527	Direct/coast clutch piston spring retainer
7	E860125-S	Retaining ring
8	7B442	Direct clutch external spline plate
9	7B164	Direct clutch internal spline plate
10	7B066	Direct/coast clutch pressure plate
11	E860126S/129S	Retaining ring (select fit)

Disassembly

1. Remove the direct clutch retaining ring and the direct clutch pressure plate.
 1. Remove the direct clutch retaining ring.
 2. Remove the direct clutch pressure plate.



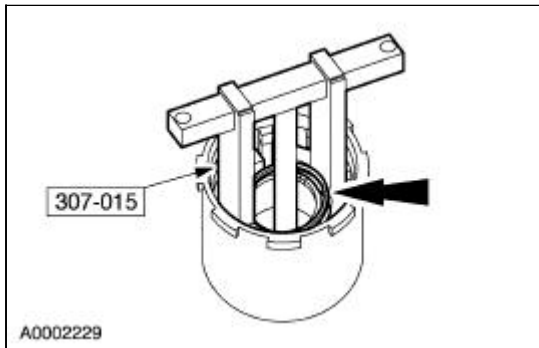
2. Remove the direct clutch disc pack.
 - Inspect and install new friction plates if worn, damaged, or overheated.



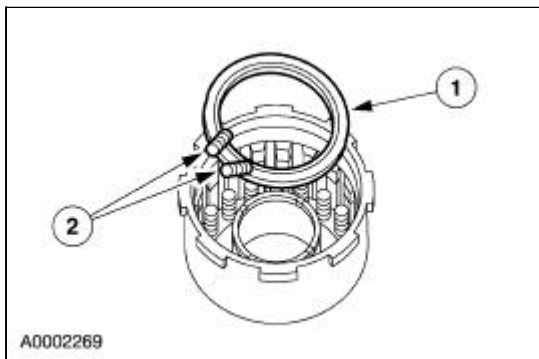
3.  **WARNING:** After removing the retaining ring, use care when releasing the pressure on the springs. Failure to follow these instructions may result in personal injury.

⚠ CAUTION: Do not fully compress the special tool or damage to the spring retainer may occur.

Using the special tool, remove the direct clutch piston retaining ring.



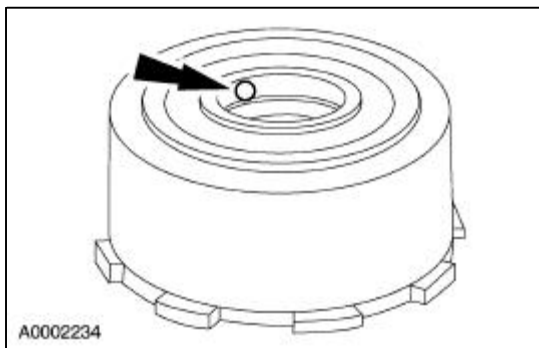
4. Relieve the direct clutch spring tension and remove the special tool.
5. Remove the direct clutch piston spring retainer and the direct clutch piston springs.
 1. Remove the direct clutch piston spring retainer.
 2. Remove the direct clutch piston springs.



6. **⚠ WARNING: Air pressure must not exceed 138 kPa (20 psi). Wear safety glasses when using compressed air, and make sure the drum is facing down as shown. Failure to follow these instructions may result in personal injury.**

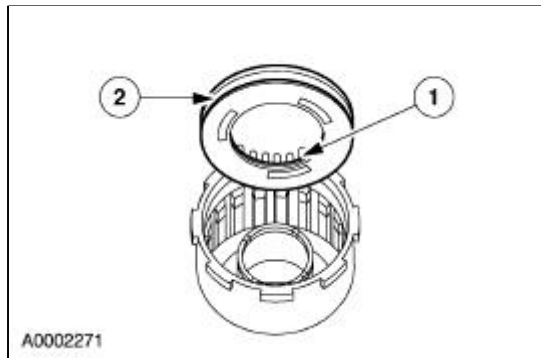
Using compressed air, remove the direct clutch piston from the direct clutch drum.

- Apply air pressure to the hole in the drum while blocking the other hole with a finger.



7. Remove the direct clutch piston inner and outer seal.
 1. Remove the direct clutch piston inner seal.
 2. Remove the direct clutch piston outer seal.

- Clean and install new components as necessary.



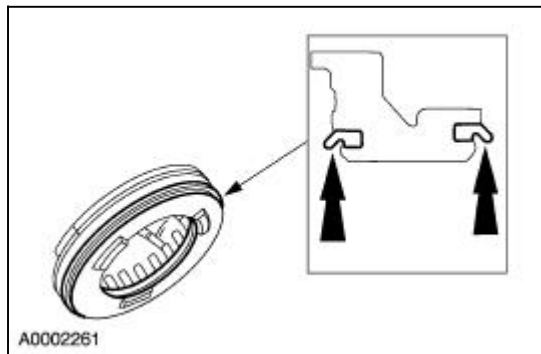
Assembly

1. Inspect the clutch components for damage or wear. Install new components as necessary.
 - Inspect the drum surface for damage.
 - Inspect the clutch piston bore, and piston.
 - Check the fluid passages for obstructions. All fluid passages must be clean and free of obstructions.
 - Inspect the clutch plates for damage.
 - Inspect the clutch springs.

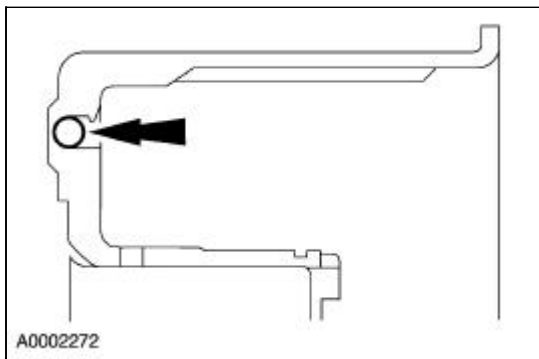
2.  **CAUTION: The lip seals must be positioned as shown. Care must be taken to prevent rollover of the lip seal.**

NOTE: Use new seals to help prevent seal failures.

Install the new direct clutch piston inner seal and the direct clutch piston outer seal.

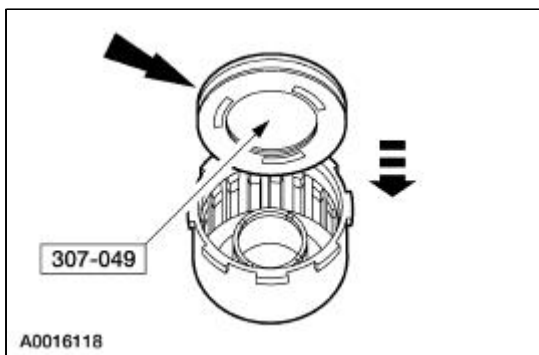


3. Verify the check ball is free to move.

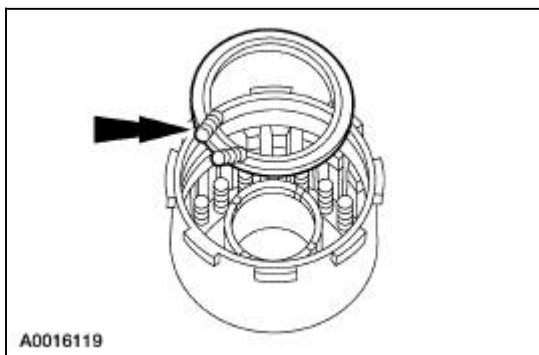


4.  **CAUTION:** Care must be taken to prevent damage to the seals during installation.

Using the special tool, install the direct clutch piston.




5. Install the direct clutch piston springs and the retainer.

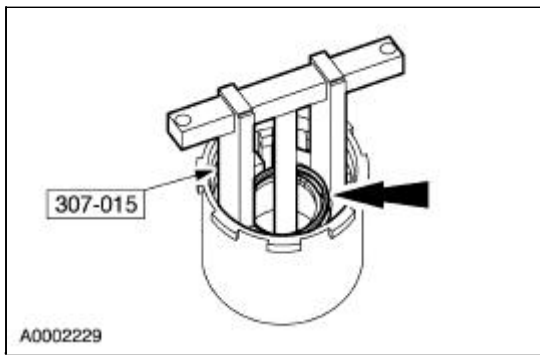


6. Relieve the direct clutch spring tension and remove the special tool.


7.  **WARNING:** After removing the retaining ring, use care when releasing the pressure on the springs. Failure to follow these instructions may result in personal injury.

 **CAUTION:** Do not fully compress the special tool or damage to the spring retainer may occur.

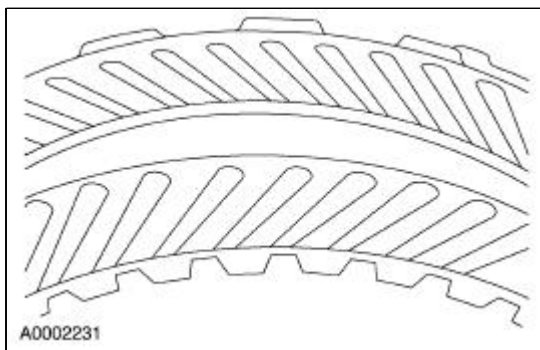
Using the special tool, install the direct clutch piston retaining ring.



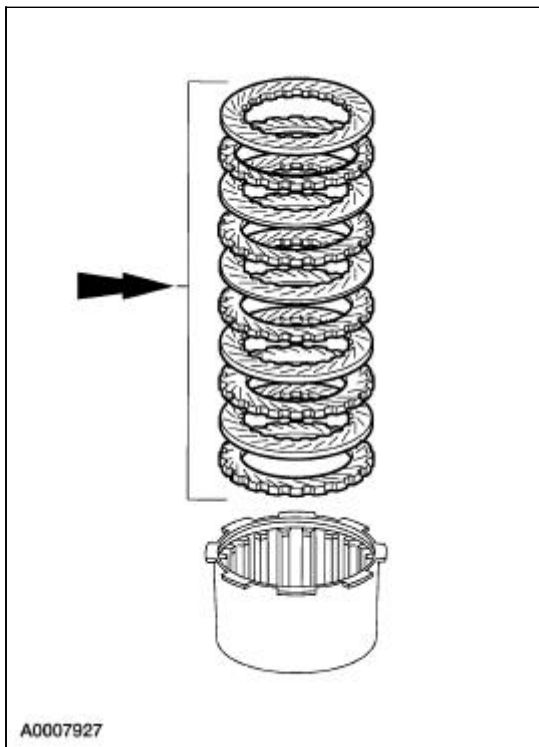
8.  **CAUTION:** The direct clutch friction plates are directional and must be installed correctly. Alternate the internally splined (clockwise) and the externally splined (counterclockwise) clutch plates.

 **CAUTION:** If new plates are used, they should be soaked in clean automatic transmission fluid for at least 30 minutes before assembly.

When installing friction plates, alternate the internally splined (clockwise) and the externally splined (counterclockwise) clutch plates. Install the direct clutch disc pack.

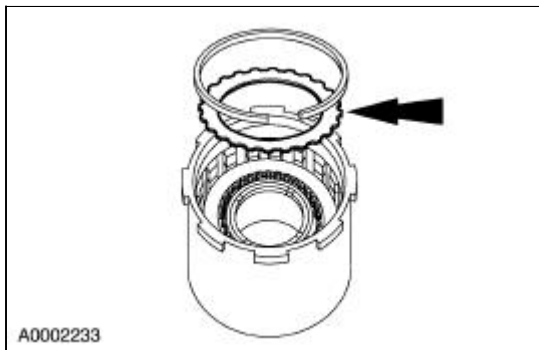



9. Install the friction plates alternating the internally splined (clockwise) and the externally splined (counterclockwise) clutch plates starting with an externally splined (counterclockwise) clutch plate.



10.  **CAUTION:** The retaining ring is a select fit.

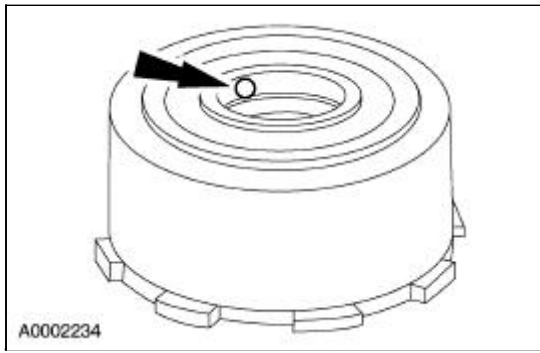
Install the direct clutch pressure plate using the original direct clutch retaining ring.



11.  **WARNING:** Air pressure must not exceed 138 kPa (20 psi). Wear safety glasses when using compressed air, and make sure drum is facing down as shown. Failure to follow these instructions may result in personal injury.

Air check the assembly.

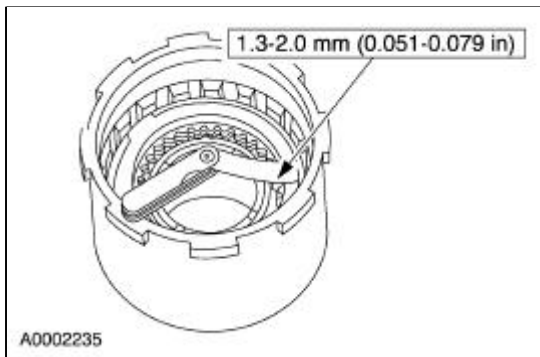
- Apply air pressure to the hole in the drum while blocking the other hole with a finger.



12. Push down on direct clutch disc pack and check gap between the direct clutch retaining ring and the direct clutch pressure plate with a feeler gauge.
 - If specifications do not match use a select fit direct clutch retaining ring to match specifications and verify with a feeler gauge.




Direct Clutch

Part Number	Thickness		Diameter	
	mm	In	mm	In
E860126-S	1.37	0.0539	130.1	5.122
E860127-S	1.73	0.0681	130.1	5.122
E860128-S	2.08	0.0819	130.1	5.122
E860129-S	2.44	0.0961	130.1	5.122



Forward Clutch

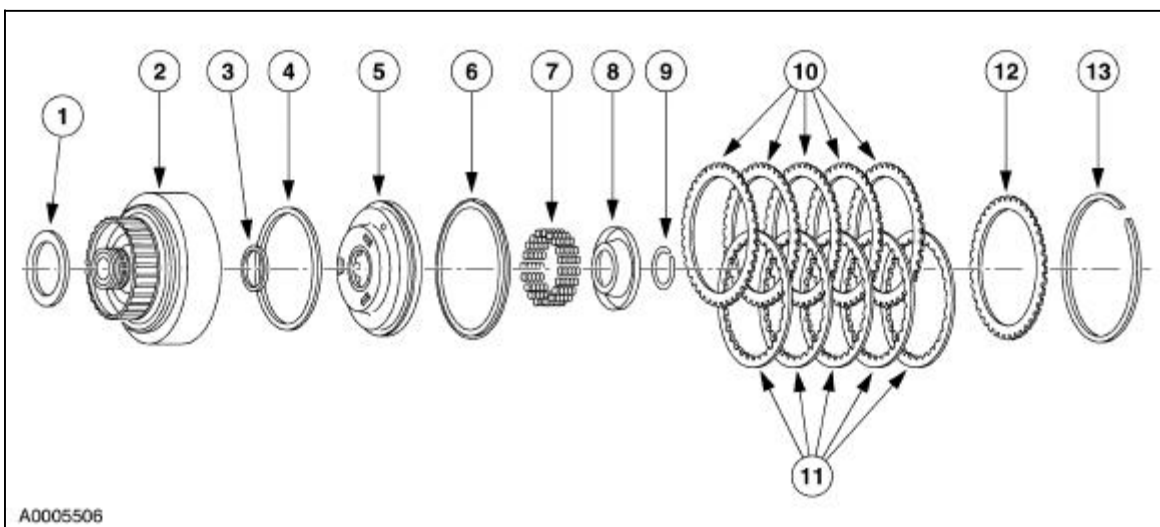
Special Tool(s)

 <p>ST1190-A</p>	Compressor, Clutch Spring 307-015 (T65L-77515-A)
 <p>ST1813-A</p>	Protector, Piston Seal 307-051 (T74P-77548-A)
 <p>ST1812-A</p>	Protector, Piston Seal 307-052 (T74P-77548-B)

Material

Item	Specification
MERCON® V Automatic Transmission Fluid XT-5-QM, XT-5-DM	MERCON® V

Forward Clutch Assembly

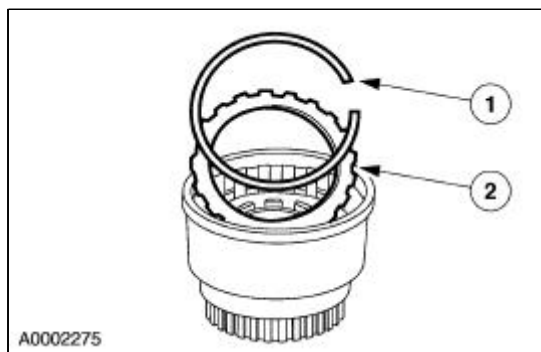


Part	
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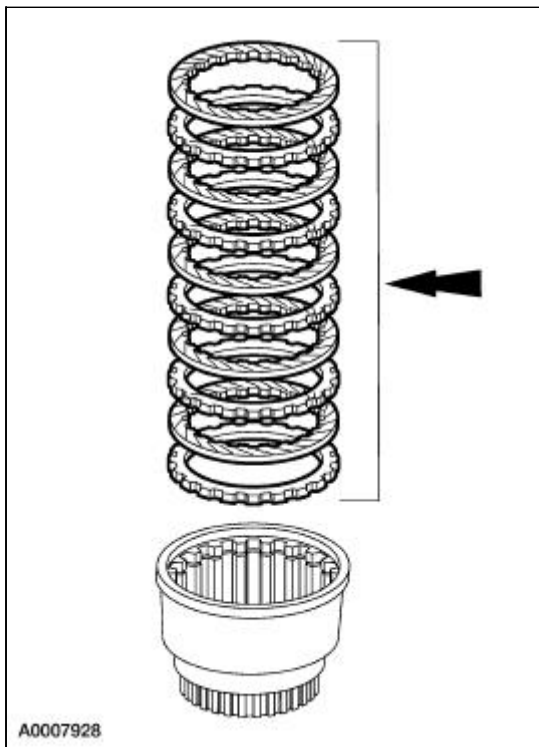
Item	Number	Description
1	7M153	Forward clutch cylinder thrust bearing (no. 5)
2	7A360	Forward clutch cylinder assembly
3	7A548	Forward clutch piston inner seal ring
4	7A548	Forward clutch piston outer seal ring
5	7A262	Forward clutch piston
6	7B070	Forward clutch cushion spring
7	7C151	Forward clutch piston spring (15 req'd)
8	7A527	Forward clutch piston spring retainer
9	E860109-S	Forward clutch retaining ring
10	7B442	Forward clutch external plate-steel (vehicle-dependent)
11	7B164	Forward clutch internal plate- friction (vehicle-dependent)
12	7B066	Forward clutch pressure plate
13	7D483	Forward clutch retaining ring (select fit)


Disassembly


1. Remove the pressure plate.
 1. Remove the forward clutch retaining ring.
 2. Remove the pressure plate.



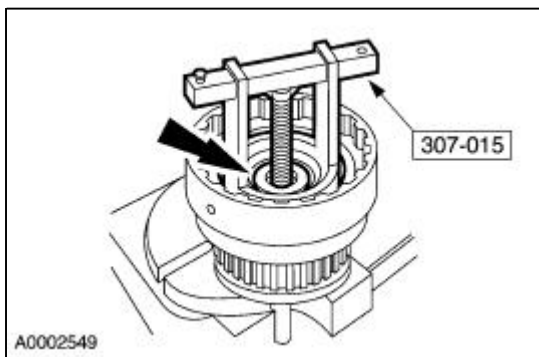
2. Remove the forward clutch disc pack.
 - Inspect the forward clutch plates for wear, damage or overheating.



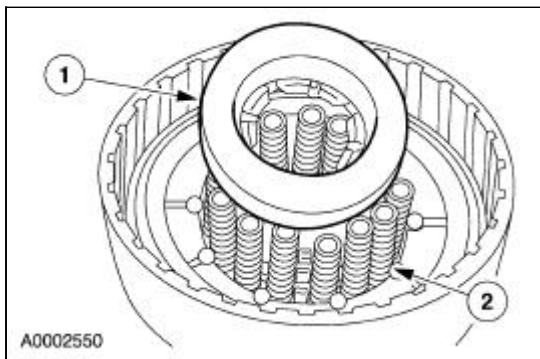
3.  **WARNING:** Use caution when releasing tool pressure on the clutch piston springs. Failure to follow these instructions may result in personal injury.

 **CAUTION:** Do not fully depress the special tool or damage to the spring retainer may occur.

Using the special tool, remove the forward clutch piston retaining ring.



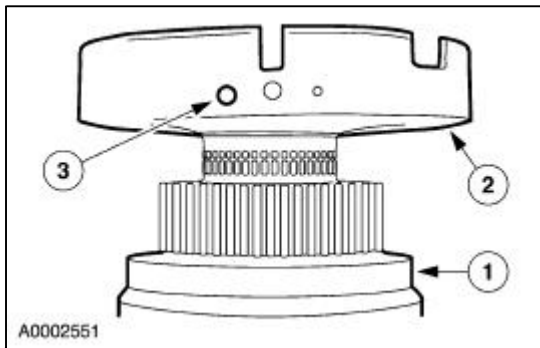
4. Relieve the forward clutch spring tension and remove the tool.
5. Remove the forward clutch piston spring retainer, springs, and cushion spring.
1. Remove the forward clutch piston spring retainer.
 2. Remove the forward clutch piston springs.
 - Inspect the forward clutch piston springs for distortion.



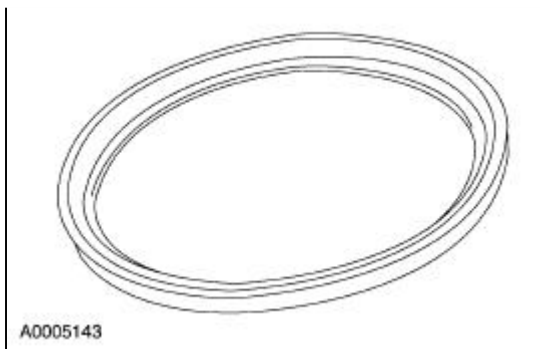
6. **⚠ WARNING:** Air pressure must not exceed 138 kPa (20 psi). Wear safety glasses when using compressed air. Make sure the cylinder is facing down as shown. Failure to follow these instructions may result in personal injury.

Remove the forward clutch piston.

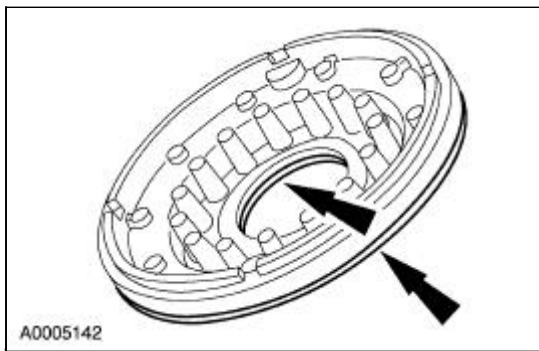
1. Place the forward clutch cylinder with forward clutch piston facing down.
2. Install the center support on the forward clutch cylinder.
3. Apply air pressure to the left port of the center support.



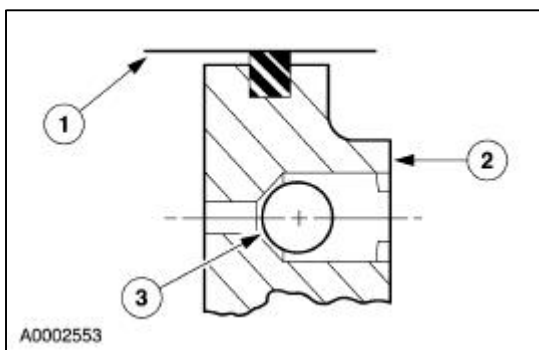
7. Remove the cushion spring.



8. Remove and discard the forward clutch piston seals.
- Inspect the forward clutch piston for cracks.

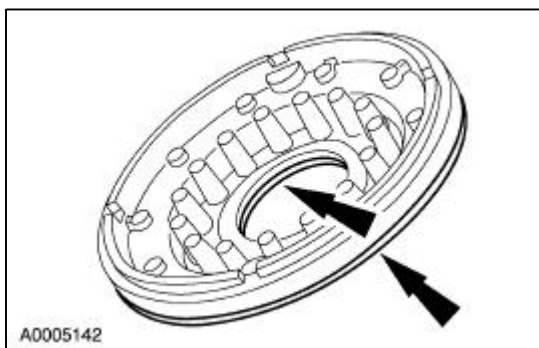


9. Inspect the forward clutch drum assembly.
 1. Inspect the forward clutch cylinder surfaces for scores or burrs.
 2. Inspect forward clutch piston for scores or burrs.
 3. Verify the check ball is free to move in the piston.



Assembly

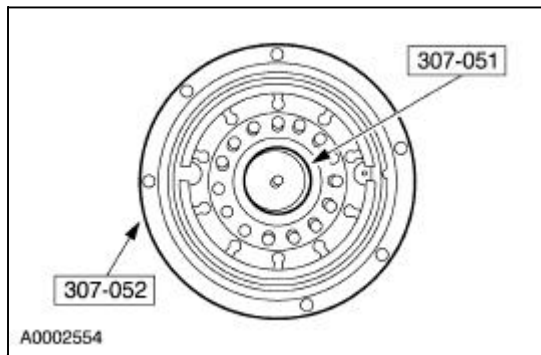
1. Inspect the clutch components for damage or wear. Install new components as necessary.
 - Check the fluid passages for obstructions. All fluid passages must be clean and free of obstructions.
 - Inspect the clutch plates for damage.
 - Inspect the clutch springs.
 - Inspect the needle bearing and seal rings for damage.
 - Check clutch hub thrust surfaces for damage.
 - Check clutch plates for flatness and fit on the clutch hub serrations.
2. Install new forward clutch piston seals.



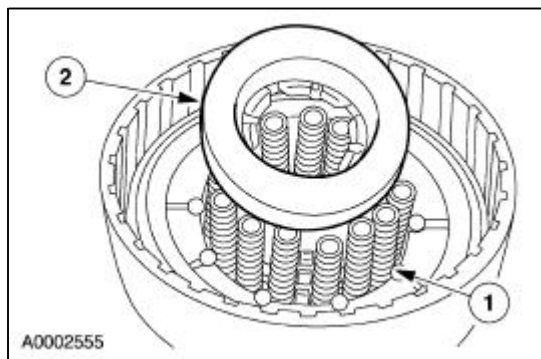
3.  **CAUTION: Care must be taken to prevent damage to the seals.**

NOTE: Lubricate the forward clutch piston inner and outer seal with clean automatic transmission fluid.

Using the special tool, install the forward clutch piston into the forward clutch cylinder.

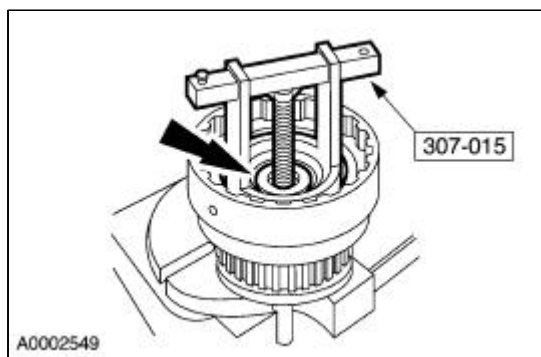


4. Install the forward clutch piston spring retainer.
 1. Install the forward clutch piston spring.
 2. Install the forward clutch piston spring retainer.



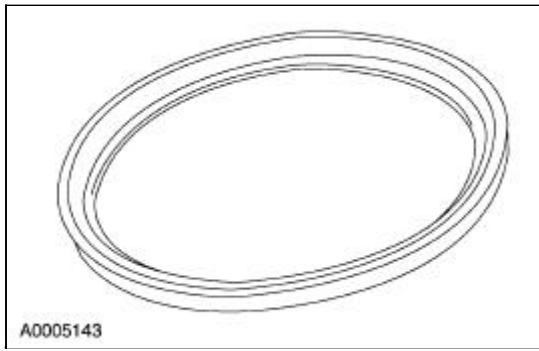
5.  **CAUTION:** Do not fully depress the clutch spring compressor or damage to the spring retainer may occur.

Using the special tool, install the forward clutch piston spring retaining ring.




6.  **CAUTION:** If there is evidence of clutch plate burning, install a new forward clutch cushion.

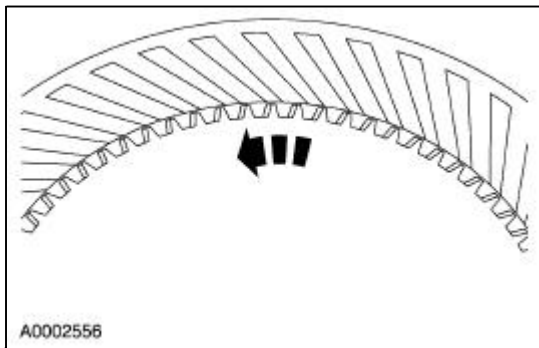
Install the forward clutch cushion spring.



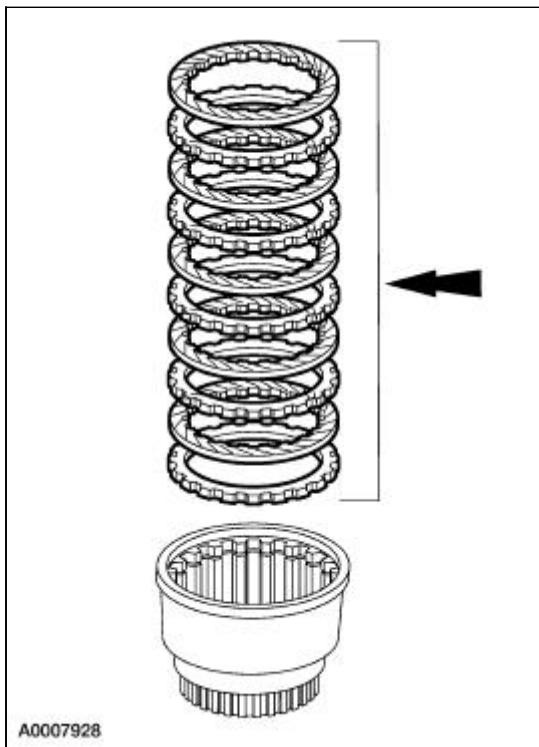
7.  **CAUTION:** The forward clutch friction plates are directional and must be installed with grooves pointing counterclockwise.

 **CAUTION:** If new plates are used, they should be soaked in clean automatic transmission fluid for at least 30 minutes before assembly.

If reusing plates, grooves must be installed counterclockwise. Install the direct clutch disc pack.



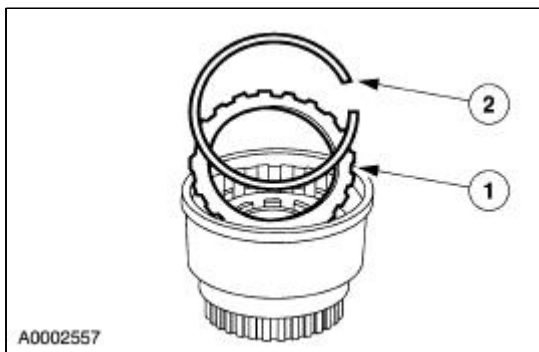
8. Install the steel clutch plates and friction clutch plates in alternating order starting with a steel clutch plate.




9.  **CAUTION: The retaining ring is a select fit.**

Install the original selective retaining ring.

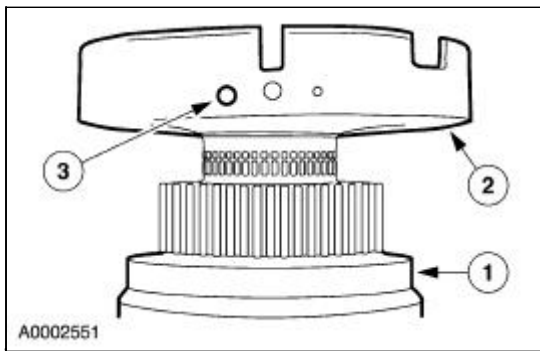
1. Install the forward clutch pressure plate.
2. Install the original selective retaining ring.



10.  **WARNING: Air pressure must not exceed 138 kPa (20 psi). Wear safety glasses when using compressed air. Make sure the cylinder is facing down as shown. Failure to follow these instructions may result in personal injury.**

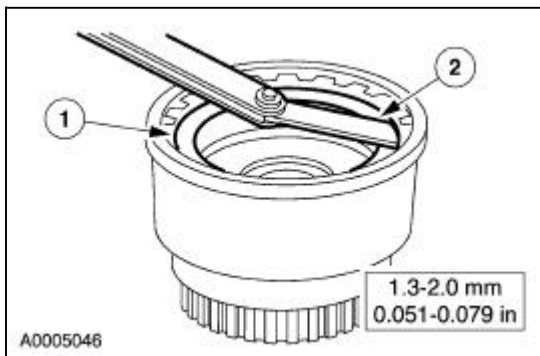
Air check the forward clutch piston.

1. Place the forward clutch cylinder with forward clutch piston facing down.
2. Install the transmission center support on the forward clutch cylinder.
3. Apply air pressure to the left port of the center support.

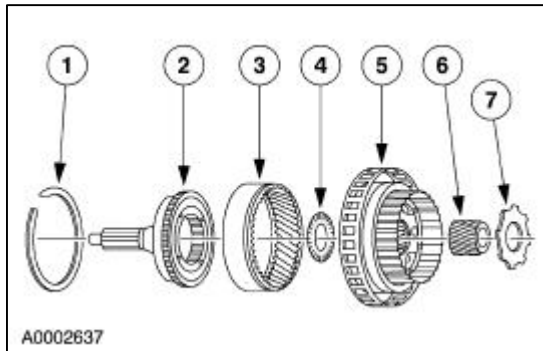


11. Check forward clutch disc pack free play.
1. Press down on forward clutch disc pack.
 2. Using a feeler gauge, check the gap between the forward clutch retaining ring and the forward clutch pressure plate.
- If the clearance is not within specifications, install the correct size retaining ring.

Part Number	Thickness		Diameter	
	mm	In	mm	In
XW4Z-7D483-AB	1.73	.0681	141.45	5.65 in
XW4Z-7D483-AC	2.08	.0819	141.45	5.65 in
XW4Z-7D483-AD	2.44	.0961	141.45	5.65 in



Overdrive Planetary and One-Way Clutch Assembly



A0002637

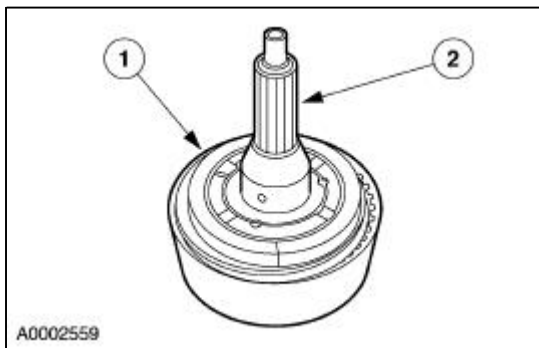
Item	Part Number	Description
1	W702037-S300	Retaining ring
2	7A658	Center shaft
3	7653	Overdrive ring gear
4	7L495	No. 2 overdrive planetary thrust bearing
5	7B446	Overdrive planetary gear carrier assembly
6	7D063	Overdrive sun gear
7	7660	Coast clutch adapter

Disassembly

- NOTE:** The overdrive one-way clutch is serviced with the center shaft assembly.

Remove the center shaft from the overdrive ring gear.

- Remove the overdrive center shaft retaining ring.
- While rotating counterclockwise remove the center shaft from the ring gear.

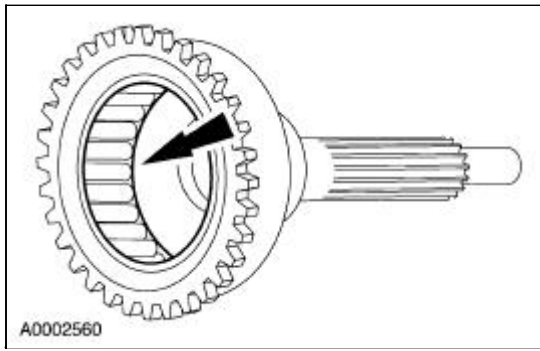


A0002559

- CAUTION:** Do not remove the overdrive one-way clutch. Damage to the clutch may occur if it is removed.

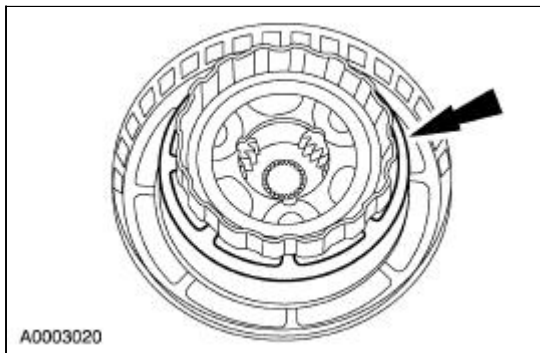
Clean and inspect the overdrive one-way clutch and center shaft.

- Inspect for cracks in the roller cage and wear on the roller clutch, and the press fit of the one-way clutch to the center shaft.



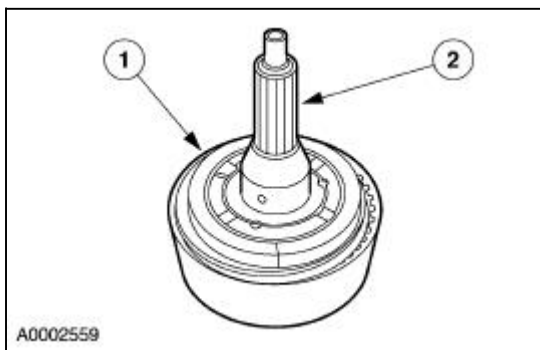
3. Inspect the one-way clutch.

- Temporarily insert the overdrive planetary gear carrier assembly into the one-way clutch rollers for verification of the one-way clutch.
- The planetary gear must rotate counterclockwise and hold when rotated clockwise.
- Remove the planetary gear carrier assembly.



Assembly

1. Install the center shaft and one-way clutch.
 1. Install the center shaft and one-way clutch.
 2. Install the center shaft retaining ring.



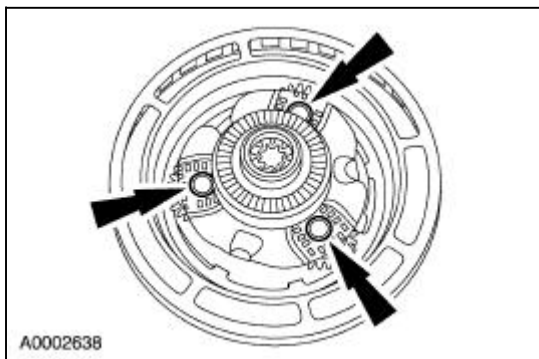
Overdrive Planetary Gears

Disassembly

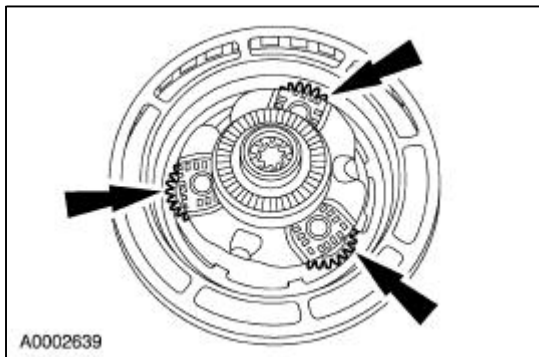
1.  **CAUTION: New planetary gears must be installed. Do not restake the originals.**

NOTE: Individual parts of the planetary carriers are not serviceable.

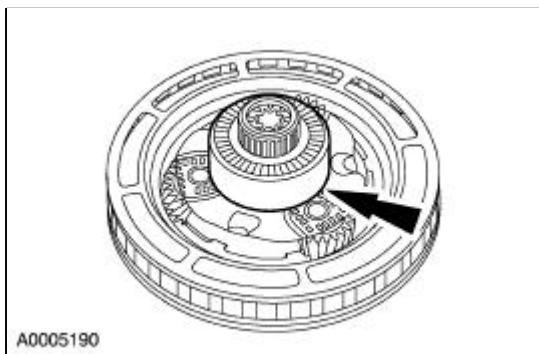
Before installing a planetary assembly, the shaft retaining pins should be checked for adequate staking. Check the pins and shafts in the planetary assemblies for loose fit and/or complete disengagement. Install a new planetary assembly if necessary.



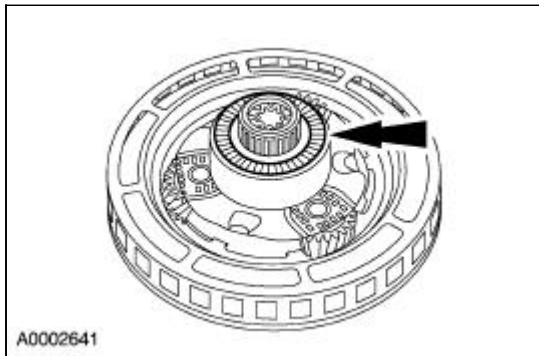
2. Inspect the pinion gears for damaged or excessively worn teeth, and for free rotation.



3. Inspect the overdrive one-way clutch inner race, and the inner and outer races for scored or damaged surface areas where the rollers contact the races.

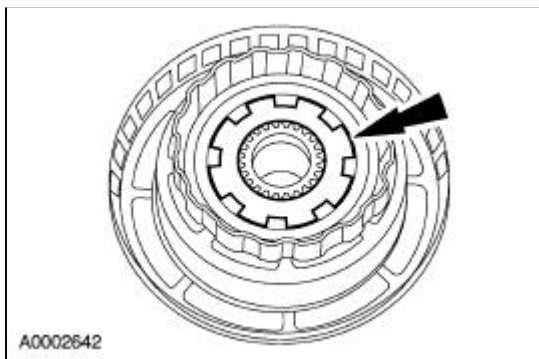


4. Remove and inspect the No. 2 overdrive planetary thrust bearing on the nose of the overdrive planetary gear carrier assembly.

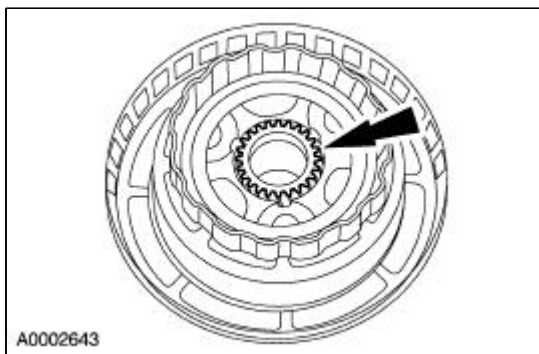



5. **NOTE:** Inspect the sun gear for damaged or worn teeth.

Remove the coast clutch-to-overdrive carrier adapter.

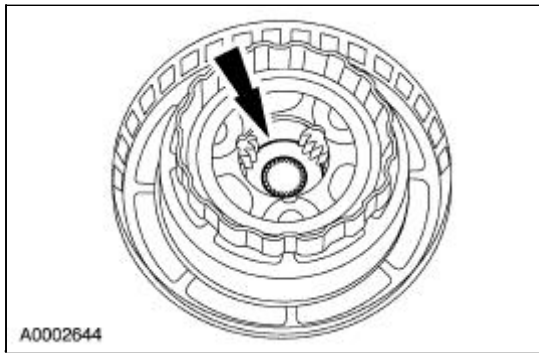


6. Remove the overdrive sun gear.



7.  **CAUTION:** Do not attempt to remove the No. 12 bearing from behind the pinion gears.

Inspect the No. 12 bearing for damage.

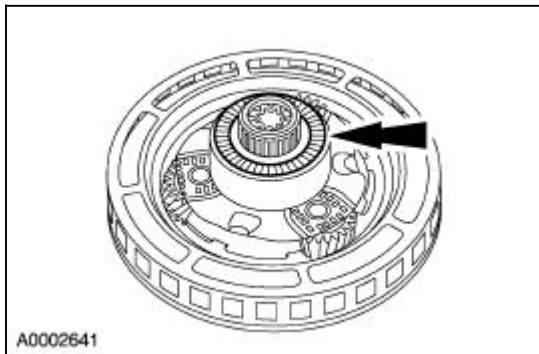


Assembly

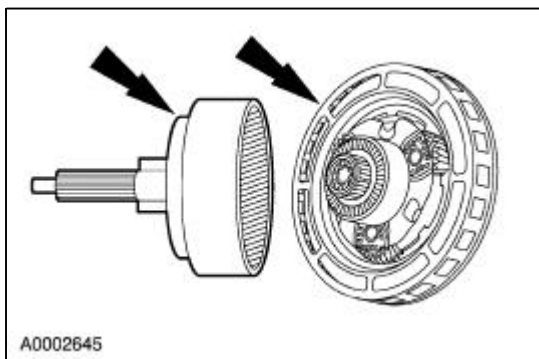
1. **NOTE:** Thoroughly clean all parts and blow dry with moisture-free compressed air.


NOTE: Use petroleum jelly to hold the No. 2 overdrive planetary thrust bearing in place.

Install the No. 2 overdrive planetary thrust bearing.

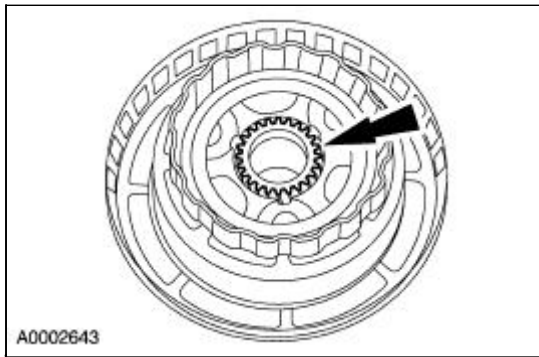


2. Install the overdrive planetary gear carrier into the center shaft and overdrive.



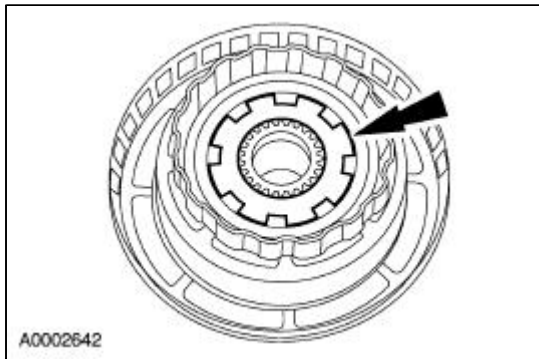
3.  **CAUTION:** Make sure that the No. 12 bearing is in place in the overdrive planetary prior to installing the overdrive sun gear.

Install the front sun gear with the recessed gear teeth facing toward the adapter.



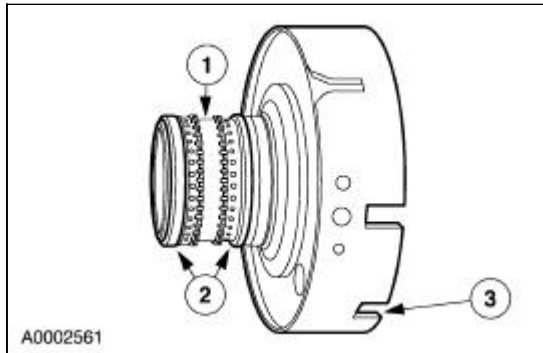
4. **NOTE:** Inspect the sun gear for damaged or worn teeth.

Install the coast clutch-to-overdrive carrier adapter.



Center Support

Disassembly and Assembly

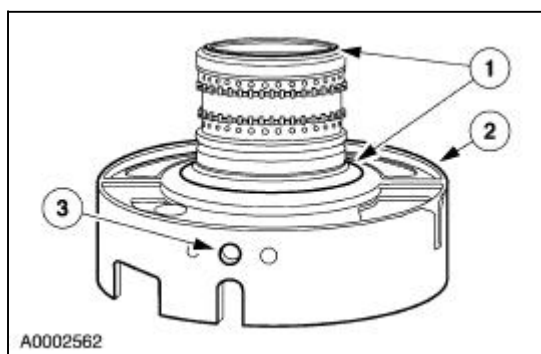


Item	Part Number	Description
1	—	Bearing
2	—	Seal rings
3	7A130	Center support

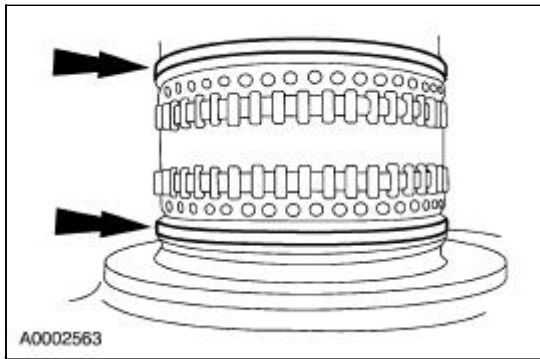
NOTE: Thoroughly clean center support assembly and blow dry with compressed air.

NOTE: The center support is repaired as an assembly. Any damage requires installing a new component.

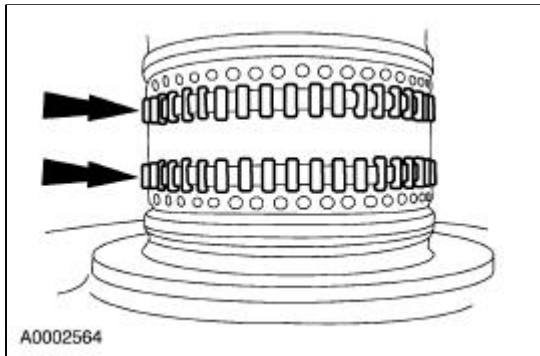
1. Inspect the center support assembly for wear or damage.
 1. Inspect the thrust surfaces for wear, scoring or damage.
 2. Inspect the center support sealing surface.
 3. Inspect the fluid passage for blockage or damage.



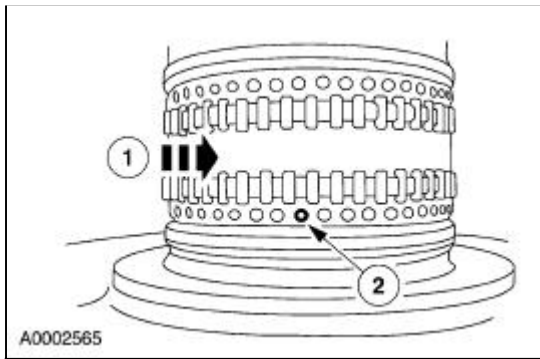
2. Inspect the seal rings for damage.



3. Inspect the bearing for missing rollers or damage.



4. Inspect the direct clutch feed hole for blockage or damage.
 1. Rotate center support bearing to locate the direct clutch feed hole.
 2. Inspect the direct clutch feed hole for blockage or damage.



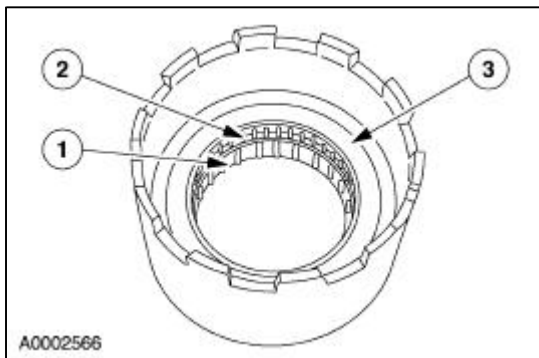
Reverse Brake Drum

Check

1. **NOTE:** The reverse one-way clutch is part of the reverse brake drum assembly. Install a new reverse brake drum as an assembly only.

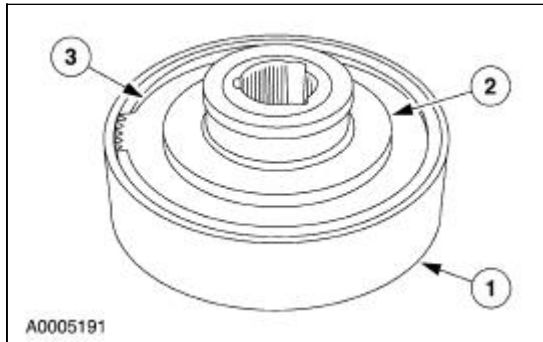
Inspect the reverse brake drum assembly and install a new reverse brake drum assembly if damaged.

1. Inspect the reverse brake drum sprags.
2. Inspect the reverse brake drum rollers.
3. Inspect the reverse brake drum.



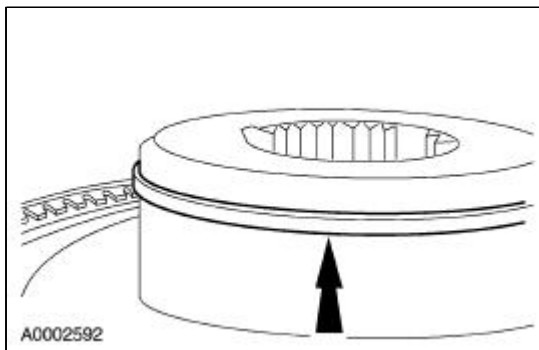
Output Shaft Ring Gear and Hub Shaft Assembly

Disassembly

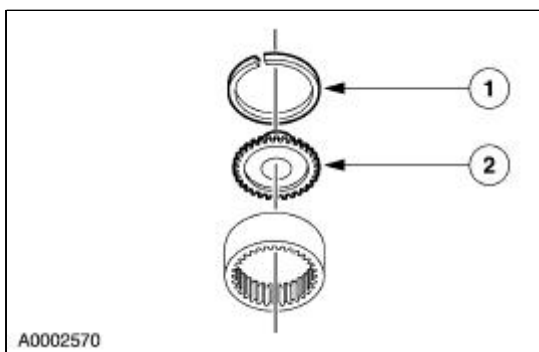


Item	Part Number	Description
1	7A153	Output shaft ring gear
2	7D164	Output shaft hub
3	7C122	Retaining ring

1. Inspect the output shaft ring gear and hub shaft assembly for damage. If repair is necessary use the following procedure.
2. Remove the seal.

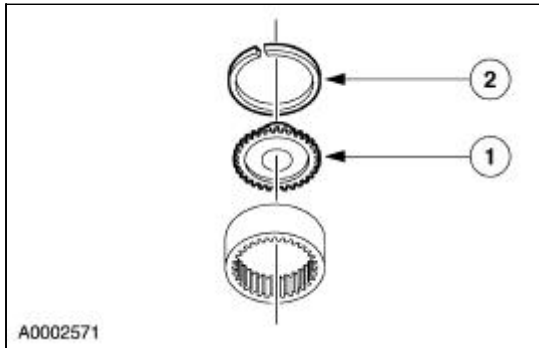


3. Remove the output shaft ring gear from the output shaft hub.
 1. Remove the retaining ring.
 2. Remove the output shaft ring gear.

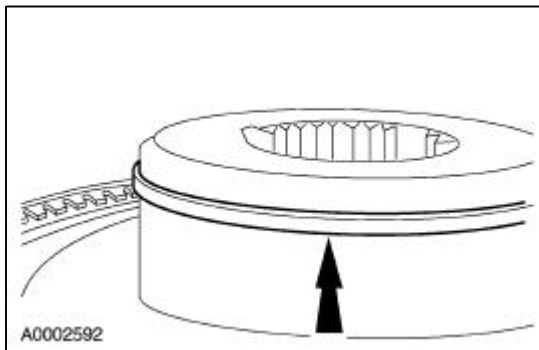


Assembly

1. Install the output shaft ring gear onto the output shaft hub.
 1. Install the output shaft ring gear.
 2. Install the retaining ring.



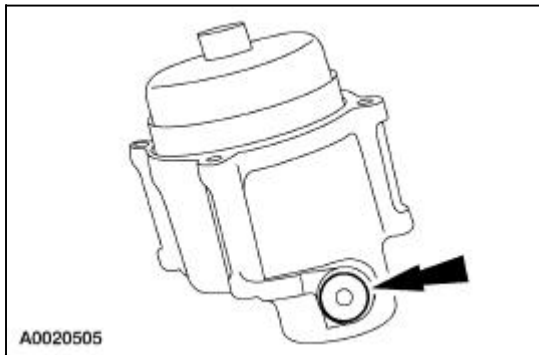
2. Install the seal.



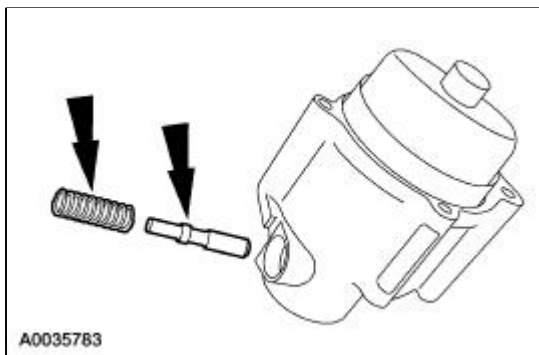
Reverse Servo Assembly


Disassembly

1. Remove the control valve spring retainer.



2. Remove the reverse servo spring and check valve.

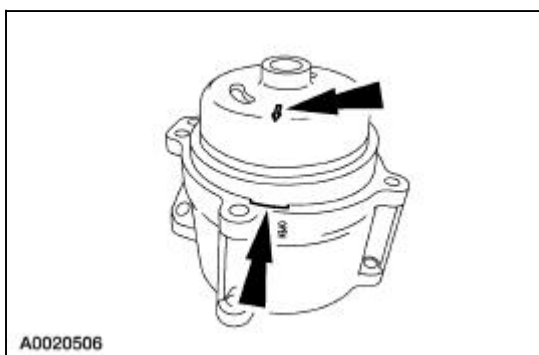


3.  **WARNING:** The upper and lower servo covers are under spring tension. Use care when separating the two halves. Failure to follow these instructions may result in personal injury.

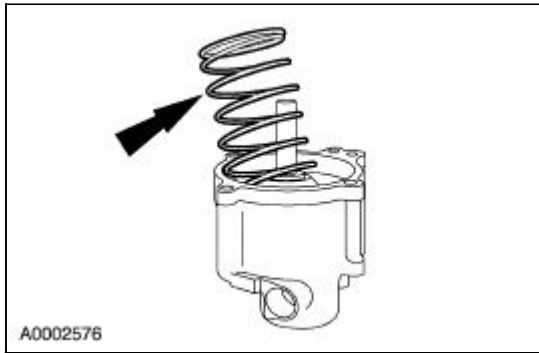
NOTE: Tabs on servo plate mate with slots on cover every 120 degrees.

Remove the reverse servo plate by turning in either direction to release.

- Align arrow on servo plate with any slot on cover.

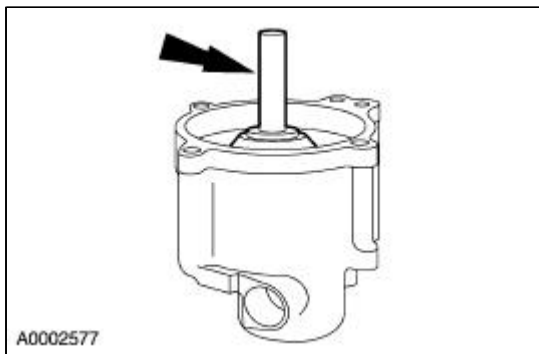


4. Remove the reverse servo spring.

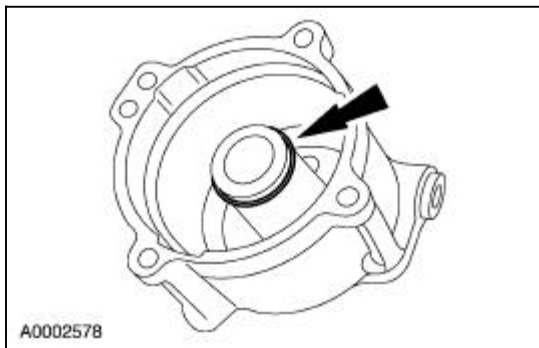


5. Remove the reverse servo piston and seal assembly.

- Inspect the seal for damage, install new reverse servo piston if necessary.



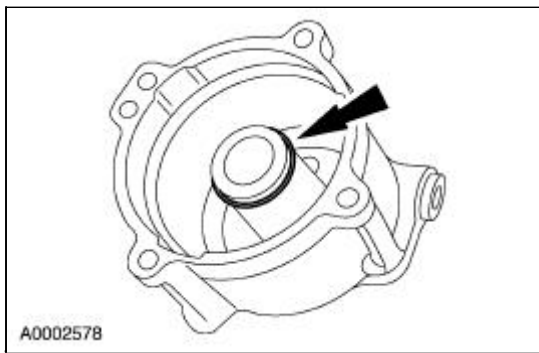
6. Remove and discard the reverse servo piston seal.



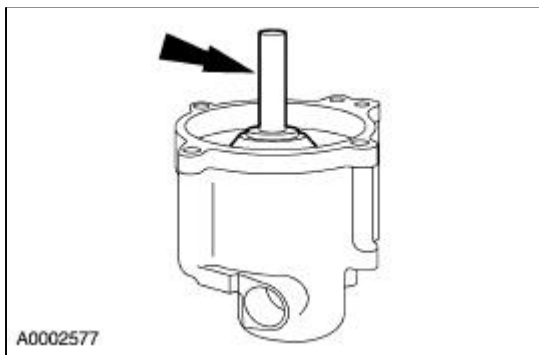
Assembly

1. **NOTE:** Try not to roll the seal onto the housing when installing the seal or damage to the seal could occur.

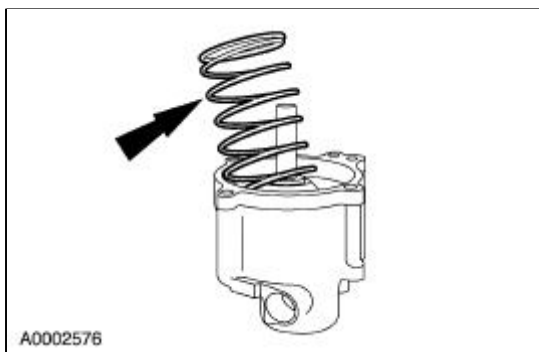
Lubricate and install a new reverse servo piston seal.



2. Lubricate and install reverse servo piston and seal assembly.

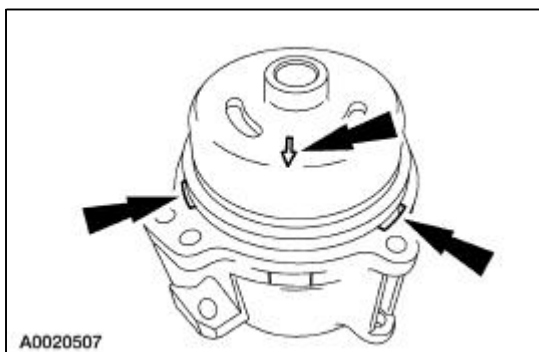


3. Install the reverse servo spring.

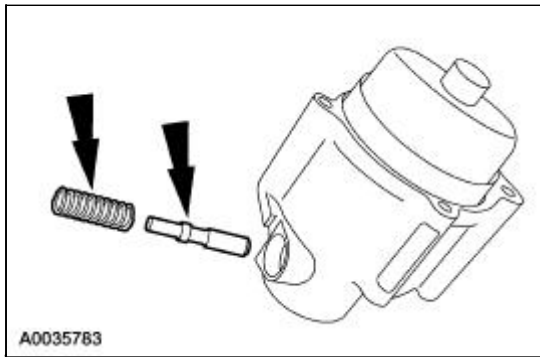


4.  **CAUTION:** The arrow on the servo plate must be aligned evenly between any two slots on the cover.

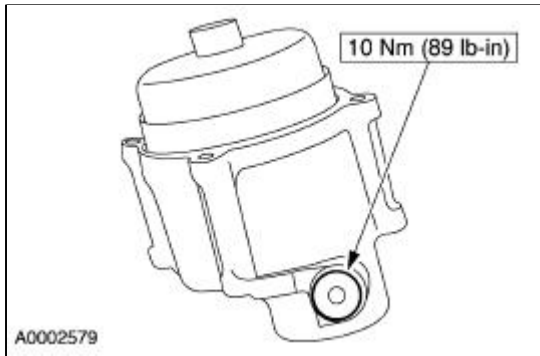
Install the reverse servo plate.



5. Install the reverse servo spring and check valve.




6. Install the control valve spring retainer.




Torque Converter

1. A new torque converter must be installed if one or more of the following statements are true:
 - A torque converter failure has been determined based on complete diagnostic procedures.
 - Converter stud(s), impeller hub or bushing are damaged.
 - Discoloration of the torque converter (due to overheating).
 - The torque converter is found to be out of specification when carrying out one of the following torque converter checks:
 - One-Way Clutch Check
 - End Play Check
 - Stator to Turbine Interference Check
 - Stator to Impeller Interference Check
 - Torque Converter Leak Check
 - Evidence of transmission assembly or fluid contamination due to the following transmission or converter failure modes:
 - major metallic failure
 - multiple clutches or clutch plate failures
 - sufficient component wear which results in metallic contamination
-

Torque Converter Cleaning And Inspection

1. If a new torque converter is being installed, continue with Substep 2 of Step 2.
2.  **CAUTION: The torque converter drain plug and seal are not reusable. Discard the drain plug and seal, install a new drain plug assembly.**

If a new torque converter is not being installed, the following procedures must be carried out:

1. The torque converter must be thoroughly cleaned.
 - Torque converter with drain plugs can be cleaned by using a suitable torque converter/fluid cooler cleaner.
 -  **CAUTION: Do not use water based cleaners or transmission damage will occur.**

A torque converter without drain plugs can be cleaned by hand. Partially fill the torque converter using only recommended transmission fluid for the applicable transmission. Hand-agitate the torque converter and then thoroughly drain the fluid. Fill the torque converter with new fluid specified for the transmission, and install.


2. All in-tank and auxiliary coolers must be thoroughly cleaned by forward and backward flushing. For additional information, refer to [Transmission Fluid Cooler — Backflushing and Cleaning](#) in this section.
 3. All cooler tubes must be thoroughly cleaned by backward and forward flushing. For additional information, refer to [Transmission Fluid Cooler — Backflushing and Cleaning](#) in this section.
 4. All cooler bypass valves (CBV), if equipped, must be thoroughly cleaned.
 5. Carry out the Transmission Fluid Cooler Flow Test. For additional information, refer to [Section 307-02](#).
 6. If the transmission cooling system fails the Transmission Fluid Cooler Flow Test, install new components as necessary. For additional information, refer to [Section 307-02](#).
 7. If new coolers are to be installed, use only factory-approved repair parts. For additional information, refer to [Section 303-03](#).
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Torque Converter Flushing

Material

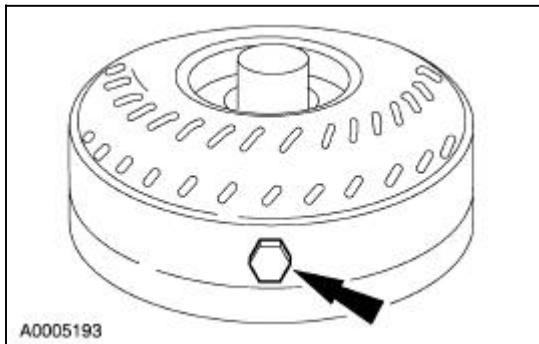
Item	Specification
MERCON® V Automatic Transmission Fluid XT-5-QM, XT-5-DM	MERCON® V

1.  **CAUTION:** The torque converter drain plug and seal are not reusable. Discard the drain plug and seal, install a new drain plug and seal assembly.

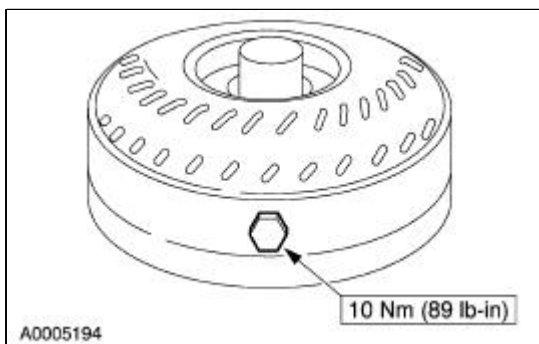
 **CAUTION:** Mineral spirits used to clean the torque converter must be fresh, non-water based, non-chlorinated and non-halogenated.

Using a suitable torque converter/fluid cooler cleaner, flush the torque converter.

2. After flushing, remove the drain plug and drain the remainder of the solvent.

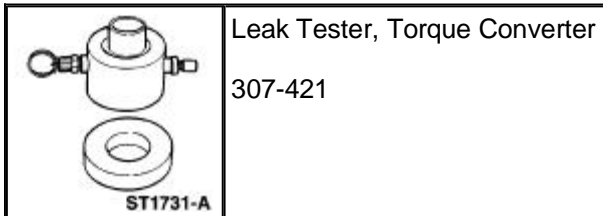


3. Add 1.9 liter (2 qt.) of clean automatic transmission fluid into the converter fluid filler tube and agitate by hand.
4. Thoroughly drain the solution.
5. Install a new torque converter drain plug.

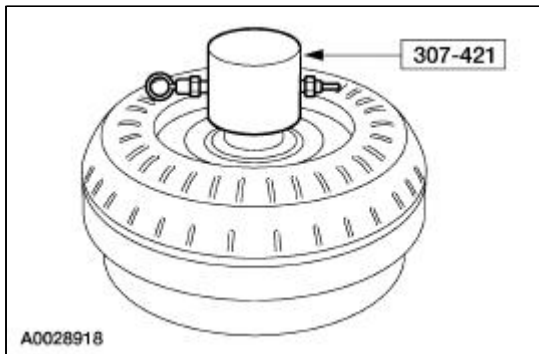


Torque Converter Leak Check

Special Tool(s)

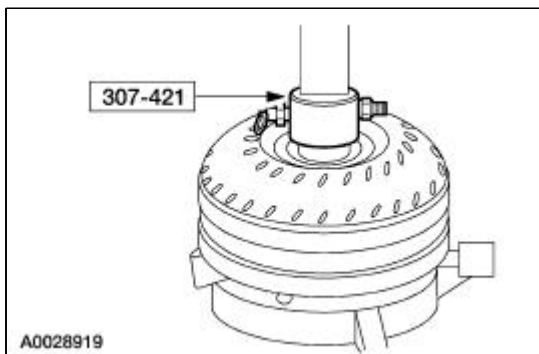


1. Clean the outside surface of the torque converter.
2. Install the special tools into converter hub.



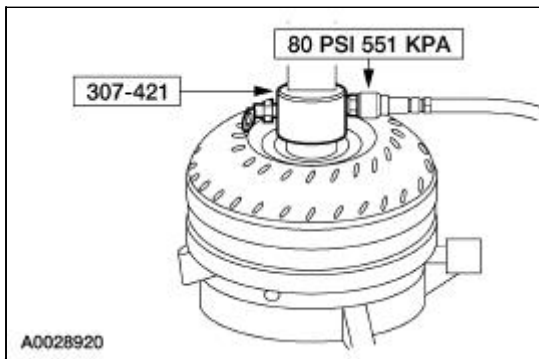
3.  **WARNING:** Always follow correct safety procedures while using the press. Failure to follow these instructions may result in personal injury.

Install the torque converter with the special tool installed into the arbor press.
Secure the press. Apply enough force from the press to seal the tool into the torque converter.

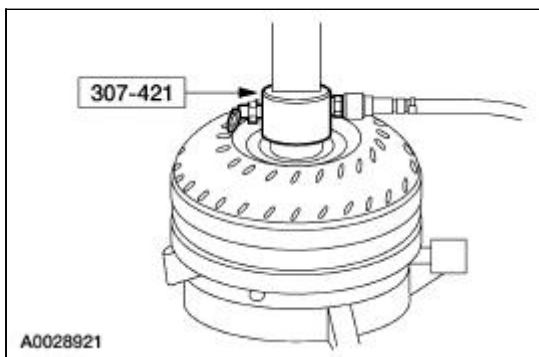


4. **NOTE:** Use clean, dry shop air.

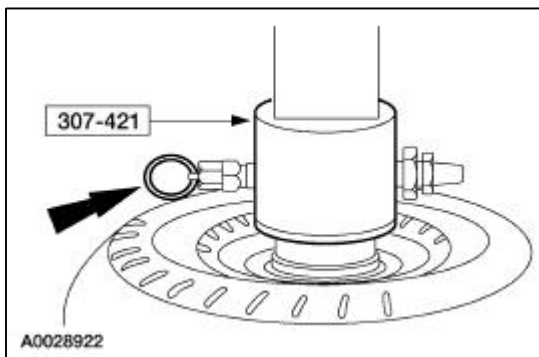
Apply air pressure to valve on the special tool.



5. With air pressure applied to the valve, inspect for leaks at the converter hub, the seams, drain plug, and the studs. A soap bubble solution can be applied around those areas to aid in the diagnosis. If a leak is found around the drain plug install a new drain plug and recheck the torque converter. If any other leaks are present, install a new or remanufactured converter.

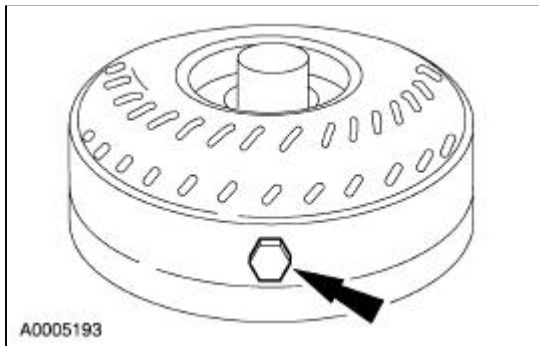


6. Remove the air hose. Release the pressure, and then slowly release the press. Remove the converter. Remove the tool.

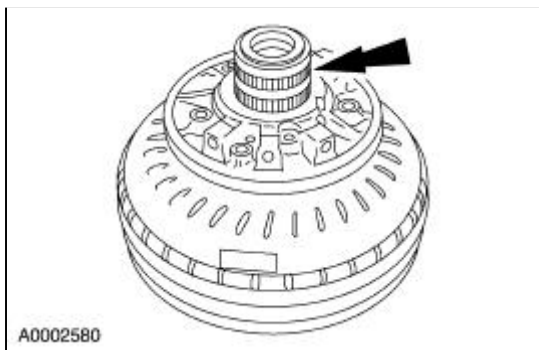


Torque Converter Impeller to Pump Stator Interference Check

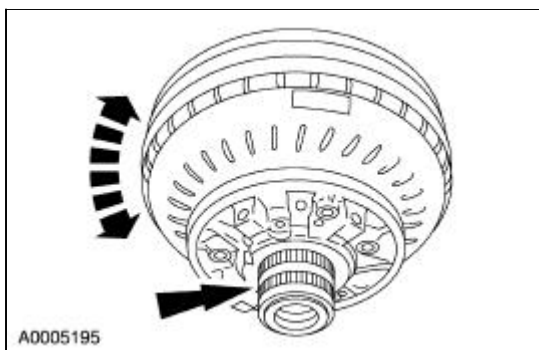
1. Remove the drain plug and drain the fluid from the torque converter.



2. Install fluid pump support into torque converter. Engage splines of the one-way clutch inner race with the mating splines of the overdrive pump support.





3. While holding the fluid pump support stationary, rotate the torque converter clockwise and counterclockwise. The torque converter should rotate freely with no signs of scraping. If there are signs of scraping, install a new or remanufactured torque converter.

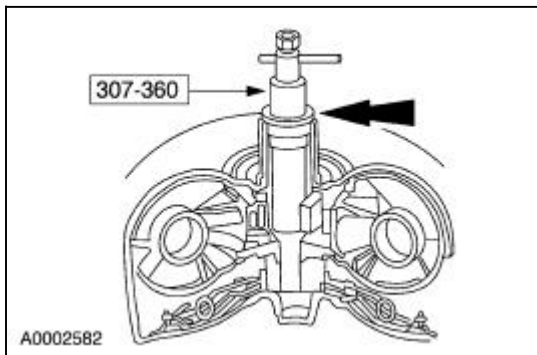


End Play Check

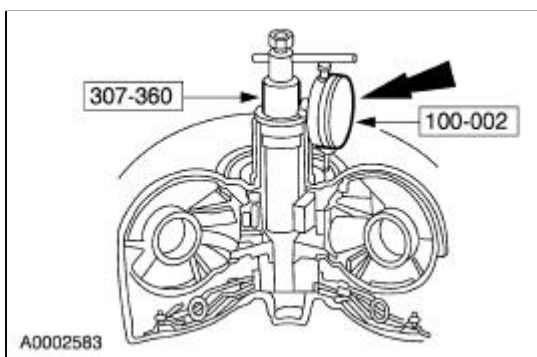
Special Tool(s)

 ST1214-A	Dial Indicator with Holding Fixture 100-002 (TOOL-4201-C) or equivalent
 ST2128-A	End Play Gauge, Torque Converter 307-360

1. Install the special tool into the torque converter until it bottoms out.
 - Tighten the inner post until the tool is securely locked.



2. Install the special tool on the converter impeller housing and zero the dial.

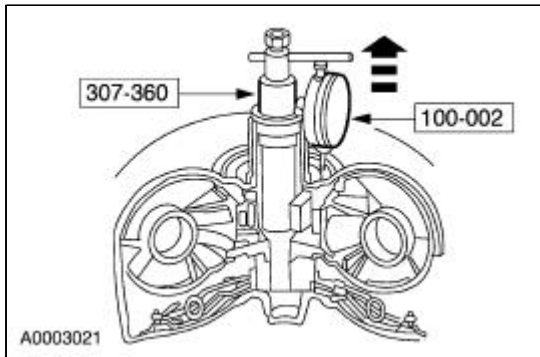


3. Lift up on the special tool and note the dial indicator reading. If the reading exceeds end play limits, install new or rebuilt torque converter.

Torque Converter End Play

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New or Rebuilt Torque Converter	Used Torque Converter
0.44 mm (0.017 in)	Max. 0.80 mm (0.031 in)

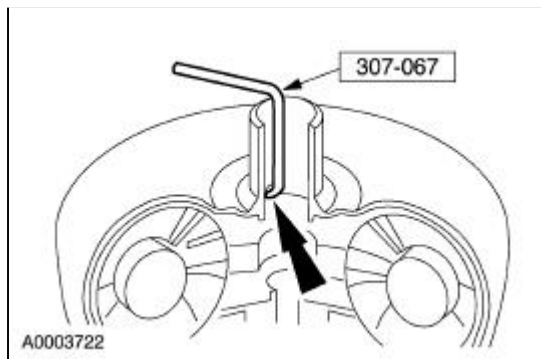


Torque Converter One-Way Clutch Check

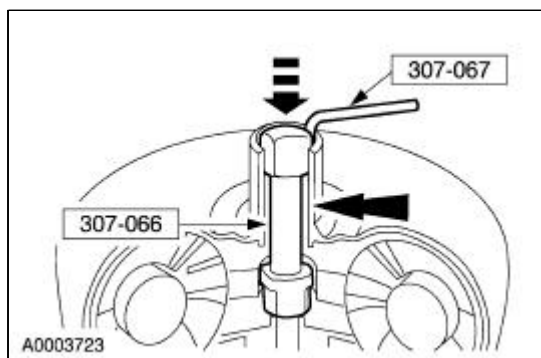
Special Tool(s)

A long, thin metal tool with a hook-shaped end. ST1195-A	Holding Tool, Torque Converter Clutch 307-067 (T77L-7902-R)
A metal adapter with a square end and a cylindrical end. ST2383-A	Torque Adapter, Torque Converter Clutch 307-066 (T77L-7902-B)

1. Insert the special tool in one of the grooves in the stator bearing retainer.

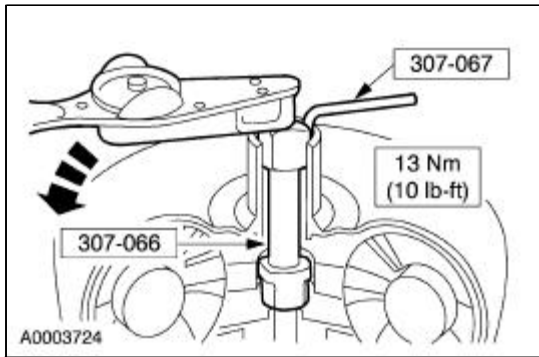


2. Install the special tools in the converter one-way clutch inner race spline.



3. Use the special tool to hold the stator bearing retainer while using the special tool to turn the converter one-way clutch inner race spline.
 - The torque converter one-way clutch should lock up and hold torque in the counter clockwise direction.
 - The torque converter one-way clutch should rotate freely in the clockwise direction.

- Try the clutch for lockup and hold in at least five positions.
- If the converter fails the lockup test torque, install a new or rebuilt torque converter.

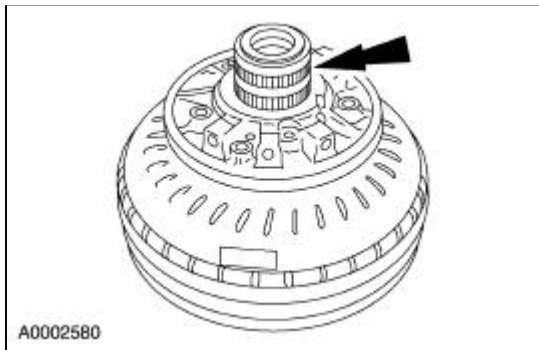


Torque Converter Turbine to Pump Stator Interference Check

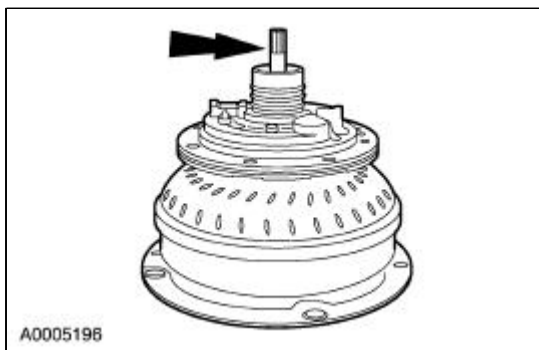
1. **NOTE:** The pump support may remain in the pump assembly during this test.

Position the torque converter with the pump drive up.

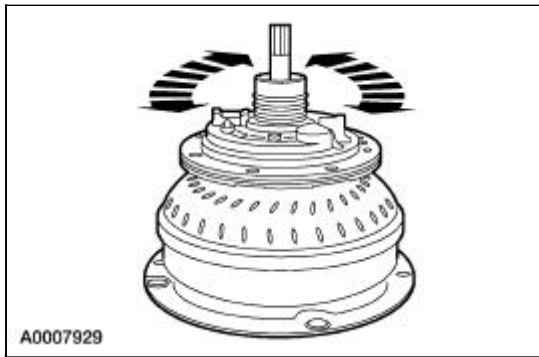
2. Install the pump support into the torque converter. Engage the splines of the one-way clutch inner race with the mating splines of the front pump support.



3. Install the input shaft engaging the splines with the turbine hub.










4. Check for stator to turbine interference.
 1. Hold the front pump support stationary.
 2. Attempt to rotate the input shaft.
 - The turbine and damper assemblies should rotate in both directions not exceeding maximum torque of 7 Nm (62 lb-in) without any signs of metallic interference or scraping noise.



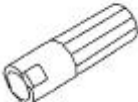







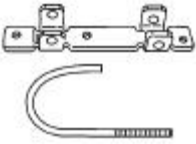

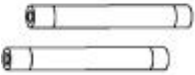

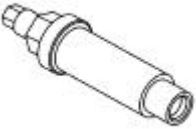



5. If interference exists, the stator front thrust washer may be worn, allowing the stator to hit the turbine. In such cases, a new or remanufactured torque converter must be installed.
 - The converter crankshaft pilot should be checked for nicks or damaged surfaces that could cause interference when installing the torque converter into the crankshaft. Check the converter front impeller hub for nicks or sharp edges that would damage the pump seal.
-


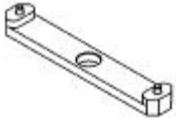
Transmission

Special Tool(s)

 <p>ST1792-A</p>	<p>Adjustment Set, Transmission Band 307-S022 (T71P-77370-A)</p>
 <p>ST1200-A</p>	<p>Remover, Bearing Cup 308-047 (T77F-1102-A)</p>
 <p>ST1635-A</p>	<p>Installer, Output Shaft Bearing 307-348 (T97T-77110-A)</p>
 <p>ST1186-A</p>	<p>Holding Fixture, Transmission 307-003 (T57L-500-B)</p>
 <p>ST1274-A</p>	<p>Depth Micrometer 303-D026 (D80P-4201-A)</p>
 <p>ST1214-A</p>	<p>Dial Indicator Gauge with Holding Fixture 100-002 (TOOL-4201-C) or equivalent</p>
 <p>ST1633-A</p>	<p>Alignment Gauge, TR Sensor 307-351 (T97L-70010-A)</p>
	<p>Adapter for 303-224 (Handle) 205-153 (T80T-4000-W)</p>

 <p>ST1255-A</p>	
 <p>ST1791-A</p>	<p>Installer, Transmission Extension Housing Fluid Seal 307-038 (T74P-77052-A)</p>
 <p>ST1826-A</p>	<p>Sizer, Piston Seal 307-338 (T95L-70010-G)</p>
 <p>ST1817-A</p>	<p>Alignment Set, Fluid Pump 307-S039 (T74P-77103-X)</p>
 <p>ST2532-A</p>	<p>Alignment Gauge Transmission Fluid Pump 307-431</p>
 <p>ST2533-A</p>	<p>Alignment Gauge Transmission Fluid Pump 307-432</p>
 <p>ST2432-A</p>	<p>Gauge Bar 307-400</p>
 <p>ST1185-A</p>	<p>Slide Hammer 100-001 (T50T-100-A)</p>
	<p>Compressor, Servo Cover 307-402</p>

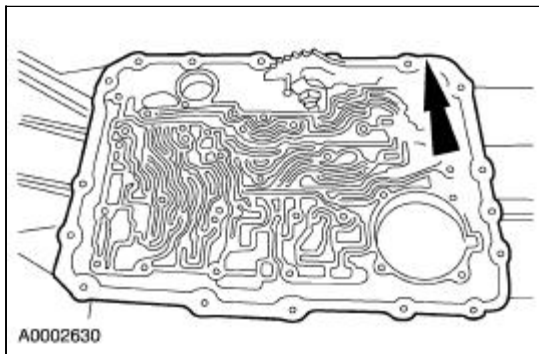
 <p>ST2393-A</p>	
 <p>ST1199-A</p>	<p>Installer, Shift Shaft Fluid Seal 307-050 (T74P-77498-A)</p>
 <p>ST1631-A</p>	<p>Handles, Torque Converter 307-091 (T81P-7902-C)</p>
 <p>ST1639-A</p>	<p>Aligner, Valve Body 307-334 (T95L-70010-C) (2 req'd)</p>
 <p>ST2440-A</p>	<p>Installer, Drive Pinion Flange 205-479</p>
 <p>ST2416-A</p>	<p>Installer, Output Shaft Flange 307-404</p>
 <p>ST2433-A</p>	<p>Alignment Pins, Transmission Fluid Pump 307-399</p>
 <p>ST2424-A</p>	<p>Compressor, Cushion Spring 307-401</p>
	<p>Retaining Ring Pliers 307-343 (T95P-77001-AHR)</p>

 <p>ST1104-B</p>	
 <p>ST2426-A</p>	<p>Aligner, Flex Plate 307-403</p>

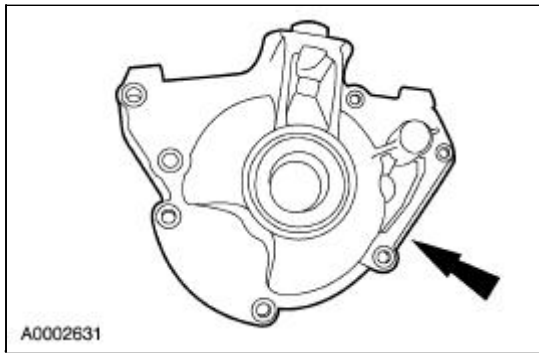
Material

Item	Specification
<p>MERCON® V Automatic Transmission Fluid XT-5-QM</p>	<p>MERCON® V</p>
<p>Multi-Purpose Grease DOAZ-19584-AA</p>	<p>ESB-M1C93- B</p>

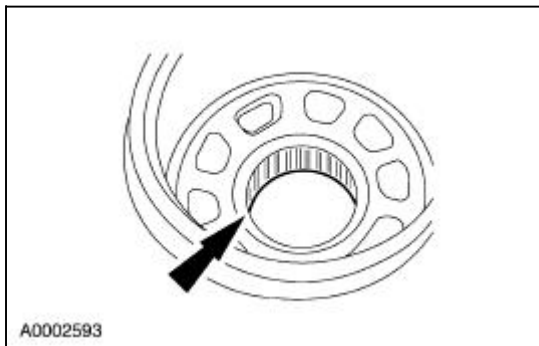
1. Thoroughly clean the transmission case and extension housing in solvent and blow dry with compressed air.
2. Inspect the transmission case for the following:
 - stripped bolt hole threads
 - gasket and mating surfaces for burrs or nicks
 - obstructed vent and fluid passages
 - cracks or warpage



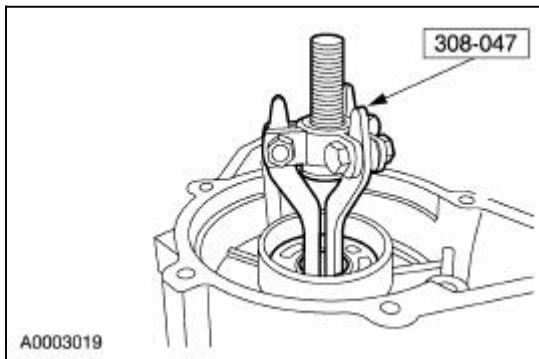
3. Inspect the extension housing for cracks, burrs or warpage.



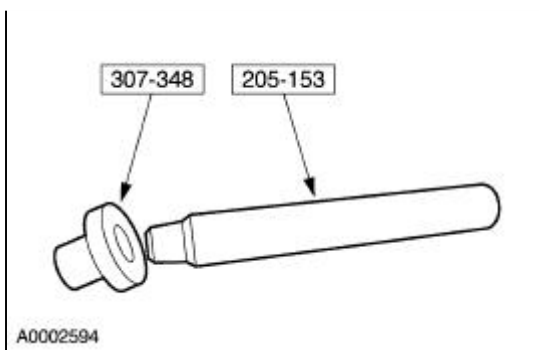
4. Inspect case bearing for damage. Install a new component as necessary. Follow Steps 5-8 if replacing the case bearing. If not replacing the case bearing, proceed to Step 9.



5. Using the special tool, remove the case bearing.
 - Use an oil stone to remove any nicks or burrs in the bearing case bore.

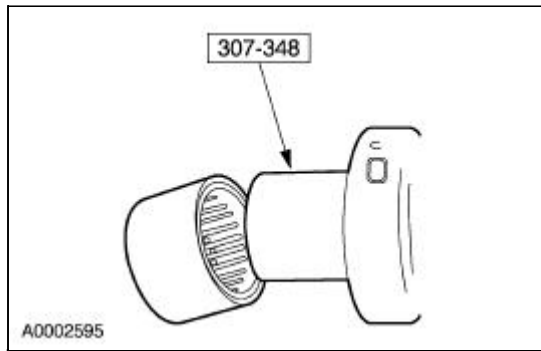


6. Assemble the special tools.

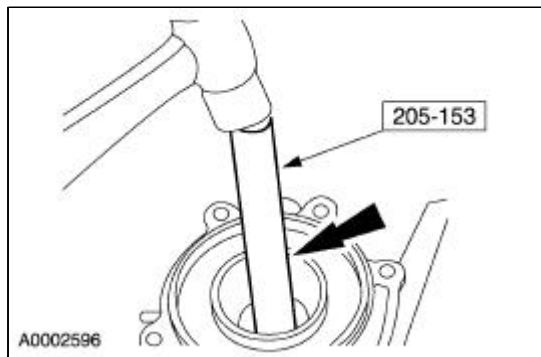


7.  **CAUTION:** Make sure bearing seal ring is facing the drive handle.

Install the bearing on the special tools.

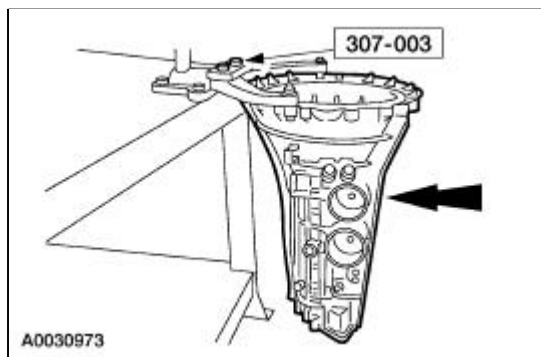


8. Using the special tool, tap case bearing into case bearing bore.

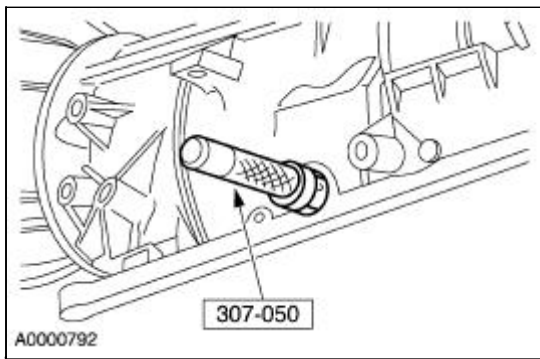


9.  **WARNING: Make sure the lock pin on bench-mounted holding fixture is secure. Failure to follow these instructions can result in personal injury.**

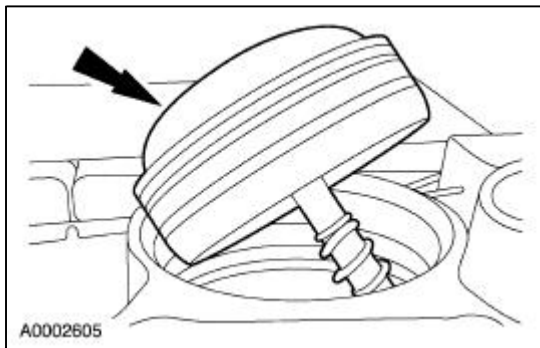
Using the special tool, install the transmission into the bench with the converter housing facing up.



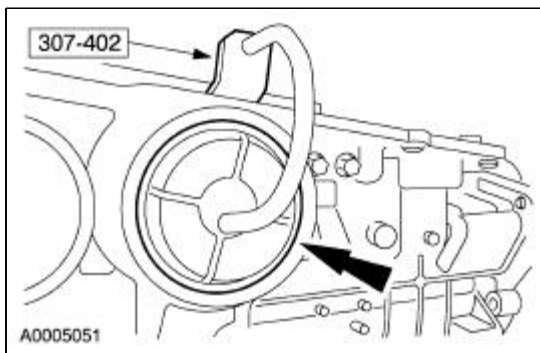
10. Using the special tool, install the manual control lever shaft seal and lubricate it with petroleum jelly.



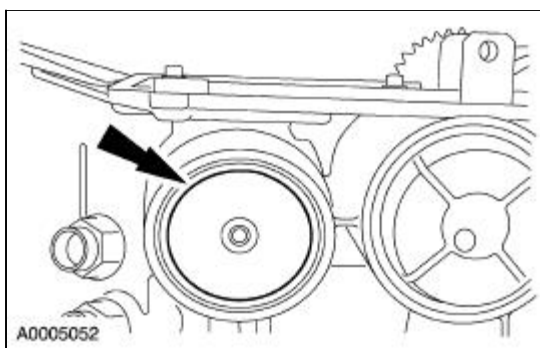
11. Install the intermediate servo piston and spring.
 - Lubricate the servo bore with clean automatic transmission fluid.



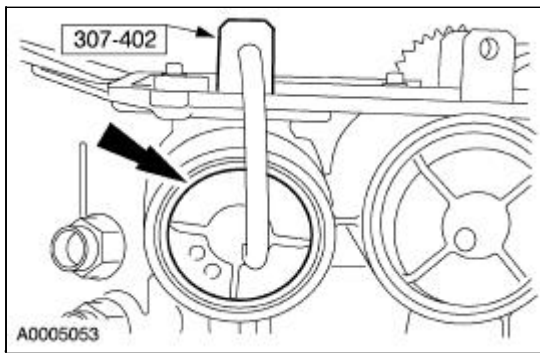
12. Using the special tool, install the retaining ring.



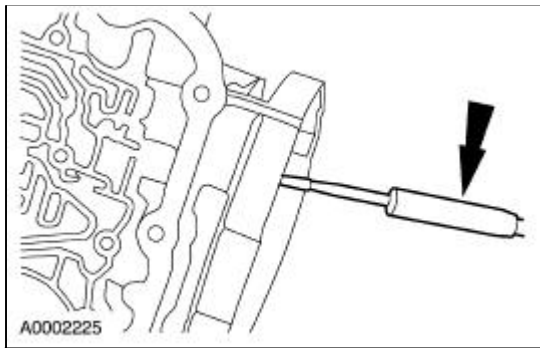
13. Install the overdrive band servo piston and spring.
 - Lubricate the servo bore with clean automatic transmission fluid.



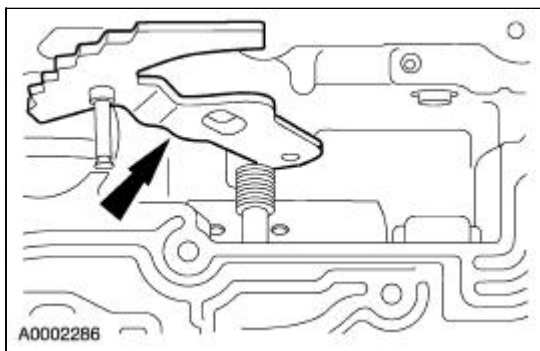
14. Using the special tools, install the retaining ring.



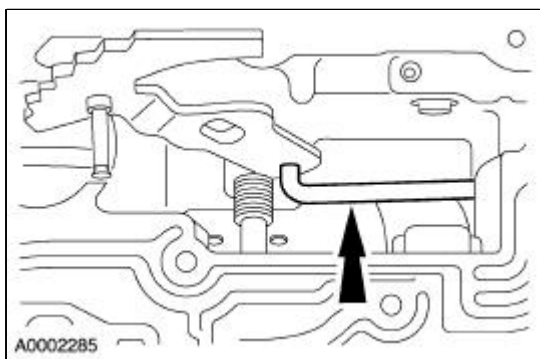
15. Install the parking lever rod.




16. Install the manual control lever.

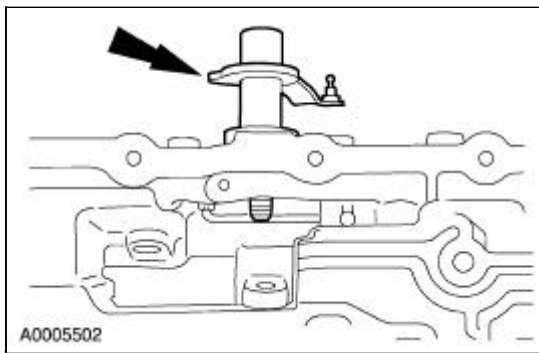


17. Assemble the manual valve inner lever and parking lever actuating rod as shown.

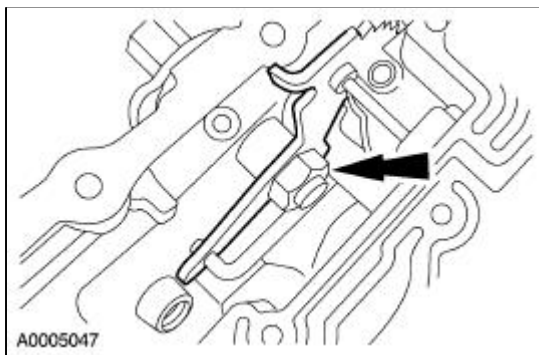


18.  **CAUTION:** Align the flats on the manual valve inner lever with the flats on the manual control lever shaft.

Install the manual control lever shaft.



19. Install the manual valve inner lever onto the manual shaft and loosely install the nut.

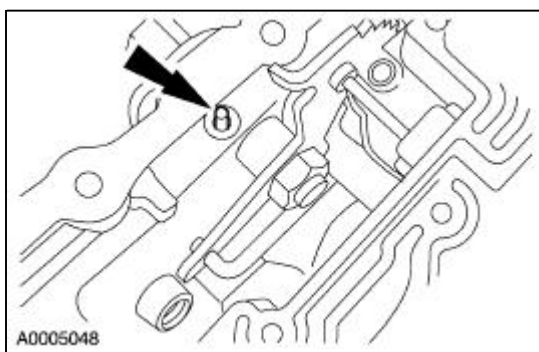


20.  **CAUTION:** Use care not to damage the fluid pan rail surface when installing the retaining pin.

NOTE: Align the manual control lever shaft alignment groove with the manual control lever shaft spring pin bore in the transmission case.

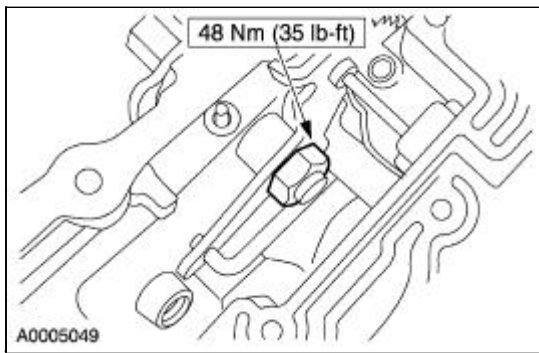
Install the manual control lever shaft spring pin.


- Tap the manual control lever shaft spring pin into the transmission case.



21.  **CAUTION:** To avoid damage, do not allow the wrench to strike the manual valve inner lever pin.

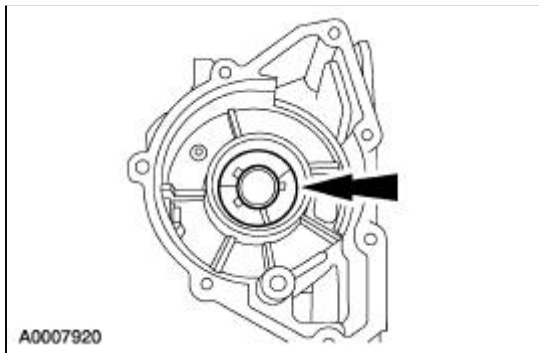
Tighten the nut.



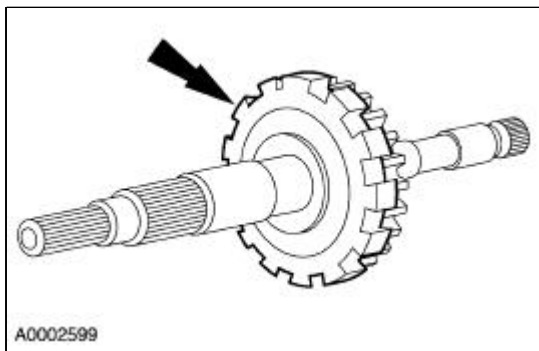
22.  **CAUTION:** The tabs on the output shaft thrust washer (No. 11) point into the case. Make sure the thrust washer is correctly seated.

Install the output shaft thrust washer (No. 11).

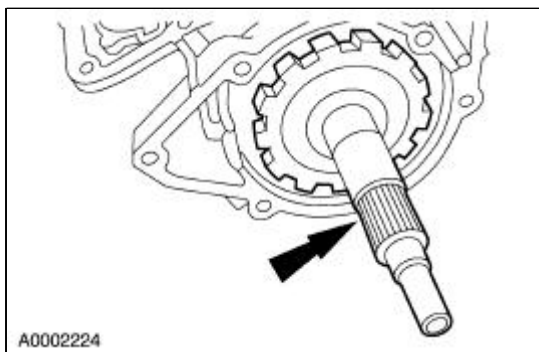
- Coat the output shaft thrust washer with petroleum jelly.



23. Install the park gear on the output shaft.

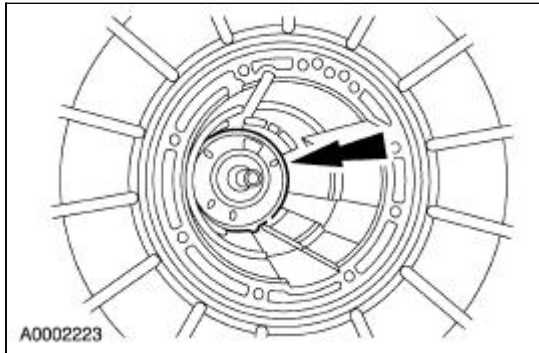


24. Install the output shaft and park gear.



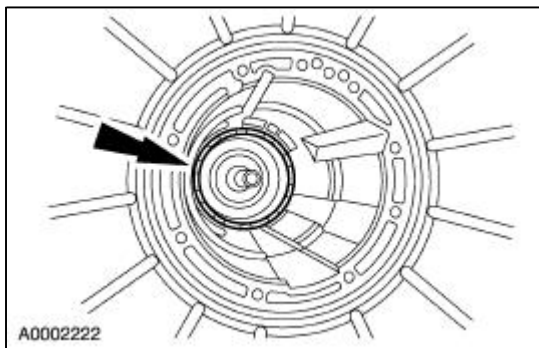
25.  **CAUTION:** Make sure band is resting on the two anchor pins in the case.

Install the low/reverse band.



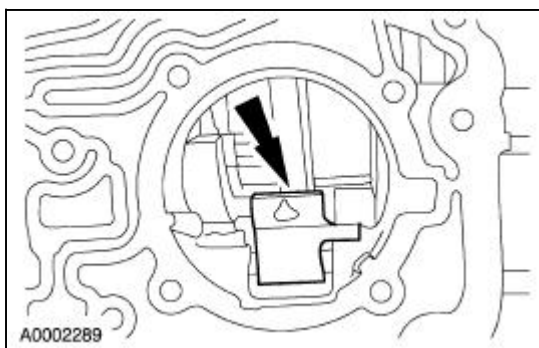
26. Install the low/reverse brake drum.

- Rotate the low/reverse brake drum clockwise to install.

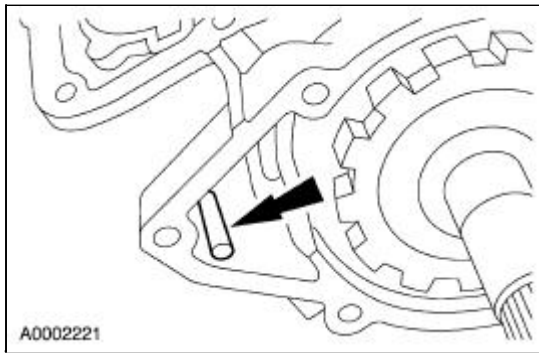


27. **NOTE:** The reverse band actuating lever must fit into the notches in the band.

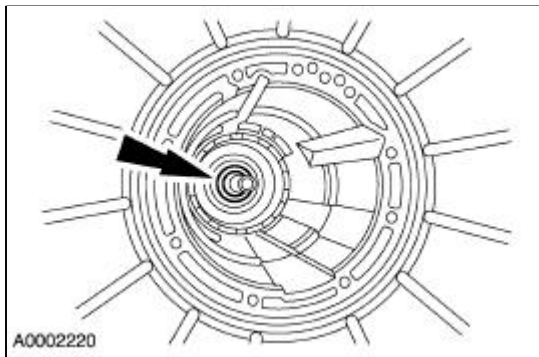
Install the reverse band actuating lever into the reverse band.



28. Install the reverse band actuating lever shaft into the case and into the reverse band actuating lever.

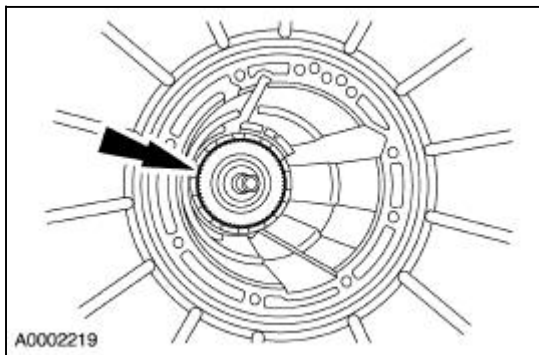


29. Install the No.10 needle bearing into the case.



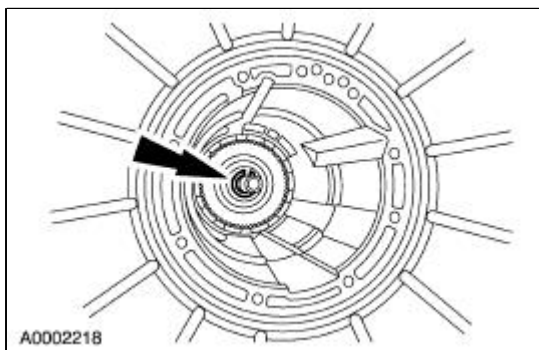
30.  **CAUTION: Do not damage the seal against the case during assembly.**

Install the output shaft ring gear, hub and seal.



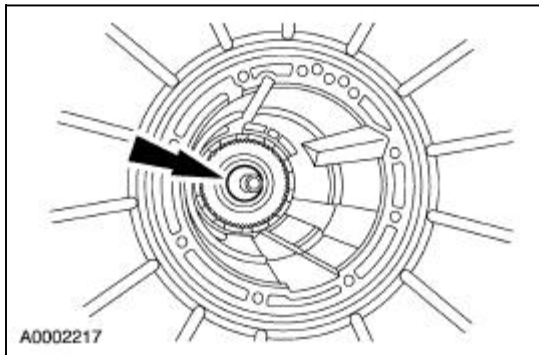
31.  **CAUTION: Always install a new output shaft retaining ring.**

Install a new output shaft retaining ring.

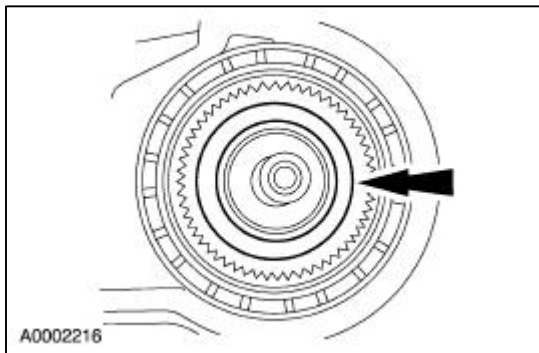


32. **NOTE:** Install the output shaft sleeve with the cone facing up. This sleeve will snap into place when correctly installed.

Install the output shaft sleeve.

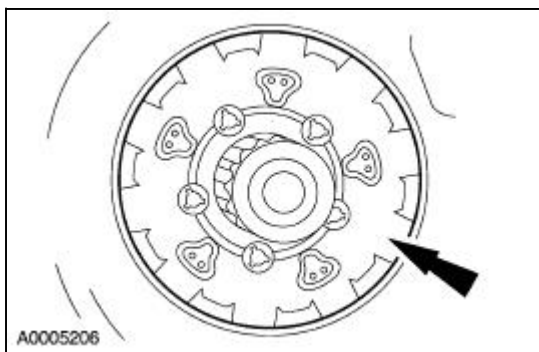


33. Install low/reverse planetary carrier needle bearing (No. 9) onto the output shaft ring gear and hub assembly.



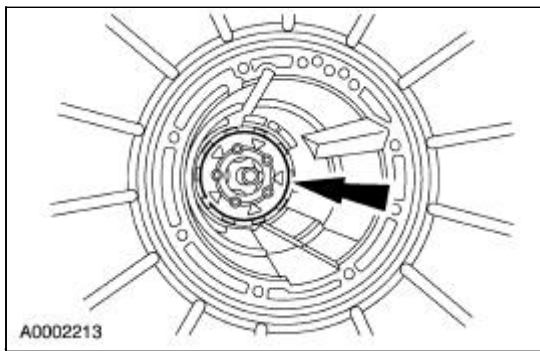
34.  **CAUTION:** Make sure the needle bearings stay in place.

Install the low/reverse planetary assembly.

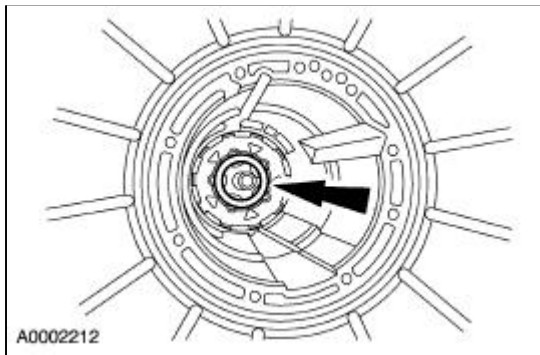


35.  **CAUTION:** The low/reverse brake drum must be pulled forward to install the low/reverse planet retaining ring.

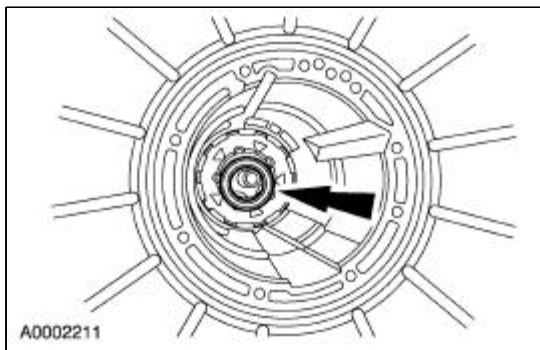
Install the retaining ring.




36. Install the No. 8 thrust bearing.

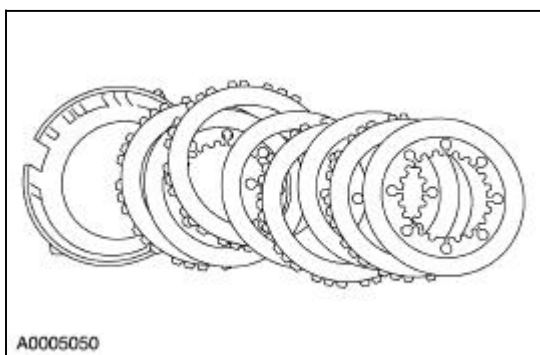


37. Install the low and reverse gear spacer.



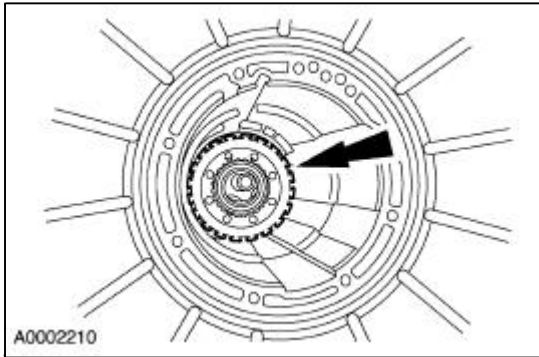
38.  **CAUTION:** If new clutch plates are being used, they should be soaked in clean automatic transmission fluid 30 minutes prior to installation. The friction side of the plates must face down toward cylinder.

Install the new clutch plates in an alternating order, starting with an internally splined clutch plate into the clutch cylinder.

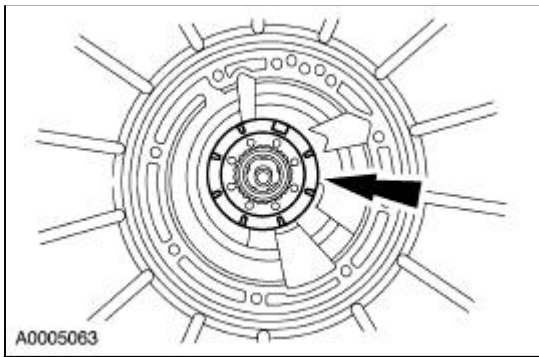


39. Install the clutch plate retaining ring.

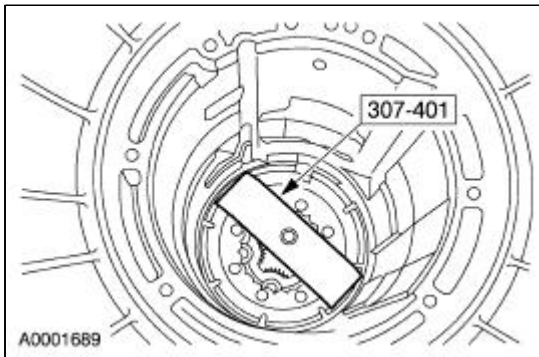
40. Install the intermediate clutch assembly.



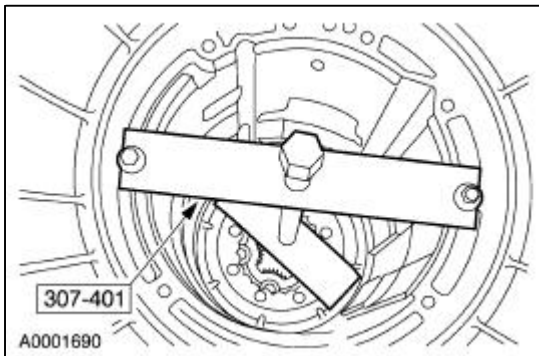
41. Install the intermediate clutch housing and piston assembly.



42. Install the special tools.

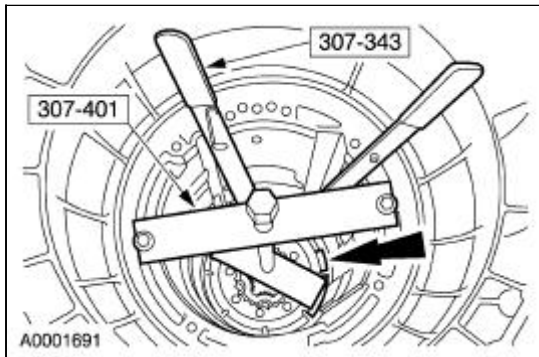


43. Install the special tools.



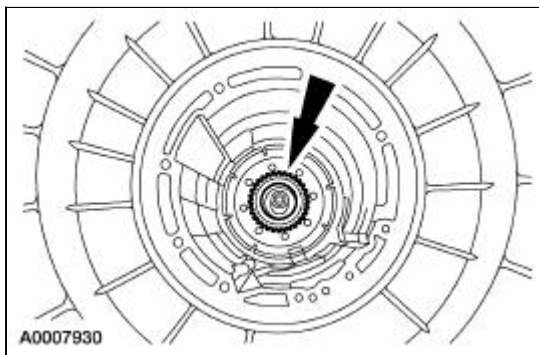
44.  **CAUTION:** Do not use the original intermediate clutch retaining ring that was removed during disassembly.

Using the special tools, install a new service intermediate clutch retaining ring.

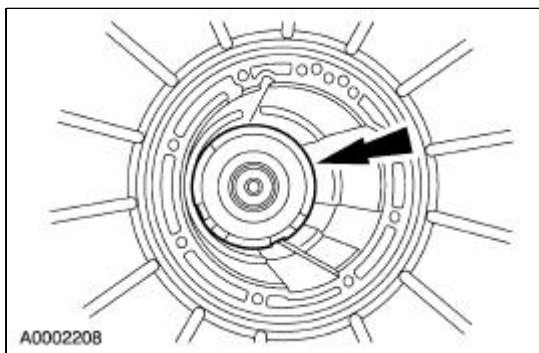


45. **NOTE:** The recess portion of the sprag must face down during installation.

Install the sprag and race assembly.

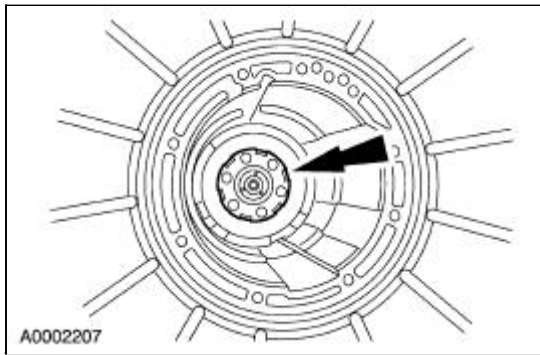


46. Install the input shell and sun gear assembly.

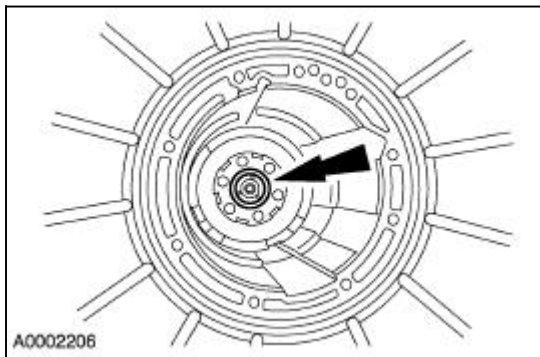


47. **NOTE:** The No. 13 bearing must be properly seated in the forward planet assembly so the sun gear can be installed correctly.

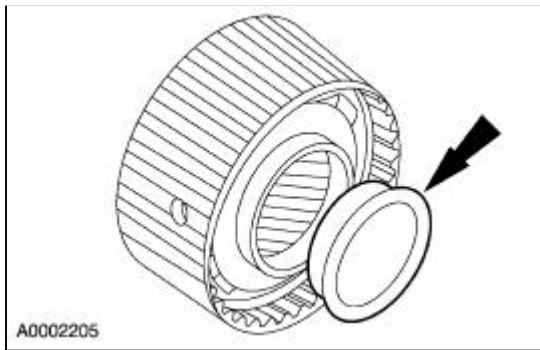
Install the forward planetary assembly.



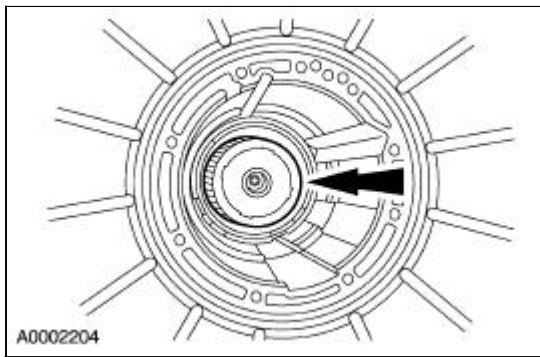
48. Install the No. 7 forward planet thrust bearing into the forward ring gear and hub assembly. Use petroleum jelly to hold the bearing in place.



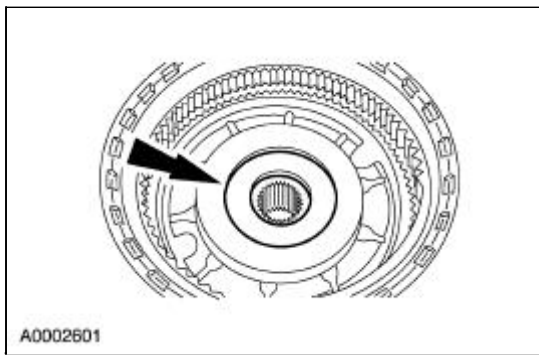
49. Install the No. 6B forward clutch thrust washer onto the forward ring gear hub.



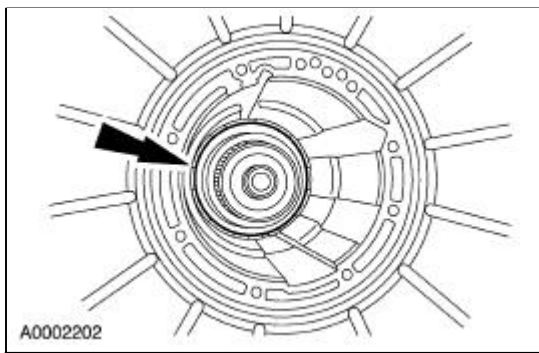
50. Install the forward ring gear and hub as an assembly.



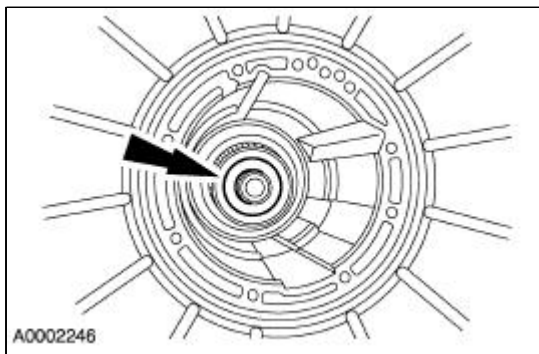
51. Install the No. 6A forward ring gear hub thrust bearing into the forward clutch. Use petroleum jelly to hold the bearing in place.



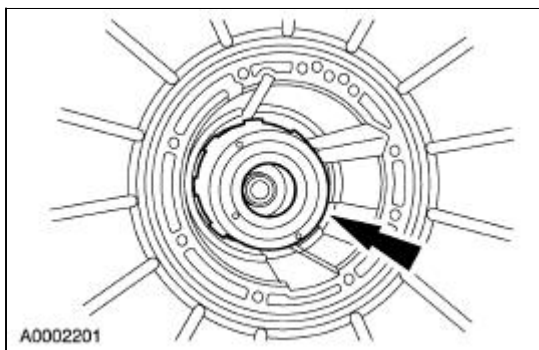
52. Install the forward clutch cylinder.



53. Install the No. 5 thrust bearing.

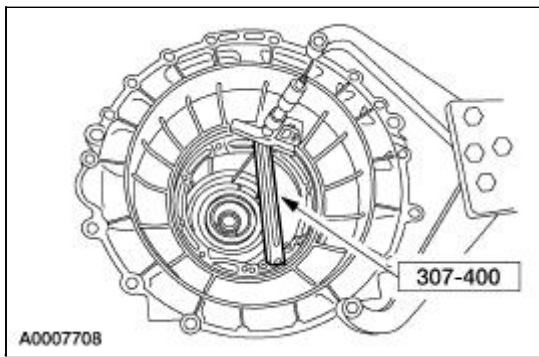


54. Install the direct clutch drum.



55. Using a depth micrometer with an 8-inch extension, measure from the top of the gauge bar to center support ledge in case at four places 90 degrees apart.

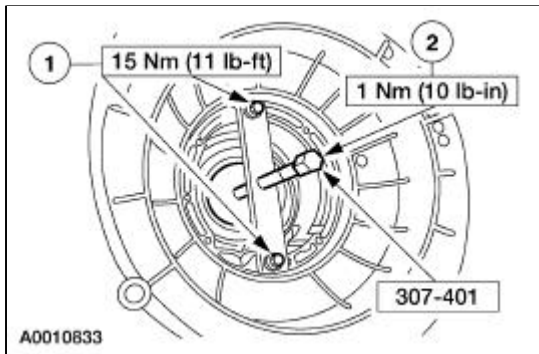
- Add the four measurements, divide by four, and record as dimension A.



56.  **CAUTION:** The torque specifications are critical for this procedure. Failure to use the correct torque specifications may cause transmission damage.

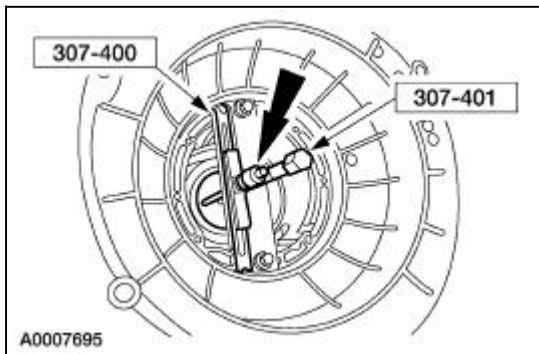
Install the special tool.

1. Install the special tool and the bolts using the two pump screw locations at approximately 6 and 12 o'clock positions.
2. Tighten the center screw.



57. **NOTE:** Align the disc holes on special tool with the slot in gauge bar for correct measurement.

Measure the distance from the top of the gauge bar to the drum bearing surface through the hole in the disc and record as dimension B. Repeat measurement 180 degrees opposite side of the special tool and record as dimension C.



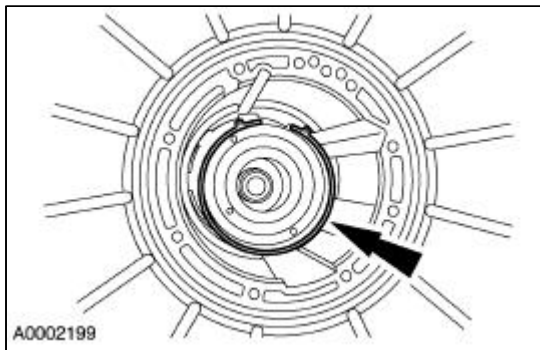
58. Add dimension B to C, divide by two and record as dimension D.
59. Subtract A from D, and record as dimension E.
60. Select bearing from the following chart, using dimension E.

Dimension E	Service Part Number (7D014)	Bearing Thickness	Identification (Notches)
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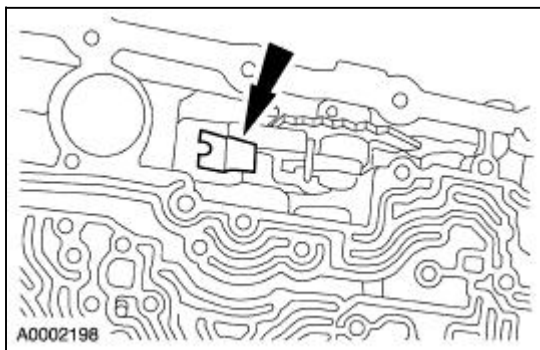
1.69-1.87 mm (0.066-0.073 in)	XW4Z-CA	2.65-2.80 mm (0.104-0.110 in)	None
1.88-2.05mm (0.073-0.080 in)	XW4X-DA	2.83-2.98mm (0.111-0.116 in)	One
2.05-2.22 mm (0.081- 0.088 in)	XW4Z-EA	3.01-3.16mm (0.118-0.124 in)	Two
2.33-2.43 mm (0.089-0.096 in)	XW4Z-FA	3.21-3.36 mm (0.126-0.132 in)	Three

61. **NOTE:** Make sure that the intermediate apply strut is aligned with the band notch.

Install the intermediate band.

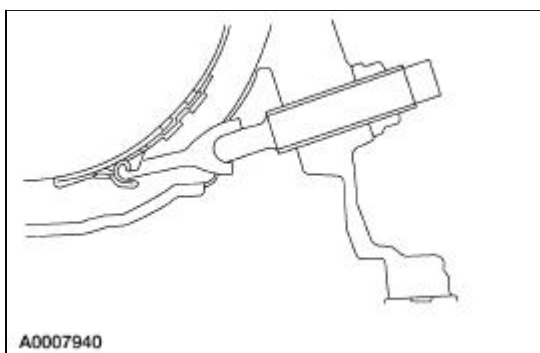


62. Install the intermediate band anchor strut.

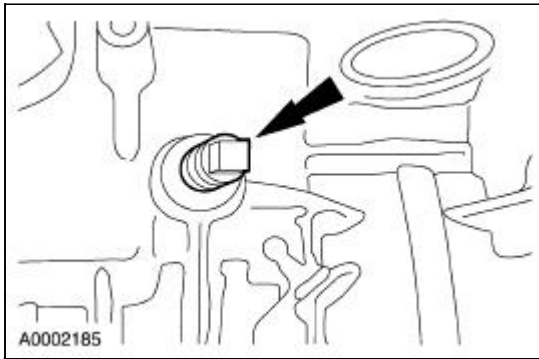


63.  **CAUTION:** If the strut is installed incorrectly, transmission damage will occur.

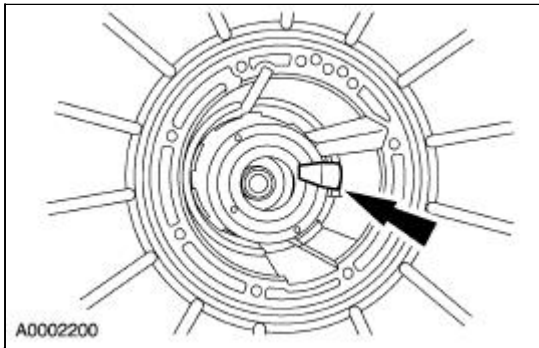
Check to make sure that the intermediate band anchor strut is installed in the correct orientation to the case and adjustment screw.




64. Loosely install the screw.

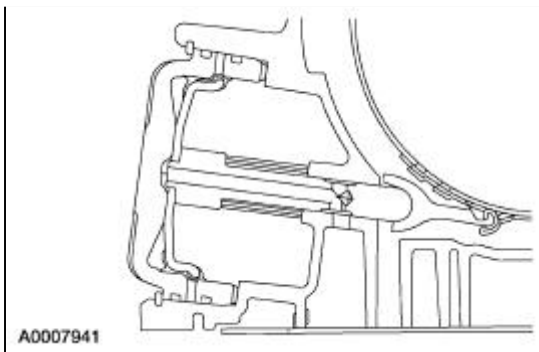


65. Install the intermediate band apply strut.



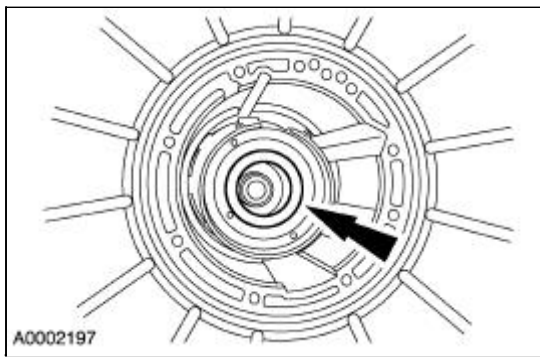
66.  **CAUTION: If the strut is installed incorrectly, transmission damage will occur.**

Check to make sure that the intermediate band apply strut is installed in the correct orientation to the case and piston rod.



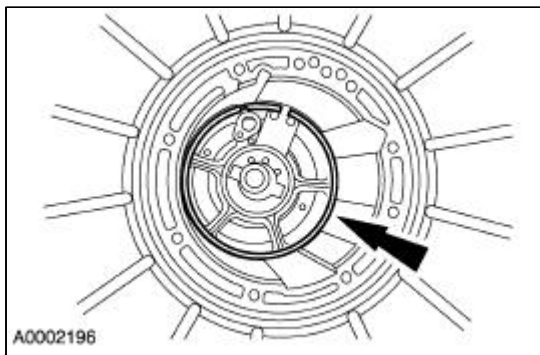
67. Install the selected No. 4 thrust washer on the direct clutch drum.

- Coat the thrust washer with petroleum jelly.

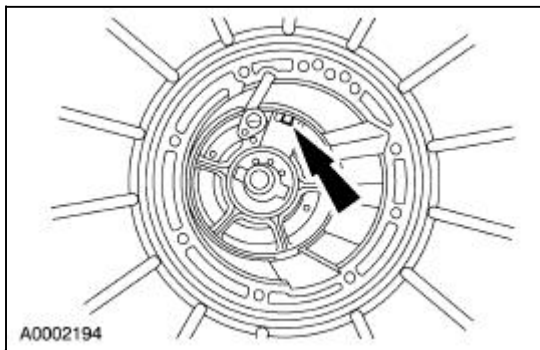


68. **NOTE:** Align the center support screw hole with correct case hole.

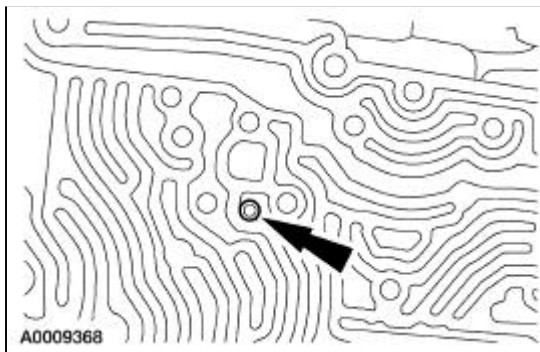
Install the center support.



69. Install the center support locknut and cage.



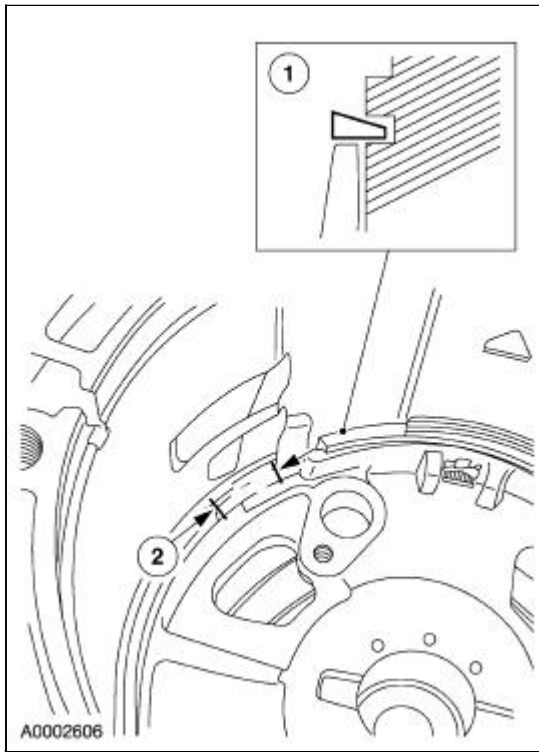
70. Loosely install the screw.



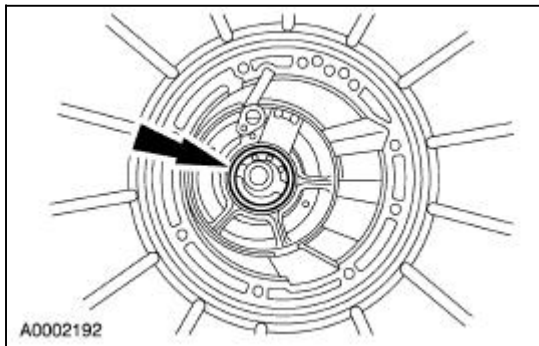
71.  **CAUTION:** Install the center support retaining ring with the tapered side facing up.

 **CAUTION:** Make sure the center support retaining ring does not obstruct the notch opening.

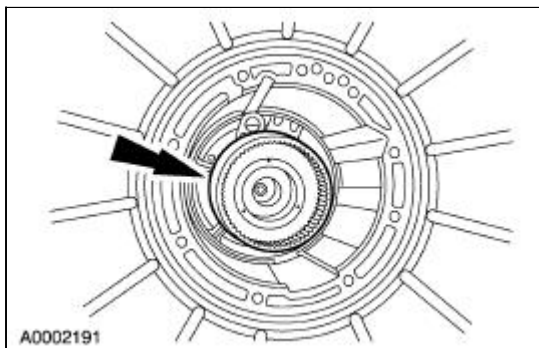
Install the center support retaining ring.




72. Install the center shaft thrust bearing (No. 3).

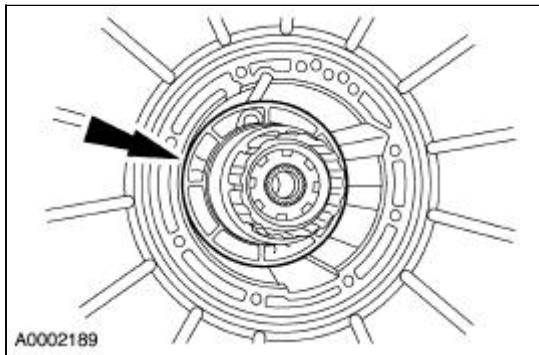


73. Install the overdrive ring gear, overdrive one-way clutch and center shaft assembly.

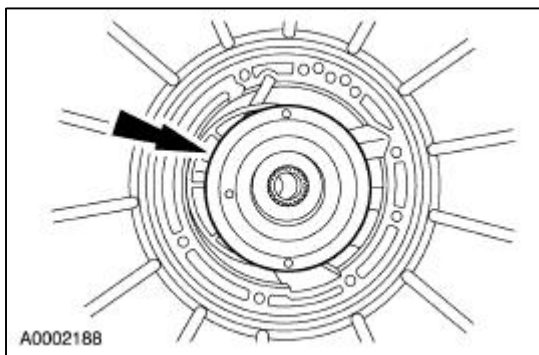


74.  **CAUTION:** Do not bend the trigger wheel. Make sure that the No. 2 thrust bearing is in this assembly.

Install the planetary gear overdrive carrier.

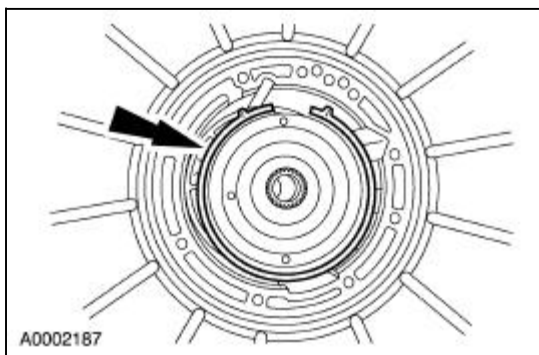


75. Install the overdrive brake drum and coast clutch drum assembly.

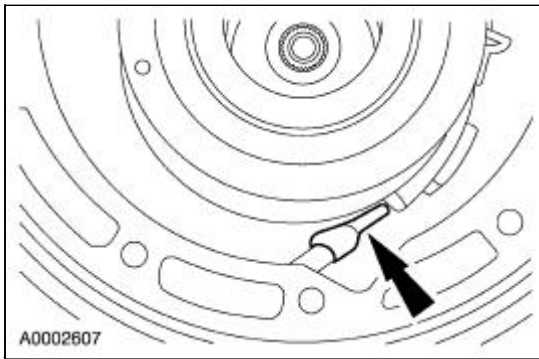



76. **NOTE:** If the overdrive band is reused, it must be installed in the same position from which it was removed.

Install the overdrive band.

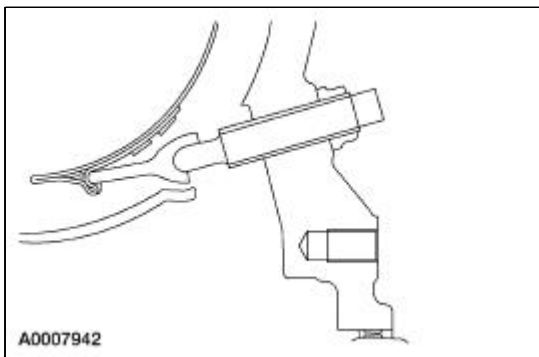


77. Install the overdrive anchor strut.

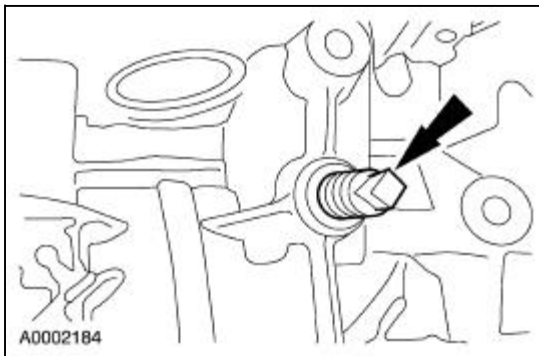


78.  **CAUTION: If the strut is installed incorrectly, transmission damage will occur.**

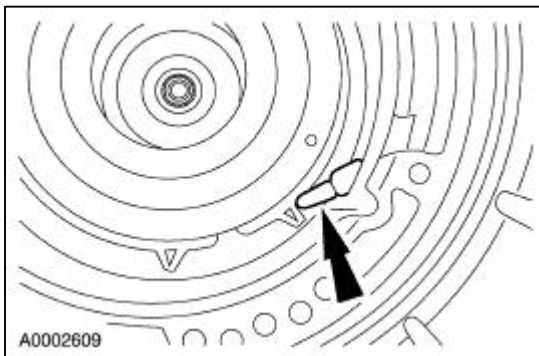
Check to make sure that the overdrive band anchor strut is installed in the correct orientation to the case and adjustment screw.




79. Loosely install the screw.

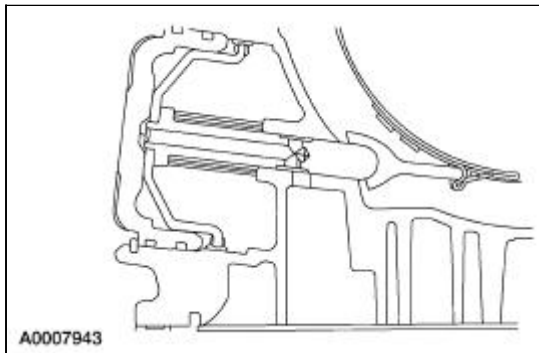



80. Install the overdrive apply strut.



81.  **CAUTION:** If the strut is installed incorrectly, transmission damage will occur.

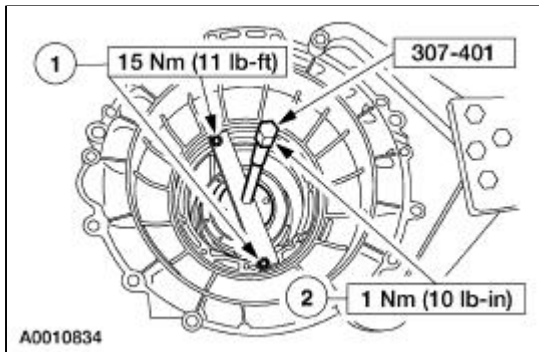
Check to make sure that the overdrive band apply strut is installed in the correct orientation to the case and piston rod.



82.  **CAUTION:** The torque specifications are critical for this procedure. Failure to use the correct torque specifications can cause transmission damage.

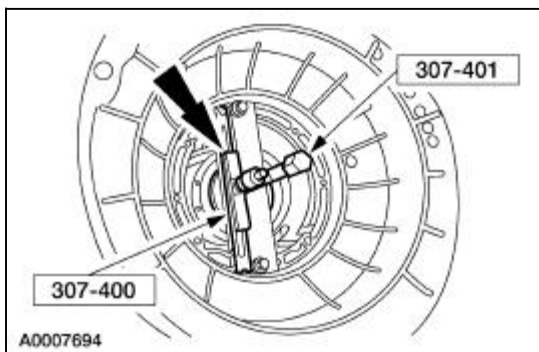
Install the special tool.

1. Install the special tool and the bolts, using the two pump screw locations at approximately 6 and 12 o'clock positions.
2. Tighten the center screw.



83. **NOTE:** Align the disc holes on special tool with the slot in gauge bar for correct measurement.

Measure the distance from the top of the gauge bar to the drum bearing surface through the hole in the disc and record as dimension A. Repeat measurement 180 degrees opposite side of the special tool and record as dimension B.

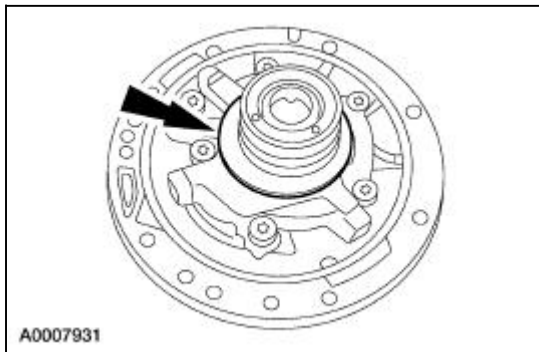


84. Add dimension A to B, divide by two and record as dimension C.

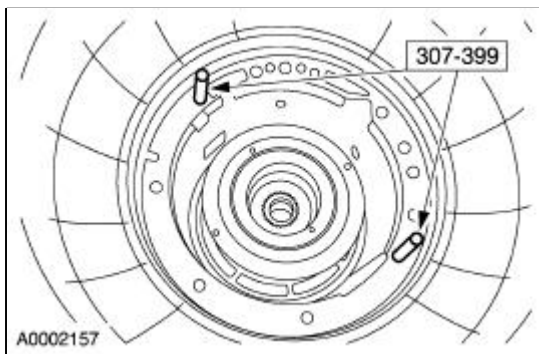
85. Subtract the thickness of the gauge bar (17.78 mm or 0.700 in) from dimension C, and record as dimension D.
86. Select the No.1 thrust bearing from the following chart, using dimension D.

Dimension D	Service Part Number (7D014)	Bearing Thickness	Identification (Color/ID)
38.04-38.28 mm (1.50-1.51 in)	XW4Z-XA	1.70-1.75 mm (0.06 in)	Brown/8
38.29-38.43 mm (1.51 in)	XW4Z-NA	1.85-1.90 mm (0.07 in)	Red/4
38.44-38.63 mm (1.51-1.52 in)	XW4Z-RA	2.05-2.10 mm (0.08 in)	Black/6
38.64-38.78 mm (1.52-1.53 in)	XW4Z-YA	2.20-2.25 mm (0.09 in)	Orange/9
38.79-38.97 mm (1.53 in)	XW4Z-ZA	2.40-2.45 mm (0.10 in)	Purple/10

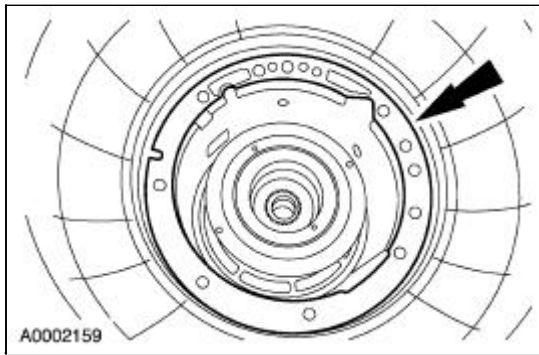
87. Install the selected No. 1 fluid pump input thrust washer.
- Coat the fluid pump input thrust washer with petroleum jelly.



88. Install the special tools into the transmission case.

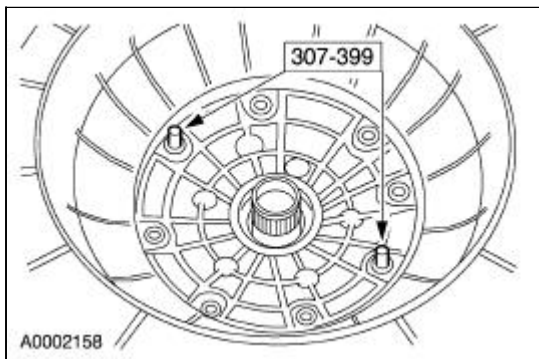


89. Install the pump gasket.



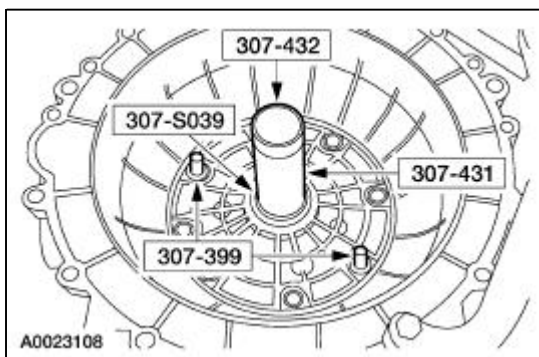
90. **⚠ CAUTION:** Make sure that the fluid pump inlet thrust washer (No. 1), selective thrust washer, fluid pump gasket, and the fluid pump-to-case O-ring seal remain in the correct position throughout this step.

Install the fluid pump.

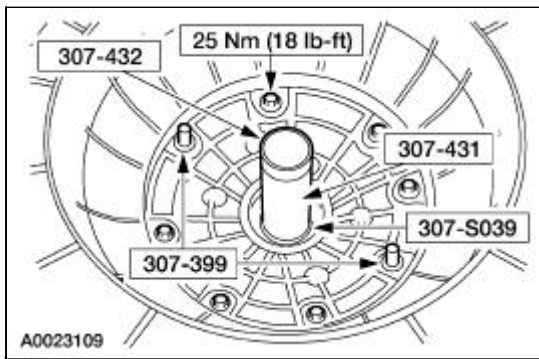


91. **⚠ CAUTION:** The special tools must be used to correctly align the pump with the adapter plate to reduce gear noise, bushing failure and leakage.

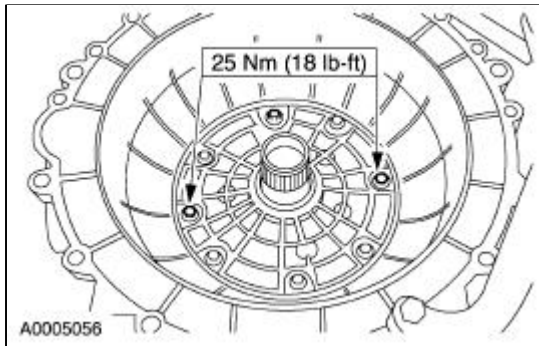
Using the special tool, align the fluid pump to the adapter plate.



92. Install screws. Tighten the screws in a star pattern.



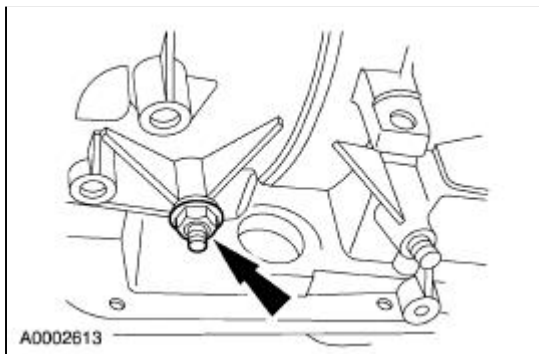
93. Remove the special tools and install the two remaining screws.



94.  **CAUTION:** Do not allow overdrive band adjustment screw to back out. Band strut could fall out of position.

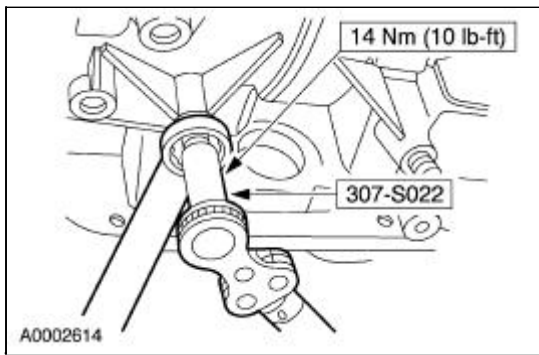
 **CAUTION:** Install, but do not tighten, a new locknut on the band adjustment screw. Apply petroleum jelly to the locknut seal.

Install a new locknut on the band adjustment screw.

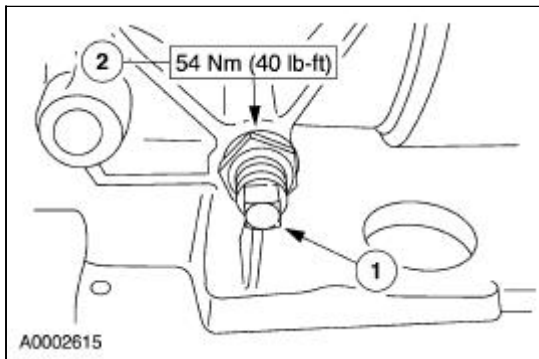


95.  **CAUTION:** The overdrive servo must be installed prior to band adjustment.


Using the special tool, tighten the overdrive band adjustment screw then back off the screw exactly (2) turns and hold that position.



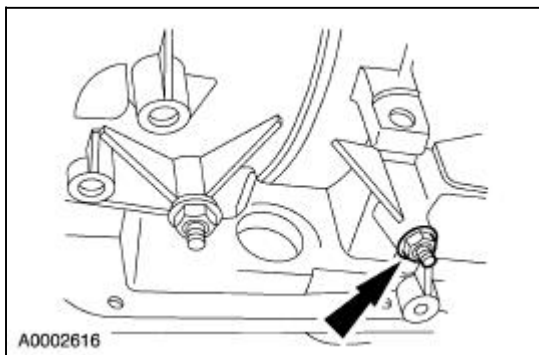
96. Tighten the overdrive band locknut.
1. Hold the overdrive band adjustment screw stationary.
 2. Tighten the overdrive band locknut.



97.  **CAUTION: Do not allow the intermediate band adjusting screw to back out. Band strut could fall out of position.**

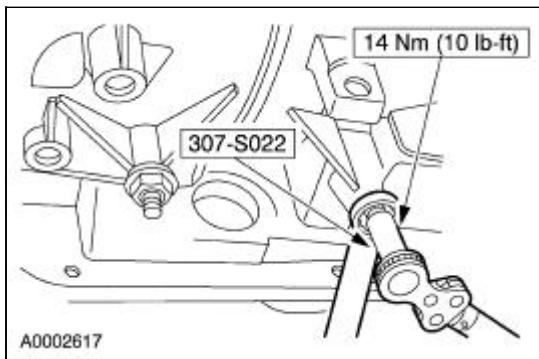
 **CAUTION: Install, but do not tighten, a new locknut on the band adjustment screw. Apply petroleum jelly to the locknut seal.**

Install new nut on the band adjustment screw.

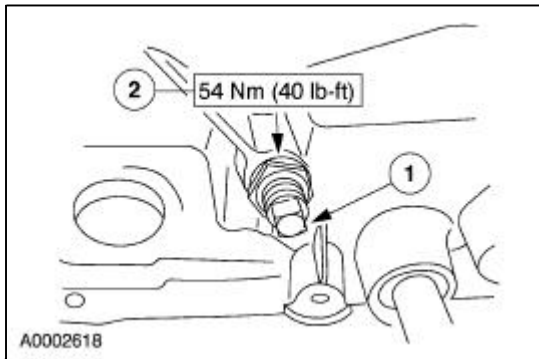


98.  **CAUTION: The intermediate servo must be installed prior to band adjustment.**

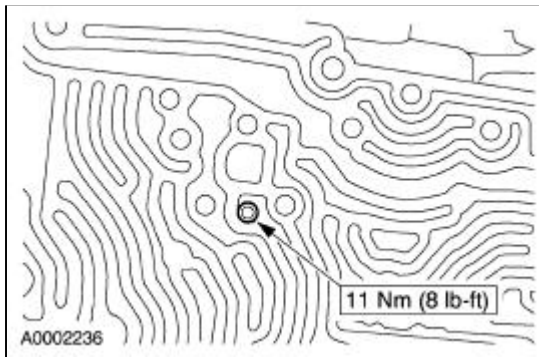
Tighten the intermediate band adjustment screw then back off the screw exactly (2) turns and hold that position.




99. Tighten the intermediate band locknut.
1. Hold the intermediate band adjustment screw stationary.
 2. Tighten the intermediate band locknut.

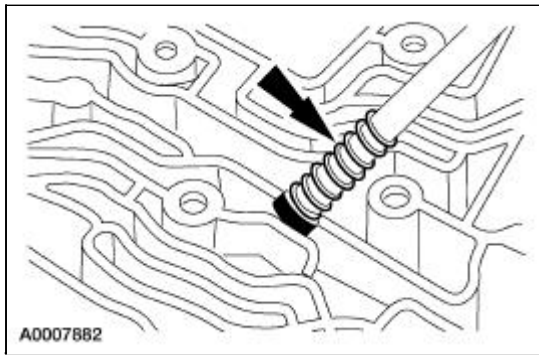


100. Tighten the center support screw.

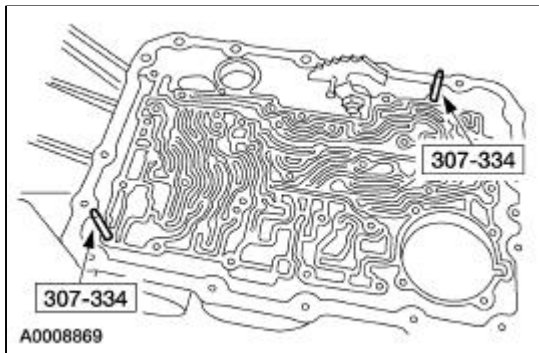


101.  **CAUTION: The intermediate clutch fluid inlet tube seal and spring must be correctly seated in the case. Failure to correctly seat the inlet tube seal and spring will cause an internal fluid leak and transmission damage.**

Using a drift punch, correctly install and seat the intermediate clutch fluid inlet tube seal and spring into the case.

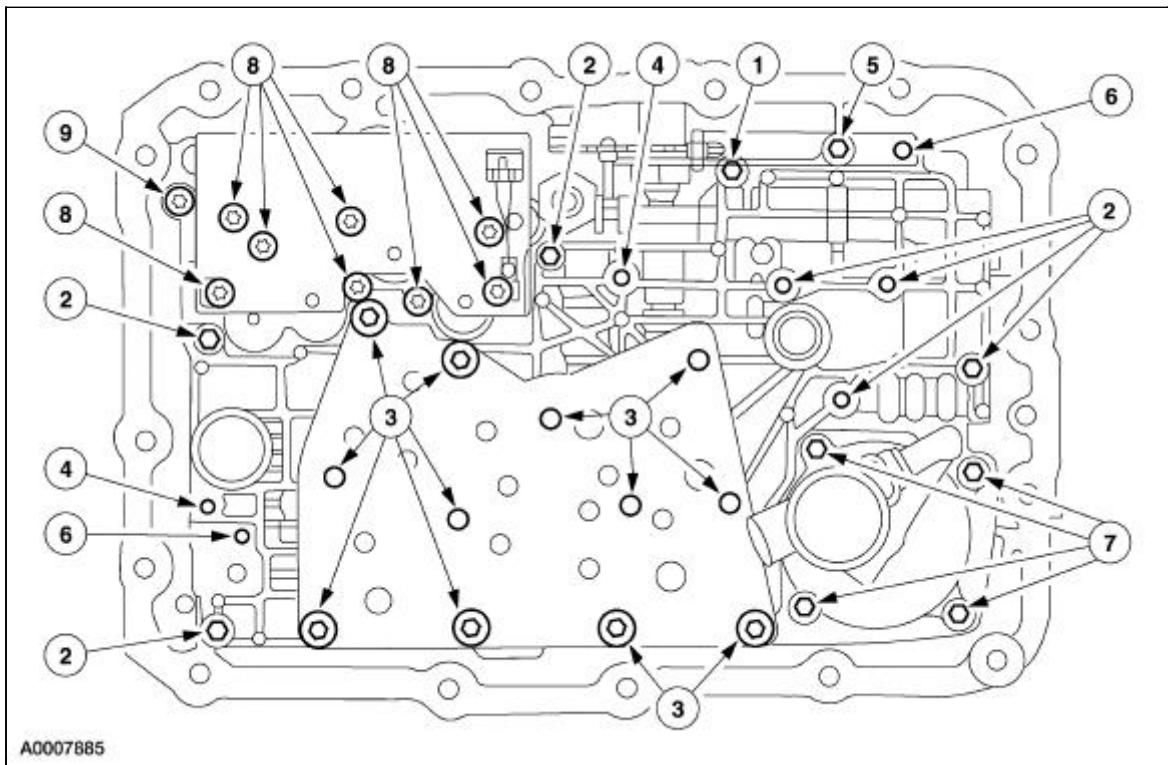


102. Install the special tools into the transmission case.

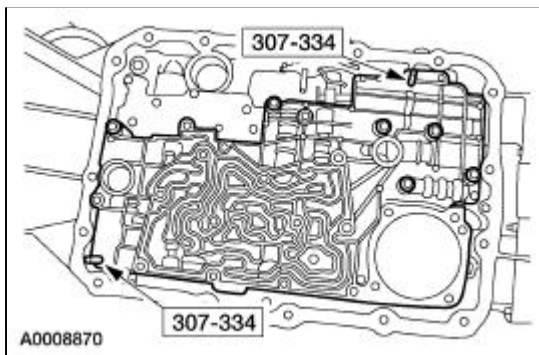


103. Refer to the following chart for bolt locations.

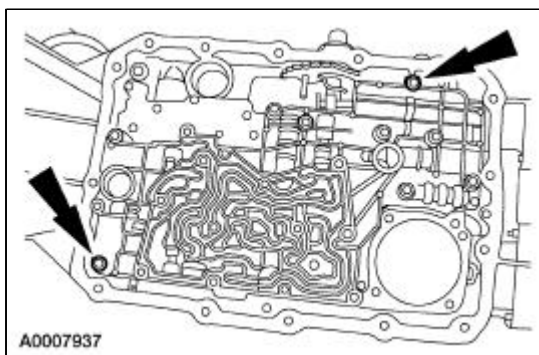
Item	Part No.	Part Name	Size
1	W702791-S300	Hex Bolt	M6X27
2	W500103-S1300	Hex Bolt	M6X45
3	W703133-S1300	Hex Bolt	M6X52
4	W705559-S300	Hex Bolt	M6X82.2
5	W500100-S300	Hex Bolt	M6X30
6	W701099-S1430	Cap Int Lob Screw	M6X20
7	W703135-S1300	Hex Bolt	M6X70
8	W703189-S1430	Cap Int Lob 8	M6X63
9	W702921-S430	Cap Int Lob 8	M6X25



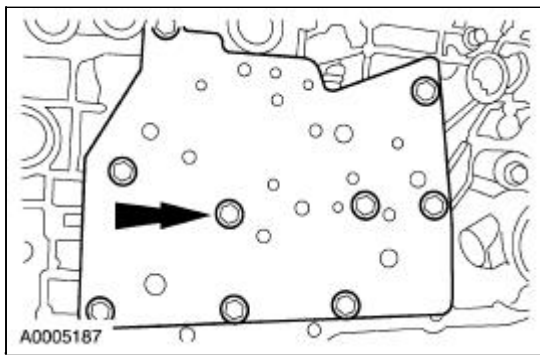
104. Install the main control valve body and loosely install the screws.



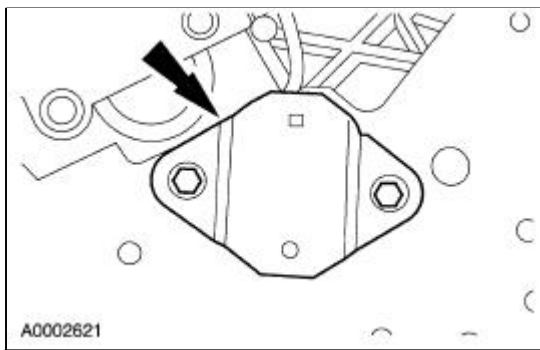
105. Remove the special tools and loosely install the screws.



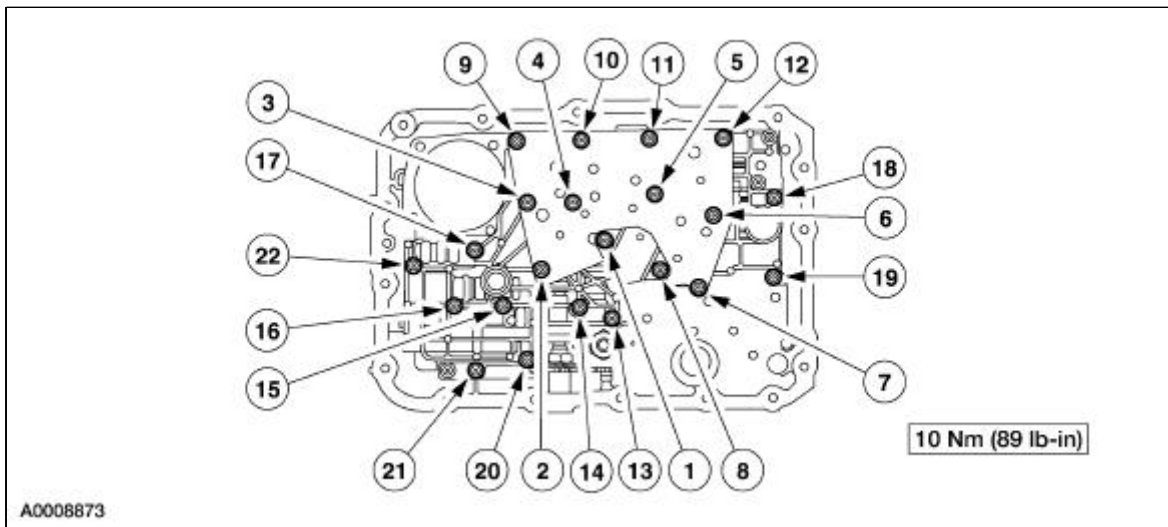
106. Install the valve body cover plate and gasket and loosely install the screws.



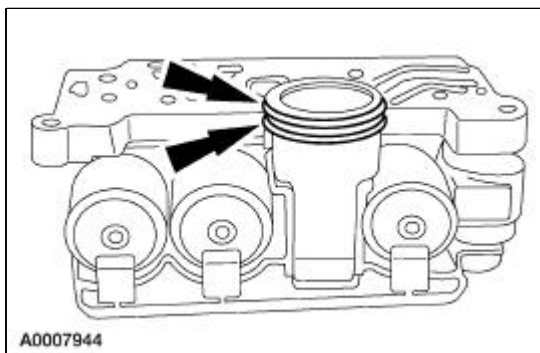
107. Install a new reverse pressure switch and loosely install the screws.




108. Tighten the screws in the sequence shown.

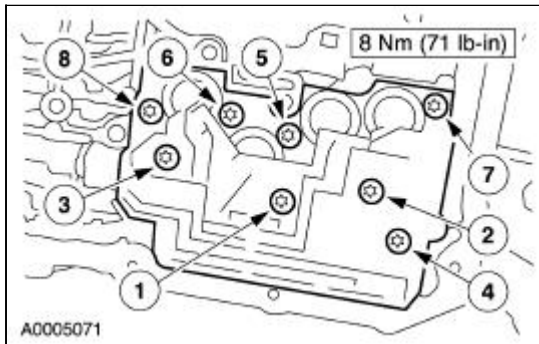


109. Install new O-ring seals on the solenoid body connector. Lubricate the O-ring seals with clean automatic transmission fluid.



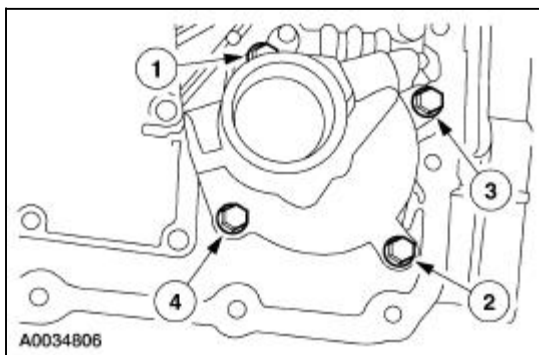
110.  **CAUTION: Inspect the transmission case bore to make sure it is free of debris and not damaged. If damaged, transmission leak can result.**

Install the solenoid body. Tighten bolts in sequence shown.

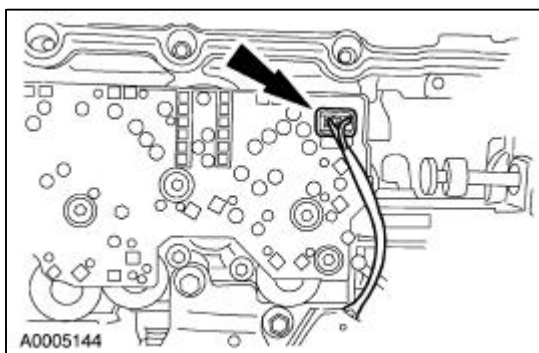


111. Install the reverse servo. Tighten the bolts in sequence shown in two stages.

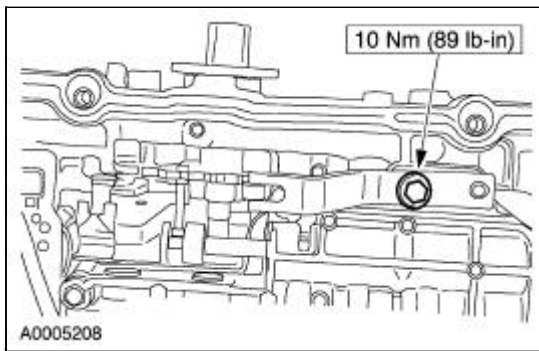
- Stage 1: Tighten bolts to 5 Nm (44 lb-in)
- Stage 2: Tighten bolts to 11 Nm (8 lb-ft)



112. Connect the reverse pressure switch connector.



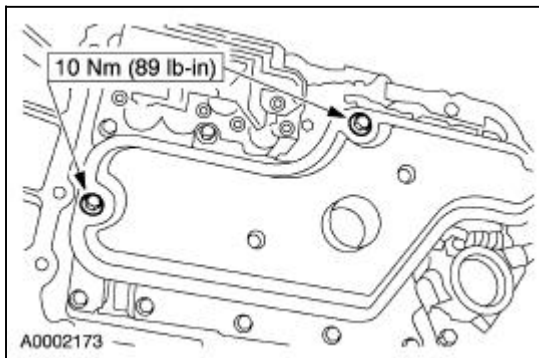
113. Install the manual valve detent spring.



114.  **CAUTION:** Lubricate the fluid filter O-ring seals with clean automatic transmission fluid or they can be damaged.

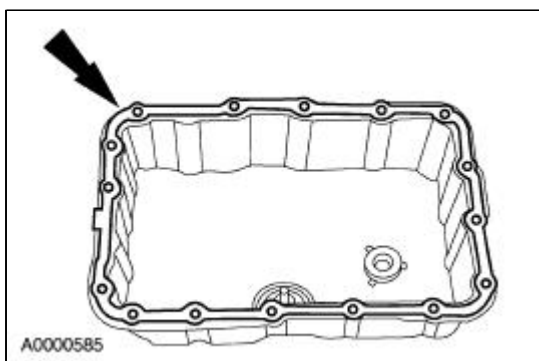
NOTE: Make sure that the fluid filter O-ring seals are correctly seated on the filter.

Lubricate the seals and install the transmission fluid filter.

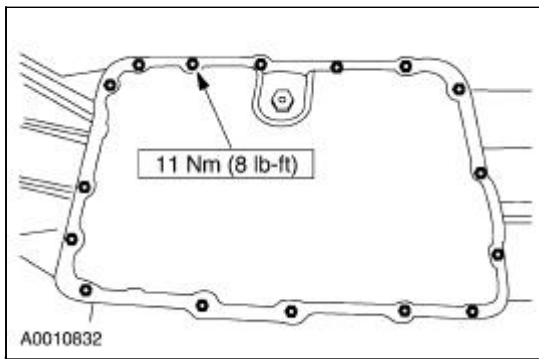


115. **NOTE:** The transmission fluid pan gasket is reusable. Clean and inspect for damage. If not damaged, the gasket should be reused.

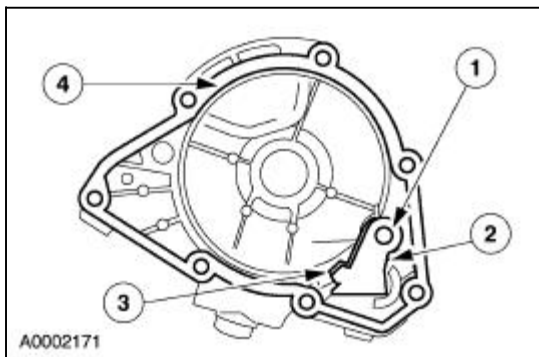
Install the transmission fluid pan and gasket.



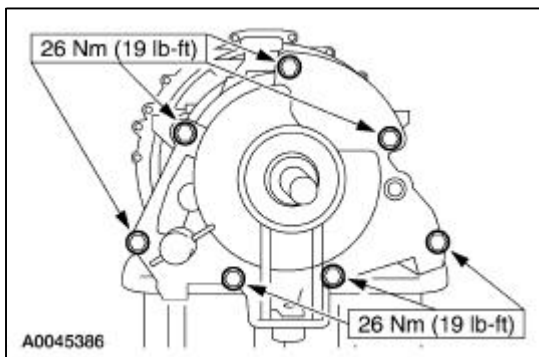
116. Tighten the screws in a crisscross sequence.



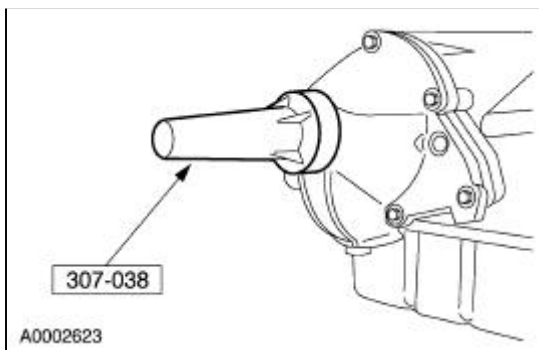
117. Install the parking pawl assembly and gasket.
1. Install the parking pawl shaft.
 2. Install the parking pawl.
 3. Install the parking pawl return spring.
 4. Install the gasket.



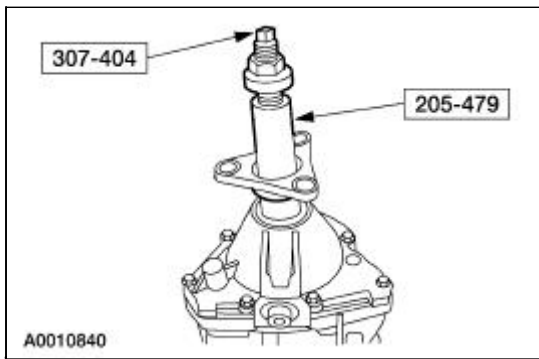
118. Install the extension housing.



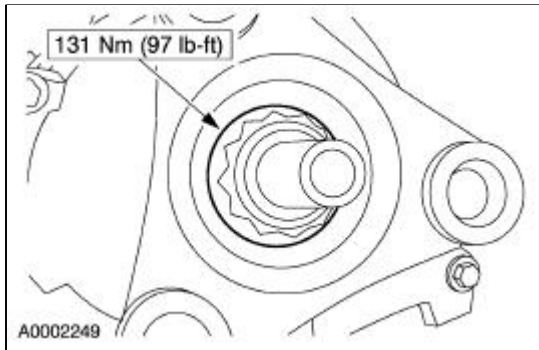
119. Using the special tool, install the extension housing seal.




120. Using the special tools, install the output shaft flange.

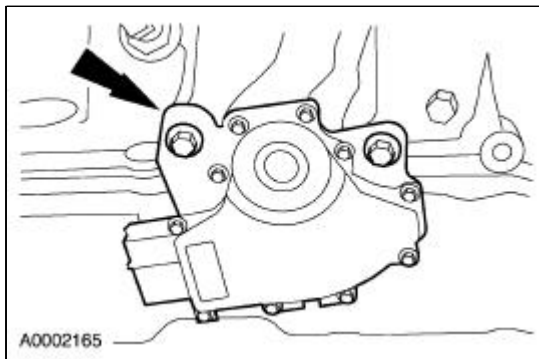



121. Install a new nut.



122.  **CAUTION:** The digital transmission range sensor must fit flush against the boss on the case to prevent damage to the sensor.

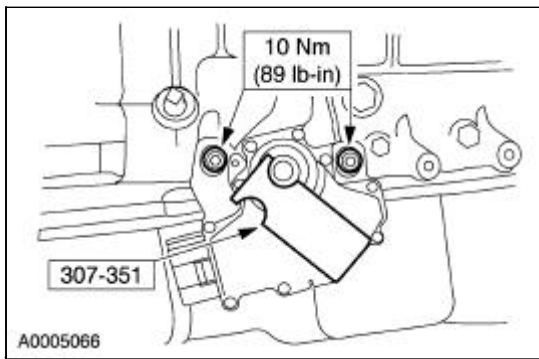
Install the digital transmission range (TR) sensor and loosely install the screws.



123.  **CAUTION:** Tightening one screw before tightening the other can cause the sensor to bind or become damaged.

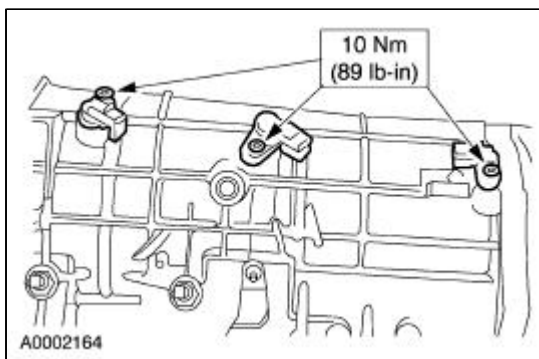
NOTE: The manual lever must be in the NEUTRAL position.

Using the special tool, align the digital TR sensor and tighten the screws in an alternating sequence.



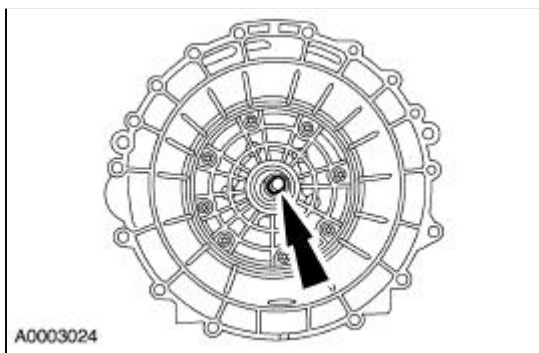
124. **NOTE:** Inspect O-ring seal for damage. Install new if damaged. Lubricate the O-ring seals with petroleum jelly to prevent damage to the O-ring seals.

Install the sensors.

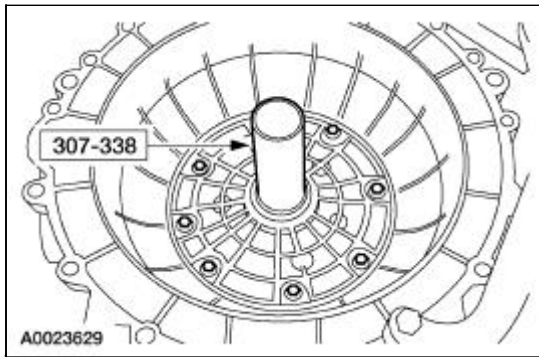


125. **CAUTION:** The splines of the input shaft are not the same length on both ends. The shaft end with the shorter splines goes into the fluid pump.

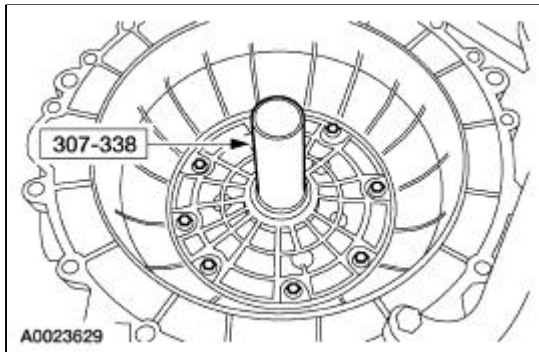
Install the input shaft.




126. Using the special tool, make sure that the fluid pump gear seal ring is fully seated.



127. Remove the special tool.

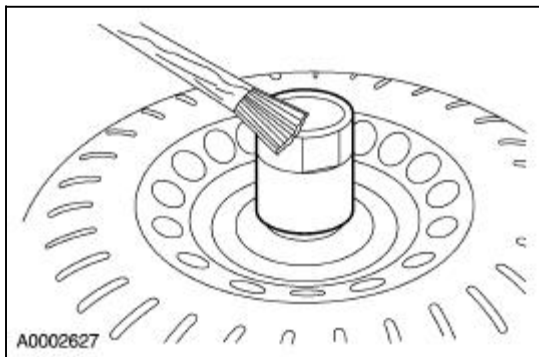


128.  **CAUTION:** Do not damage the fluid pump gear O-ring seal when installing torque converter.

 **CAUTION:** Make sure the converter hub is fully engaged in the pump support and gear and rotates freely. Do not damage the hub seal.

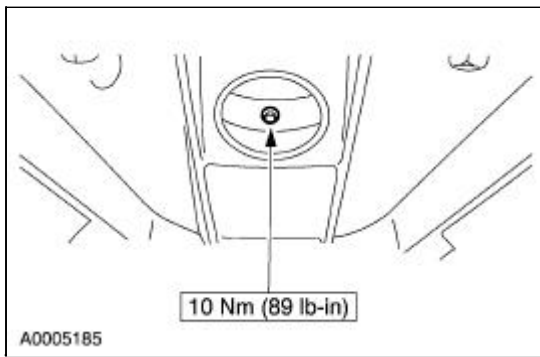
 **CAUTION:** If the torque converter slides out, the hub seal can be damaged.

Lubricate the converter hub with clean automatic transmission fluid.

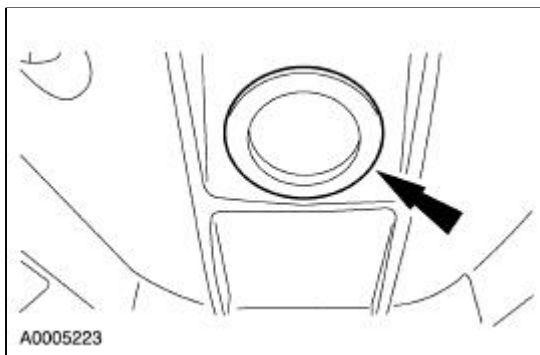


129. **NOTE:** A new converter drain plug must be used to prevent leakage.

Install the drain plug.

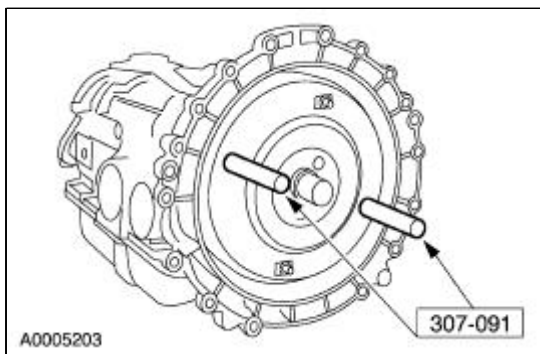


130. Install the converter housing access plug.

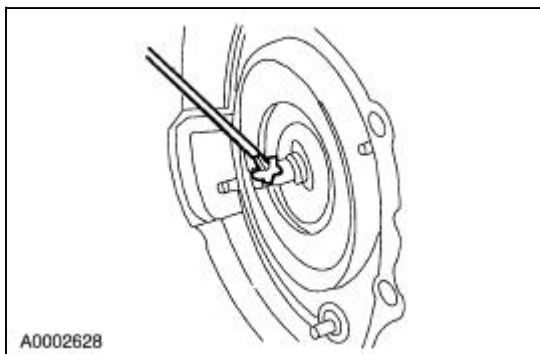



131.  **WARNING: The torque converter can fall out if the transmission is tipped. Failure to follow these instructions may cause personal injury.**

Using the special tools, install the torque converter by pushing and rotating.



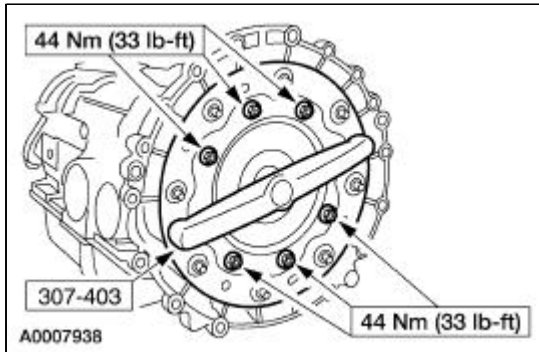
132. Lubricate the torque converter pilot hub with multi-purpose grease.



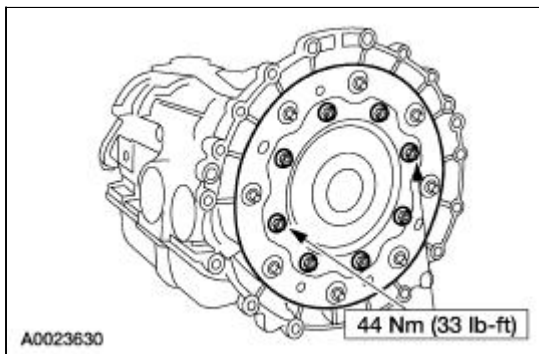
133.  **CAUTION:** The special tool must be used to correctly align the adapter plate to the converter or transmission damage can occur.

In order to correctly install the special service tool, it must be installed using one round and one oblong hole. Using two oblong holes will cause damage to the transmission.

If the vehicle is equipped, use the special tool to install the torque converter flex plate adapter assembly and eight nuts.

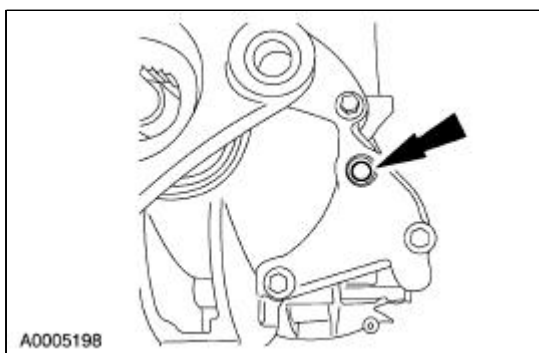


134. Install two torque converter flex plate adapter nuts.

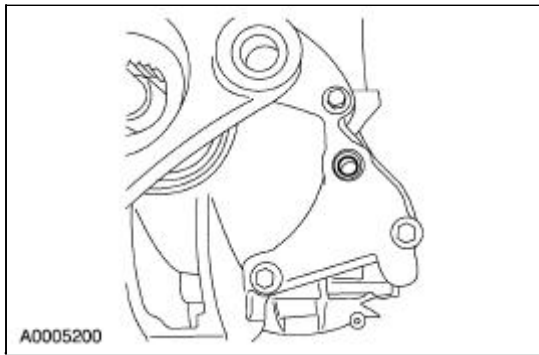


135. **NOTE:** Use the 5/16 inch Allen key to remove the fill plug.

Remove the fill plug.



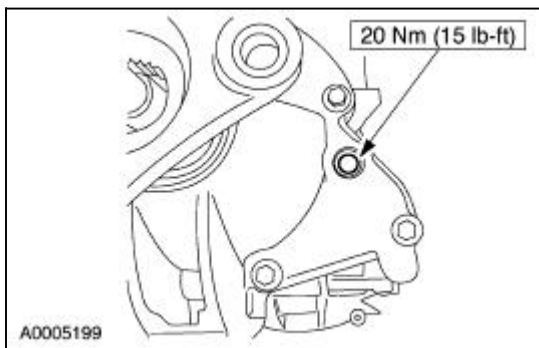
136. Fill the transmission with 8.5L (9 quarts) of clean automatic transmission fluid.



137.  **CAUTION:** When installing the fill plug, make sure not to cross thread the plug to prevent damage.

NOTE: Use a 5/16 inch Allen key to install the fill plug.

Install the fill plug.



138. Before installing transmission, make sure that the transmission cooling system (tube and cooler [s]) have been thoroughly flushed. If contamination cannot be removed or correct flow cannot be obtained, install a new cooler(s) and/or tubes. For additional information, refer to [Section 307-02](#).
-

Transmission

Special Tool(s)

 ST2455-A	Torquing Wrenches, Driveshaft Coupler 205-474
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Material

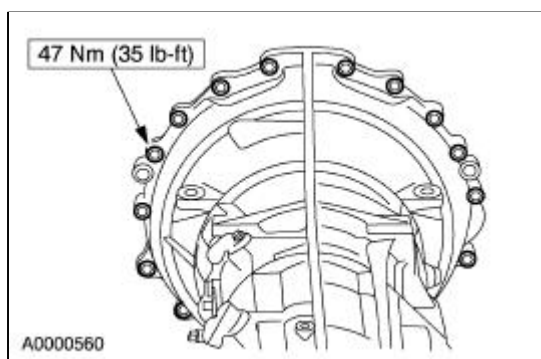
Item	Specification
Premium Long Life Grease XG-1-C	ESA-M1C75-B
Threadlock and Sealer E2FZ-19554-B	WSK-M2G351-A6

- WARNING:** Secure the transmission to the transmission jack with a safety chain. Failure to follow these instructions can result in personal injury.

Raise and position the transmission.

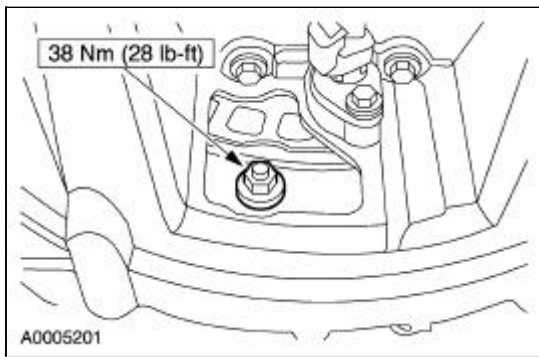
- NOTE:** Align the flexplate to converter marks made at removal.

Install the bolts.

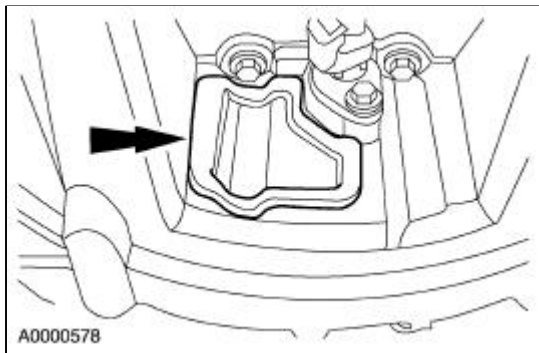


- NOTE:** Align the flexplate to converter marks made at removal.


Align the marks made during removal, and install the nuts.



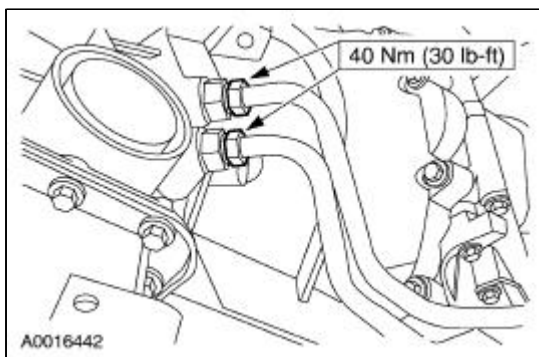
4. Install the access cover.



5. On 3.0L engines only, install the starter motor. For additional information, refer to [Section 303-06](#).

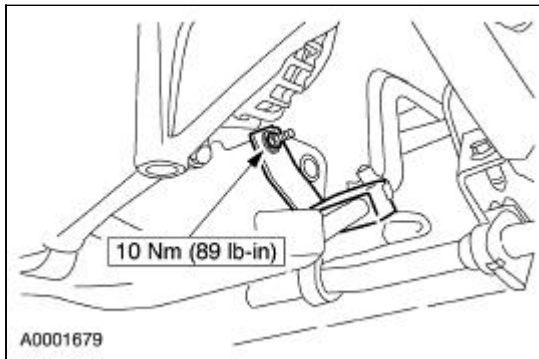
6.  **CAUTION:** Use care not to bend or force the cooler tubes otherwise damage to the cooler tubes and the transmission may result.

Install the transmission cooler tubes.

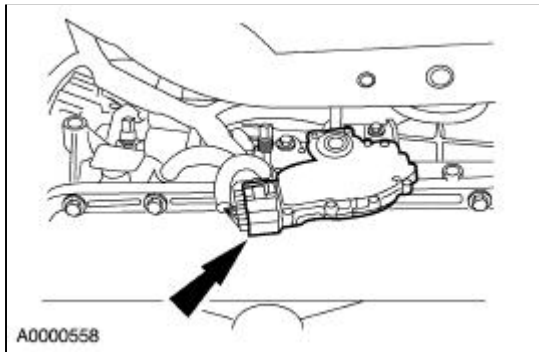



7. **NOTE:** V6 application shown, V8 application similar. The torque specification for the V8 is 18Nm (13 lb-ft).

Install the transmission cooler line bracket.



8. Reconnect the digital transmission range (TR) sensor connector.



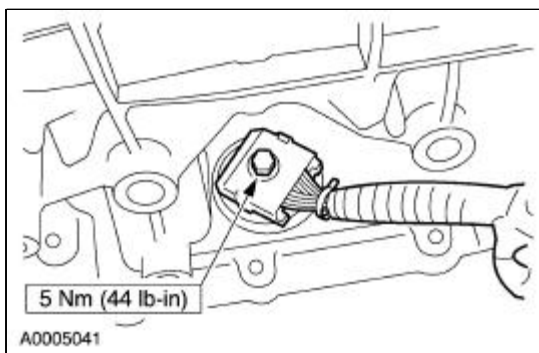
9.  **CAUTION:** Damage will occur to the solenoid body assembly if the screw is tightened above the specification.

NOTE: Always install new O-ring seals on vehicle harness connector.

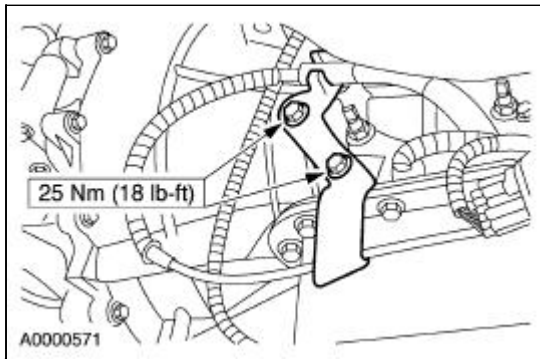
NOTE: Clean the area around connector to prevent contamination of the solenoid body connector.

NOTE: Use petroleum jelly to lubricate the O-ring seals to aid in the installation process.

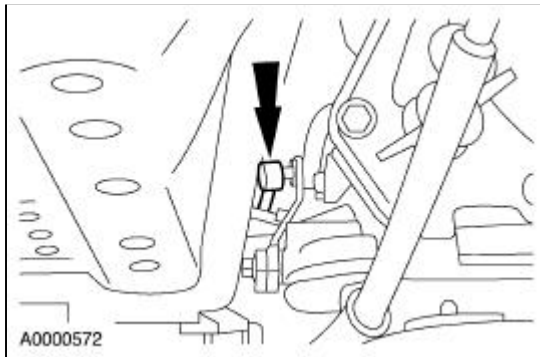
Install and lubricate new O-ring seals on the transmission connector and connect the connector.



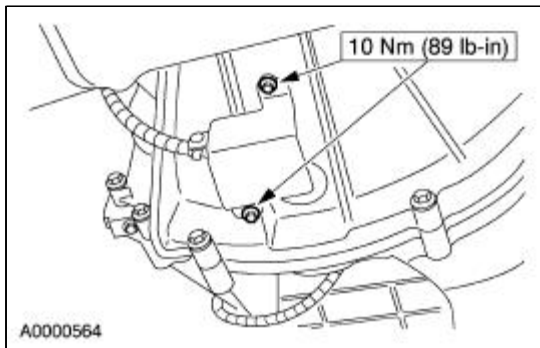
10. Install the shift cable bracket.



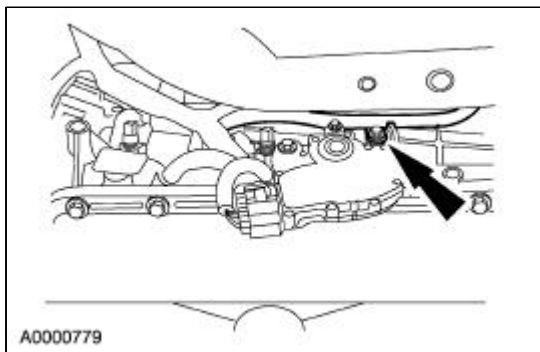
11. Connect the shifter cable.



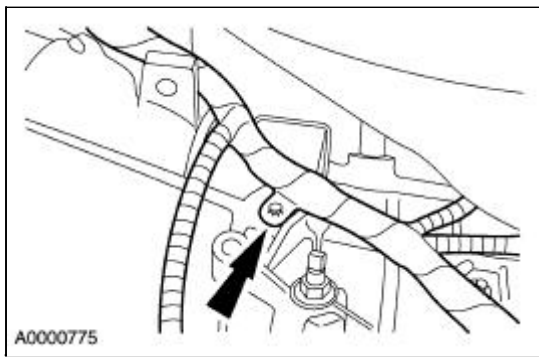
12. Install the heated oxygen sensor (HO2S) connector.



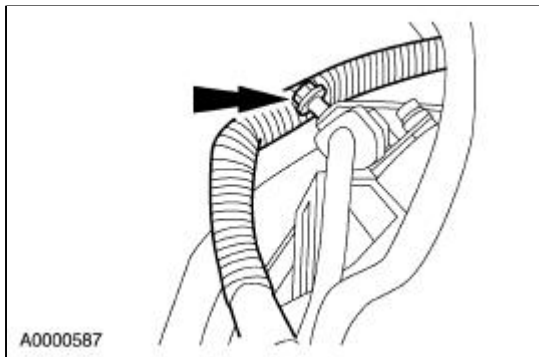
13. Connect the harness retainer.



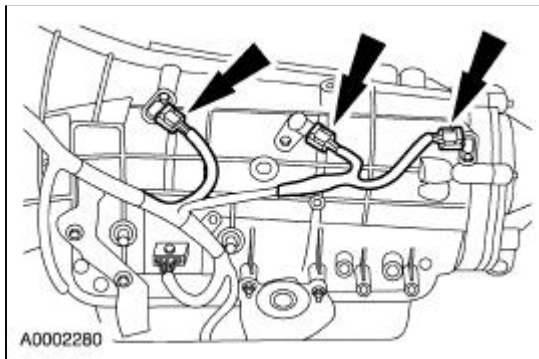
14. Connect the harness retainer.



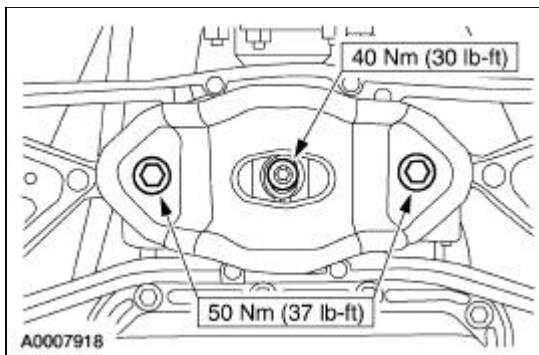
15. Install the harness screw.



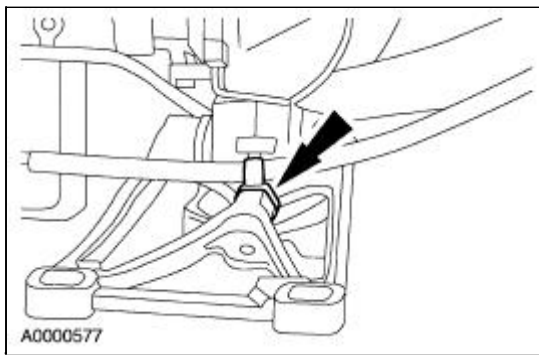
16. Connect the turbine shaft speed (TSS) sensor, output shaft speed (OSS) sensor, and intermediate shaft speed (ISS) sensor electrical connectors.



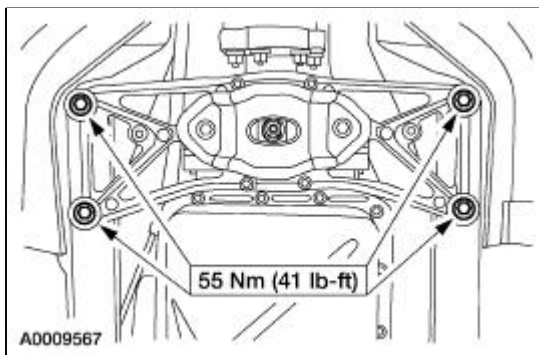
17. Install the rear transmission mount.



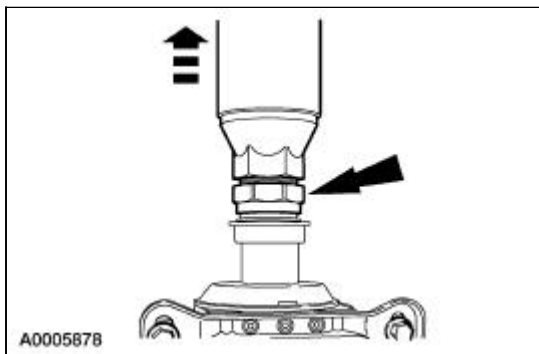
18. Install the shift cable.



19. Install the rear transmission mount.

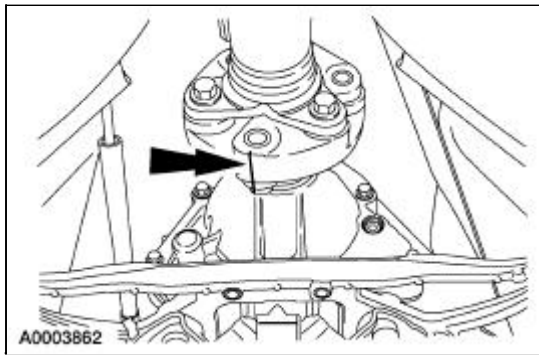


20. Remove the transmission jack.
21. Add one gram of grease to both alignment bushing cavities.
22. Loosen the nut and slide the front shaft assembly forward.

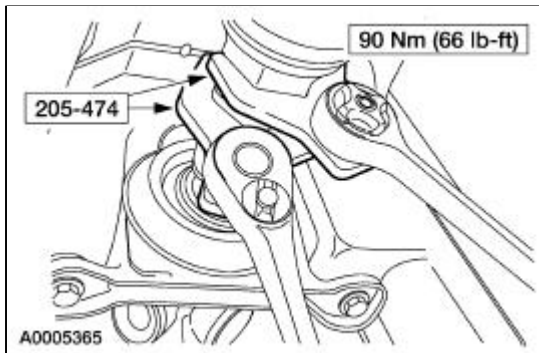


23.  **CAUTION: Align the index marks or driveshaft imbalance can occur.**

Align index marks and position the alignment bushing on the transmission flange piloting system.



24. Using the special tools, tighten the nut.



25. Install the heat shield.



26. Lower the vehicle.
27. **NOTE:** When the battery is disconnected or a new battery installed, certain transmission operating parameters can be lost. The powertrain control module (PCM) must relearn these parameters. During this learning process, you may experience slightly firm shifts, delayed, or early shifts. This operation is considered normal and will not affect the function of the transmission. Normal operation will return once these parameters are stored by the PCM.

Connect the battery ground cable. For additional information, refer to [Section 414-01](#).

28. Raise and support the vehicle. For additional information, refer to [Section 100-02](#).
29. Carry out the fluid level check. For additional information, refer to [Transmission Fluid Level Check](#) in this section.
30. Verify that the shift cable is correctly adjusted. For additional information, refer to [Section 307-05](#).
31. Check the operation of the transmission and inspect for leaks.

General Specifications

Item	Specification
MERCON V Automatic Transmission Fluid XT-5-QM	MERCON V

Torque Specifications

Description	Nm	lb-ft	lb-in
Bolt retaining the transmission fluid cooler to the radiator	10	—	89
Nut retaining the fluid cooler tube bracket to the stud (V8 engine)	18	13	—
Nut retaining the fluid cooler tube bracket to the stud (V6 engine)	10	—	89
Nut retaining the fluid cooler tube to the transmission	35	26	—
Hose clamp retaining the transmission fluid cooler hose to the transmission fluid cooler tube	5	—	44

Transmission Cooling

The transmission fluid cooler is an oil-to-air (OTA) fluid cooler. The fluid cooler is mounted between the radiator and the A/C condenser.

- When the transmission fluid is cold and the thermostatic valve is closed, the transmission fluid does not circulate through the fluid cooler.
 - As the transmission fluid temperature increases, the thermostatic bypass valve opens and allows the transmission fluid to circulate through the fluid cooler.
-

Transmission Cooling



CAUTION: Whenever a transmission has been disassembled to install new parts, the transmission fluid cooler must be replaced and the transmission fluid cooler tubes must be cleaned and backflushed.

NOTE: Cleaning and backflushing the transmission fluid cooling system, along with normal cleaning and inspection procedures as outlined in this section during disassembly and reassembly, will keep contamination from reentering the transmission and causing a repeat repair.

When internal wear or damage has occurred in the transmission, metal particles, clutch plate material, or band material may have been carried into the torque converter and transmission fluid cooler. These contaminants are a major cause of recurring transmission troubles and must be removed from the system before the transmission is put back in use.

Inspection and Verification

When fluid leakage is found in the fluid cooler, install a new fluid cooler.

When there is evidence of transmission assembly or fluid contamination due to the following transmission failure modes, install a new fluid cooler.

- major metallic failure
- multiple clutches or clutch plate failure
- sufficient component wear which results in metallic contamination

Symptom Chart

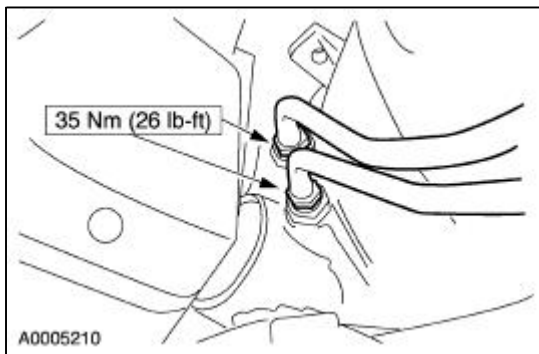
Symptom Chart

Condition	Possible Sources	Action
<ul style="list-style-type: none"> ● Transmission overheating 	<ul style="list-style-type: none"> ● Damaged OTA fluid cooler. ● System leaks. ● Incorrect fluid level. ● Fluid condition. ● Damaged, blocked, reversed, leaking, or restricted cooler tubes. ● Incorrect idle or performance. 	<ul style="list-style-type: none"> ● INSTALL a new OTA cooler. ● INSPECT for leaks. REPAIR as necessary. ● ADJUST to correct level. ● INSPECT according to instructions under Fluid Level Condition Check. REFER to Section 307-01. ● INSPECT cooler tubes. REPAIR as necessary. ● REFER to the Powertrain Control/Emissions Diagnosis (PC/ED) manual.

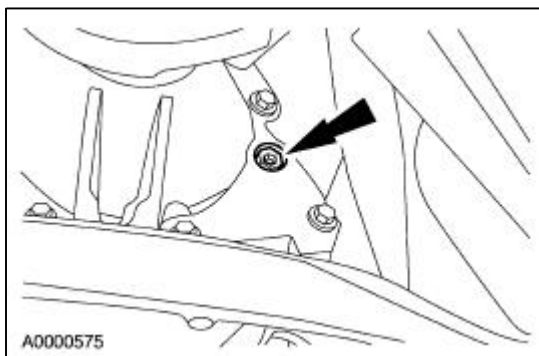
Transmission Fluid Cooler Flow Test

NOTE: The transmission linkage/cable adjustment, fluid level and line pressure must be within specification before carrying out this test. Refer to [Section 307-05](#) for adjustments.

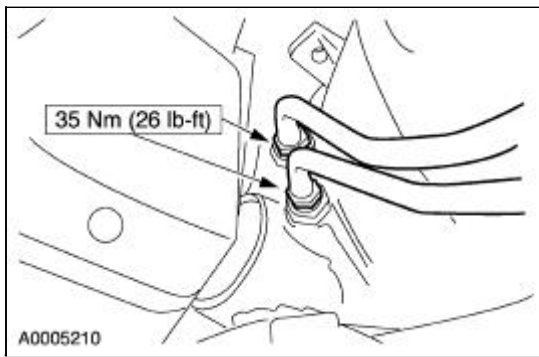
1. Refer to [Section 307-01](#) for fluid level check procedures and line pressure specifications.
2. Raise and support the vehicle. For additional information, refer to [Section 100-02](#).
3. Remove the cooler return line (upper fitting) from the fitting on the transmission case.



4. Connect one end of a hose to the cooler return line and route other end of the hose up to a point where it can be inserted into the hole at the extension housing.



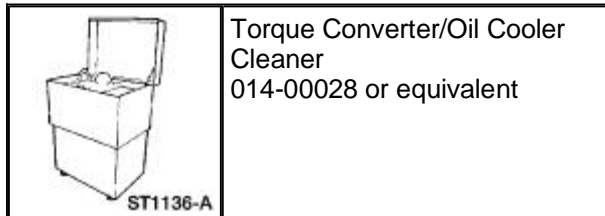
5. Start the engine and run it at idle with the transmission in NEUTRAL position.
6. Raise the vehicle.
7. Once a steady flow of fluid (without air bubbles) is observed, remove the hose from the fluid fill hole and place the hose in a measuring container for 15 seconds. After 15 seconds place the hose back into the fluid fill hole and turn the engine off. Measure the amount of fluid in the container. If adequate flow was observed, approximately 615 ml (20.8 oz) will be in the measuring container; the test is now complete.
8. If the flow is not liberal, stop the engine. Disconnect the hose from the cooler return line (upper line) and connect it to the transmission outline fitting on the transmission case.



9. Repeat Steps 6 and 8. If flow is now approximately 615 ml (20.8 oz) in 15 seconds, refer to [Transmission Fluid Cooler — Backflushing and Cleaning](#). For cleaning of the cooler, refer to [Transmission Cooling](#) for fluid cooler diagnosis. If the flow is still not approximately 615 ml (20.8 oz) in 15 seconds, repair the pump, main control and converter as necessary.
-

Transmission Fluid Cooler — Backflushing and Cleaning

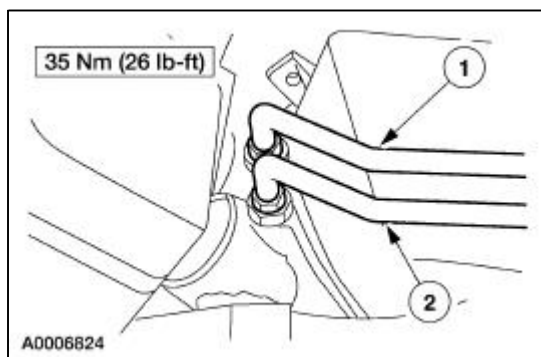
Special Tool(s)



⚠ CAUTION: Whenever a transmission has been disassembled to install new parts or because the valve body sticks from foreign material, the transmission fluid cooler must be cleaned using the Torque Converter/Oil Cooler Cleaner. Under no circumstances should torque converters be cleaned by hand agitation with solvent.

When internal wear or damage has occurred in the transmission, metal particles, clutch plate material, or band material may have been carried into the transmission cooler. These contaminants are a major cause of recurring transmission concerns.

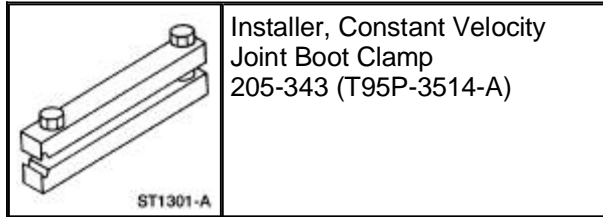
1. Using the special tool, backflush the torque converter. Test the equipment to make sure that a vigorous fluid flow is present before proceeding. Install a new system filter if flow is weak or contaminated.
2. To aid in attaching the cleaner to the transmission steel cooler tubes, connect two additional rubber hoses to the transmission end of the steel transmission cooler tubes.
 1. Connect the cleaner tank pressure line to the steel transmission inlet tube.
 2. Connect a tank return hose to the steel transmission outlet tube. Place the outlet end of this hose in the solvent.



3. Turn on solvent pump and allow the solvent to circulate a minimum of 5 minutes (cycling switch on and off will help dislodge contaminants in cooler system).
4. Switch off the solvent pump and disconnect the solvent pressure hose from the transmission cooler return line.
5. Use compressed air to blow out the cooler(s) and tubes (blow air into the transmission cooler return line) until all solvent is removed.
6. Remove the rubber return hose from the remaining steel cooler line.

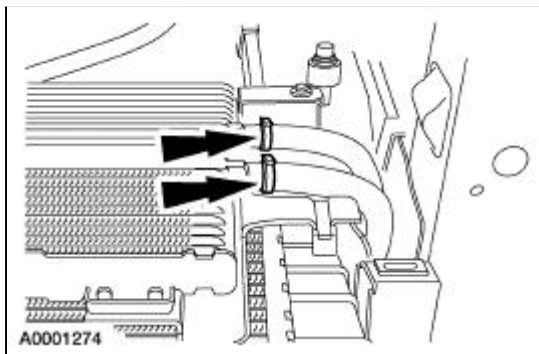
Combination Fluid Cooler

Special Tool(s)



Removal

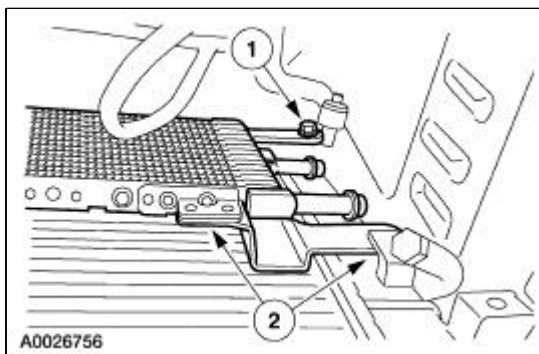
1. Remove the A/C condenser core. For additional information, refer to [Section 412-03](#).
2. Remove and discard the six hose clamps.



3. **NOTE:** Position a drain pan under the vehicle to catch any fluid that may spill.

Disconnect the six hoses from the cooler. Plug the hoses and the cooler.

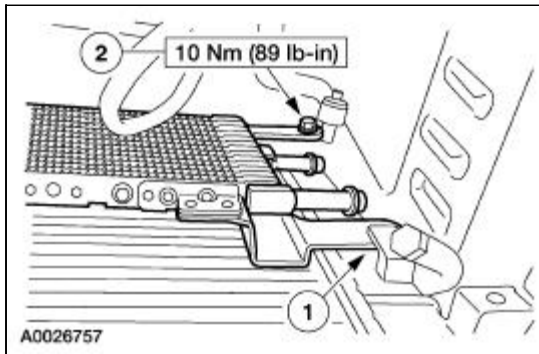
4. Remove the cooler.
 1. Remove the two bolts.
 2. Lift the cooler from the retainers and remove the cooler.



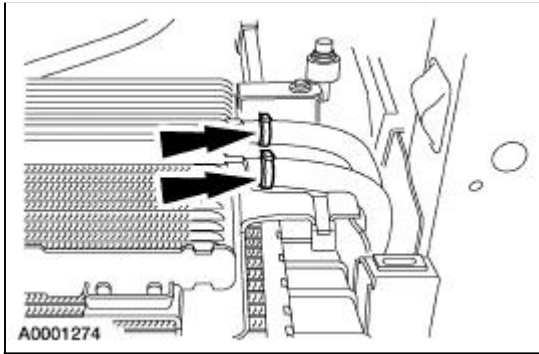
Installation

1. Install the cooler.

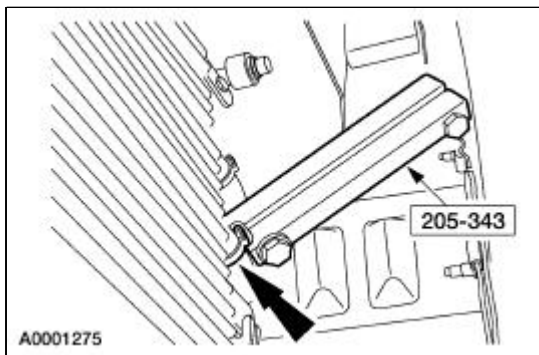
1. Position the cooler on the retainers.
2. Install the two bolts.



2. Position new hose clamps on the six hoses.
3. Remove the plugs from the six hoses and the cooler. Connect the six hoses to the cooler.



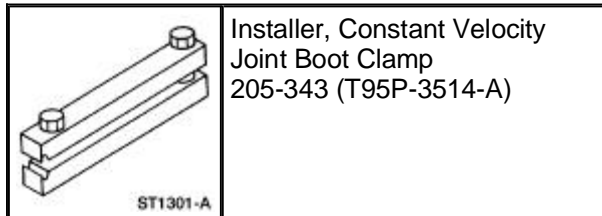
4. Using the special tool, tighten the six hose clamps.



5. Install the A/C condenser. For additional information, refer to [Section 412-03](#).
 6. Fill and leak check the power steering system. For additional information, refer to [Section 211-00](#).
 7. Fill and leak check the cooling fan system. For additional information, refer to [Section 303-03](#).
 8. Fill the automatic transmission and leak check the cooling system. For additional information, refer to [Section 307-01](#).
-

Transmission Fluid Cooler Tubes

Special Tool(s)



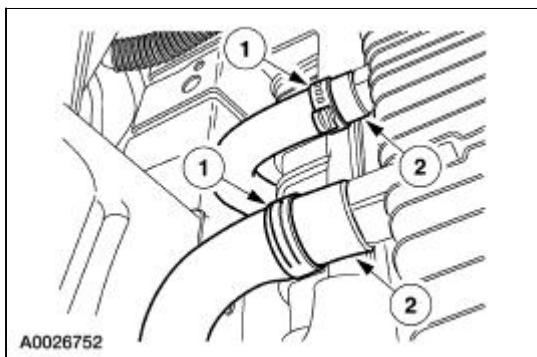
Removal

NOTE: This procedure describes the removal and installation of all the transmission cooling system tubes and hoses. Only disconnect those that require removal from the vehicle.

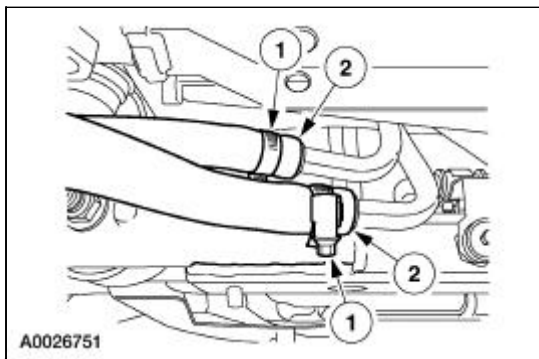
Hose removal

NOTE: Proceed to Disconnecting the tubes in this section if only removing the transmission fluid cooler tubes from the vehicle.

1. Remove the A/C condenser core. For additional information, refer to [Section 412-03](#).
2. Disconnect the transmission fluid cooler hose from the cooler.
 1. Cut and discard the clamp.
 2. Disconnect the transmission fluid cooler hose from the cooler.

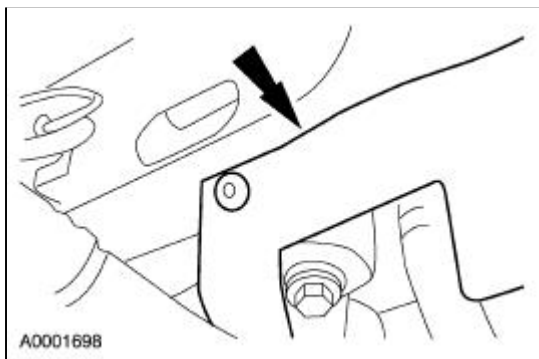


3. Disconnect the transmission fluid cooler hose from the transmission fluid cooler tube.
 1. Loosen and position the clamp aside.
 2. Disconnect the transmission fluid cooler hose from the transmission fluid cooler tube.
 - Proceed to Hose installation in this section if not removing the transmission fluid cooler tubes from the vehicle. Otherwise, proceed as follows.

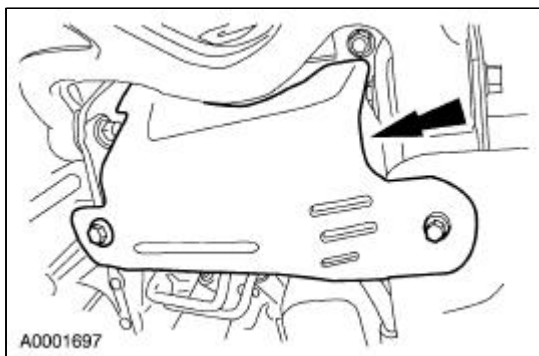


Disconnecting the tubes

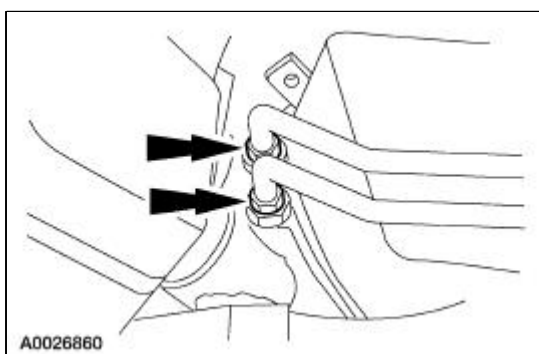
4. If not done previously, raise and support the vehicle. For additional information, refer to [Section 100-02](#).
5. If not done previously, remove the LH splash shield pushpin.



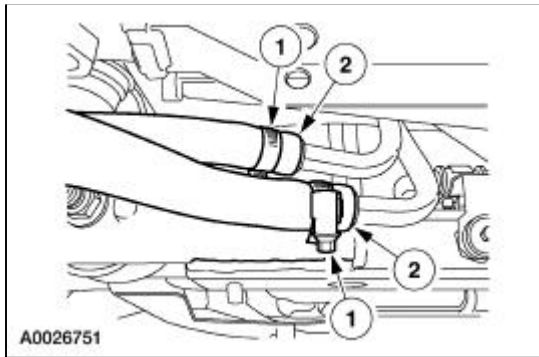
6. If not done previously, remove the bolts and the LH splash shield.



7. Disconnect the transmission fluid cooler tubes from the transmission.



8. If not done previously, disconnect the transmission fluid cooler hoses from the transmission fluid cooler tubes.
 1. Loosen and position the clamps aside.
 2. Disconnect the transmission fluid cooler hoses from the transmission fluid cooler tubes.



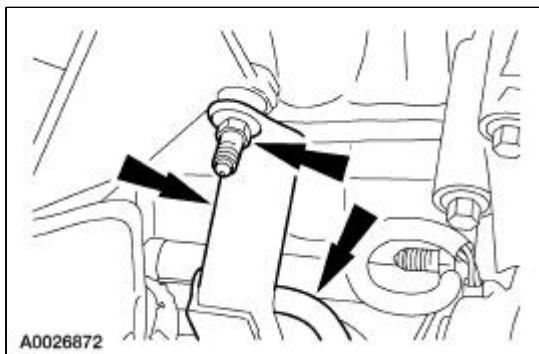
Tube removal, vehicle with V6 engine

9. Remove the nut, the fluid cooler tube bracket, and the fluid cooler tubes.



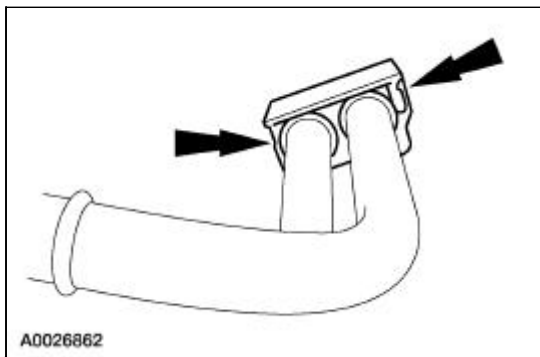
Tube removal, vehicle with V8 engine

10. Remove the nut, the fluid cooler tube bracket, and the fluid cooler tubes.



Routing bracket removal

11. Remove the fluid cooler tube routing bracket from the fluid cooler tubes.

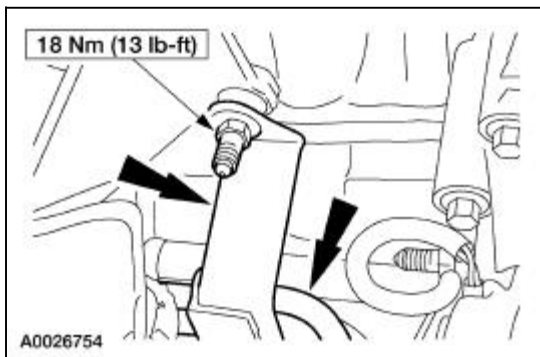


Installation

Tube installation, vehicle with V8 engine

NOTE: Proceed to Hose installation in this section if the transmission fluid cooler tubes were not removed from the vehicle.

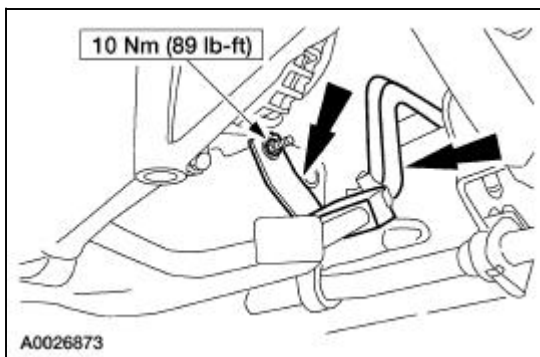
1. Position the transmission fluid cooler tubes and the fluid cooler tube bracket, and install the nut.



Tube installation, vehicle with V6 engine

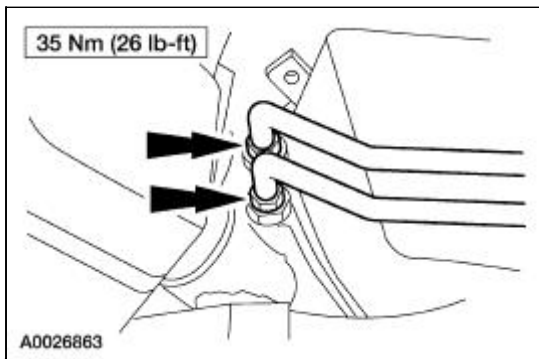
NOTE: Proceed to Hose installation in this section if the transmission fluid cooler tubes were not removed from the vehicle.

2. Position the transmission fluid cooler tubes and the fluid cooler tube bracket, and install the nut.



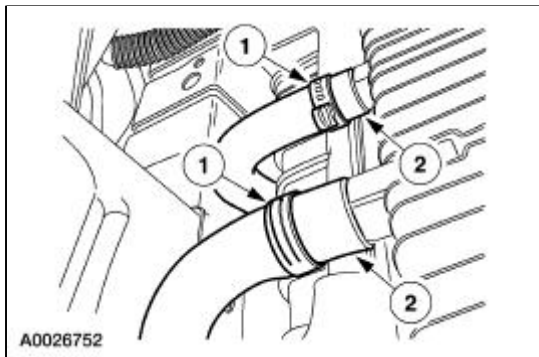
Connecting the tubes

3. Connect the transmission fluid cooler tubes to the transmission.
 - Proceed to Connecting the hose(s) in this section if the transmission fluid cooler hoses were not removed from the vehicle. Otherwise, proceed as follows.

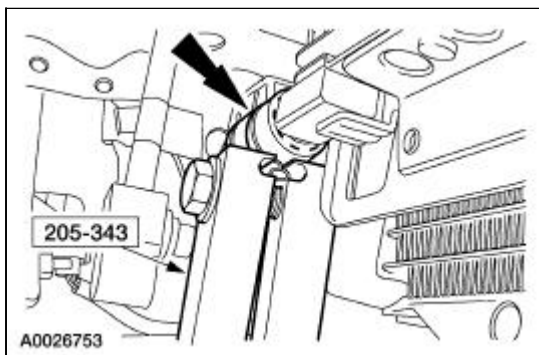


Hose installation

4. Connect the transmission fluid cooler hose(s) to the cooler.
 1. Position the clamp on the transmission fluid cooler hose.
 2. Connect the transmission fluid cooler hose to the cooler.

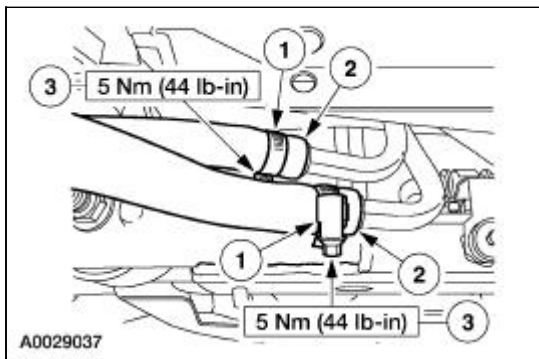


5. Using the special tool, tighten the clamp.
 - Repeat this step for the other hose clamp, if removed.



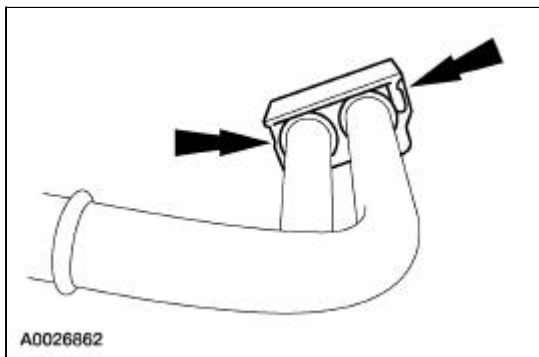
Connecting the hose(s)

6. Connect the transmission fluid cooler hose to the transmission fluid cooler tube.
 1. Position the clamp.
 2. Push the transmission fluid cooler hose onto the transmission fluid cooler tube until bottomed against the stop.
 3. Tighten the clamp.

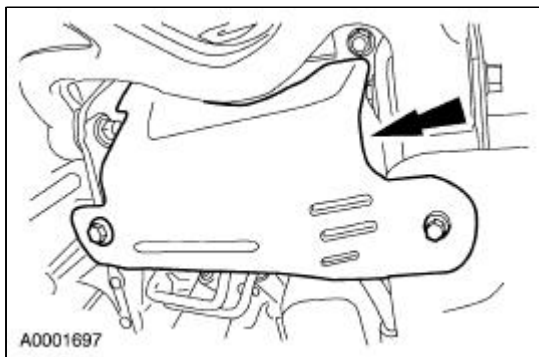


Final assembly

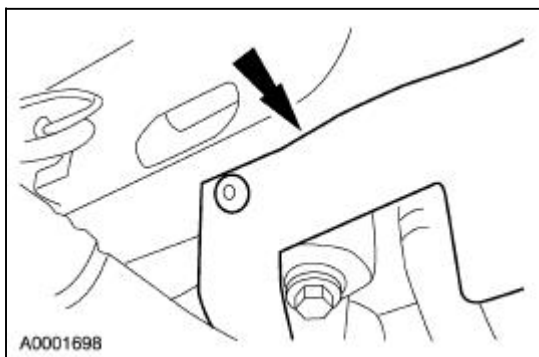
7. If removed, install the fluid cooler tube routing bracket.



8. If removed, install the A/C condenser core. For additional information, refer to [Section 412-03](#).
9. Install the LH splash shield and the bolts.



10. Install LH splash shield pushpin.



11. Lower the vehicle.

12. Fill the automatic transmission and leak check the cooling system. For additional information, refer to [Section 307-01](#).

Torque Specifications

Description	Nm	lb-ft	lb-in
Shifter assembly bolts	7	—	62
Shift lock actuator bolts	9	—	80
Transmission shift cable and bracket bolts	27	20	—
Screw retaining the lower instrument panel steering column opening cover to the instrument panel	2-3	—	19-26
Bolt retaining the instrument panel steering column opening cover reinforcement to the instrument panel	3-5	—	31-45

DESCRIPTION AND OPERATION

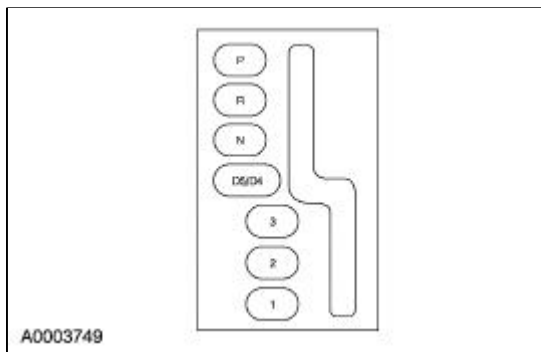
External Controls

The transmission shift cable transfers the transmission operating mode from the transmission range selector lever to the automatic transmission. The indicated position of the lever is transferred to the transmission through the cable and down to the manual control lever on the transmission.

Depending on the vehicle options selected the lever may have different range positions.

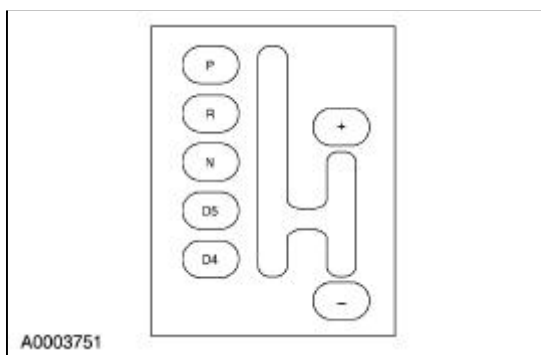
The standard lever has eight positions: P, R, N, D5, D4, 3, 2, and 1.

Base Range Shifter



The optional select shift transmission (SST) range selector lever has seven positions P, R, N, D5, or D4, + and -. The + and - option will allow the driver to manually upshift and downshift into any gear range.

Optional Range Shifter



Brake Shift Interlock System

The shift interlock system prevents shifting the transmission out of the PARK position unless the brake pedal is depressed. The shift interlock system consists of a shift lock actuator mounted on the ignition switch. The actuator is energized when the ignition switch is turned to RUN, locking the transmission range selector lever in the PARK position. When the brake pedal is applied and the brake pedal position (BPP) switch activated, the shift lock actuator is deactivated, allowing the selector lever to move out of the PARK position.

The ignition shift interlock cable locks the selector lever in the PARK position when the ignition switch

is in the lock position. It also requires the selector lever to be in the PARK position in order to turn the ignition switch to the lock position.

Select Shift Transmission (SST) Switches (+ and -)

The positions indicated by a (+) or a (-) allow the driver to manually select the appropriate upshift (+) or downshift (-) and gear range.

The SST switches are located within the transmission range selector assembly and are momentary contact switches that send a signal to the powertrain control module (PCM) each time the driver moves the selector lever into the upshift or downshift gear range.

The PCM uses the input signals from the SST+ and the SST- switches, along with other vehicle inputs, to determine which gear should be commanded.

Transmission Control Switch (TCS)

The TCS is a momentary contact switch that sends a signal to the PCM when the driver selects the D4 position, canceling operation of 5th (overdrive) gear.

The TCS is located within the range selector assembly for the base shifter only.

The PCM uses this signal to control the shift solenoids to disengage/disable 5th gear operation and activates coast clutch for the base shifter only. At the same time the PCM changes the instrument panel indicator to display D4.

When the driver moves the selector lever back to the D5 position, 5th gear operation is enabled, the coast clutch is released and the instrument panel indicator displays D5.

Park Sense Switch

The park sense switch prevents the redundant PRNDL from displaying "P" until the shifter is in the PARK position.


Electronic Transmission Error Indicator

The vehicle is equipped with a redundant electronic gearshift indicator. This character appears with the key in the RUN position and displays the same gear selection as shown on the selector lever floor console next to the range selector lever. If an "E" character flashes or remains on this indicates that a transmission malfunction has occurred.

External Controls

Refer to Wiring Diagrams Section [307-05](#) for schematic and connector information.

Special Tool(s)

 ST1137-A	73III Automotive Meter 105-R0057 or equivalent
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Inspection and Verification

1. Verify the customer concern by operating the transmission external control.
2. Visually inspect for obvious signs of mechanical and electrical damage; refer to the following charts:

Visual Inspection Chart

Mechanical	Electrical
<ul style="list-style-type: none"> ● Shift lock actuator ● Transmission control switch ● SST (+/-) switches ● Shift cable and bracket ● Park sense switch 	<ul style="list-style-type: none"> ● Central junction box (CJB) Fuse: <ul style="list-style-type: none"> ■ 204 (5A) ■ 205 (5A) ● Damaged wiring harness ● Loose or corroded connections ● Powertrain control module (PCM)

Diagnostic Trouble Code Chart

Five Digit DTC	Component	Description	Condition	Symptom	Action
P0815	SST +/-	SST +/- circuit input signal failed.	PCM has detected an incorrect voltage SST input.	May not be able to shift in manual mode.	Go To Pinpoint Test C.
P1780	TCS	TCS input incorrect per selected position.	TCS voltage incorrect.	No overdrive cancel when range selector is moved.	Go To Pinpoint Test A.

3. If the concern is not visually evident, determine the symptom and proceed to the Symptom Chart.

Symptom Chart


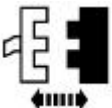

SYMPTOM CHART

Condition	Possible Sources	Action
<ul style="list-style-type: none"> The shift interlock system does not release or lock correctly 	<ul style="list-style-type: none"> Circuitry. Front electrical module (FEM). CJB Fuse 204 (5A) and 205 (5A). Shift lock actuator. Brake pedal position (BPP) switch. 	<ul style="list-style-type: none"> GO to Pinpoint Test D.
<ul style="list-style-type: none"> The shift control is out of correct gear relationship with bezel 	<ul style="list-style-type: none"> Transmission shift cable and bracket. Transmission control shifter. 	<ul style="list-style-type: none"> REFER to Cable Adjustment in this section.
<ul style="list-style-type: none"> Transmission range indicator does not correspond to the gear position display on instrument cluster 	<ul style="list-style-type: none"> Transmission shift cable bracket. Transmission shift cable loose from the transmission shift cable bracket. Shift cable. Digital transmission range (TR) sensor. Transmission shifter. 	<ul style="list-style-type: none"> TIGHTEN the bolts holding the transmission shift cable bracket. INSTALL a new cable. VERIFY the transmission shift cable adjustment. REFER to Cable Adjustment in this section. VERIFY correct digital transmission range (TR) sensor adjustment. REFER to Section 307-01. REFER to Section 307-01. INSTALL a new shifter assembly.
<ul style="list-style-type: none"> Unable to cancel overdrive 	<ul style="list-style-type: none"> Digital transmission range (TR) sensor (SST only). Fuse. TCS (base shifter only). TCS not cycled during self-test. Powertrain control module. Circuitry. 	<ul style="list-style-type: none"> GO to Pinpoint Test A.
<ul style="list-style-type: none"> Transmission does not shift in manual mode (SST only) 	<ul style="list-style-type: none"> Fuse. SST (+/- switches). SST (+/-) not cycled during self- 	<ul style="list-style-type: none"> GO to Pinpoint Test C.

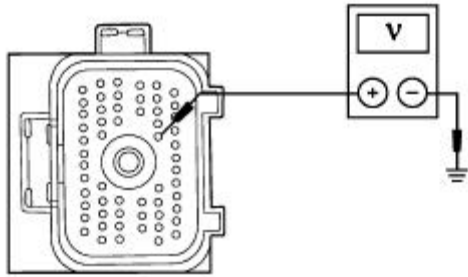
	<ul style="list-style-type: none"> test. ● Powertrain control module. ● Circuitry. 	
<ul style="list-style-type: none"> ● Instrument panel does not indicate park 	<ul style="list-style-type: none"> ● Park sense switch. ● Circuitry. 	<ul style="list-style-type: none"> ● GO to Pinpoint Test B.
<ul style="list-style-type: none"> ● Rattle, buzz, or other noise 	<ul style="list-style-type: none"> ● Selector lever knob. ● Selector lever bezel. ● Shifter assembly. 	<ul style="list-style-type: none"> ● INSTALL a new selector lever knob. ● INSTALL a new selector lever bezel. ● TIGHTEN housing bolts.
<ul style="list-style-type: none"> ● Excessive shift effort 	<ul style="list-style-type: none"> ● Transmission shift cable. ● Transmission components. ● Shifter assembly. 	<ul style="list-style-type: none"> ● INSTALL a new transmission shift cable. ● REFER to Section 307-01. ● INSTALL new shifter assembly.
<ul style="list-style-type: none"> ● Transmission range shifter will not move 	<ul style="list-style-type: none"> ● Transmission shift cable. ● Transmission components. ● Transmission shift cable. ● Brake shift interlock system. ● Transmission shifter assembly. 	<ul style="list-style-type: none"> ● INSTALL new transmission shift cable. ● REFER to Section 307-01. ● INSTALL a new transmission shift cable. ● GO to Pinpoint Test D. ● INSTALL new shifter assembly.

Pinpoint Tests

PINPOINT TEST A: OVERDRIVE CANCEL SWITCH NOT WORKING

CONDITIONS	DETAILS/RESULTS/ACTIONS
A1 CHECK INPUT TO PCM	
<p>1</p>  <p>2</p>  <p>PCM C175a</p> <p>3</p> 	

4



A0005935

4

Measure the voltage between PCM C175a pin 41, circuit 8-TA21 (WH/GN), harness side and ground.

• Is the voltage greater than 10 volts?

→ **Yes**
REFER to [Section 413-01](#).

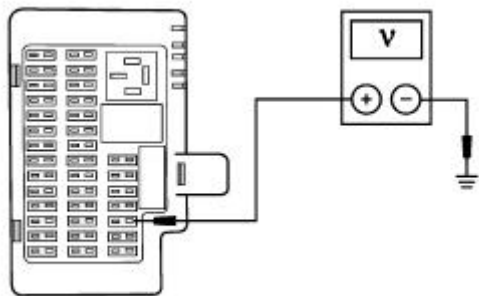
→ **No**
GO to [A2](#).

A2 CHECK FOR VOLTAGE TO FUSE 205 (5A)

1



2



A0005936

2

Measure the voltage between primary junction box fuse 205 (5A) input pin and ground.

• Is the voltage greater than 10 volts?

→ **Yes**
GO to [A3](#).

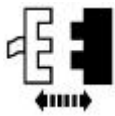
→ **No**
REPAIR the circuit. TEST the system for normal operation.

A3 CHECK FOR VOLTAGE INPUT TO THE SHIFTER

1



2

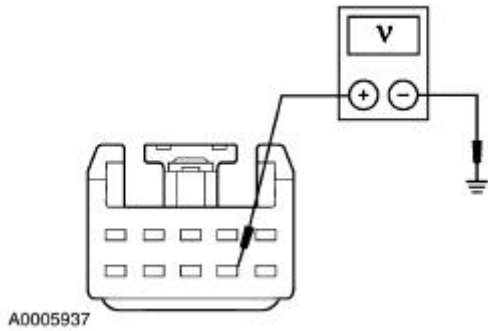


Transmission Shift Selector C307

3



4



4 Measure the voltage between transmission shift selector C307 pin 7, circuit 15-TA21 (GN/BK), harness side and ground.

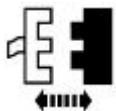
• Is the voltage greater than 10 volts?

→ **Yes**
GO to [A4](#).

→ **No**
REPAIR circuit 15-DA5 (GN/OG) or 15-TA21 (GN/BK). TEST the system for normal operation.

A4 CHECK CIRCUIT 8-TA21 (WH/GN) FOR SHORT TO GROUND

1



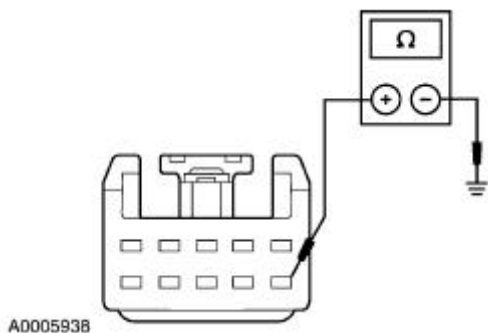
PCM C175a

2



Transmission Shift Selector C307


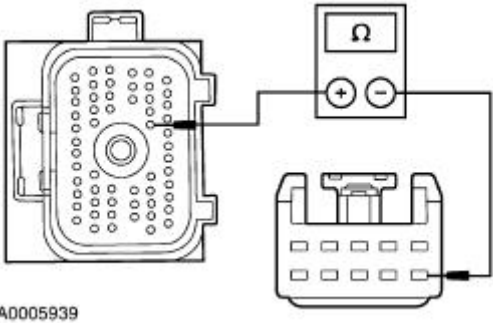
3



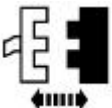

3 Measure the resistance between transmission shift selector C307 pin 6, circuit 8-TA21 (WH/GN), harness side and ground.

	<ul style="list-style-type: none"> ● Is the resistance greater than 10,000 ohms? <p>→ Yes GO to A5.</p> <p>→ No REPAIR the circuit. TEST the system for normal operation.</p>
--	--

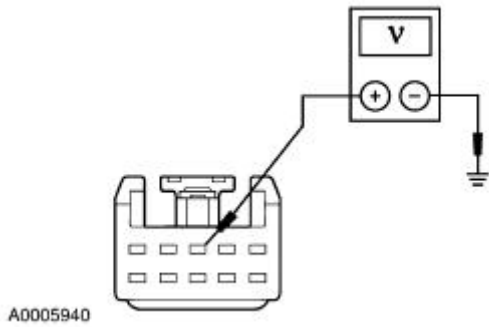
A5 CHECK CIRCUIT 8-TA21 (WH/GN) FOR AN OPEN

<p>1</p>  <p>2</p>  <p>A0005939</p>	<p>2</p> <p>Measure the resistance between PCM C175a pin 41, circuit 8-TA21 (WH/GN), harness side and transmission shift selector C307 pin 6, circuit 8-TA21 (WH/GN), harness side.</p> <ul style="list-style-type: none"> ● Is the resistance less than 5 ohms? <p>→ Yes INSTALL a new shifter harness. TEST the system for normal operation.</p> <p>→ No REPAIR the circuit. TEST the system for normal operation.</p>
--	---

PINPOINT TEST B: THE PARK SWITCH NOT WORKING

CONDITIONS	DETAILS/RESULTS/ACTIONS
<p>B1 CHECK CIRCUIT 15-TA34 (GN/YE) FOR OPEN</p>	
<p>1</p>  <p>Transmission Shift Selector C307</p> <p>2</p> 	

3



3

Measure the voltage between transmission shift selector C307 pin 3, circuit 15-TA34 (GN/YE), harness side and ground.

● Is the voltage greater than 10 volts?

→ **Yes**
GO to [B2](#).

→ **No**
REPAIR the circuit. TEST the system for normal operation.

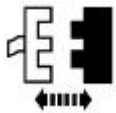
B2 CHECK FOR VOLTAGE ON CIRCUIT 8-TA34 (WH)

1



Transmission Shift Selector C307

2



Instrument Cluster C220b

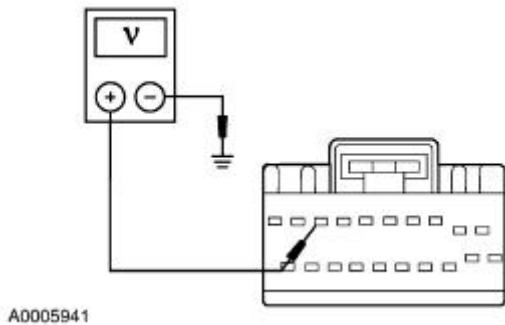
3



4



5



5

Measure the voltage between instrument cluster C220b pin 8, circuit 8-TA34 (WH), harness side and ground.

● Is the voltage greater than 10 volts?

→ **Yes**
INSTALL a new instrument cluster.
REFER to [Section 413-01](#). TEST the system for normal operation.

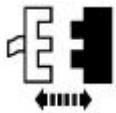
→ **No**
GO to [B3](#).

B3 CHECK CIRCUIT 8-TA34 (WH) FOR SHORT TO GROUND

1

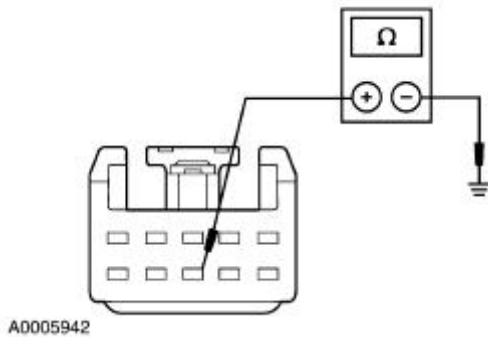


2



Transmission Shift Selector C307

3



3 Measure the resistance between transmission shift selector C307 pin 8, circuit 8-TA34 (WH), harness side and ground.

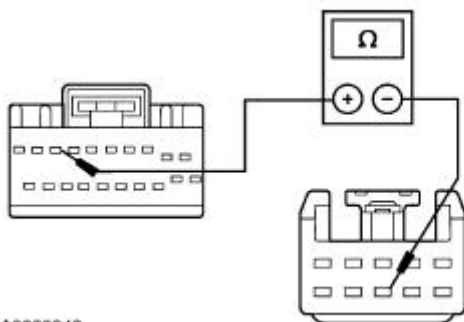
● Is the resistance greater than 10,000 ohms?

→ **Yes**
GO to [B4](#).

→ **No**
REPAIR the circuit. TEST the system for normal operation.

B4 CHECK CIRCUIT 8-TA34 (WH) FOR OPEN

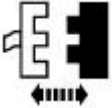
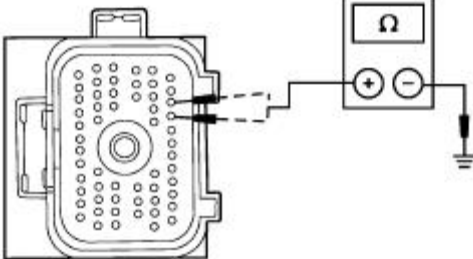
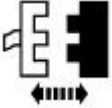
1

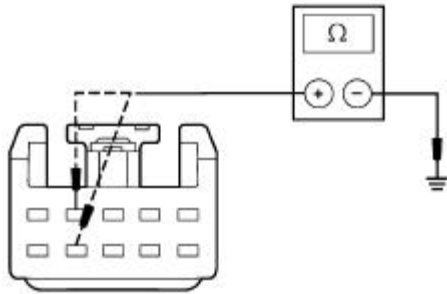


1 Measure the resistance between transmission shift selector C307 pin 8, circuit 8-TA34 (WH), harness side and instrument cluster C220b pin 8, circuit 8-TA34 (WH), harness side.

	<ul style="list-style-type: none"> ● Is the resistance less than 5 ohms? <p>→ Yes INSTALL a new shifter harness. TEST the system for normal operation.</p> <p>→ No REPAIR the circuit. TEST the system for normal operation.</p>
--	---

PINPOINT TEST C: THE TRANSMISSION MANUAL SHIFT (+/-) IS INOPERATIVE

CONDITIONS	DETAILS/RESULTS/ACTIONS
C1 CHECK CIRCUITS 8-TA67 (WH/VT) AND 8-TA68 (WH/BK) INPUT TO THE PCM	
<p>1</p>  <p>PCM C175a</p> <p>2</p>  <p>A0005947</p>	<p>2</p> <p>Measure the resistance between PCM C175a pin 49, circuit 8-TA67 (WH/VT), harness side and ground; and between PCM C175a pin 50, circuit 8-TA68 (WH/BK), harness side and ground, while activating the shifter to the manual up and down position.</p> <ul style="list-style-type: none"> ● Are the resistances less than 5 ohms? <p>→ Yes GO to C4.</p> <p>→ No GO to C2.</p>
C2 CHECK TRANSMISSION SHIFT SELECTOR CIRCUITS 31-TA67 (BK/WH) AND 31-TA68 (BK/RD) FOR OPEN	
<p>1</p>  <p>Transmission Shift Selector 307</p> <p>2</p>	<p>2</p> <p>Measure the resistance between transmission shift selector C307 pin 9, circuit 31-TA67 (BK/WH), harness side</p>



A0008895

and ground; and between shifter C307 pin 4, circuit 31-TA68 (BK/RD), harness side and ground.

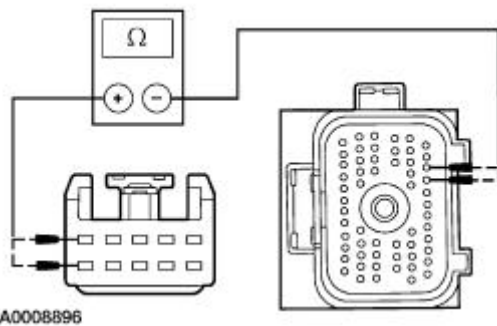
- Are the resistances less than 5 ohms?

→ **Yes**
GO to [C3](#).

→ **No**
REPAIR the circuits. TEST the system for normal operation.

C3 CHECK CIRCUITS 8-TA67 (WH/VT) AND 8-TA68 (WH/BK) FOR OPEN

1



A0008896

1

Measure the resistance between shifter C307 pin 10, circuit 8-TA67 (WH/VT), harness side and PCM C175a pin 49, circuit 8-TA67 (WH/VT) harness side; and C307 pin 5, circuit 8-TA68 (WH/BK), harness side, and PCM C175a pin 50, circuit 8-TA68 (WH/BK), harness side.

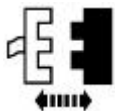
- Are the resistances less than 5 ohms?

→ **Yes**
INSTALL a new shifter harness. TEST the system for normal operation.

→ **No**
REPAIR the circuits. TEST the system for normal operation.

C4 CHECK CIRCUITS 8-TA67 (WH/VT) AND 8-TA68 (WH/BK) FOR SHORT TO GROUND

1

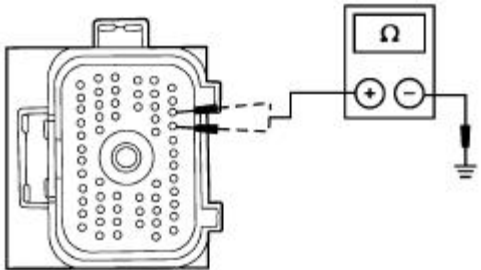


Shifter C307

2

2

Measure the resistance between PCM C175a pin 49, circuit 8-TA67 (WH/VT), harness side and ground; and between PCM C175a pin 50, circuit 8-TA68



A0005947

(WH/BK), harness side and ground.

- Are the resistances greater than 10,000 ohms?

→ **Yes**
GO to [C5](#).

→ **No**
REPAIR the circuit. TEST system for normal operation.

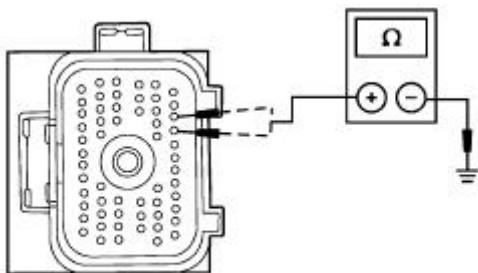
C5 CHECK THE TRANSMISSION SHIFT SELECTOR SWITCHES

1



Transmission Shift Selector C307

2



A0005947

2 Measure the resistance between PCM C175a pin 49, circuit 8-TA67 (WH/VT), harness side and ground; and between PCM C175a pin 50, circuit 8-TA68 (WH/BK), harness side and ground while activating the manual up and down position.

- Is the resistance less than 5 ohms with the switch on and greater than 10,000 ohms with the switch off?

→ **Yes**
INSTALL a new PCM.

→ **No**
INSTALL a new harness. TEST the system for normal operation.

PINPOINT TEST D: BRAKE SHIFT INTERLOCK INOPERATIVE

CONDITIONS	DETAILS/RESULTS/ACTIONS
------------	-------------------------

D1 CHECK FOR FEM DTCs

1 Retrieve FEM DTCs. Refer to [Section 417-01](#).

- Are any DTCs retrieved related to the brake switch?

→ **Yes**
GO to [D1](#); REFER to [Section 417-01](#).

→ **No**
GO to [D2](#).

D2 CHECK FOR VOLTAGE ON CIRCUIT 7S-TA33 (YE/VT)

1



2

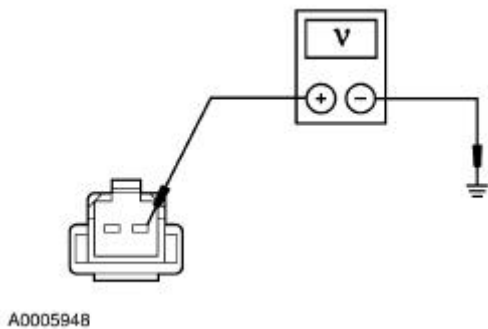


Brake Shift Interlock C322

3



5



4 Press and hold the brake pedal.

5 Measure the voltage between brake shift interlock C322 pin 2, circuit 7S-TA33 (YE/VT), harness side and ground.

- Is the voltage greater than 10 volts?

→ **Yes**
GO to [D5](#).

→ **No**
GO to [D3](#).

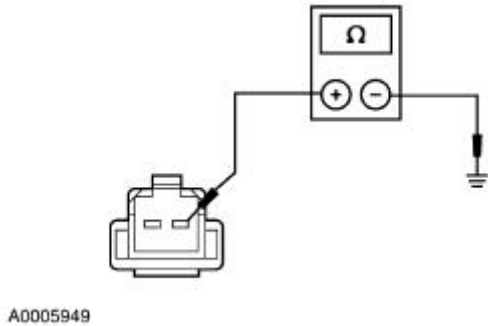
D3 CHECK CIRCUIT 75-TA33 (YE/VT) FOR SHORT TO GROUND

1



FEM C201f

2



2

Measure the resistance between brake shift interlock C322 pin 2, circuit 7S-TA33 (YE/VT), harness side and ground.

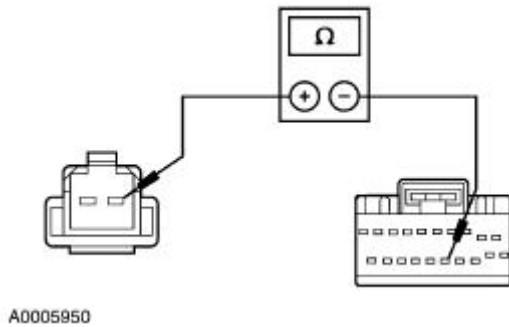
● Is the resistance greater than 10,000 ohms?

→ **Yes**
GO to [D4](#).

→ **No**
REPAIR the circuit. TEST the system for normal operation.

D4 CHECK CIRCUIT 7S-TA33 (YE/VT) FOR OPEN

1



1

Measure the resistance between brake shift interlock C322 pin 2, circuit 7S-TA33 (YE/VT), harness side and FEM C201f pin 15, circuit 7S-TA33 (YE/VT), harness side.

● Is the resistance less than 5 ohms?

→ **Yes**
INSTALL a new FEM; REFER to [Section 419-10](#).

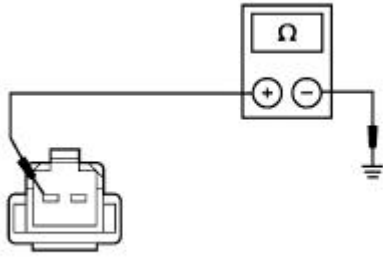
→ **No**
REPAIR the circuit. TEST the system for normal operation.

D5 CHECK CIRCUIT 31-TA33 (BK) FOR AN OPEN

1

1

Measure the resistance between brake shift interlock C322 pin 1, circuit 31-TA33 (BK), harness side and ground.



A0005951

- Is the resistance less than 5 ohms?

→ **Yes**

INSTALL a new brake shift interlock actuator; REFER to [Brake Shift Interlock Actuator](#). TEST the system for normal operation.

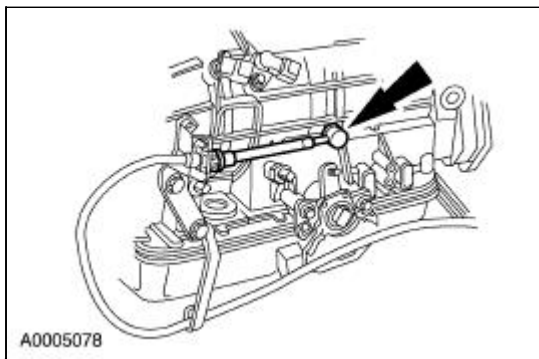
→ **No**

REPAIR the circuit. TEST the system for normal operation.

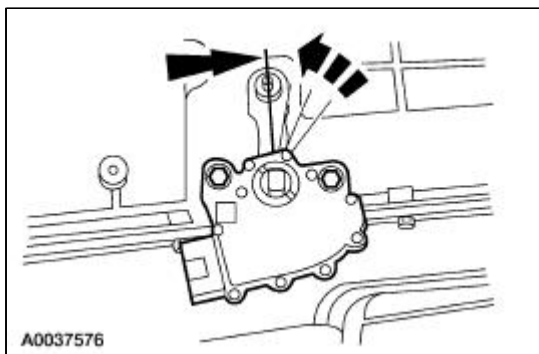
Cable Adjustment

Shift Cable

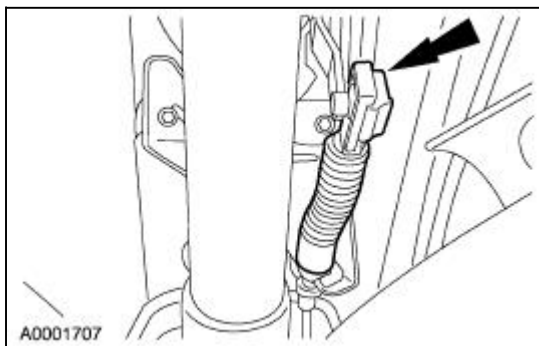
1. Place the gearshift lever (7210) in the D5 position.
2. Raise and support the vehicle. For additional information, refer to [Section 100-02](#).
3. Disconnect the transmission shift cable from the manual control lever (7A256).



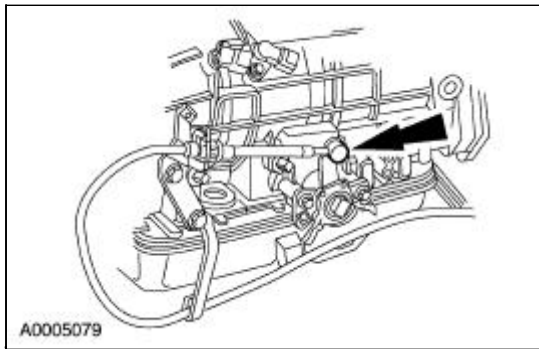
4. Place the manual control lever in the D5 position. This is three positions from the most rearward position.



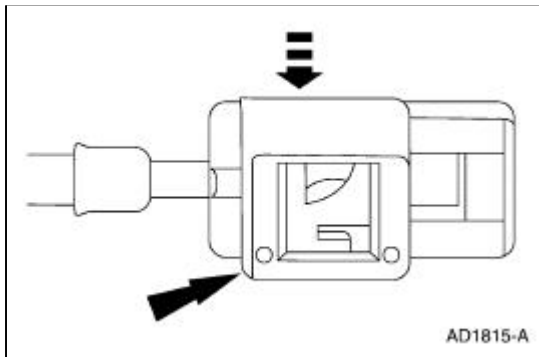
5. Disconnect the transmission shift cable from the selector lever.



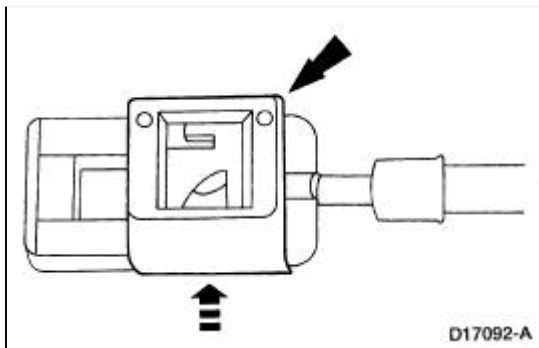
6. Connect the transmission shift cable to the manual control lever.



7. Unlock the adjuster at the end of the cable.



8. Connect the shift cable to the shifter and lock the end of the adjuster.



9. Lower the vehicle.
 10. Carefully move the manual control lever from detent to detent and compare with transmission settings. Verify that the vehicle will start in PARK or NEUTRAL and backup lamps illuminate in REVERSE. If not, Steps 1-5 must be repeated and include digital transmission range (TR) sensor adjustment in NEUTRAL. For additional information, refer to [Section 307-01](#).
 - Adjust as necessary.
-

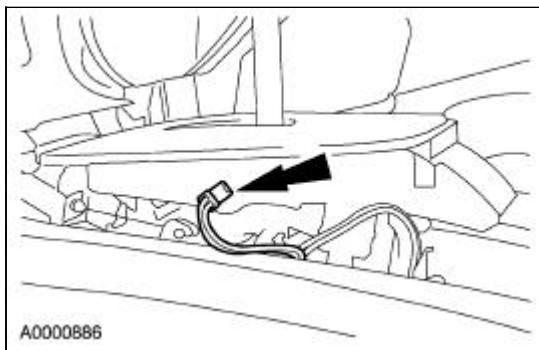
Brake Shift Interlock Actuator

Removal and Installation

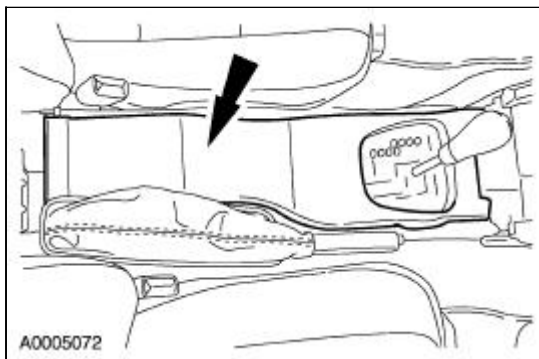
1. **NOTE:** If equipped with the traction control switch, the switch will need to be disconnected prior to removing the center console.

Remove the center console. For additional information, refer to [Section 501-12](#).

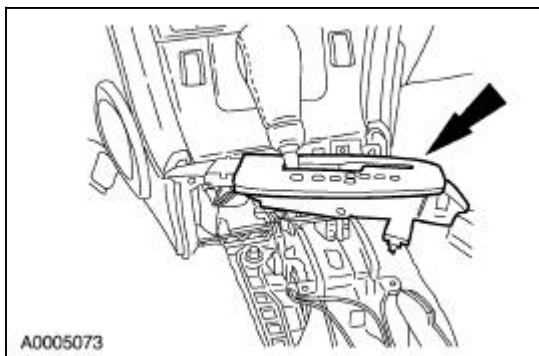
2. Remove the PRNDL indicator bulb.



3. Remove the rear A/C air duct.

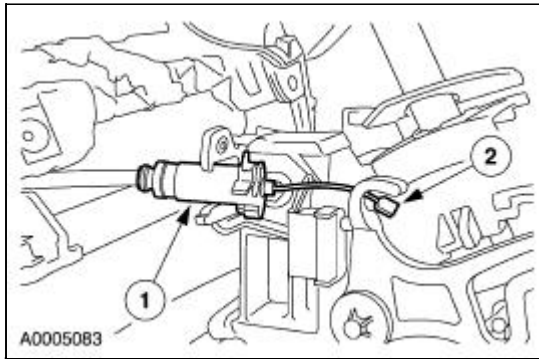


4. Rotate the shifter bezel.

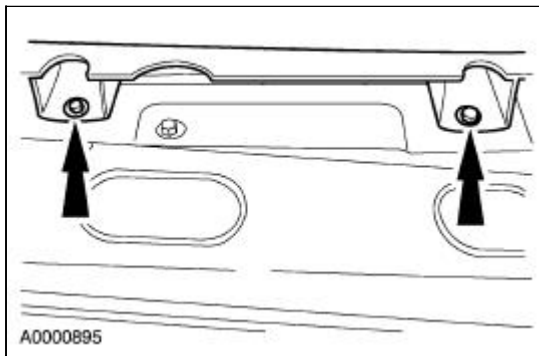


5. Disconnect the cable from the lever.
 1. Remove the shift interlock cable from the bracket.

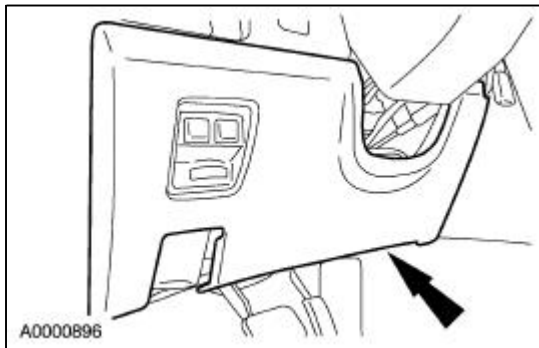
2. Disconnect the cable from the lever.



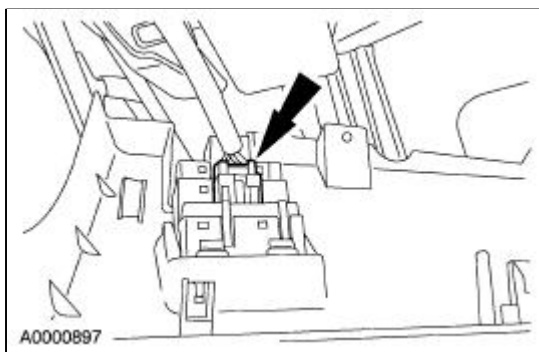
6. Remove the lower steering column cover screws.



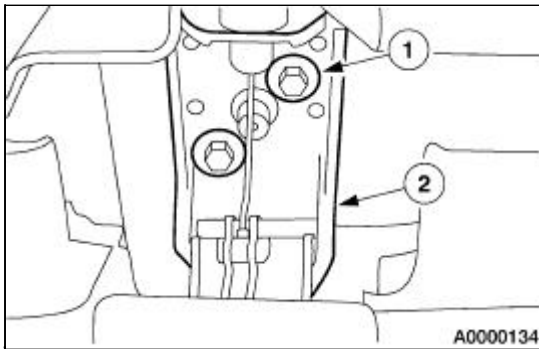
7. Remove the instrument panel steering column cover.



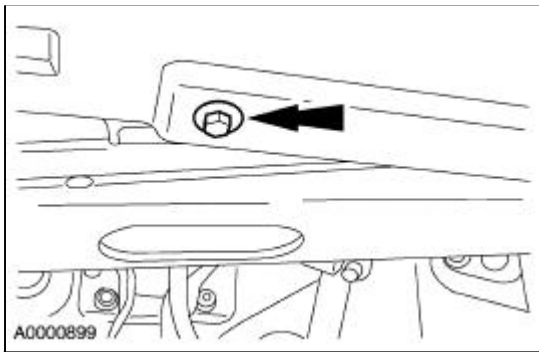
8. Disconnect the electrical connector.



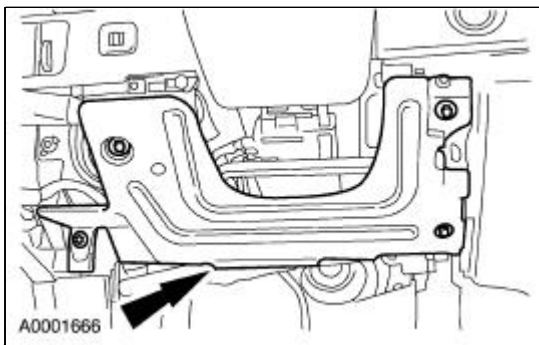
9. Position the hood release cable and bracket aside.
 1. Remove the screws.
 2. Position the hood release cable and bracket aside.



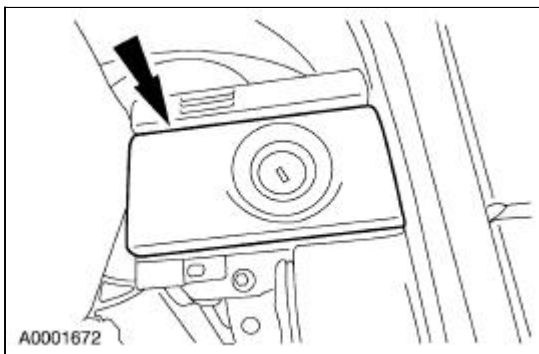
10. Remove the floor heat duct screw.



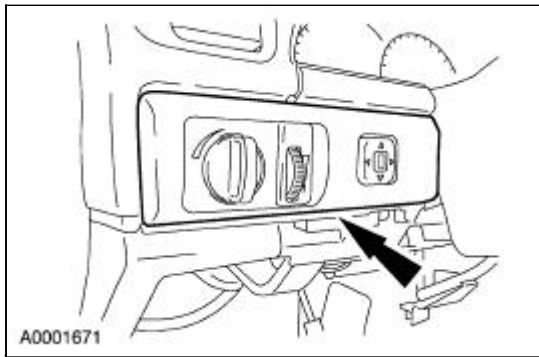
11. Remove the lower reinforcement panel.



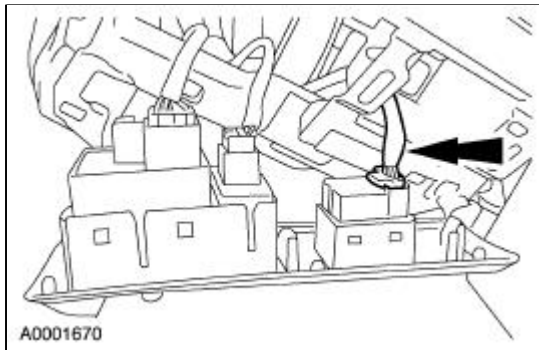
12. Remove the inner instrument panel finish panel.



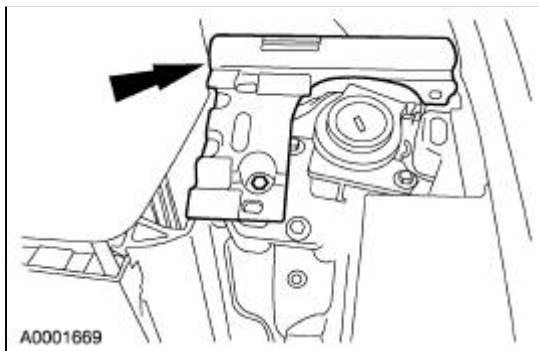
13. Remove the outer instrument panel finish panel.



14. Disconnect the power mirror switch.

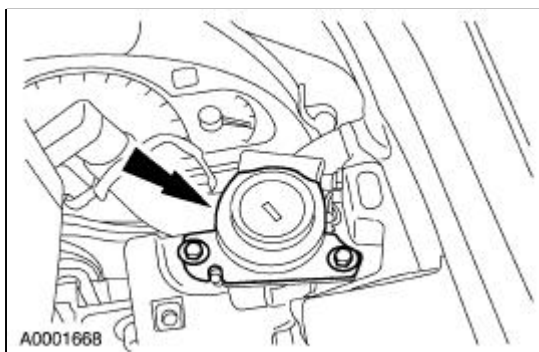


15. Remove the inner trim support panel.

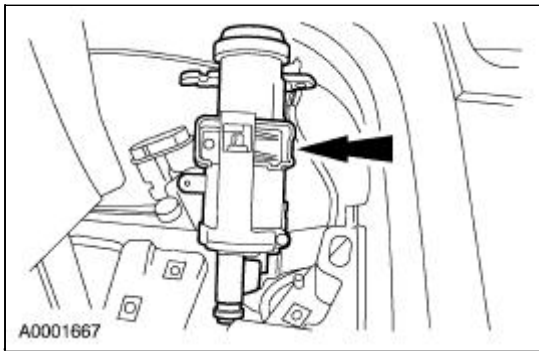


16. Remove the ignition switch.

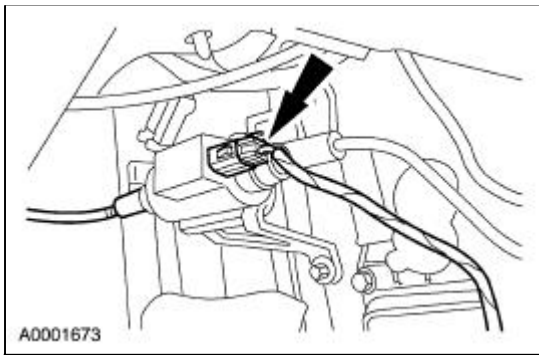
- Remove the screws.
- Remove the ignition switch.



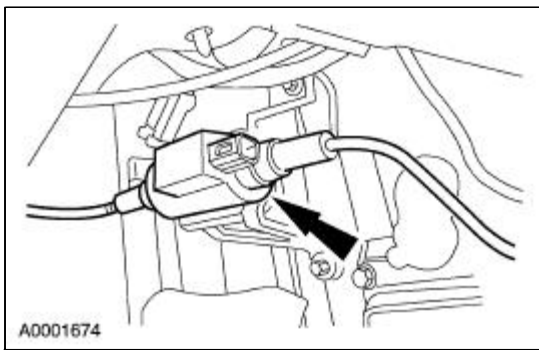
17. Remove two screws for the shift lock actuator cable.



18. Disconnect the electrical connector.



19. Remove the cable from the bracket and remove the cable.

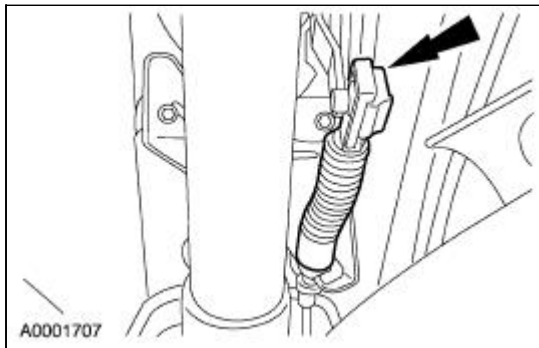


20. To install, reverse the removal procedure.

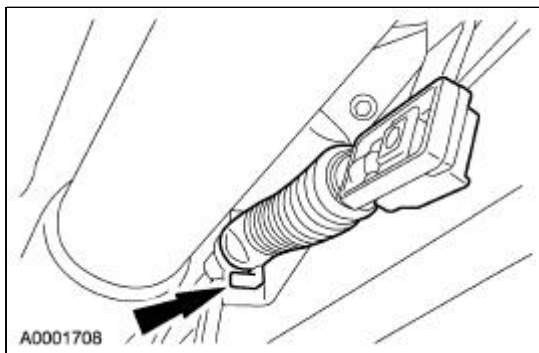
Cable

Removal and Installation

1. Position the gearshift lever in the D-5 position.
2. Raise and support the vehicle. For additional information, refer to [Section 100-02](#).
3. Disconnect the transmission shift cable from the selector lever.

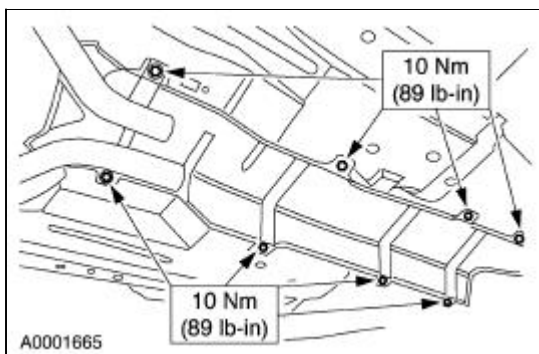


4. Disconnect the transmission shift cable from the bracket.

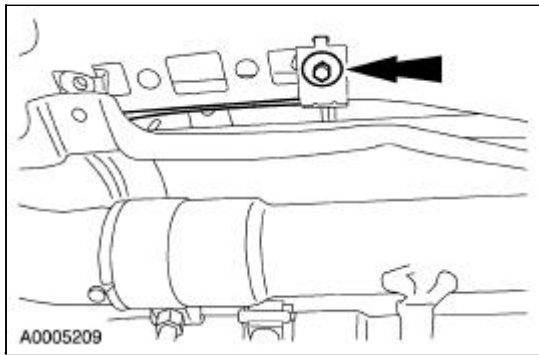


5. **NOTE:** It is not necessary to remove the exhaust.

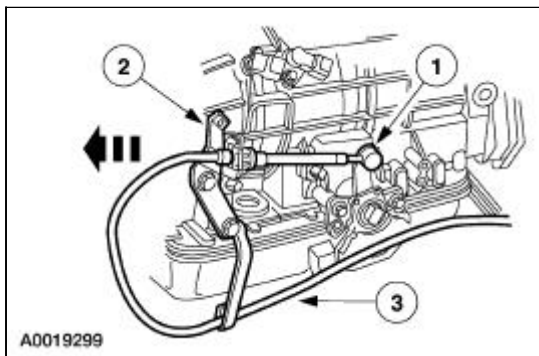
Remove the bolts from the heat shield and allow the shield to rest on the exhaust.



6. Remove the bolt at the shift cable bracket.



7. Remove the transmission shift cable.
 1. Disconnect the shift cable from the transmission manual control lever.
 2. Depress the tab and slide the shift cable out of the shift cable bracket.
 3. Remove the shift cable.



8. **NOTE:** A cable adjustment must be performed after the installation procedure.

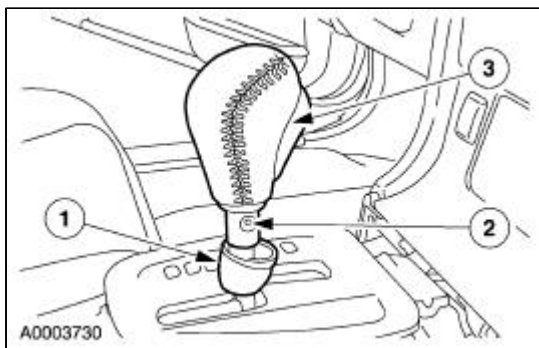
To install, reverse the removal procedure.

- Adjust the shifter cable. For additional information, refer to [Cable Adjustment](#) in this section.
-

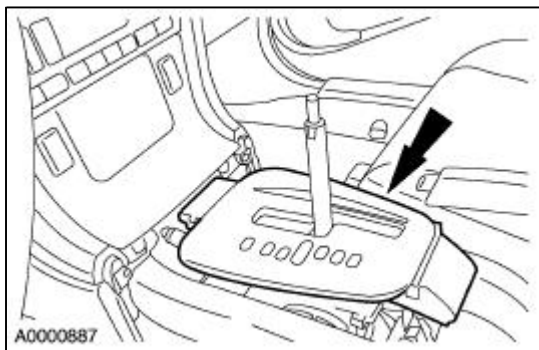
Selector Lever

Removal and Installation

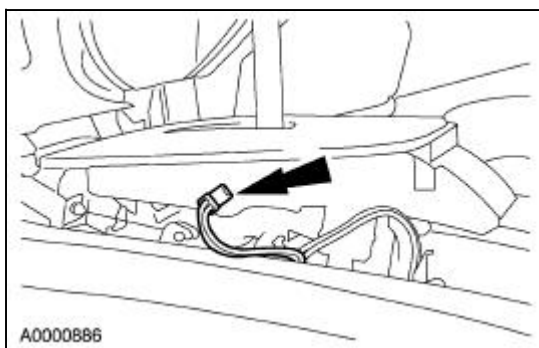
1. Remove the center console. For additional information, refer to [Section 501-12](#).
2. Remove the handle and the cover.
 1. Slide the cover down.
 2. Remove the two screws.
 3. Remove the handle and the cover.



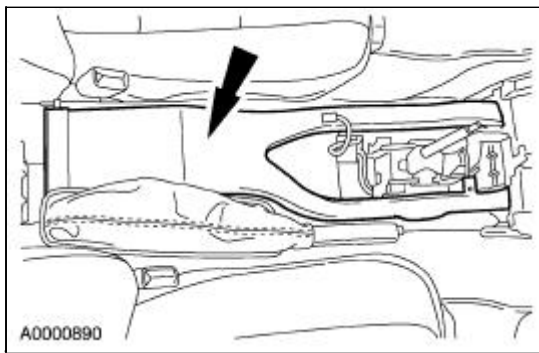
3. Remove the shift bezel.



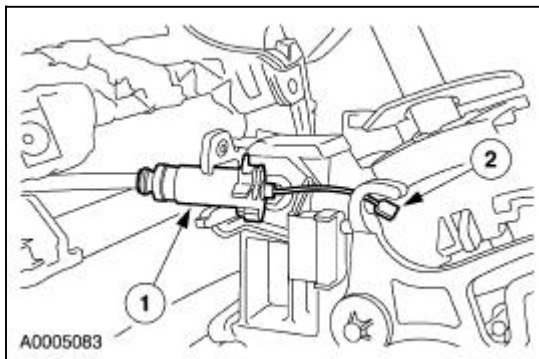
4. Remove the PRNDL indicator bulb.



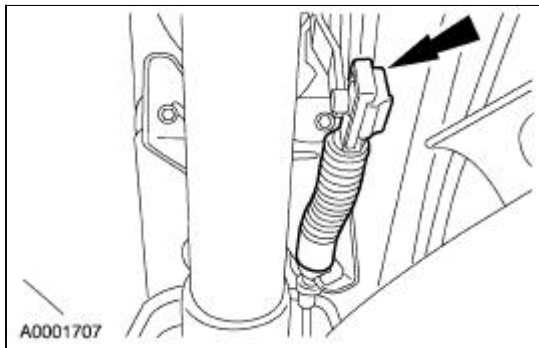
5. Remove the rear A/C air duct.



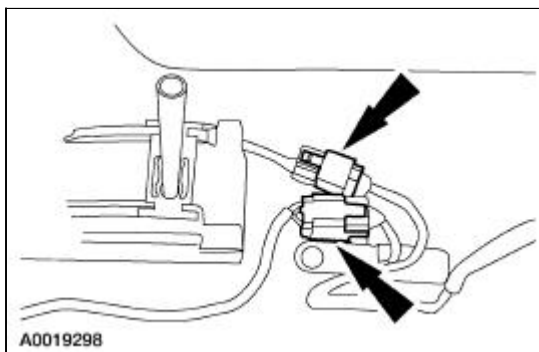
6. Disconnect the cable from the lever.
 1. Remove the shift interlock cable from the bracket.
 2. Disconnect the cable from the lever.



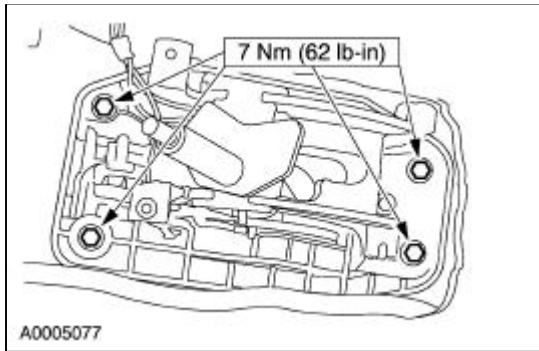
7. Raise and support the vehicle. For additional information, refer to [Section 100-02](#).
8. Disconnect the transmission shift cable from the selector lever.



9. Lower the vehicle.
10. Disconnect the two electrical connectors.



11. Remove the shifter assembly.
 - Remove the bolts.
 - Remove the shifter assembly.



12. **NOTE:** A cable adjustment must be performed after the installation procedure.

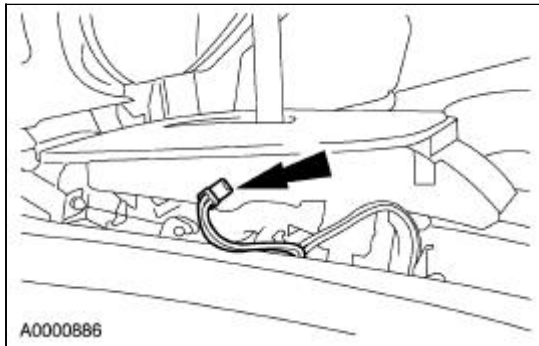
To install, reverse the removal procedure.

- Adjust the shifter cable. For additional information, refer to [Cable Adjustment](#) in this section.
-

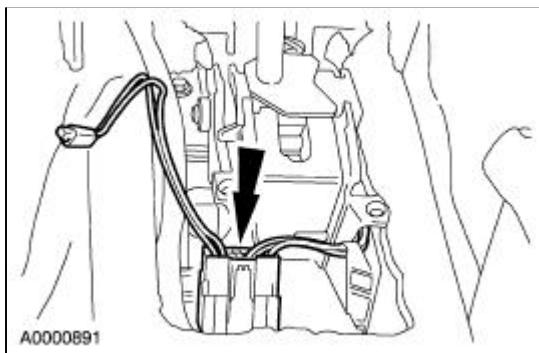
Transmission Control Switch

Removal and Installation

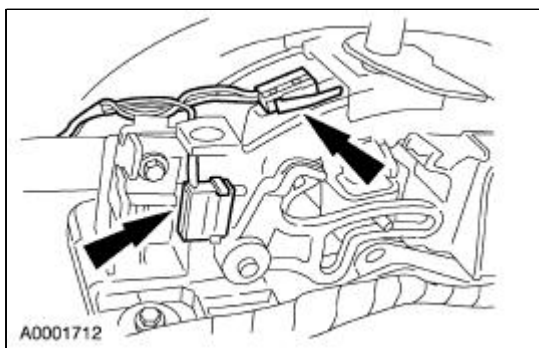
1. Remove the center console. For additional information, refer to [Section 501-12](#).
2. Remove the PRNDL indicator bulb.



3. Disconnect the electrical connector.



4. Disconnect the switches and remove the harness.



5. To install, reverse the removal procedure.

SPECIFICATIONS

Lubricants, Fluids, Sealers and Adhesives

Item	Specification
High Performance DOT 3 Motor Vehicle Brake Fluid C6AZ-19542-AB	ESA-M6C25-A, DOT 3

DESCRIPTION AND OPERATION

Manual Transmission and Clutch

The clutch system consists of the following components:

- a flywheel
- a clutch disc
- a clutch pressure plate
- a clutch master cylinder
- a clutch slave cylinder
- a clutch release hub and bearing

The clutch master cylinder transmits fluid pressure to the slave cylinder, which in turn moves the clutch release hub and bearing.

The clutch master cylinder uses brake fluid and shares a common reservoir with the brake master cylinder.

The clutch is a single plate, dry-friction disc with a diaphragm-style spring clutch pressure plate. The clutch disc has a hub which is splined to the input shaft. The clutch disc has friction material where it contacts the flywheel and the pressure plate. The clutch pressure plate applies pressure to the clutch disc, holding it tightly against the surface of the flywheel.

In the engaged position, the diaphragm spring holds the clutch pressure plate against the clutch disc so that engine torque is transmitted to the input shaft. When the clutch pedal is depressed, the clutch release hub and bearing pushes the diaphragm spring center toward the flywheel. The diaphragm spring pivots at the fulcrum, relieving the load on the clutch pressure plate. Steel spring straps riveted to the clutch pressure plate cover pull the clutch pressure plate from the clutch disc, disengaging the engine torque from the transmission and enabling the gears to be changed.

Manual Transmission and Clutch

Inspection and Verification - Clutch

1. Verify the customer concern by operating the system.
2. Visually inspect for obvious signs of mechanical damage.

Visual Inspection Chart

Mechanical
<ul style="list-style-type: none"> ● Transmission oil leak ● Loose or missing screws or nuts

3. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
4. If the concern is not visually evident, verify the symptom and refer to the Symptom Chart.

Inspection and Verification - Manual Transmission

The following checks should be carried out before repairing or installing a new transmission:

Transmission Noise

If transmission noises are reported, check the transmission fluid level. If damage has occurred due to a lack of fluid, install a new transmission. For additional information, refer to [Section 308-03](#).

Oil Leakage

- Check that the leaking fluid is actually transmission fluid and not hydraulic fluid (from the hydraulically operated clutch) or engine oil.
- Check the transmission fluid level and, as necessary, drain off any excess fluid.
- Clean the transmission and the adjacent areas carefully before the road test.

Symptom Chart - Poor Gear Shifting

Symptom Chart

Condition	Possible Sources	Action
<ul style="list-style-type: none"> ● Significant effort required when downshifting or synchronizer clashing 	<ul style="list-style-type: none"> ● Inadequate gear synchronization . 	<ul style="list-style-type: none"> ● INSTALL a new transmission. REFER to Section 308-03.
<ul style="list-style-type: none"> ● Gear jumps out of engagement while 	<ul style="list-style-type: none"> ● Transmission assembly error (missing snap rings 	<ul style="list-style-type: none"> ● INSTALL a new transmission. REFER

driving	or circlips synchronizer components). ● Manufacturing error (incorrect gear wheel tooting or synchronizer ring).	to Section 308-03 .
● Gearshift problems in different gears (stiff or partially seized)	● Linkage.	● REPAIR the transmission accordingly. CHECK the transmission for any resulting damage.
● Brief scratching noise during gear shifting	● Inadequate gear synchronization.	● INSTALL a new transmission. REFER to Section 308-03 .

Symptom Chart - Oil Leakage

Symptom Chart

Condition	Possible Sources	Action
● Leak from transmission housing	<ul style="list-style-type: none"> ● Leak from crankshaft rear seal. ● Leak from clutch hydraulics. ● Sealing lip on input shaft damaged. 	<ul style="list-style-type: none"> ● INSTALL a new crankshaft seal. ● For additional information, REFER to Pinpoint Test H . ● INSTALL a new input shaft seal.

Symptom Chart - General Concerns

Symptom Chart

Condition	Possible Sources	Action
● Clicking noises in reverse gear	● Gear wheels.	● RUN the vehicle on a hoist to establish that the noise is coming from the transmission. If the noise is coming from the transmission, INSTALL a new transmission.
● Gear wheels banging when shifting	<ul style="list-style-type: none"> ● Damaged clutch. ● Selector forks or synchronizer rings. 	<ul style="list-style-type: none"> ● CHECK the clutch is clearing correctly. <ul style="list-style-type: none"> ■ No-For additional information, REFER to Pinpoint Test A . ■ Yes-CHECK transmission oil level. If transmission oil level is okay INSTALL a new transmission. REFER to Section 308-03 . ● INSTALL a new transmission. REFER to Section 308-03 .
● Noises in the forward gears	● Transmission fluid level low.	● FILL the transmission with correct amount of fluid.

	<ul style="list-style-type: none"> ● The engine/transmission assembly is in contact with the chassis/body. ● Engine/transmission flange bolts. ● Input and output shaft bearings. 	<ul style="list-style-type: none"> ● INSPECT for points of contact for damaged engine/transmission isolator, support insulator. ● TIGHTEN the transmission flange bolts. For additional information, REFER to Section 308-03. ● INSTALL a new transmission. REFER to Section 308-03.
<ul style="list-style-type: none"> ● Gears jump out of engagement 	<ul style="list-style-type: none"> ● Engine/transmission support insulator. ● Internal components. 	<ul style="list-style-type: none"> ● REPAIR or INSTALL new components as necessary. ● INSTALL a new transmission. REFER to Section 308-03.
<ul style="list-style-type: none"> ● One of the gears cannot be selected 	<ul style="list-style-type: none"> ● Gearshift linkage malfunction. ● Transmission internal selection problem. 	<ul style="list-style-type: none"> ● CHECK gearshift linkage correctly attached to transmission case, sector arm and the rear mounted to body. <ul style="list-style-type: none"> ■ CHECK gearshift linkage functions correctly. ● INSTALL a new transmission. REFER to Section 308-03.
<ul style="list-style-type: none"> ● Gears jump out of engagement 	<ul style="list-style-type: none"> ● Gearshift linkage fault. ● Internal selector mechanism loose. ● Synchronizer fault. 	<ul style="list-style-type: none"> ● CHECK gearshift linkage for correct function. ● INSTALL a new transmission. REFER to Section 308-03. ● INSTALL a new transmission. REFER to Section 308-03.
<ul style="list-style-type: none"> ● Clattering, or rattling noises 	<ul style="list-style-type: none"> ● Gearshift mechanism grounding out. ● Gearshift lever joint. ● Gearshift lever knob loose. 	<ul style="list-style-type: none"> ● MAKE SURE that the gearshift mechanism is correctly located and the rear mount to body is correctly located. <ul style="list-style-type: none"> ■ MAKE SURE that there are no components interfering with the gearshift linkage. ■ MAKE SURE the air conditioning ducts and wiring harness are not interfering with the gearshift levers inside the center console. ● CHECK free play in bearing between the lever and support housing, and between the lever and shift arm. ● TIGHTEN the gearshift lever knob or, INSTALL a new gearshift lever knob as

	<ul style="list-style-type: none"> ● Trim ring loose on knob/lever. 	<p>necessary.</p> <ul style="list-style-type: none"> ● MAKE SURE the trim ring is securely located onto the gear knob. INSTALL a new trim ring if necessary.
<ul style="list-style-type: none"> ● Gearshift linkage has excessive play 	<ul style="list-style-type: none"> ● Gear lever bearing worn. ● Gearshift selector rod assembly damaged or worn. ● Stabilizer bar support insulator damaged or worn. ● Stabilizer to transmission bushings worn. 	<ul style="list-style-type: none"> ● CHECK free play in bearing. INSTALL a new gear lever bearing if necessary. ● INSTALL a new gearshift selector rod assembly. ● INSTALL a new stabilizer bar support insulator. ● INSTALL new transmission bushings.
<ul style="list-style-type: none"> ● Gearshift linkage does not operate freely 	<ul style="list-style-type: none"> ● Excessive friction in gear lever bearing. ● Gearshift selector rod assembly damaged or worn. ● Possible fault in transmission. 	<ul style="list-style-type: none"> ● INSTALL a new gear lever bearing. ● INSTALL a new gearshift selector rod assembly. ● INSTALL a new transmission. REFER to Section 308-03.

Symptom Chart - Clutch

Symptom Chart

Condition	Possible Sources	Action
<ul style="list-style-type: none"> ● Clutch slippage 	<ul style="list-style-type: none"> ● Clutch pedal free play. ● Sticking clutch pedal. ● Diaphragm springs. ● Clutch pressure plate. ● Clutch disc facing. ● Hardened or oiled clutch disc facing surface. ● Flywheel. ● Excessive temperature. ● Slave cylinder sticking. ● Adjuster ring at fully worn position. 	<ul style="list-style-type: none"> ● GO to Pinpoint Test A. ● ALLOW the clutch to fully cool. ● CHECK that the slave cylinder travels freely over its complete travel. ● INSTALL a new clutch drive plate.
<ul style="list-style-type: none"> ● Clutch chatter or shudder 	<ul style="list-style-type: none"> ● Engine mounts. ● Oil on clutch disc facing. ● Diaphragm springs. ● Clutch pressure plate. ● Clutch disc facing. ● Flywheel. 	<ul style="list-style-type: none"> ● GO to Pinpoint Test B.
<ul style="list-style-type: none"> ● Clutch drag 	<ul style="list-style-type: none"> ● Insufficient brake fluid. ● Air in hydraulic system. ● Clutch pedal free play. ● Diaphragm springs. ● Clutch disc. ● Clutch disc splines. ● Oil on clutch disc facing. 	<ul style="list-style-type: none"> ● GO to Pinpoint Test C.

	<ul style="list-style-type: none"> ● Insufficient clutch pedal travel. 	<ul style="list-style-type: none"> ● MAKE SURE the clutch pedal has its full range of travel. ● MAKE SURE the clutch pedal returns to the fully released position and the reservoir is full.
<ul style="list-style-type: none"> ● Clutch pedal pulsation 	<ul style="list-style-type: none"> ● Clutch and brake pedal pivot shaft not correctly lubricated. ● Flywheel. ● Damaged springs in pressure plate. ● Release bearing noisy or worn. ● Cover assembly. 	<ul style="list-style-type: none"> ● GO to Pinpoint Test D. ● INSTALL a new release bearing. ● CHECK runout of clutch cover. INSTALL a new clutch cover.
<ul style="list-style-type: none"> ● Clutch pedal related vibrations 	<ul style="list-style-type: none"> ● Engine component grounding against frame. ● Accessory drive belt. ● Flywheel bolts. ● Flywheel. ● Imbalanced clutch pressure plate. 	<ul style="list-style-type: none"> ● GO to Pinpoint Test E.
<ul style="list-style-type: none"> ● Hard shifting 	<ul style="list-style-type: none"> ● Insufficient brake fluid. ● Clutch pedal free play. ● Manual transmission concern. 	<ul style="list-style-type: none"> ● GO to Pinpoint Test F.
<ul style="list-style-type: none"> ● Excessive noise 	<ul style="list-style-type: none"> ● Clutch pedal free play. ● Clutch release bearing. ● Poor lubrication of clutch release bearing. ● Pilot bearing. ● Excessive crankshaft end play. ● If the noise is heard from the transmission when the engine is started and switched off with the clutch engaged, and the noise disappears if the clutch pedal is depressed. 	<ul style="list-style-type: none"> ● GO to Pinpoint Test G. ● INSTALL a new flywheel.
<ul style="list-style-type: none"> ● Fluid leakage 	<ul style="list-style-type: none"> ● Clutch master cylinder. ● Clutch slave cylinder. ● Clutch hydraulic tubes. 	<ul style="list-style-type: none"> ● GO to Pinpoint Test H.

PINPOINT TEST A: CLUTCH SLIPPAGE

CONDITIONS	DETAILS/RESULTS/ACTIONS
A1 TEST CLUTCH SLIPPAGE	
	<ol style="list-style-type: none"> 1 Lock wheels and apply the parking brake. 2 Start the engine and engage 4th gear. 3 Run the engine at approximately 2,000 rpm. 4 Release the clutch pedal slowly.

● Does the engine stall when the clutch pedal is fully released?

→ **Yes**
Clutch is OK.

→ **No**
GO to [A2](#).

A2 TEST CLUTCH FOR CLEARING

1 Start engine, fully depress the clutch pedal, partially engage reverse gear, slowly engage clutch until a grating noise is heard, depress the clutch slowly until grating stops.

2 Measure pedal travel from the pedal to the floor.

● Is the measurement between 25 mm and 40 mm (0.98 in and 1.57 in)?

→ **Yes**
GO to [A3](#).

→ **No**
GO to [A5](#).

A3 TEST FULL PEDAL TRAVEL

1 Measure the clutch pedal travel from fully up to the fully compressed position.

● Is the measurement between 133 mm and 143 mm (5.23 in and 5.62 in)?

→ **Yes**
GO to [A4](#).

→ **No**
CHECK clutch pedal for obstructions. TEST the system for normal operation.

A4 CHECK CLUTCH PEDAL SHAFT LUBRICATION

1 Check the clutch pedal shaft lubrication.

● Is the clutch pedal shaft sufficiently lubricated?

→ **Yes**
GO to [A5](#).

→ **No**
LUBRICATE the clutch pedal shaft.

A5 TEST CLUTCH PRESSURE PLATE

1 Remove clutch pressure plate. For additional information, refer to [Section 308-01](#).

● Does the clutch pressure plate have signs of wear or damage?

→ **Yes**
INSTALL a new clutch pressure plate.

	→ No GO to A6 .
A6 TEST CLUTCH FRICTION DISC	
	<p>1 Visually check the clutch friction disc.</p> <ul style="list-style-type: none"> ● Is the clutch friction disc oil-fouled or does it have burn marks? <p>→ Yes INSTALL a new clutch friction disc. TEST the system for normal operation.</p> <p>→ No CHECK the flywheel.</p>

PINPOINT TEST B: CLUTCH CHATTER OR SHUDDER

CONDITIONS	DETAILS/RESULTS/ACTIONS
B1 TEST CLUTCH CHATTER OR SHUDDER	
	<p>1 Start the engine and engage 1st gear.</p> <p>2 Run the engine between 1,200 rpm and 1,500 rpm.</p> <p>3 Release clutch pedal slowly.</p> <ul style="list-style-type: none"> ● Does the vehicle shudder when it begins to move? <p>→ Yes GO to B2.</p> <p>→ No Clutch is OK.</p>
B2 TEST ENGINE/TRANSMISSION SUPPORT INSULATOR	
	<p>1 Check engine/transmission mountings and support insulator for damage or loose bolts.</p> <ul style="list-style-type: none"> ● Are the engine/transmission mountings or support insulator loose or damaged? <p>→ Yes TIGHTEN the bolts or INSTALL new bolts as necessary. TEST the system for normal operation.</p> <p>→ No GO to B3.</p>
B3 TEST CLUTCH PRESSURE PLATE	
	<p>1 Remove the clutch pressure plate. For additional information, refer to Section 308-01.</p> <ul style="list-style-type: none"> ● Does the clutch pressure plate have signs of wear or damage? <p>→ Yes</p>

	<p>INSTALL a new clutch pressure plate.</p> <p>→ No GO to B4.</p>
B4 TEST CLUTCH FRICTION DISC	
	<p>1 Visually check the clutch friction disc.</p> <ul style="list-style-type: none"> ● Is the clutch friction disc oil-fouled or does it have burn marks? <p>→ Yes INSTALL a new clutch friction disc. TEST the system for normal operation.</p> <p>→ No CHECK the flywheel.</p>

PINPOINT TEST C: CLUTCH DRAG

CONDITIONS	DETAILS/RESULTS/ACTIONS
C1 CHECK BRAKE FLUID LEVEL	
NOTE: The hydraulic clutch fluid is supplied from the brake master cylinder.	
	<p>1 Check the brake fluid level.</p> <ul style="list-style-type: none"> ● Is the brake fluid level between the MAX and MIN marks on the brake fluid reservoir? <p>→ Yes GO to C2.</p> <p>→ No FILL brake fluid, and CHECK the brake and clutch system for leaks. TEST system for normal operation.</p>
C2 TEST CLUTCH PEDAL FREE TRAVEL	
	<p>1 Operate clutch pedal manually to the point of resistance and release.</p> <p>2 Measure pedal travel.</p> <ul style="list-style-type: none"> ● Is the measured dimension within 10 mm (0.39 in)? <p>→ Yes GO to C3.</p> <p>→ No GO to C5.</p>
C3 TEST FULL PEDAL TRAVEL	
	<p>1 Measure the clutch pedal travel from fully up to the fully compressed position.</p> <ul style="list-style-type: none"> ● Is the measurement between 133 mm and 143 mm (5.23 in and 5.62 in)?

	<p>→ Yes GO to C4.</p> <p>→ No CHECK clutch pedal for obstructions. TEST the system for normal operation.</p>
C4 CHECK CLUTCH PEDAL SHAFT LUBRICATION	
	<p>1 Check the clutch pedal shaft lubrication.</p> <p>● Is the clutch pedal shaft sufficiently lubricated?</p> <p>→ Yes GO to C5.</p> <p>→ No LUBRICATE the clutch pedal shaft.</p>
C5 TEST CLUTCH PRESSURE PLATE	
	<p>1 Remove clutch pressure plate. For additional information, refer to Section 308-01.</p> <p>● Does the clutch pressure plate have signs of wear or damage?</p> <p>→ Yes INSTALL a new clutch pressure plate.</p> <p>→ No GO to C6.</p>
C6 TEST CLUTCH FRICTION DISC	
	<p>1 Visually check the clutch friction disc.</p> <p>● Is the clutch friction disc oil-fouled or does it have burn marks?</p> <p>→ Yes INSTALL a new clutch friction disc. TEST the system for normal operation.</p> <p>→ No CHECK the flywheel.</p>

PINPOINT TEST D: CLUTCH PEDAL PULSATION

CONDITIONS	DETAILS/RESULTS/ACTIONS
D1 CHECK CLUTCH PEDAL SHAFT LUBRICATION	
	<p>1 Check the clutch pedal shaft lubrication.</p> <p>● Is the clutch pedal shaft sufficiently lubricated?</p> <p>→ Yes CHECK the flywheel.</p> <p>→ No</p>

LUBRICATE the clutch pedal shaft. TEST the system for normal operation.

PINPOINT TEST E: CLUTCH RELATED VIBRATIONS

CONDITIONS	DETAILS/RESULTS/ACTIONS
E1 CHECK FOR ENGINE COMPONENT GROUNDING	
	<ol style="list-style-type: none">1 Raise and support the vehicle. For additional information, refer to Section 100-02.2 Check the engine mountings for grounding on the body frame.3 Check the exhaust manifold or other engine component grounding on the body or frame. <ul style="list-style-type: none">● Is there evidence of grounding on body or frame? <p>→ Yes REPAIR or INSTALL a new component as necessary. TEST the system for normal operation.</p> <p>→ No GO to E2.</p>
E2 CHECK FOR ACCESSORY DRIVE VIBRATIONS	
	<ol style="list-style-type: none">1 Feel accessory vibration at clutch engage/disengage when engine torque changes.2 Disconnect the accessory drive belt and check for vibration. <ul style="list-style-type: none">● Does the vibration stop when the drive belt is removed from the engine? <p>→ Yes REPAIR or INSTALL new accessory drive belt components. For additional information, REFER to Section 303-05.</p> <p>→ No GO to E3.</p>
E3 CHECK FOR RELEASE BEARING NOISE	
	<ol style="list-style-type: none">1 Start the engine.2 Depress and hold clutch pedal. <ul style="list-style-type: none">● Is a whirring, grating or grinding noise present? <p>→ Yes INSTALL a new clutch slave cylinder. For additional information, REFER to Section 308-02. TEST the system for normal operation.</p> <p>→ No GO to E4.</p>
E4 INSPECT FLYWHEEL	
	<ol style="list-style-type: none">1 Remove the transmission. For additional information, refer to Section 308-

[03.](#)

Inspect for loose flywheel bolts.

Carry out flywheel runout check. For additional information, refer to [Section 303-00](#).

● **Is the flywheel OK?**

→ **Yes**
DIAGNOSE engine vibration concern. For additional information, REFER to [Section 303-00](#).

→ **No**
TIGHTEN flywheel bolts or INSTALL a new flywheel. For additional information, REFER to [Section 308-01](#). TEST the system for normal operation.

PINPOINT TEST F: HARD SHIFTING

CONDITIONS	DETAILS/RESULTS/ACTIONS
F1 CHECK FLUID LEVEL	
NOTE: The hydraulic clutch fluid is supplied from the brake master cylinder.	
	<input type="checkbox"/> Inspect the fluid level in the brake master cylinder reservoir. ● Is the fluid within the MAX and MIN level marks? → Yes GO to F2 . → No FILL brake fluid, CHECK for leaks in the clutch and brake system. TEST the system for normal operation.
F2 TEST CLUTCH PEDAL FREE TRAVEL	
	<input type="checkbox"/> Operate clutch pedal manually to the point of resistance and release. <input type="checkbox"/> Measure pedal travel. ● Is the measured dimension within 10 mm (0.39 in)? → Yes GO to F3 . → No GO to F5 .
F3 TEST FULL PEDAL TRAVEL	
	<input type="checkbox"/> Measure the clutch pedal travel from fully up to the fully compressed position. ● Is the measurement between 133 mm and 143 mm (5.23 in and 5.62 in)?

	<p>→ Yes GO to F4.</p> <p>→ No CHECK clutch pedal for obstructions. TEST the system for normal operation.</p>
F4 CHECK CLUTCH PEDAL SHAFT LUBRICATION	
	<p>1 Check the clutch pedal shaft lubrication.</p> <p>● Is the clutch pedal shaft sufficiently lubricated?</p> <p>→ Yes GO to F5.</p> <p>→ No LUBRICATE the clutch pedal shaft.</p>
F5 TEST CLUTCH PRESSURE PLATE	
	<p>1 Remove clutch pressure plate. For additional information, refer to Section 308-01.</p> <p>● Does the clutch pressure plate have signs of wear or damage?</p> <p>→ Yes INSTALL a new clutch pressure plate.</p> <p>→ No GO to F6.</p>
F6 TEST CLUTCH FRICTION DISC	
	<p>1 Visually check the clutch friction disc.</p> <p>● Is the clutch friction disc oil-fouled or does it have burn marks?</p> <p>→ Yes INSTALL a new clutch friction disc. TEST the system for normal operation.</p> <p>→ No CHECK the flywheel.</p>

PINPOINT TEST G: EXCESSIVE NOISE

CONDITIONS	DETAILS/RESULTS/ACTIONS
G1 CHECK TRANSMISSION NEUTRAL POSITION	
	<p>1 Start the engine and run it in Neutral.</p> <p>2 Depress clutch pedal fully.</p> <p>● Are there noises when the clutch is operated?</p> <p>→ Yes GO to G2.</p>

	<p>→ No System is OK.</p>
G2 TEST CLUTCH PEDAL FREE TRAVEL	
	<p>1 Press the clutch down manually until resistance is felt, then release it again.</p> <p>2 Measure pedal travel.</p> <p>● Is the measured dimension within 10 mm (0.39 in)?</p> <p>→ Yes GO to G3.</p> <p>→ No INSTALL a new clutch master cylinder. For additional information, REFER to Section 308-02. TEST the system for normal operation.</p>
G3 TEST CLUTCH SLAVE CYLINDER WITH RELEASE BEARING	
	<p>1 Remove the transmission. For additional information, refer to Section 308-03.</p> <p>2 Check the clutch slave cylinder bolts.</p> <p>3 Check the release bearing for wear and rust.</p> <p>● Are the bolts loose or are there signs of wear or rust?</p> <p>→ Yes TIGHTEN the bolts or INSTALL a new clutch slave cylinder with the release bearing. TEST the system for normal operation.</p> <p>→ No GO to G4.</p>
G4 CHECK CLUTCH FRICTION DISC TORSION SPRINGS	
	<p>1 Check torsion springs for wear.</p> <p>● Do the torsion springs have signs of wear?</p> <p>→ Yes INSTALL a new clutch friction disc. TEST the system for normal operation.</p> <p>→ No CHECK crankshaft end play. For additional information, REFER to Section 303-00. TEST the system for normal operation.</p>

PINPOINT TEST H: FLUID LEAKAGE

CONDITIONS	DETAILS/RESULTS/ACTIONS
H1 INSPECT CLUTCH MASTER CYLINDER	
	<p>1 Inspect the clutch master cylinder for leakage.</p> <p>● Is the clutch master cylinder OK?</p>

→ **Yes**
GO to [H2](#).

→ **No**
INSTALL a new clutch master cylinder as necessary. For additional information, REFER to [Section 308-02](#). TEST the system for normal operation.

H2 INSPECT CLUTCH SLAVE CYLINDER

1 Inspect the clutch slave cylinder for leaks.

- **Is the clutch slave cylinder OK?**

→ **Yes**
GO to [H3](#).

→ **No**
INSTALL a new clutch slave cylinder as necessary. For additional information, REFER to [Section 308-02](#). TEST the system for normal operation.

H3 INSPECT SYSTEM HYDRAULIC TUBES

1 Inspect the clutch hydraulic tubes for loose or damaged fittings causing leakage.


- **Are the clutch hydraulic tubes OK?**


→ **Yes**
CARRY OUT road test to verify customer complaint.

→ **No**
INSTALL new components as necessary. TEST the system for normal operation.

GENERAL PROCEDURES

Bleed Procedure

1.  **WARNING:** Brake fluid contains polyglycol ethers and polyglycols. Avoid contact with eyes. Wash hands thoroughly after handling. If brake fluid contacts eyes, flush eyes with running water for 15 minutes. Get medical attention if irritation persists. If taken internally, drink water and induce vomiting. Get medical attention immediately.

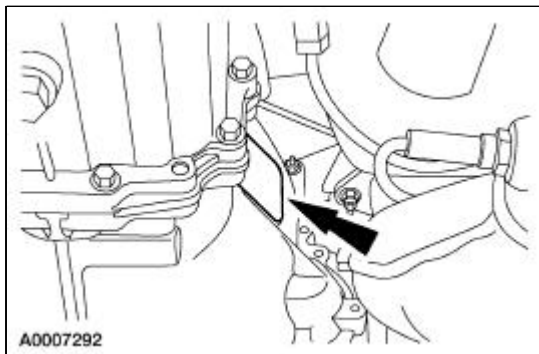
 **CAUTION:** Brake fluid is harmful to painted or plastic surfaces. If the brake fluid is spilled onto a painted or plastic surface, wash it immediately with water.

NOTE: Make sure of absolute cleanliness when filling the brake fluid reservoir.

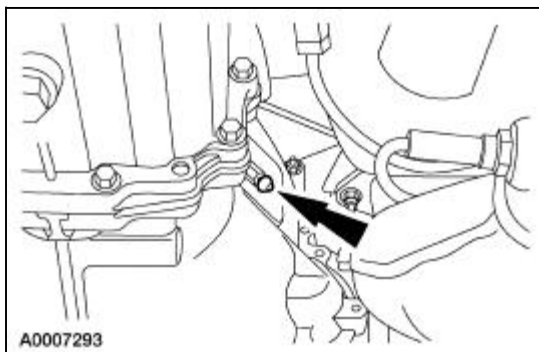
NOTE: Do not re-use brake fluid.

Fill the brake fluid reservoir with High Performance DOT3 Motor Vehicle Brake Fluid C6AZ-19542-AB or equivalent meeting Ford specification ESA-M6C25-A, DOT3.

2. Raise and support the vehicle. For additional information, refer to [Section 100-02](#).
3. Remove the dust cover.



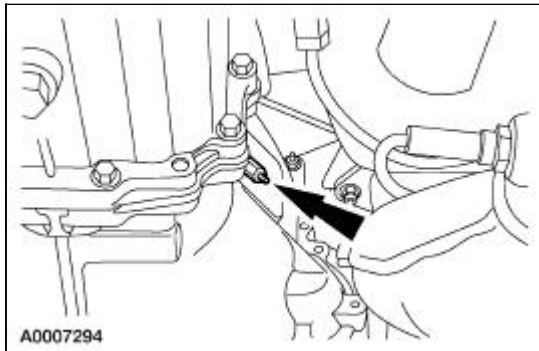
4. Remove the bleed nipple cover.



5. Bleed the clutch system.
 - Attach a proprietary bleed jar to the bleed nipple and open the bleed nipple one turn.
 - Depress the clutch pedal repeatedly until the emerging fluid is free of bubbles; always

make sure that there is sufficient fluid (5 mm [0.2 in] above the MAX) in the reservoir.

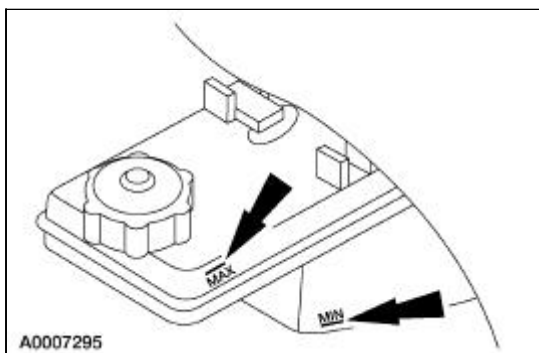
- After bleeding, tighten the bleed nipple.
- Install the bleed nipple cover.
- Install the dust cover.
- After bleeding, lower the vehicle and depress the clutch 10 times and check that it is functioning correctly.



6. **NOTE:** Make sure of absolute cleanliness when filling the brake fluid reservoir.

Check the brake fluid level.


- The fluid level should be between the MIN and MAX marks. If the level drops below the MIN mark, the brake warning indicator will light up.
- As necessary, fill the brake fluid reservoir with High Performance DOT3 Motor Vehicle Brake Fluid C6AZ-19542-AB or equivalent meeting Ford specification ESA-M6C25-A, DOT3.



GENERAL PROCEDURES

Release Hub and Bearing Check

1. Turn the clutch release hub and bearing in both directions and check for any binding or abnormal noise.

2.  **CAUTION: The clutch release hub and bearing is sealed and must not be immersed in any type of cleaning fluid.**

Check for worn or damaged clutch release hub and bearing fork contact surfaces.

3. Install the clutch release hub and bearing on the input shaft and check for a smooth sliding condition.
 4. Check driveshaft splines for rust, scoring, or damage.
-

Torque Specifications

Description	Nm	lb-ft	lb-in
Flywheel bolts	80	59	—
Pressure plate bolts	23	17	—

Clutch

The clutch transfers the engine torque to the transmission.

The clutch consists of a disc and a pressure plate with a diaphragm spring, bolted to the flywheel.

When the clutch pedal is operated the power transmission from the engine to the transmission is interrupted. The clutch is therefore engaged when the pedal is not depressed. Pressing down the pedal disengages the clutch.

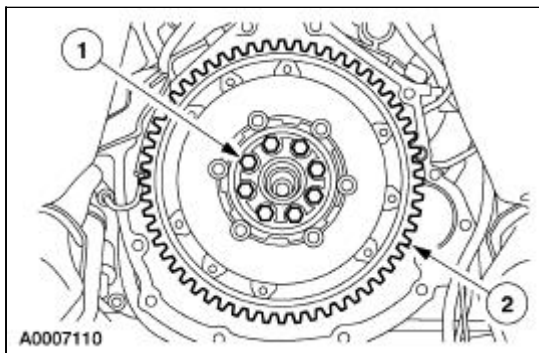
Clutch

Refer to [Section 308-00](#) .

Flywheel

Removal

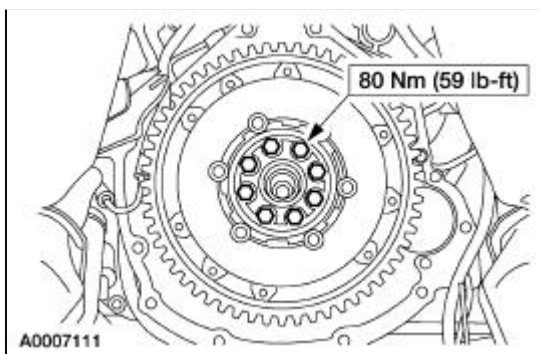
1. Remove the manual transmission. For additional information, refer to [Section 308-03](#).
2. Remove the clutch disc and pressure plate. For additional information, refer to [Disc and Pressure Plate](#).
3. Remove the flywheel.
 1. Remove the bolts.
 2. Remove the flywheel.



Installation

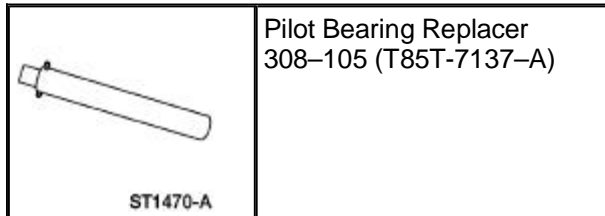
1. **NOTE:** One of the flywheel holes is offset for installation.

To install, reverse the removal procedure.



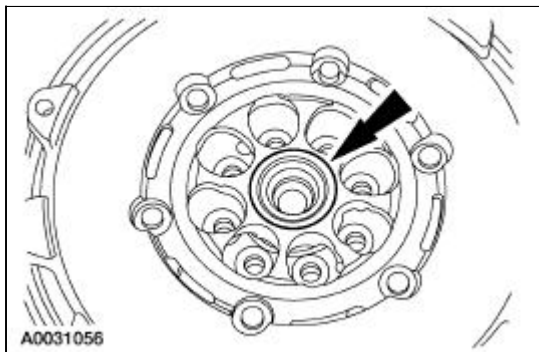
Bearing —Pilot

Special Tool(s)



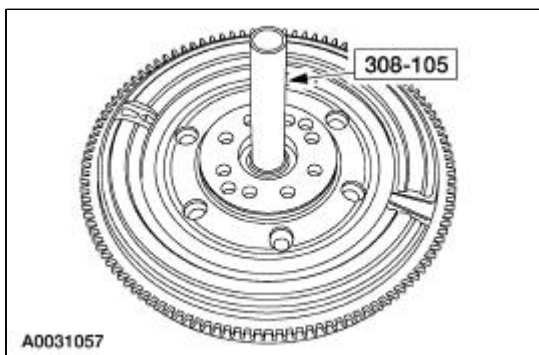
Removal

1. Remove the manual transmission. For additional information, refer to [Section 308-03](#).
2. Remove the clutch disc and the clutch pressure plate. For additional information, refer to [Disc and Pressure Plate](#) in this section.
3. Remove the pilot bearing from the flywheel.



Installation

1. Using the special tool, install the pilot bearing into the flywheel.



2. Install the clutch disc and the clutch pressure plate. For additional information, refer to [Disc and Pressure Plate](#) in this section.
3. Install the manual transmission.

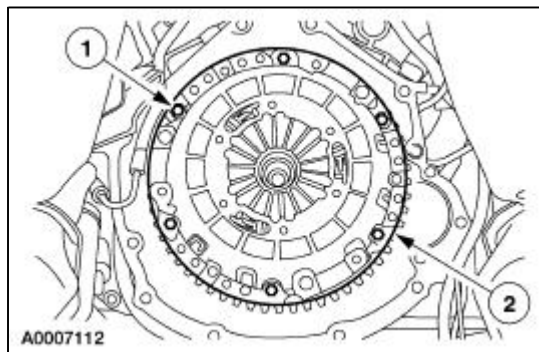
Disc and Pressure Plate

Special Tool(s)



Removal

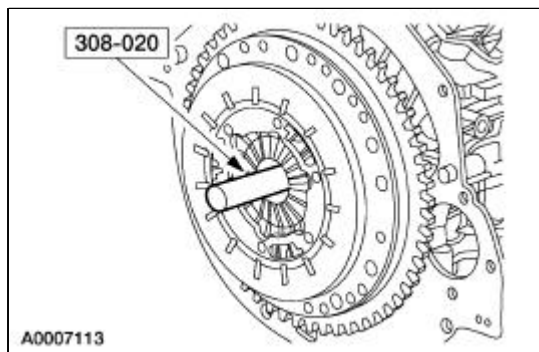
1. Remove the manual transmission. For additional information, refer to [Section 308-03](#).
2. Remove the clutch disc and pressure plate.
 1. Remove the pressure plate bolts in a uniform sequence.
 2. Remove the clutch disc and pressure plate.



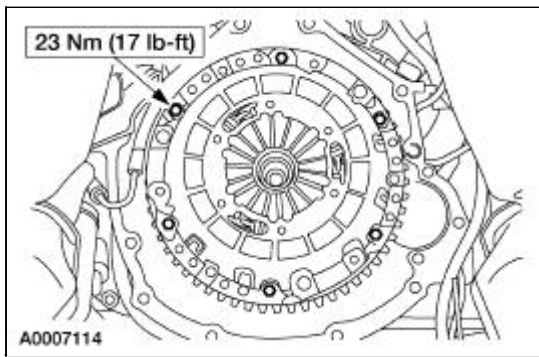
Installation

1. **NOTE:** The clutch disc is marked "Flywheel side" for correct installation.

Using the special tool, align the clutch assembly.



2. Locate the clutch pressure plate on the flywheel dowels and tighten the bolts in a diagonal sequence.



3. Remove the special tool.
4. **NOTE:** Make sure that the input shaft of the transmission is moved squarely into the hub of clutch disc. Do not bend in any direction.

Install the manual transmission. For additional information, refer to [Section 308-03](#).

General Specifications

Item	Specification
Clutch System	
Clutch control	Hydraulic
System adjustment	Automatic
Clutch pedal type	Suspended
Fluid	
High Performance DOT 3 Motor Vehicle Brake Fluid C6AZ-19542-AB	ESA-M6C25-A, DOT 3
Lubricant	
Premium Long-Life Grease XG-1-C, XG-1-K	ESA-M1C75-B
Super Premium SAE 5W-30 Motor Oil	WSS-M2C153-G

Torque Specifications

Description	Nm	lb-ft	lb-in
Slave cylinder-to-transmission bolts	22	16	—
Clutch master cylinder nuts	10	—	89
Hydraulic tube bracket nut	10	—	89
Clutch pedal position (CPP) switch bracket bolts.	10	—	89

Clutch Controls

The clutch control system consists of the following components:

- clutch master cylinder reservoir and tubing
- clutch master cylinder
- clutch hydraulic tube

For removal and installation procedures, refer to [Section 206-06](#).

The clutch control system disengages the clutch when the clutch pedal is depressed and engages the clutch when released. When the clutch pedal is depressed it pushes the clutch master cylinder plunger. This develops hydraulic pressure and applies the clutch slave cylinder which engages the clutch release hub and bearing. The clutch release hub and bearing and clutch pressure plate diaphragm springs release the pressure on the clutch disc. This in turn disengages the transmission from the engine.

The hydraulic clutch system adjusts automatically to compensate for clutch disc wear. The clutch linkage is not adjustable.

Clutch Controls

Refer to [Section 308-00](#) .

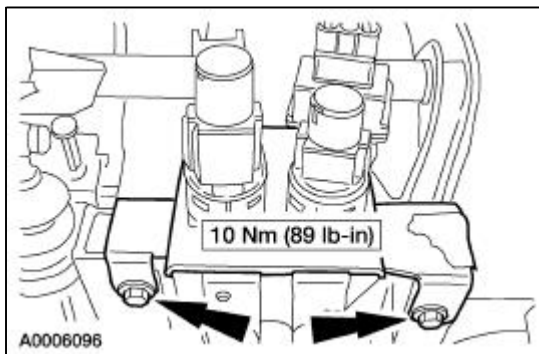
Clutch Pedal

Removal and Installation

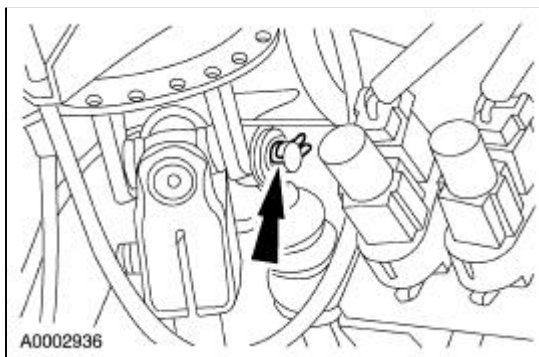
1. **NOTE:** Disconnect the footwell lamp electrical connector.

Remove the instrument panel insulator.

2. Remove the clutch pedal position (CPP) switch bracket bolts and position the bracket out of the way.

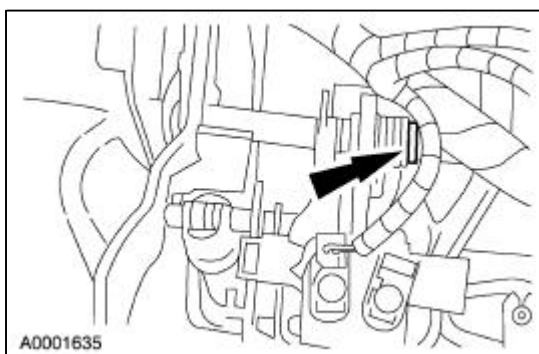


3. Remove the snap ring and disconnect the clutch master cylinder push rod.

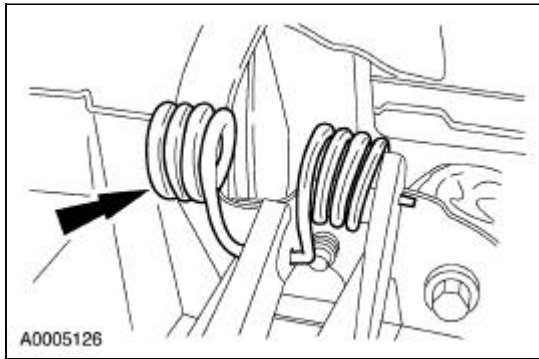


4. **NOTE:** When the clutch pedal shaft is removed from the bracket, the brake pedal, brake and clutch pedal bushings and the spring washer become accessible.

Remove the clutch pedal snap ring and the clutch pedal shaft.



5. Remove the clutch pedal return spring and the clutch pedal.



6. **NOTE:** Position the return spring in the "V" at the top of the pedal arm.

NOTE: Before the installation of the clutch pedal shaft or clutch pedal, remove and inspect the brake and clutch pedal bushings. Clean and lubricate with a light film of Super Premium SAE 5W-30 Motor Oil or equivalent meeting Ford specification WSS-M2C153-G and install a new brake and clutch pedal bushing if excessive wear is evident.


To install, reverse the removal procedure.


Clutch Master Cylinder

Material

Item	Specification
High Performance DOT 3 Motor Vehicle Brake Fluid C6AZ-19542-AB	ESA-M6C25-A, DOT 3

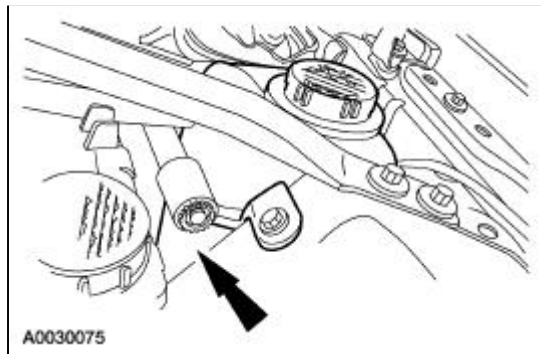
Removal and Installation

-  **WARNING:** Brake fluid contains polyglycol ethers and polyglycols. Avoid contact with eyes. Wash hands thoroughly after handling. If brake fluid contacts eyes, flush eyes with running water for 15 minutes. Get medical attention if irritation persists. If taken internally, drink water and induce vomiting. Get medical attention immediately.

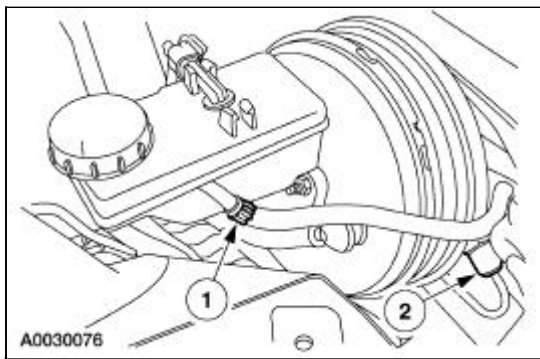
 **CAUTION:** Brake fluid is harmful to painted or plastic surfaces. If the brake fluid is spilled onto a painted or plastic surface, wash it immediately with water.

Remove the hose at the clutch master cylinder reservoir.

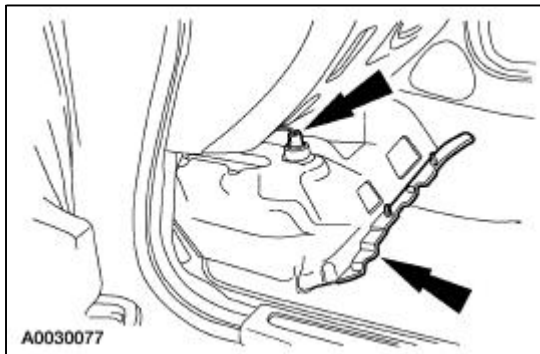
- Remove the degas bottle. For additional information, refer to [Section 303-03](#).
 - Only partially drain the coolant system.



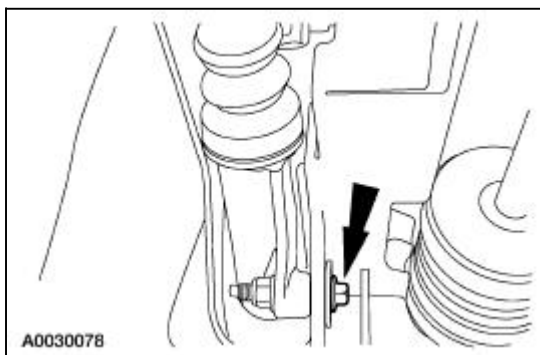
- Partially drain the brake master cylinder.
 - Drain to just below the clutch reservoir nipple.
- Remove the clutch hydraulic lines.
 - Disconnect the reservoir line from the brake master cylinder.
 - Plug the reservoir line. Discard the hose clamp.
 - Disconnect the clutch master cylinder hydraulic line.



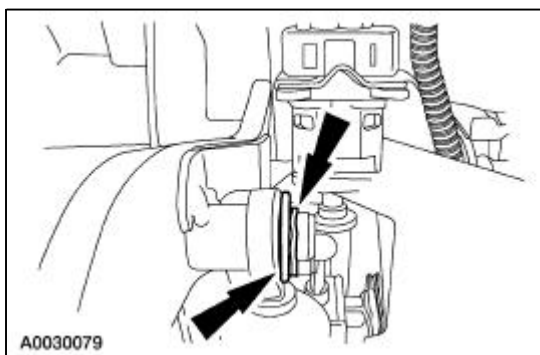
5. Remove the two retainers and lower the instrument panel insulator. Disconnect the footwell lamp electrical connector, then remove from the vehicle.



6. Remove the instrument panel finish panel.
7. Remove the two bolts.

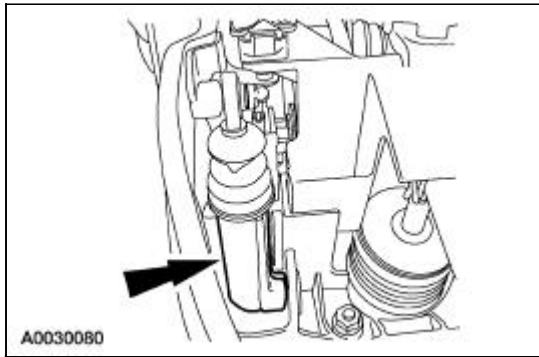


8. Remove the clip and washer from the clutch pedal arm.

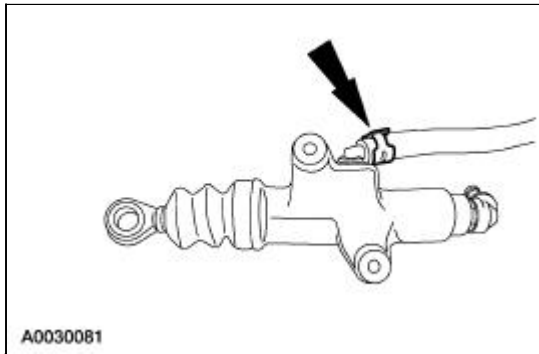


9. Disengage the clutch master cylinder from the clutch arm, then remove the clutch master

cylinder.



10. Remove the reservoir line from the clutch master cylinder



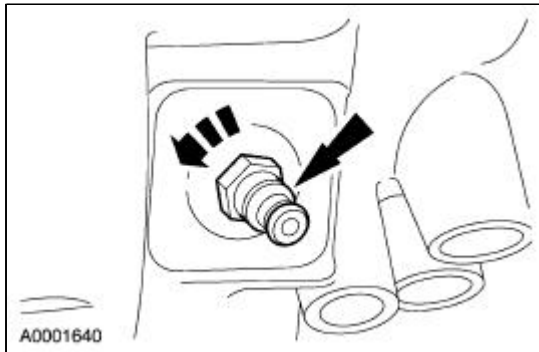
11. To install, reverse the removal procedure.

- Install new hose clamps on the reservoir line.
 - Refill the brake master cylinder with the specified fluid.
 - Refill the coolant system.
 - Bleed the clutch hydraulic system. For additional information, refer to [Section 308-00](#) .
-

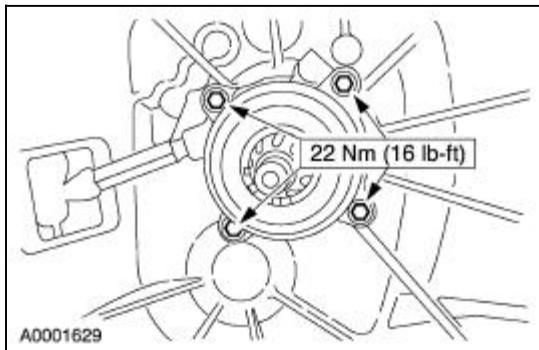
Slave Cylinder

Removal and Installation

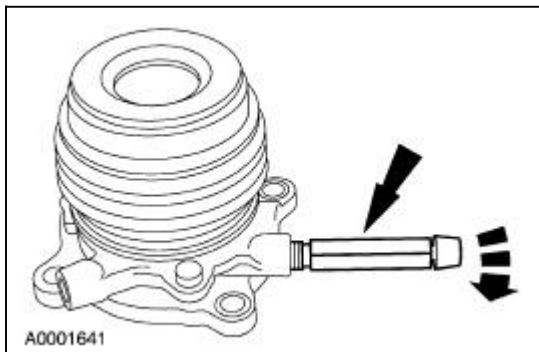
1. Remove the transmission. For additional information, refer to [Section 308-03](#).
2. Remove the hydraulic tube connector.




3. Remove the bolts and the slave cylinder.



4. Remove the drain tube.

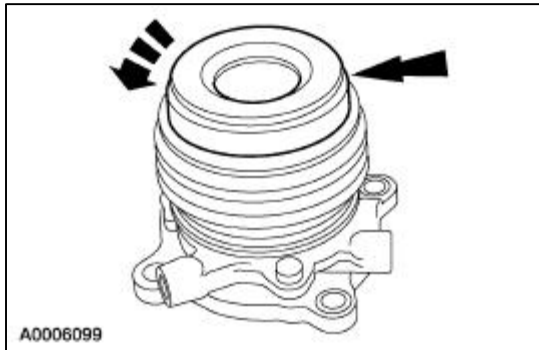


5.  **CAUTION:** The clutch release hub and bearing is pre-lubricated and should not be cleaned with solvent. The clutch release hub and bearing are installed as an assembly. Do not disassemble for inspection.

Wipe oil and dirt off the clutch release hub and bearing.

6. Inspect the clutch release hub and bearing as follows:

- Rotate outer race while applying pressure. If bearing rotation is rough, install a new clutch release hub and bearing.
- Inspect for any surface scoring or burrs that may impede the sliding motion of the clutch release hub and bearing. Any scoring or burrs should be polished off with a fine grade of emery paper.



7. To install, reverse the removal procedure.

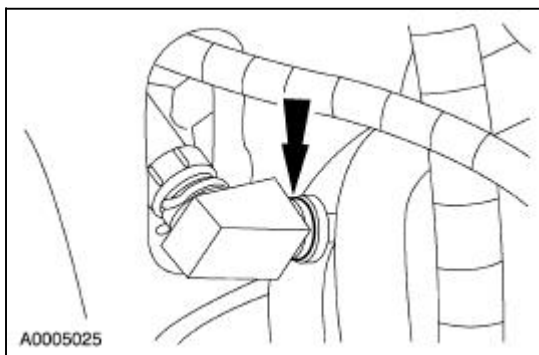
- Bleed the clutch hydraulic system. For additional information, refer to [Section 308-00](#).
-

Hydraulic Tubes

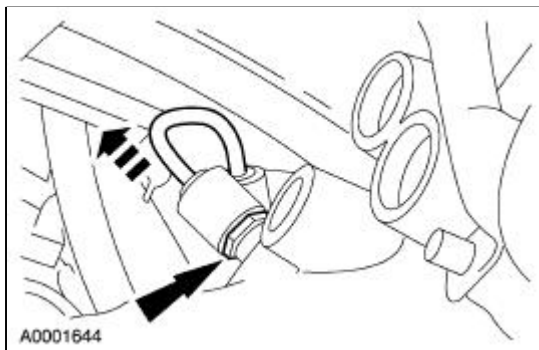
⚠ WARNING: Brake fluid contains polyglycol ethers and polyglycols. Avoid contact with eyes. Wash hands thoroughly after handling. If brake fluid contacts eyes, flush eyes with running water for 15 minutes. Get medical attention if irritation persists. If taken internally, drink water and induce vomiting. Get medical attention immediately.

⚠ CAUTION: Brake fluid is harmful to painted and plastic surfaces. If brake fluid is spilled into a painted or plastic surface, immediately wash it with water.

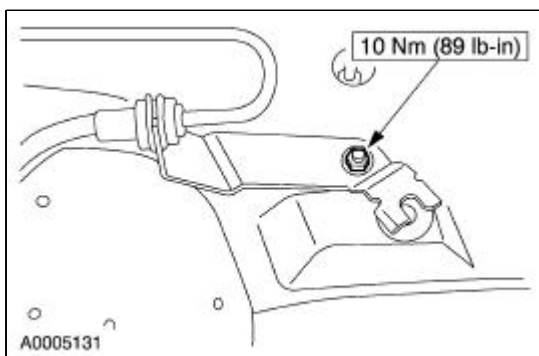
1. Remove the snap ring and tube from the clutch master cylinder connector.



2. Disconnect the clutch slave cylinder hydraulic line.



3. Remove the nut, bracket and hydraulic tube from the vehicle.



4. **NOTE:** Check the clutch slave cylinder port to make sure the old O-ring seal has been removed. Install a new O-ring seal.

To install, reverse the removal procedure.

- Bleed the system. For additional information, refer to [Section 308-00](#).
-

General Specifications

Item	Specification
Premium Long Life Grease XG-1-K	ESA-M1C75-B

Torque Specifications

Description	Nm	lb-ft	lb-in
Transmission flexible joint bolts	85	63	—
Bellhousing bolts	47	35	—
Starter motor bolts - 4.0L	25	18	—
Transmission support bolts	55	41	—
Transmission pinion nut — Stage 1	170	125	—
Transmission pinion nut — Stage 3	120	89	—
Support insulator bolt	40	30	—
Vehicle speed sensor bolt	11	8	—
Transmission drain plug	50	37	—
Balance add on nuts	24	18	—
Driveshaft yoke lock nuts	90	66	—

Manual Transmission

The transmission consists of the following:

- A two part die cast aluminum housing
- Bevel cut gears that rotate on needle roller bearings
- An input shaft and output shaft that rotate on ball bearings
- A layshaft that rotates on roller bearings
- Selector shaft assemblies

The engine rotational torque is transmitted from the crankshaft through the clutch to the transmission input shaft, which then transmits drive to a layshaft and then the output shaft by utilizing an arrangement of gears. When reverse gear is selected, the direction of the output shaft is changed by an idler gear assembly.

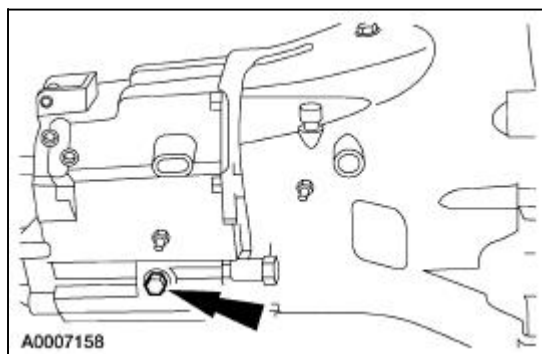
In neutral, none of the gears are connected to the input or output shaft through the relevant synchronizer unit. No torque is transmitted to the driveline.

Manual Transmission

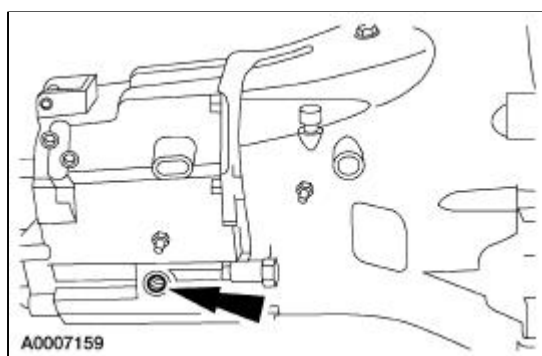
Refer to [Section 308-00](#) .

Fill Procedure

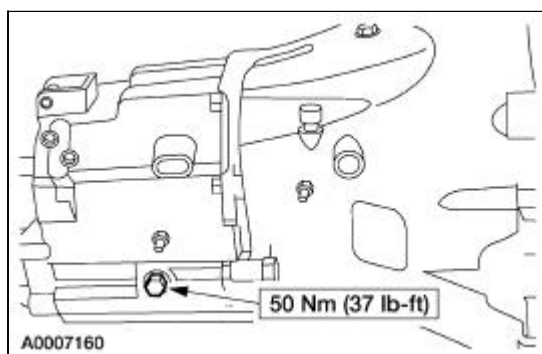
1. Raise and support the vehicle. For additional information, refer to [Section 100-02](#).
2. Remove the fill plug.



3. Fill the transmission to 0.5 mm (0.02 in) below the lower edge of the fill plug bore.



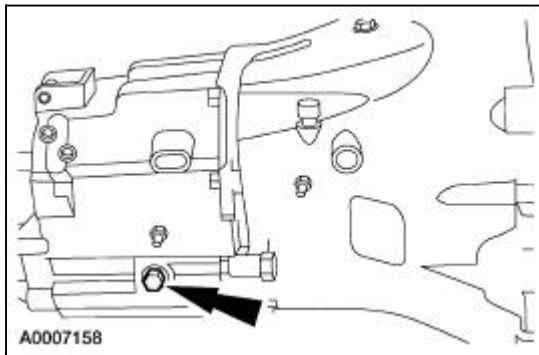
4. Install the fill plug.



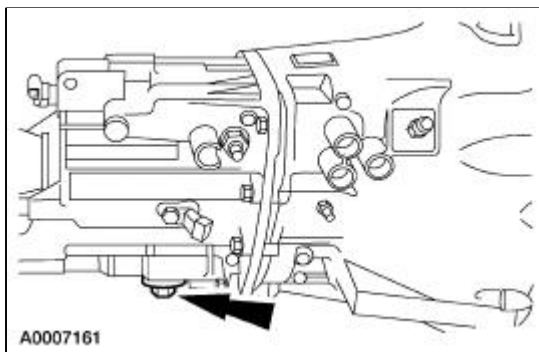
5. Lower the vehicle.

Drain Procedure

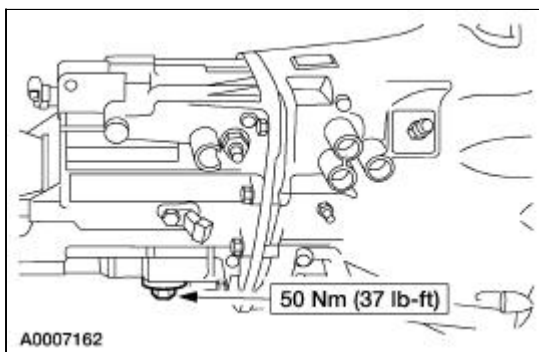
1. Raise and support the vehicle. For additional information, refer to [Section 100-02](#).
2. Remove the fill plug.



3. Remove the drain plug and drain fluid into a suitable container.



4. Install the drain plug.

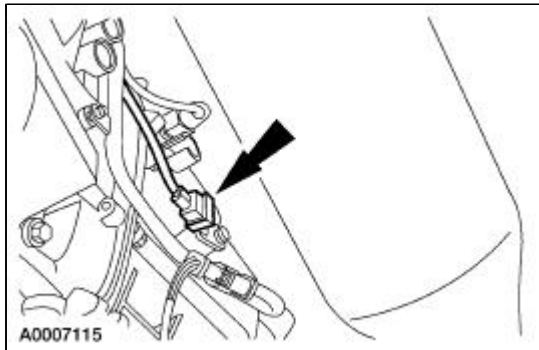


5. Fill the transmission as necessary. For additional information, refer to [Fill Procedure](#) in this section.

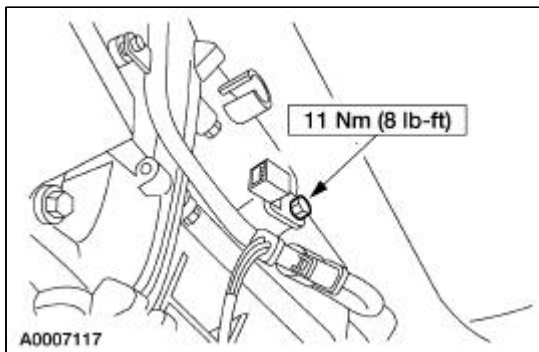
Vehicle Speed Sensor (VSS)

Removal and Installation

1. Raise and support the vehicle. For additional information, refer to [Section 100-02](#).
2. Disconnect the vehicle speed sensor (VSS) electrical connector.



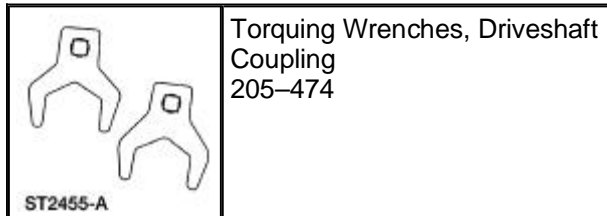
3. Remove the bolt and the VSS.



4. To install, reverse the removal procedure.
-

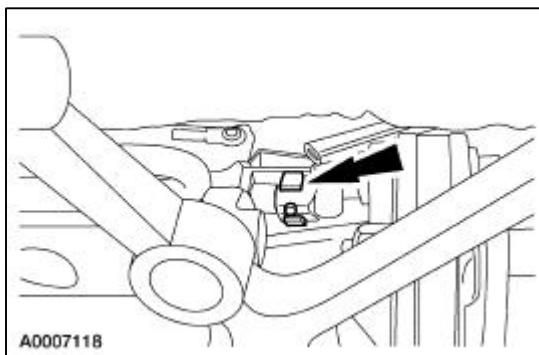
Seal —Selector Shaft

Special Tool(s)

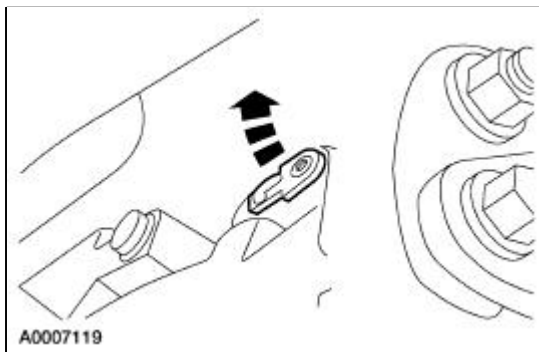


Removal

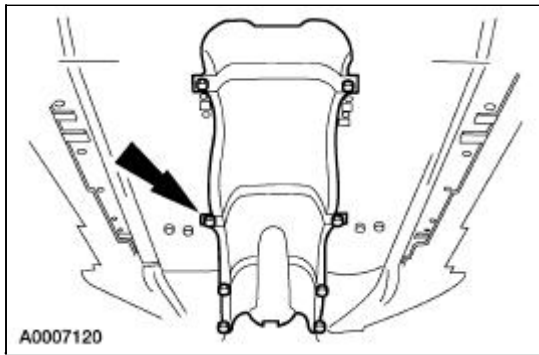
1. Raise and support the vehicle. For additional information, refer to [Section 100-02](#).
2. Disconnect the selector rod.
 - Remove the selector rod locating pin.



3. Disconnect the stabilizer rod.
 - Remove the stabilizer rod locating pin.



4. Remove the intermediate muffler. For additional information, refer to [Section 309-00](#).
5. Remove the bolts and the center heat shield.



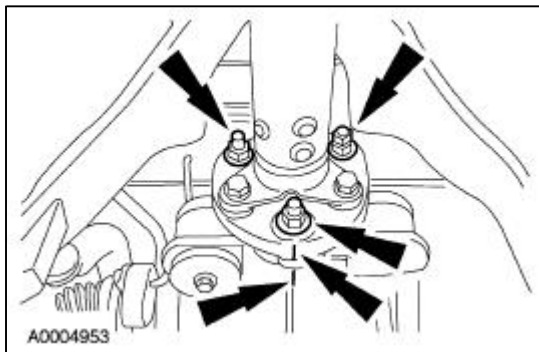
6. **⚠ CAUTION:** The transmission flange bolts, nuts, and washers must be removed as matched sets and installed in the original location. The system balance add-on nuts (if equipped) must be installed in the original location.

⚠ CAUTION: Under no circumstances must the flexible coupling (or its fixings) be loosened or removed from the driveshaft.

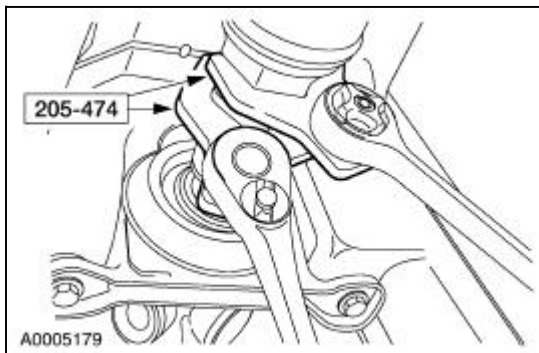
NOTE: Support the front section of the driveshaft.

Disconnect the transmission flexible joint.

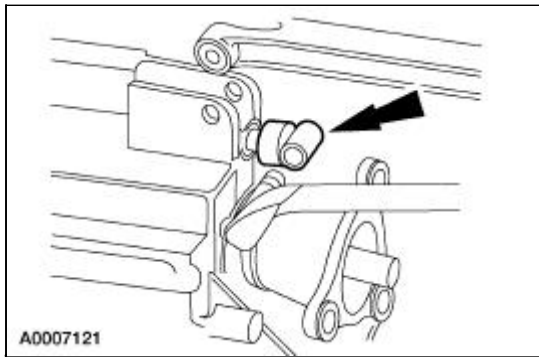
- Mark the position of the driveshaft in relation to the transmission flange.
- Mark the position of each nut and bolt in relation to the transmission flexible joint.



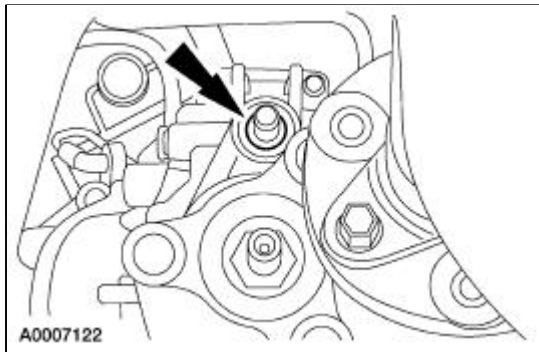
7. Shorten the length of the driveshaft.
- Using the special tool, loosen the driveshaft locknut and move the driveshaft front section towards the center bearing.



8. Remove the selector rod link.



9. Install a second oil seal over the existing seal.



Installation

1. Install the selector rod link.
2. **NOTE:** Install one gram of Premium Long Life Grease, XG-1-K or equivalent meeting Ford specifications ESA-M1C75-B, in the alignment bushing prior to installation.

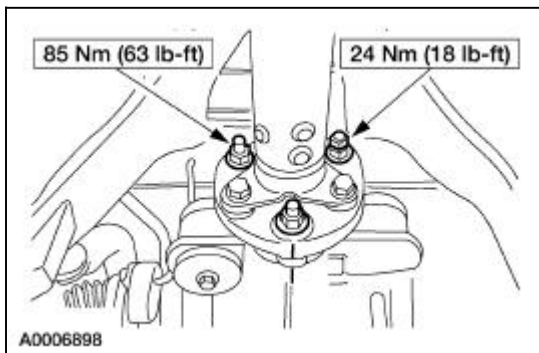
Slide the driveshaft forward until the flexible coupling engages with the transmission flange.

3. **⚠ CAUTION:** Make sure to match the transmission flange attaching bolts, nuts, washers, and balance add-on nuts (if equipped) in their original locations.

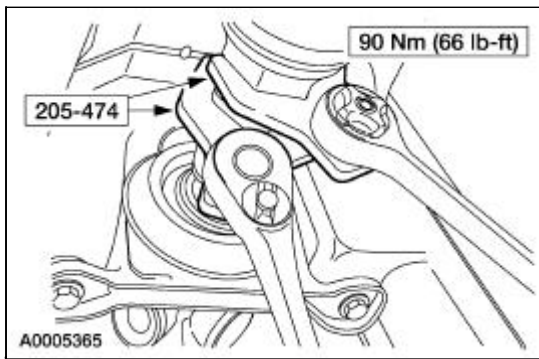
⚠ CAUTION: Tighten the transmission flange bolts and nuts with hand tools only.

NOTE: Align the driveshaft index matchmarks.

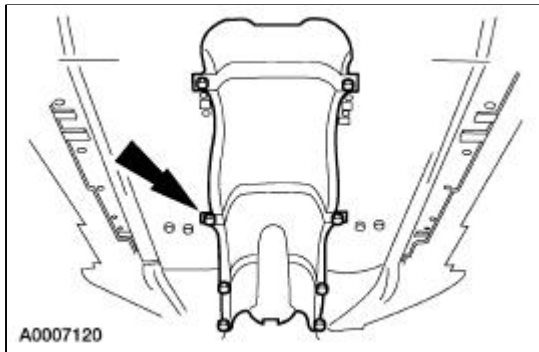
Install the flex coupling bolts, washers and attaching nuts.



4. Using the special tools, tighten the driveshaft yoke locking nuts.



5. Install the bolts and the center heat shield.



6. Install the intermediate muffler.
 7. Install the stabilizer rod and stabilizer rod pin.
 8. Install the selector rod and the selector rod pin.
 9. Lower the vehicle.
-

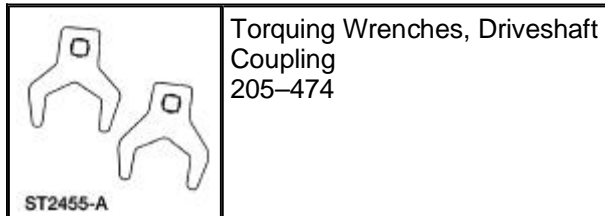
Seal —Input Shaft

Removal and Installation

1. Remove the manual transmission. For additional information, refer to [Transmission](#) in this section.
 2. Remove the clutch slave cylinder. For additional information, refer to [Section 308-02](#).
 3. Remove the input shaft seal.
 4. To install, reverse the removal procedure.
-

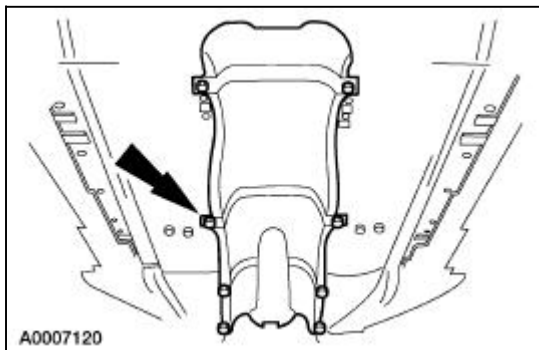
Seal —Output Shaft


Special Tool(s)




Removal

1. Raise and support the vehicle. For additional information, refer to [Section 100-02](#).
2. Remove the intermediate muffler. For additional information, refer to [Section 309-00](#).
3. Remove the bolts and the center heat shield.



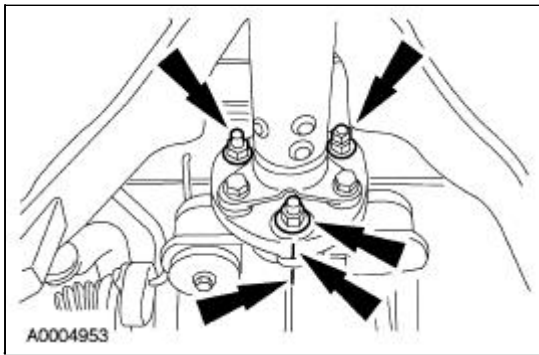
4.  **CAUTION:** The transmission flange bolts, nuts, and washers must be removed as matched sets and installed in the original locations. The system balance add-on nuts must be installed in the original locations.

 **CAUTION:** Under no circumstances must the flexible coupling (or its fixings) be loosened or removed from the driveshaft.

NOTE: Make sure to disconnect the coupling from the transmission flange only.

Detach the transmission flexible joint.

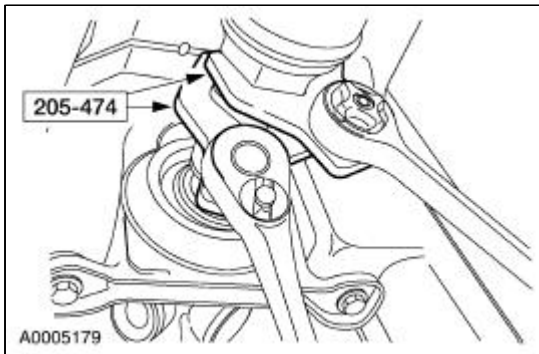
- Using different color paint markers, place index matchmarks on the transmission flange, driveshaft flexible coupling and the transmission bolts, nuts, washers and add-on nuts, so the driveshaft and the transmission flange can be aligned correctly during installation.



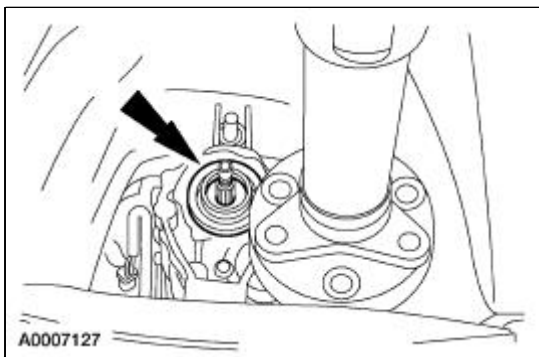
5. **NOTE:** Support the front section of the driveshaft.

Shorten the length of the driveshaft.

- Using the special tool, loosen the driveshaft locknut and move the driveshaft front section towards the center bearing.

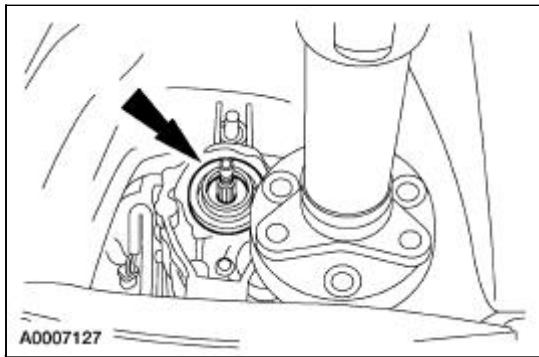


6. Remove the output shaft flange nut.
7. Remove the output shaft flange.
8. Remove the output shaft oil seal.




Installation

1. Install the output shaft oil seal.



2. Install the output shaft flange.
 - Stage 1: tighten the nut to 170 Nm (125 lb-ft).
 - Stage 2: loosen the nut by 1/2 turn.
 - Stage 3: tighten the nut to 120 Nm (89 lb-ft).
3. Install the output shaft nut.
4. **NOTE:** Install one gram of Premium Long Life Grease, XG-1-K or equivalent meeting Ford specifications ESA-M1C75-B, in the alignment bushing prior to installation.

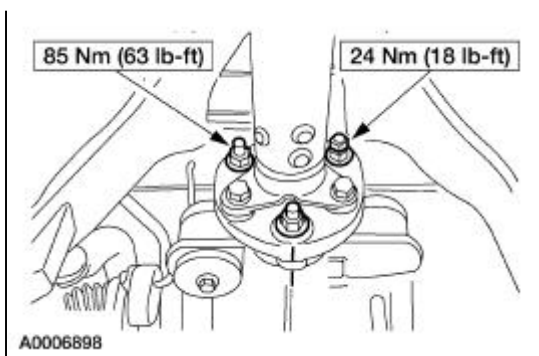
Slide the driveshaft forward until the flexible coupling engages the transmission flange.

5.  **CAUTION: Make sure to match the bolts, washers, attaching nuts and balance nuts (if equipped) to their original locations.**

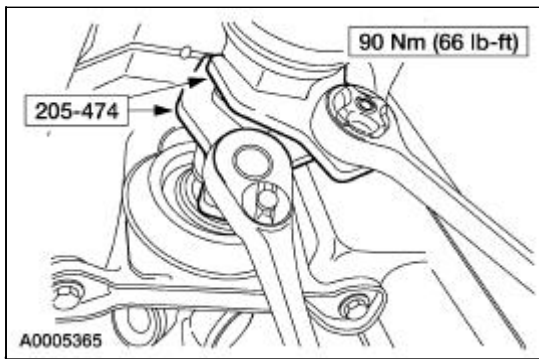
 **CAUTION: Tighten the transmission flange bolts and nuts with hand tools only.**

NOTE: Align the driveshaft index matchmarks.

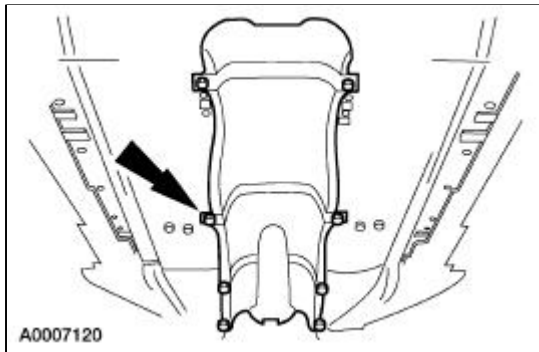
Install the flex coupling bolts, washers and attaching nuts.



6. Using the special tools, tighten the driveshaft yoke nuts.



7. Install the bolts and the center heat shield.

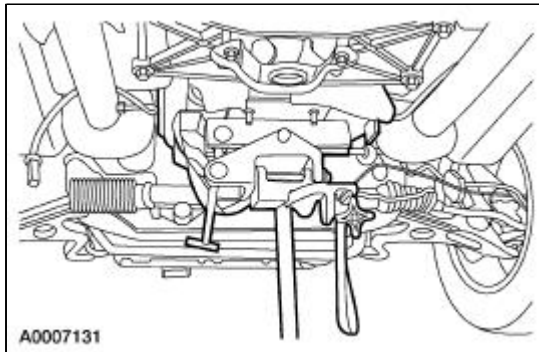


8. Lower the vehicle.
-

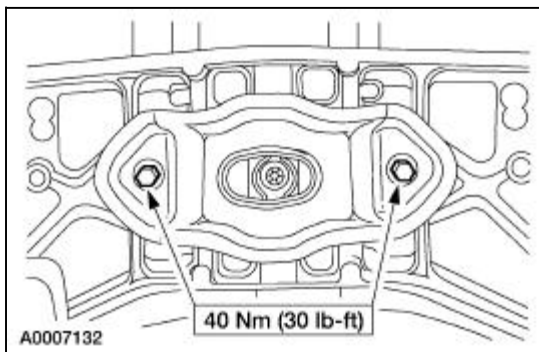
Support Insulator

Removal and Installation

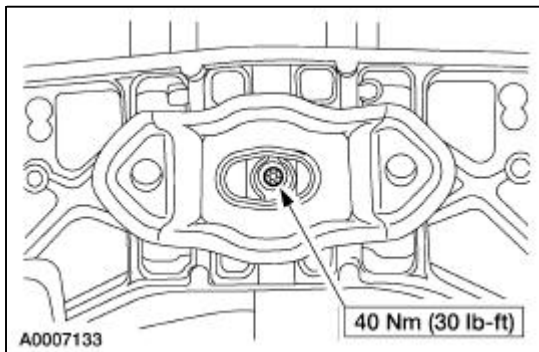
1. Raise and support the vehicle. For additional information, refer to [Section 100-02](#).
2. Position the transmission jack and install a holding strap around the transmission.



3. Remove the transmission support insulator.



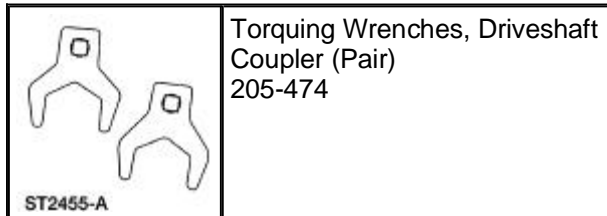
4. Remove the transmission support.



5. To install, reverse the removal procedure.

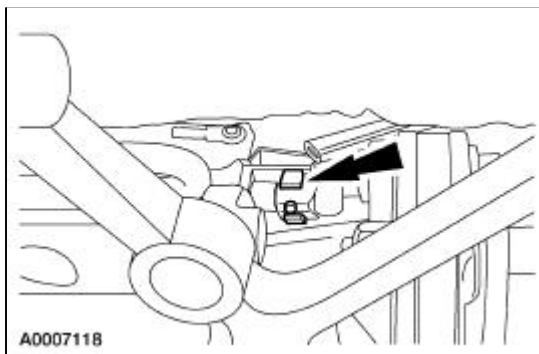
Transmission

Special Tool(s)

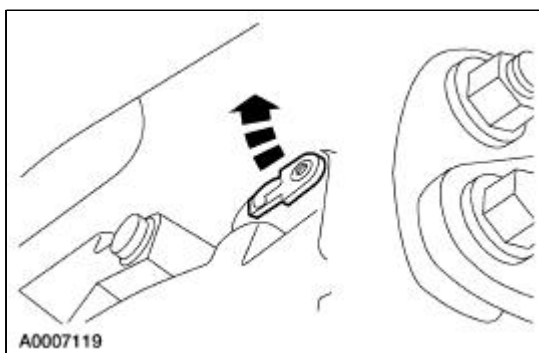


Removal

1. Disconnect the battery ground cable. For additional information, refer to [Section 414-01](#).
2. Raise and support the vehicle. For additional information, refer to [Section 100-02](#).
3. Remove the starter motor. For additional information, refer to [Section 303-06](#).
4. Disconnect the selector rod.
 - Remove the selector rod locating pin.

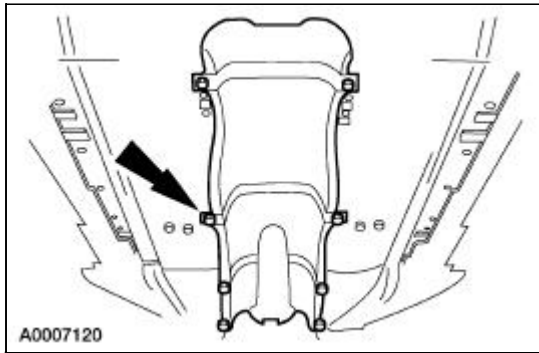


5. Disconnect the stabilizer rod.
 - Remove the stabilizer rod locating pin.




6. Remove the intermediate muffler. For additional information, refer to [Section 309-00](#).

7. Remove the bolts and the center heat shield.



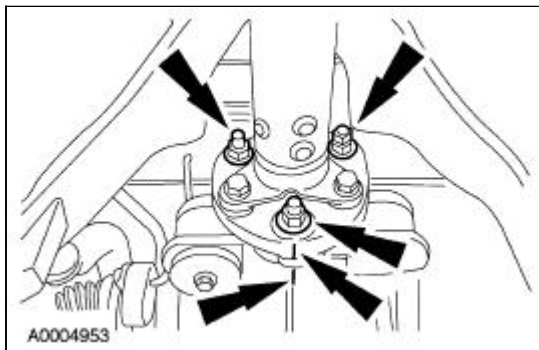
8.  **CAUTION:** The transmission flange bolts, nuts and washers must be removed as matched sets and installed in their original location. The system balance add-on nuts (if equipped) must be installed in their original location.

 **CAUTION:** Under no circumstances must the flexible coupling (or its fixings) be loosened or removed from the driveshaft.

 **CAUTION:** Support the front section of the driveshaft.

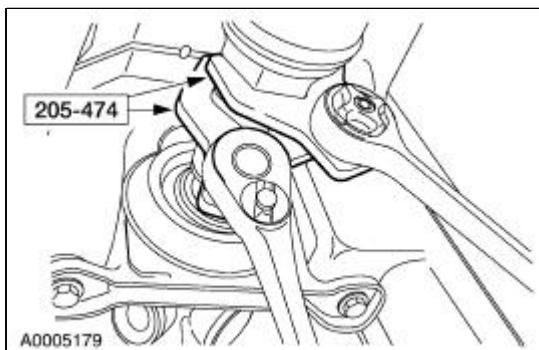
Disconnect the transmission flexible joint.

- Using different color paint markers, place index matchmarks on the transmission flange, driveshaft flexible coupling and the transmission bolts, nuts, washer and system balance and on nuts so the driveshaft and transmission flange may be correctly aligned during installation.

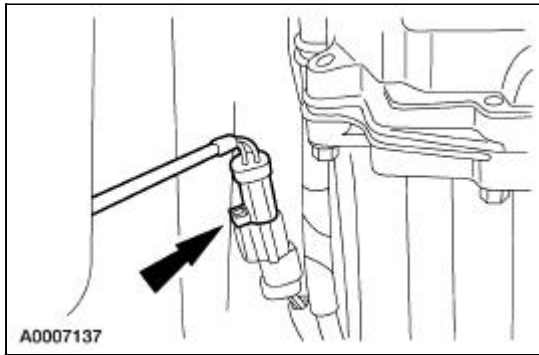


9. Shorten the length of the driveshaft.

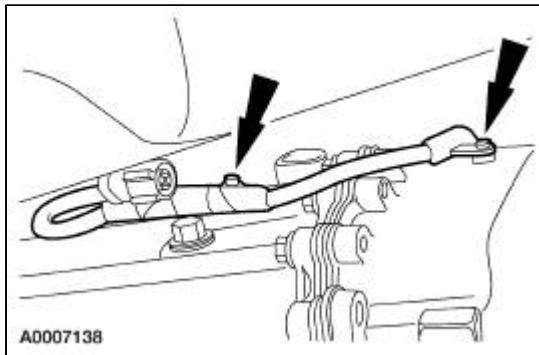
- Using the special tools, loosen the driveshaft yoke locknut and move the driveshaft front section towards the center bearing.



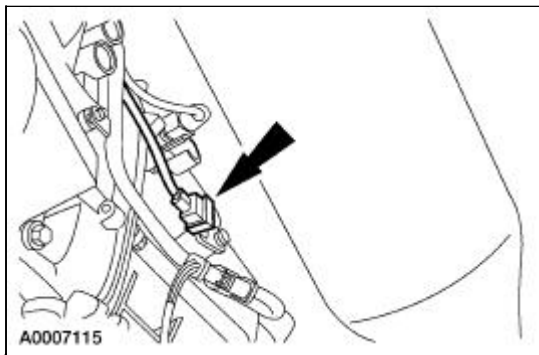
10. Disconnect the right-hand bank catalyst monitor sensor electrical connector.



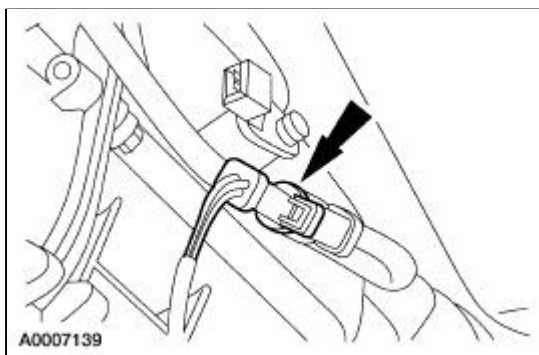
11. Remove the electrical wiring harness from the transmission.



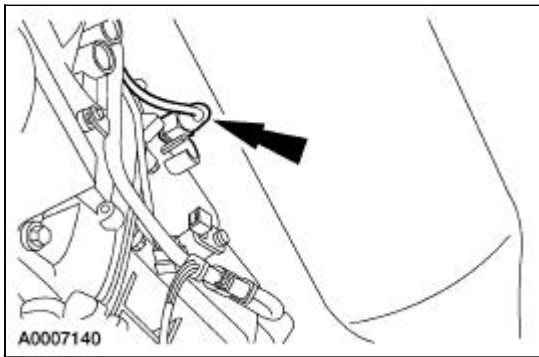
12. Disconnect the vehicle speed sensor electrical connector.



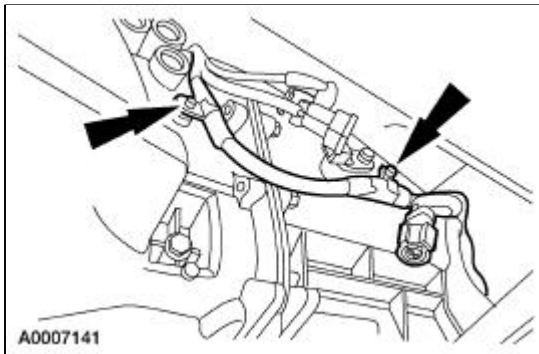
13. Disconnect the left-hand bank catalyst monitor sensor electrical connector.



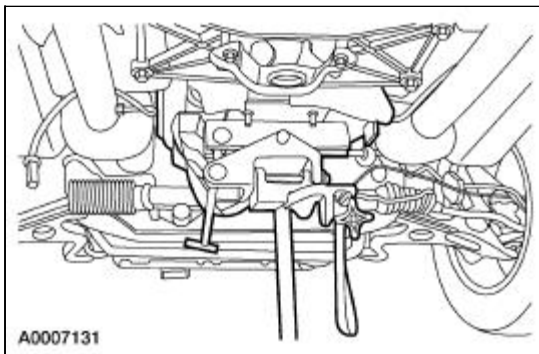
14. Disconnect the reverse light switch electrical connector.



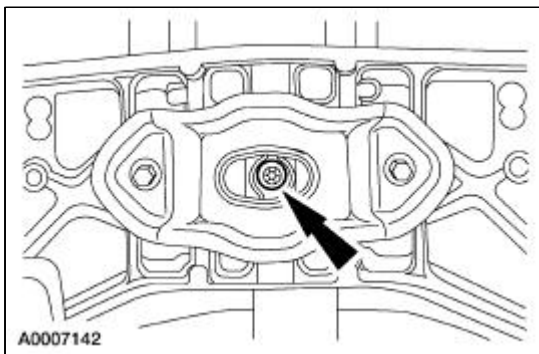
15. Detach the electrical wiring harness from the transmission.



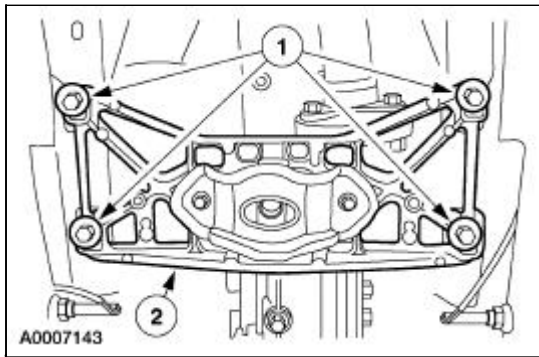
16. Position the transmission jack and install a holding strap around the transmission.



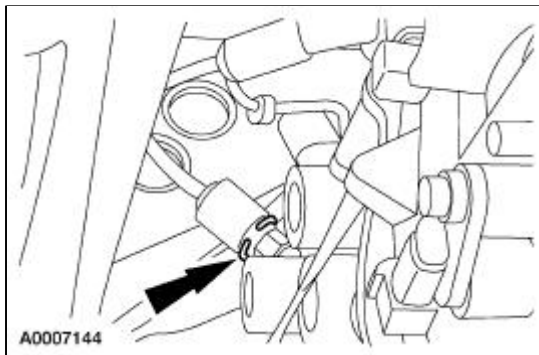
17. Remove the support insulator.



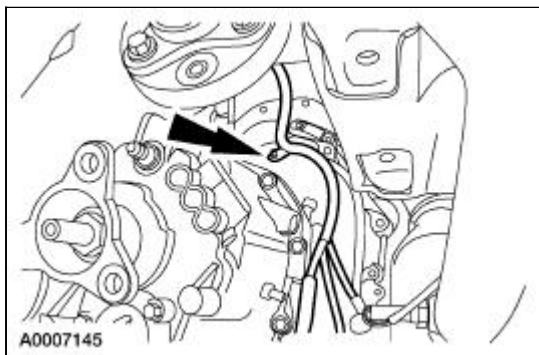
18. Remove the transmission support.
1. Remove the bolts.
 2. Remove the support.



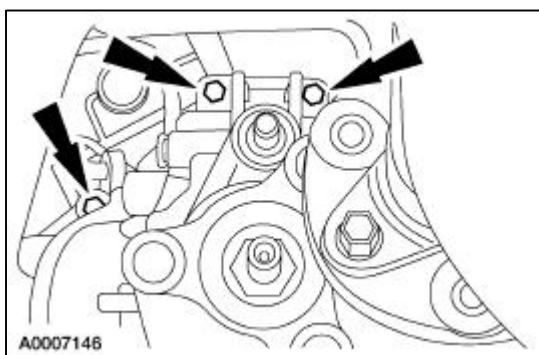
19. Partially lower the transmission.
20. Disconnect the slave cylinder supply tube.
 - Remove the slave cylinder supply tube retaining clip.
 - Plug the hose to prevent loss of fluid.



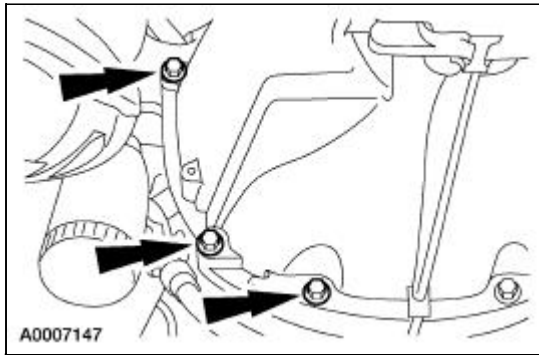
21. Remove the transmission wiring electrical harness from the transmission.



22. Remove the bellhousing bolts.

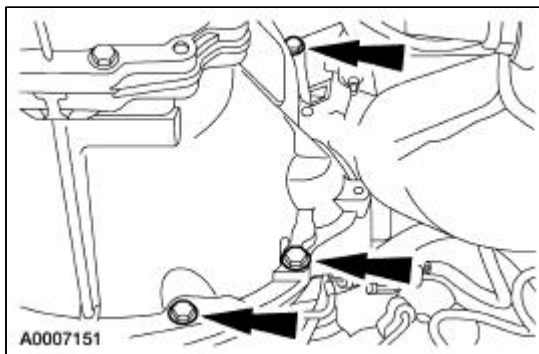


23. Remove the bellhousing bolts.



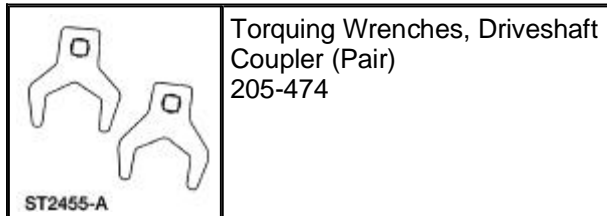
24. Remove the transmission.

- Remove the remaining bellhousing bolts.

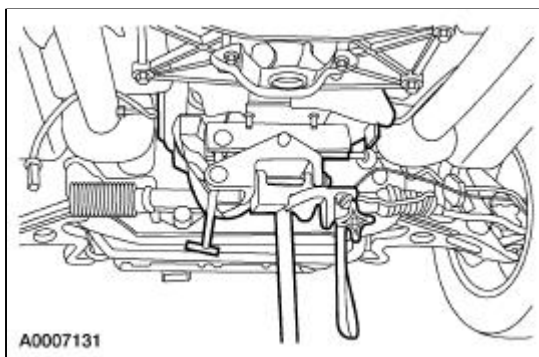


Transmission

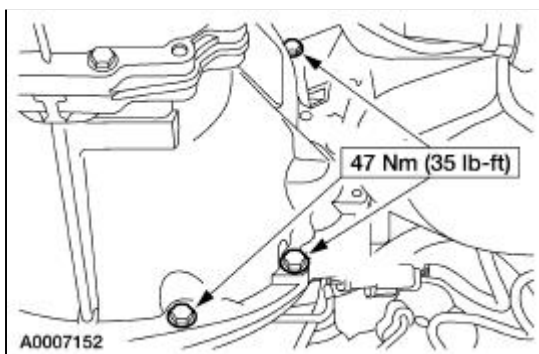
Special Tool(s)



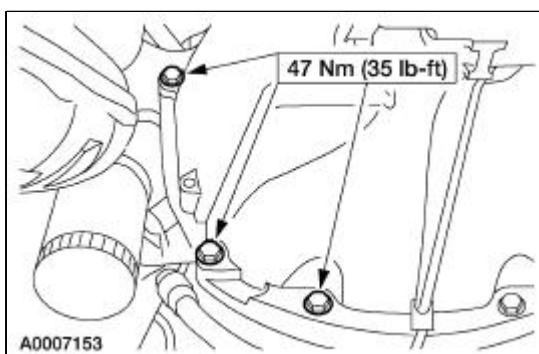
1. Position the transmission to the engine using the transmission jack.



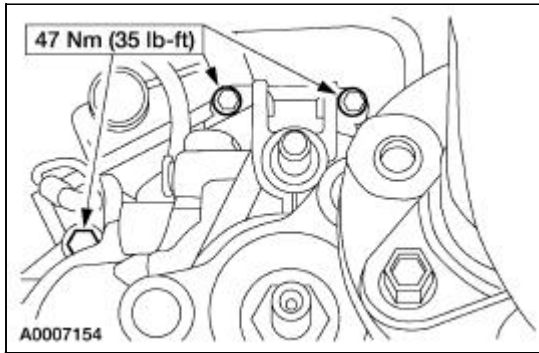
2. Install the bellhousing bolts.



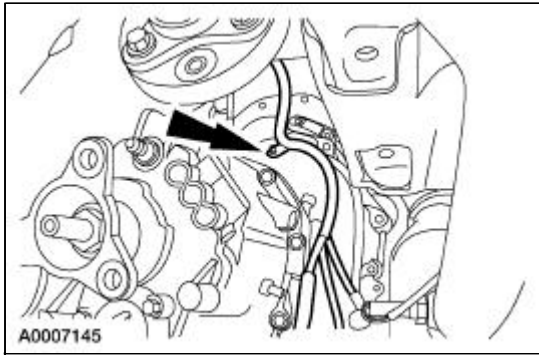
3. Install the bellhousing bolts.



4. Install the remaining bellhousing bolts.

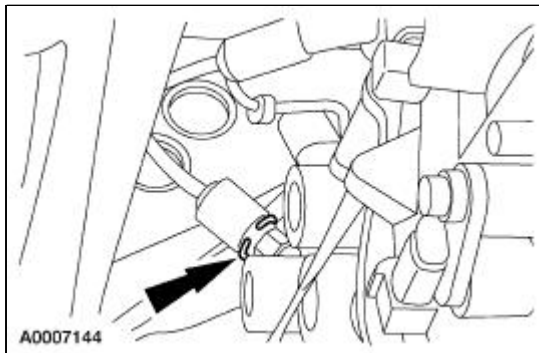


5. Attach the transmission wiring harness to the transmission.

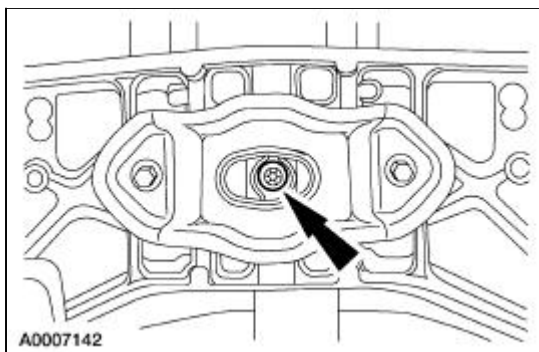


6. **NOTE:** Install a new O-ring seal and clip to the supply tube.

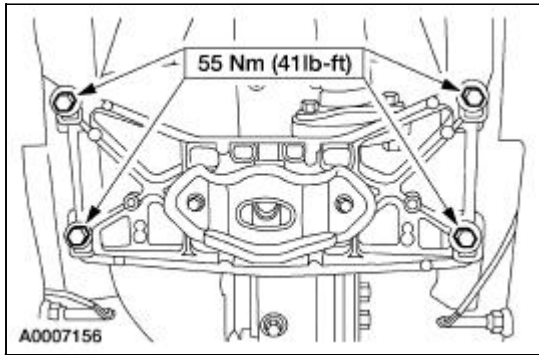
Connect the slave cylinder supply tube.



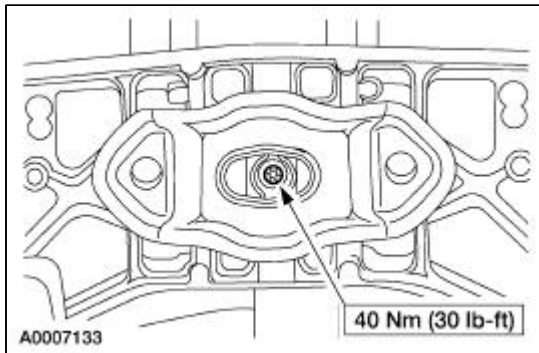
7. Loosely install the transmission support insulator.



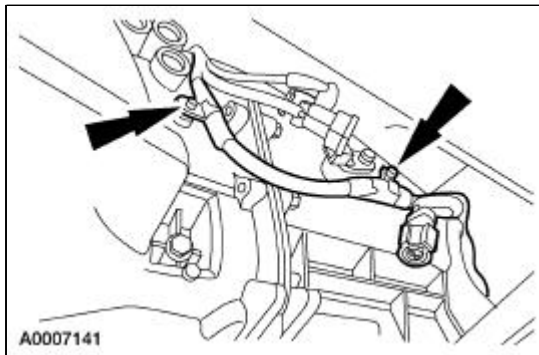
8. Install the transmission support.



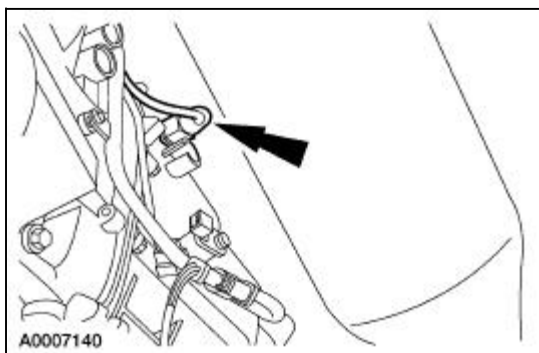
9. Tighten the transmission support insulator center bolt.



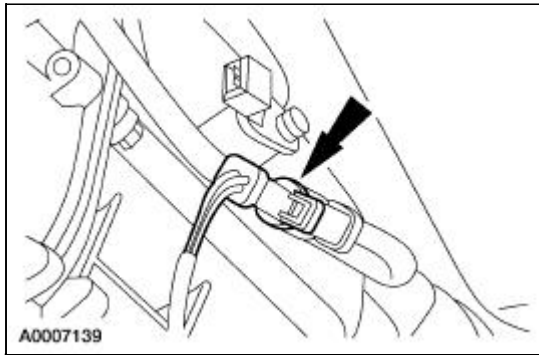
10. Remove the transmission jack.
11. Attach the electrical wiring harness to the transmission.



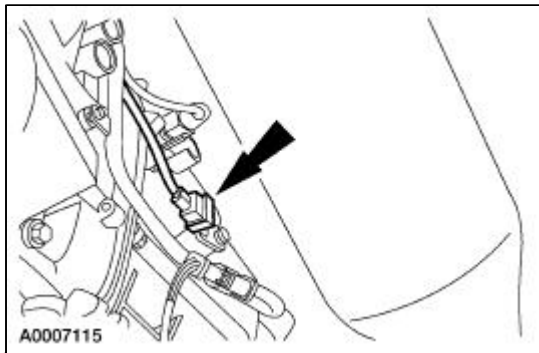
12. Connect the reverse switch electrical connector.



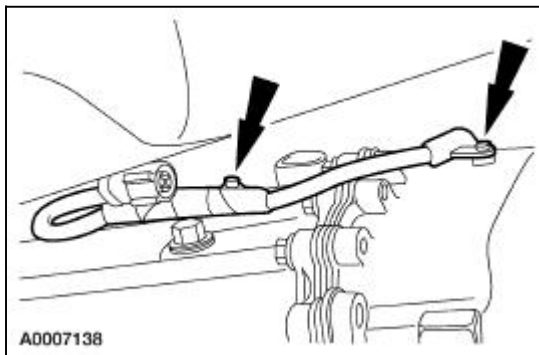
13. Connect the left-hand catalyst monitor sensor electrical connector.



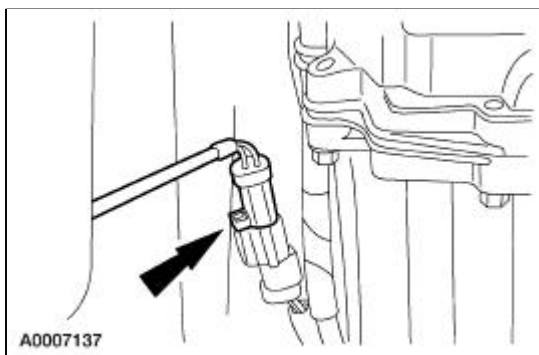
14. Connect the speed sensor electrical connector.



15. Attach the right-hand electrical wiring harness to the transmission.




16. Connect the right-hand catalyst sensor electrical connector.



17. **NOTE:** Install one gram of Premium Long Life Grease, XG-1-K or equivalent meeting Ford specifications ESA-M1C75-B, in the alignment bushing prior to installation.

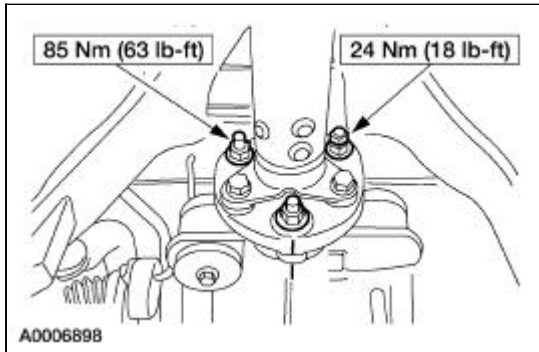
Slide the driveshaft forward until the flexible coupling engages with the transmission flange.

18.  **CAUTION:** Make sure to match the bolts, washers, attaching nuts and balance add-on nuts (if equipped) to their original location.

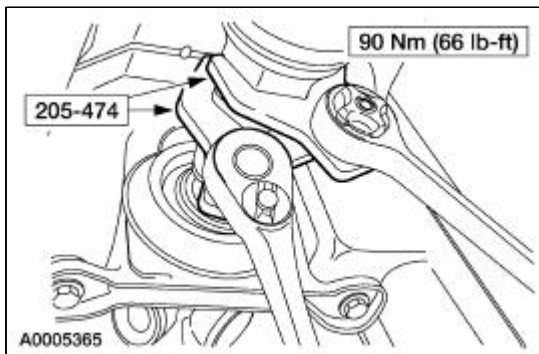
 **CAUTION:** Tighten the transmission flange bolts and nuts with hand tools only.

NOTE: Align the driveshaft index matchmarks.

Install the transmission flex coupling bolts, washers and attaching nuts.



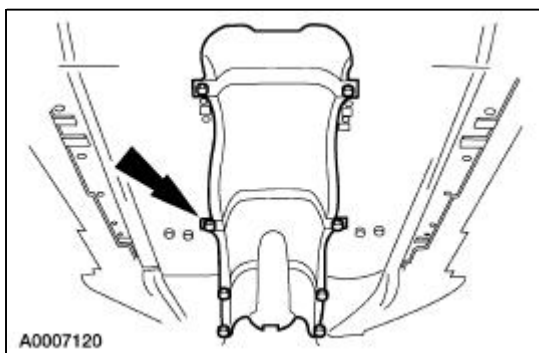
19. Using the special tools, tighten the driveshaft yoke locknuts.



20. Install the stabilizer rod and stabilizer rod pin

21. Install the selector rod and selector rod pin.

22. Install the bolts and the center heat shield.



23. Install the intermediate muffler.

24. Install the starter motor. For additional information, refer to [Section 303-06](#).
 25. Bleed the clutch slave cylinder hydraulic system. For addition information, refer to [Section 308-00](#).
 26. Lower the vehicle.
 27. Reconnect the battery ground cable.
-

General Specifications

Item	Specification
Silicone Lubricant F5AZ-19553	ESR-M13P4-A

Torque Specifications

Description	Nm	lb-ft	lb-in
Three way catalytic converter to exhaust manifold nuts	40	30	—
Muffler and resonator assembly nuts	47	35	—
Heat shield bolts and nuts	10	—	89
Worm Clamp	7	—	62
Muffler brace bolts	25	18	—62

Exhaust System



WARNING: The normal operating temperature of the exhaust system is very high. Never attempt to repair any part of the system until it has cooled. Be especially careful when working around the three way catalytic converter. The temperature of the three way catalytic converter rises to a high level after only a few minutes of engine operation. Failure to follow these instructions may result in personal injury.



CAUTION: When repairing the exhaust system or removing exhaust components, disconnect all heated oxygen sensors (HO2S) at the wiring connectors to prevent damage to the heated oxygen sensors and wiring harness. For additional information, refer to [Section 303-14](#) for the location of the heated oxygen sensors.

The exhaust system:

- contains dual three way catalytic converters.
 - has a crossover pipe downstream of the three way catalytic converters.
 - has two upstream heated oxygen sensors mounted before the three way catalytic converters.
 - the production muffler and tailpipe assembly is a one-piece design.
-

Exhaust System

Inspection and Verification

1. Verify the customer concern by running the engine at 2000 rpm or by road testing the vehicle.
2. Visually inspect the components of the exhaust system and the related controls that may affect exhaust gas quality or cause a loss of power.
3. Visually inspect for obvious signs of mechanical and electrical damage. For additional information, refer to the following chart:

Visual Inspection Chart

Mechanical	Electrical
<ul style="list-style-type: none"> ● Leaking fuel injector tips ● Damaged air inlet passages ● Inoperative exhaust gas recirculation (EGR) valve ● Exhaust pipe pinched, crushed ● Damaged, loose vacuum hoses ● Incorrect idle speed ● Dirty engine air cleaner ● Damaged catalytic converter 	<ul style="list-style-type: none"> ● Loose heated oxygen sensors ● Misrouted, damaged wiring ● Damaged, loose connectors ● Damaged ignition system

4. Exercise the wiring and connectors of the components for obvious problems due to looseness, corrosion, or other damage. This must be done while the engine is fully warmed and the system controls are activated.
5. Check the vacuum lines and connections for looseness, pinching, leakage, splitting, blockage, or other damage.
6. If a vacuum line or orifice (restrictor) blockage is suspected, correct the cause before proceeding to the next step.
7. If the concern is not visually evident, determine the symptom and proceed to the Symptom Chart.

Symptom Chart


Symptom Chart

Condition	Possible Sources	Action
<ul style="list-style-type: none"> ● Noisy or Leaking Exhaust 	<ul style="list-style-type: none"> ● Exhaust leak. ● Misaligned exhaust. ● Loose clamps. ● Restricted exhaust. ● Loose or missing heated oxygen sensors (HO2S). 	<ul style="list-style-type: none"> ● GO to Pinpoint Test A.
<ul style="list-style-type: none"> ● Loss of Power 	<ul style="list-style-type: none"> ● Kinked or damaged exhaust 	<ul style="list-style-type: none"> ● GO to Pinpoint





	pipe. ● Clogged catalytic converter. ● Foreign object in exhaust pipe.	Test B .
--	--	--------------------------

Pinpoint Tests

PINPOINT TEST A: NOISY OR LEAKING EXHAUST

CONDITIONS	DETAILS/RESULTS/ACTIONS
A1 CHECK THE CLAMPS AND BRACKETS	
<div style="border: 1px solid black; padding: 5px; width: 40px; height: 40px; display: flex; align-items: center; justify-content: center;"> 1 </div> 	<div style="border: 1px solid black; padding: 5px; width: 40px; height: 40px; display: flex; align-items: center; justify-content: center;"> 2 </div> Inspect the exhaust system for loose or broken clamps and brackets. <ul style="list-style-type: none"> ● Are the clamps and brackets OK? <p>→ Yes GO to A2.</p> <p>→ No REPAIR or INSTALL new clamps or brackets. TEST the system for normal operation.</p>
A2 CHECK THE EXHAUST COMPONENTS	
	<div style="border: 1px solid black; padding: 5px; width: 40px; height: 40px; display: flex; align-items: center; justify-content: center;"> 1 </div> Inspect the exhaust components for punctures, split seams, or incorrect welds. <ul style="list-style-type: none"> ● Are the exhaust components OK? <p>→ Yes GO to A3.</p> <p>→ No INSTALL new exhaust components. TEST the system for normal operation.</p>
A3 CHECK THE EXHAUST MANIFOLD	
	<div style="border: 1px solid black; padding: 5px; width: 40px; height: 40px; display: flex; align-items: center; justify-content: center;"> 1 </div> Inspect the exhaust manifold for loose fasteners or cracks. <ul style="list-style-type: none"> ● Is the exhaust manifold OK? <p>→ Yes GO to Pinpoint Test B.</p> <p>→ No TIGHTEN loose fasteners or INSTALL a new exhaust manifold. Refer to Section 303-01A or Section 303-01B. TEST the system for normal operation.</p>

PINPOINT TEST B: LOSS OF POWER

CONDITIONS	DETAILS/RESULTS/ACTIONS
B1 CARRY OUT A VACUUM TEST	
<p>1</p> 	<p>2 Carry out an intake manifold vacuum test. Refer to Component Tests in Section 303-00.</p> <ul style="list-style-type: none"> ● Is the exhaust system OK? <p>→ Yes REFER to the Powertrain Control/Emissions Diagnosis (PC/ED) manual for diagnosis and testing of the engine.</p> <p>→ No GO to B2.</p>
B2 CARRY OUT A VACUUM TEST - EXHAUST SYSTEM DISCONNECTED AT THE EXHAUST MANIFOLD	
<p>1</p>  <p>3</p> 	<p>2 Disconnect the exhaust system at the exhaust manifold.</p> <p>4 Carry out an intake manifold vacuum test. Refer to Component Tests in Section 303-00.</p> <ul style="list-style-type: none"> ● Is the exhaust system OK? <p>→ Yes GO to B3.</p> <p>→ No GO to B4.</p>
B3 CARRY OUT A VACUUM TEST - EXHAUST SYSTEM DISCONNECTED AT THE MUFFLER	
<p>1</p> 	<p>2 Reconnect the exhaust system at the exhaust manifold.</p> <p>3 Disconnect the exhaust system at the muffler.</p>

4



5 Carry out an intake manifold vacuum test. Refer to Component Tests in [Section 303-00](#).

● **Is the exhaust system OK?**

→ **Yes**
INSTALL a new muffler and tailpipe. Refer to [Muffler](#) in this section. TEST the system for normal operation.

→ **No**
INSTALL a new three way catalytic converter. For additional information, refer to [Three Way Catalytic Converter \(TWC\)](#) in this section. TEST the system for normal operation.

B4 CHECK THE EXHAUST MANIFOLD

1



2 Connect the exhaust system at the muffler. Refer to [Muffler](#) in this section.

3 Remove the exhaust manifold. Refer to [Section 303-01A](#) or [Section 303-01B](#).

4 Inspect the ports for casting flash.

● **Is there casting flash present?**

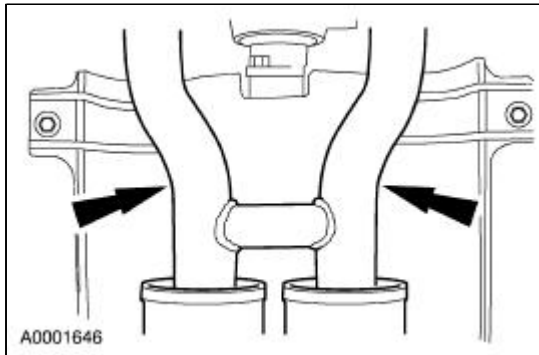
→ **Yes**
REMOVE the casting flash or INSTALL a new exhaust manifold. Refer to [Section 303-01A](#) or [Section 303-01B](#). TEST the system for normal operation.

→ **No**
REFER to the Powertrain Control/Emissions Diagnosis (PC/ED) manual for diagnosis and testing of the engine.

Muffler

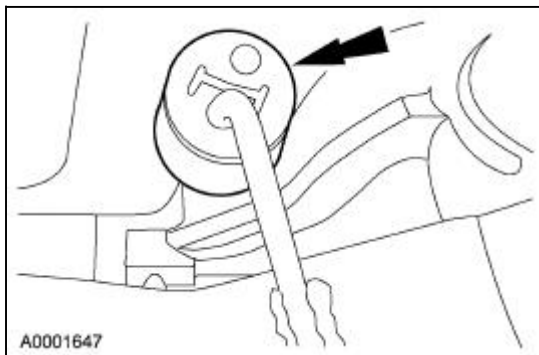
Removal and Installation

1. Raise and support the vehicle. For additional information, refer to [Section 100-02](#).
2. Support the exhaust pipes at the rear of the resonators.

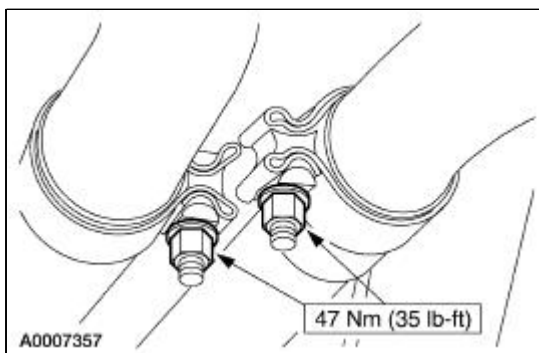


3. **NOTE:** The exhaust hanger bracket insulators can be reused if they show no signs of damage. Lubricate before removal with Silicone Lubricant F5AZ-19553-AA meeting Ford specification ESR-M13P4-A or equivalent.

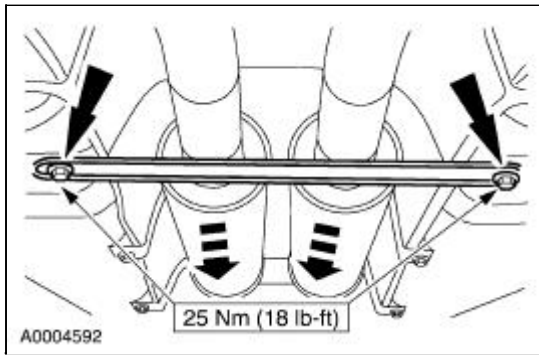
Remove the exhaust hanger insulators (5F262).



4. Remove the nuts.



5. Remove the bolts, the brace and the mufflers (5230).

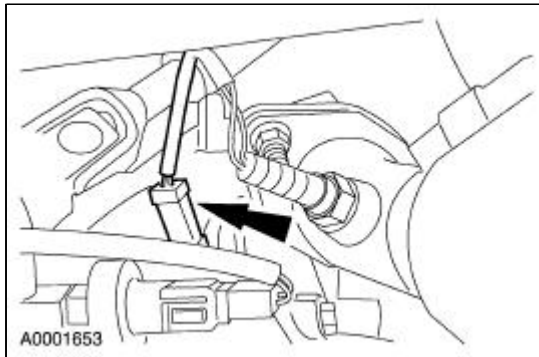


6. To install, reverse the removal procedure.

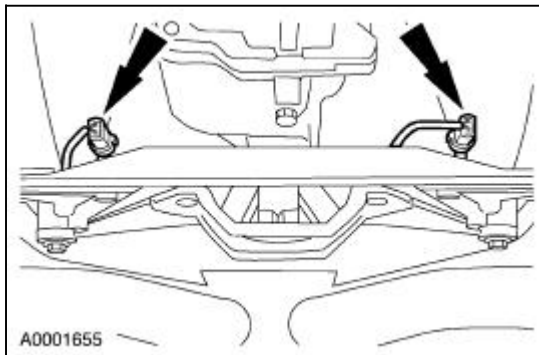
Three Way Catalytic Converter (TWC)

Removal and Installation

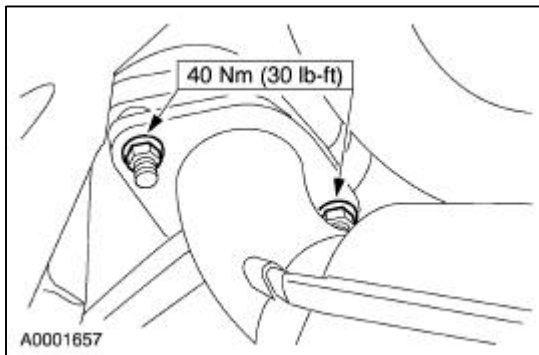
1. Raise and support the vehicle. For additional information, refer to [Section 100-02](#).
2. Disconnect the two HO2S connectors.



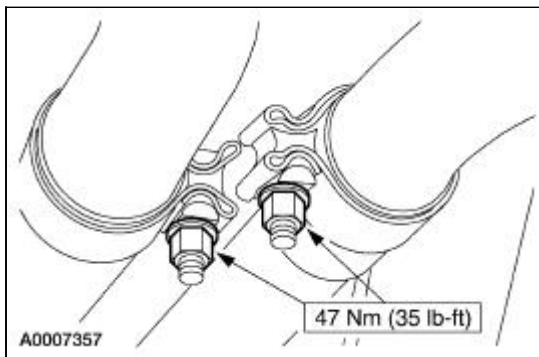
3. Disconnect the two catalyst monitor connectors.



4. Remove the four nuts.



5. Remove the nuts and the three way catalytic converter.



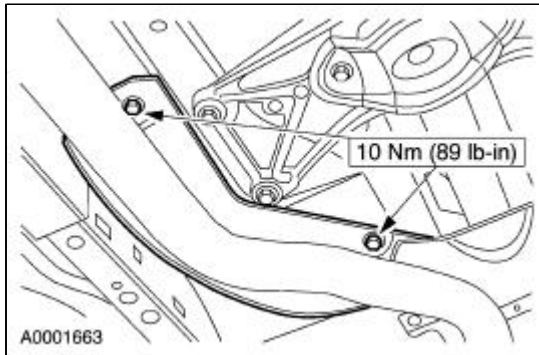
6. Transfer the two HO2S sensors and the two catalyst monitors if a new TWC is being installed.
 - Apply High Temperature Nickel Anti-Seize Lubricant F6AZ-9L494-AA or equivalent meeting Ford specification ESE-M12A4-A to the HO2S sensor and catalyst monitor threads.

 7. To install, reverse the removal procedure.
-

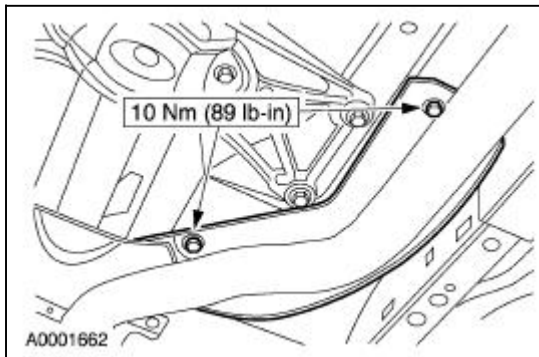
Heat Shield —Front

Removal and Installation

1. Raise the vehicle. For additional information, refer to [Section 100-02](#).
2. Remove the bolts and the LH heat shield.



3. Remove the bolts and the RH heat shield.

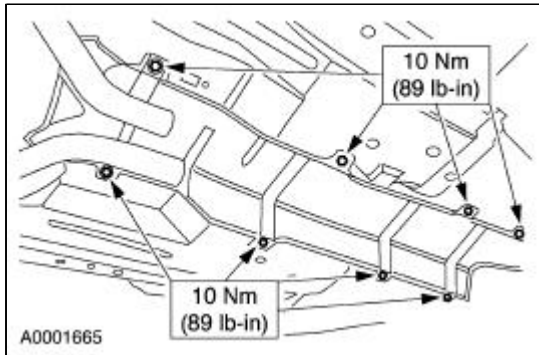


4. To install, reverse the removal procedure.

Heat Shield —Underbody

Removal and Installation

1. Remove the muffler (5230). For additional information, refer to [Muffler](#) in this section.
2. Remove the bolts, the nuts and the heat shield.

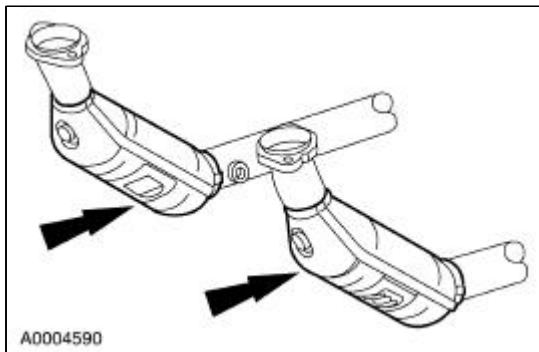


3. To install, reverse the removal procedure.
-

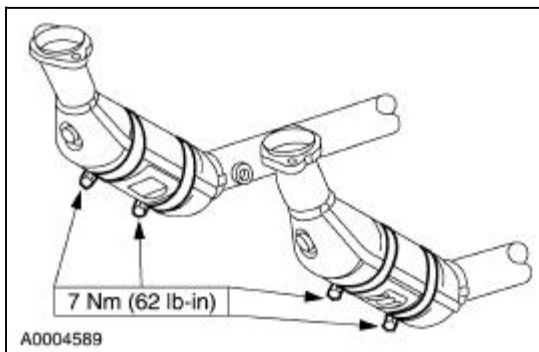
Heat Shield —Three Way Catalytic Converter

Removal

1. Raise and support the vehicle. For additional information, refer to [Section 100-02](#).
2. Inspect the catalytic converters for loose or missing heat shields.



3. Install worm clamps for heat shields that are loose.



4. If the heat shields are missing, install new heat shields. If new heat shields are not available, install a new catalytic converter. For additional information, refer to [Three Way Catalytic Converter \(TWC\)](#).
5. Lower the vehicle.

General Specifications

Item	Specification
Fuel tank capacity	68 liters (18 gal.)
Engine running fuel pressure	207-308 kPa (30-65 psi)
Key on, engine off fuel pressure	207-380 kPa (30-65 psi)
SAE 5W30 Motor Oil XO-5W30-QSP	WSS-M2C153-G

Fuel System

The vehicle:

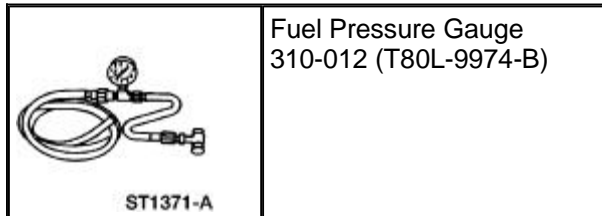
- is equipped with a multiport fuel injection (MFI) system.
 - uses separately controlled fuel injectors (9F593) mounted to the intake manifold for each cylinder.
 - fuel injectors are supplied with pressurized fuel from the fuel delivery module (9H307) through the jet pump transfer module, through the fuel injection supply manifold (9D280).
 - fuel injection supply manifold is controlled by the electronic fuel delivery module which is enabled by the powertrain control module (PCM) (12A650).
 - uses an electronic returnless fuel system.
 - has a dual-container (saddle type) fuel tank (9002), each half equipped with a fuel level sensor (9275).
 - has a jet pump transfer module (9275) in the left fuel tank half to supply fuel to the right, which contains the fuel delivery module (9H307) that supplies fuel under pressure to the fuel injection supply manifold.
 - has an inertia fuel shutoff (IFS) switch (9341), located behind the driver side left foot kick panel, which shuts off the fuel in the event of collision.
 - has a fuel system filter (9155), located behind the left front wheel well splash shield.
-

Fuel System

Refer to the Powertrain Control/Emissions Diagnosis (PC/ED) manual.

Pressure Relief

Special Tool(s)

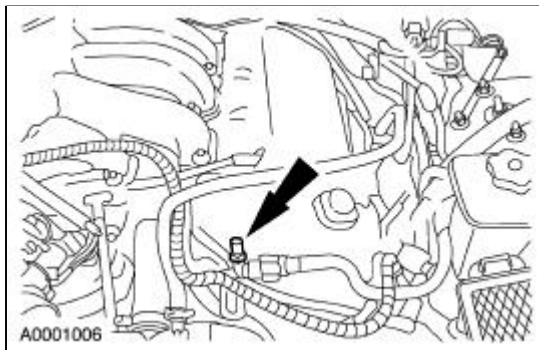


⚠ WARNING: Do not smoke or carry lighted tobacco or open flame of any type when working on or near any fuel-related component. Highly flammable mixtures are always present and may be ignited, resulting in possible personal injury.

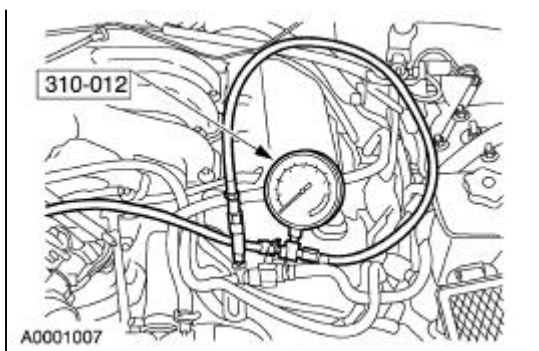
⚠ WARNING: Fuel in the fuel system remains under high pressure even when the engine is not running. Before repairing or disconnecting any of the fuel lines or fuel system components, the fuel system pressure must be relieved to prevent accidental spraying of fuel, causing personal injury or a fire hazard.

1. **NOTE:** 3.0L shown, 3.9L similar.

Remove the Schrader valve cap and install the special tool.



2. Slowly open the manual valve on the special tool and relieve the fuel pressure.
 - This will drain some fuel out of the system.



Draining

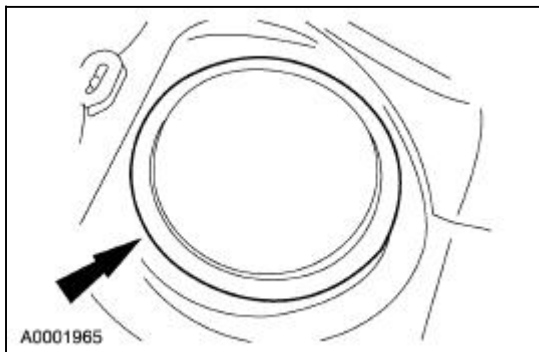
⚠ WARNING: Do not smoke or carry lighted tobacco or open flame of any type when working on or near any fuel-related component. Highly flammable mixtures are always present and may be ignited, resulting in possible personal injury.

NOTE: It will be necessary to adapt fuel line connector, part number XW4Z-9B376-AA, to the Fuel Storage Tanker hose to accomplish this draining procedure.

1. **NOTE:** When the battery is disconnected and reconnected, some abnormal drive symptoms may occur while the vehicle relearns its adaptive strategy. The vehicle may need to be driven 16 km (10 miles) or more to relearn the strategy.

Disconnect the battery ground cable. For additional information, refer to [Section 414-01](#).

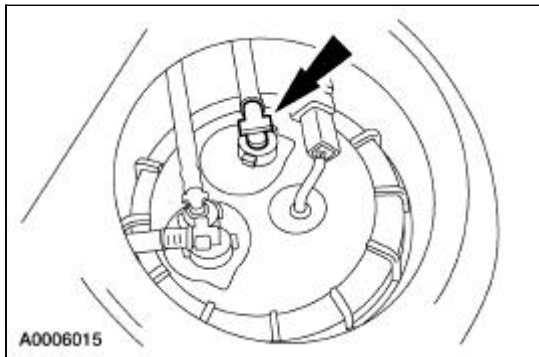
2. Relieve the fuel pressure. For additional information, refer to [Pressure Relief](#) in this section.
3. Remove the rear seat bottom and any insulation padding covering the fuel module access cover. For additional information, refer to [Section 501-10](#).
4. Remove the fuel delivery module (FDM) and jet pump module access covers.



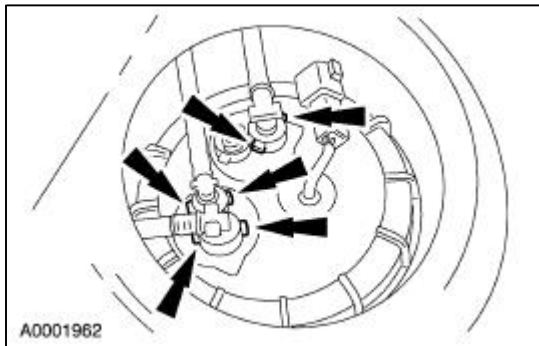
5. **⚠ CAUTION:** To disconnect the fuel line connector from the outlet fitting on the module, carefully press down on the fuel line connector while pressing the release tabs. Pull straight up to remove. Failure to follow this procedure could result in damage to the fitting or fuel line.

NOTE: Both sides of the tank must be drained individually to make sure all possible fuel is removed from the tank.

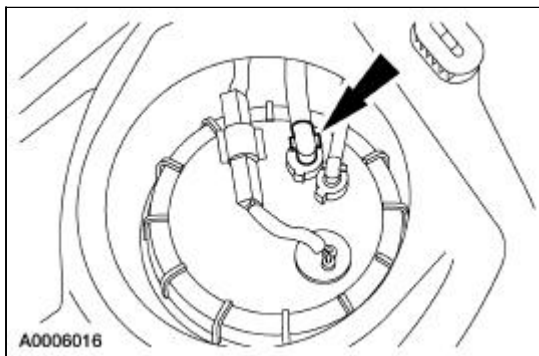
Remove the black connector elbow on the fuel tank crossover lines (jet pump module, LH side).



6. Press the release tabs on the module fitting, turn the fuel line slightly, pull straight up to remove the black fuel line connector elbow.





7. Attach the fuel line draining connector to the fuel storage tanker hose and the outlet fitting on the jet pump module. Siphon the fuel until the tank side is empty.
8. Attach the fuel draining connector to the fuel delivery module (FDM) (LH side) and repeat the procedure until the tank is empty. Remove the fuel delivery module and siphon any remaining fuel out of the tank. For additional information, refer to [Section 310-01](#) for fuel delivery module flange removal.





Coupling — Spring Lock

Special Tool(s)

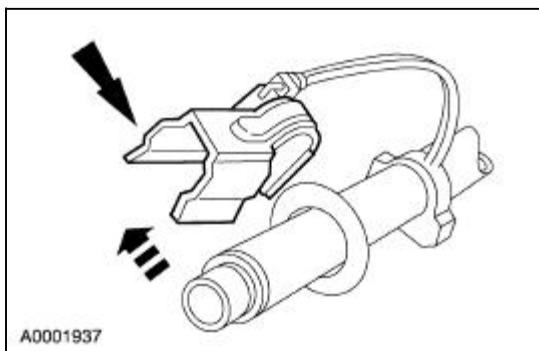
 ST1146-A	Spring Lock Coupler Tool (3/8 inch) 310-D004 (D87L-9280-A) or equivalent
 ST1147-A	Spring Lock Coupler Tool (1/2 inch) 310-D005 (D87L-9280-B) or equivalent

Disconnect

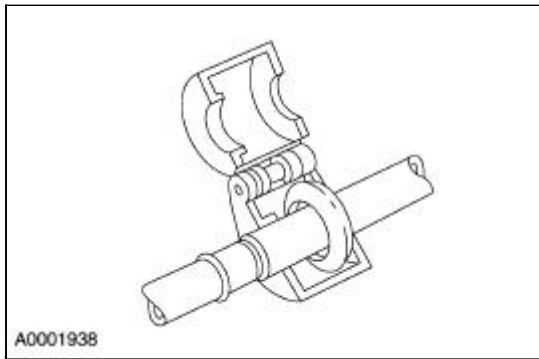
 **WARNING:** Do not smoke or carry lighted tobacco or open flame of any type when working on or near any fuel-related component. Highly flammable mixtures are always present and may be ignited, resulting in possible personal injury.

 **WARNING:** Fuel in the fuel system remains under high pressure even when the engine is not running. Before repairing or disconnecting any of the fuel lines or fuel system components, the fuel system pressure must be relieved to prevent accidental spraying of fuel, causing personal injury or a fire hazard.

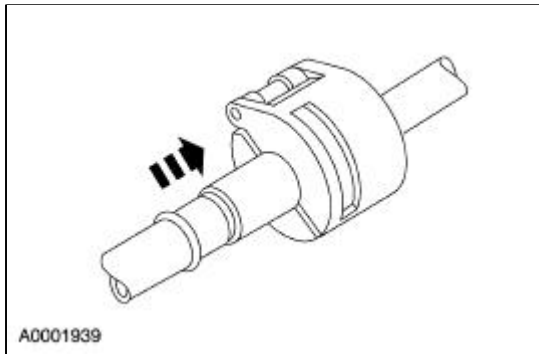
1. Relieve the fuel pressure. For additional information, refer to [Pressure Relief](#) in this section.
2. Remove the fuel tube clip.



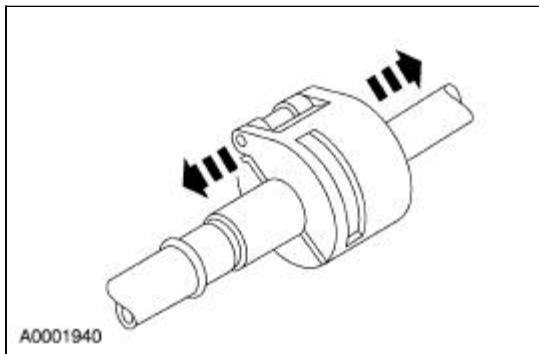
3. Install the special tool.



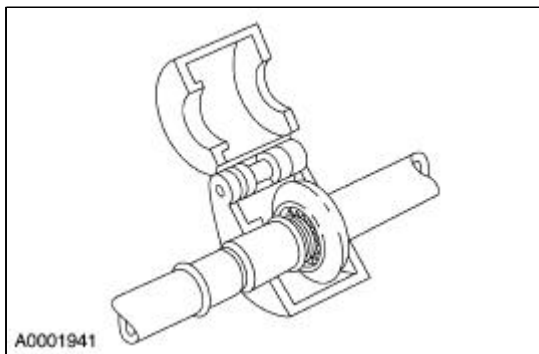
4. Close and push the special tool into the open side of the cage.



5. Separate the fitting.



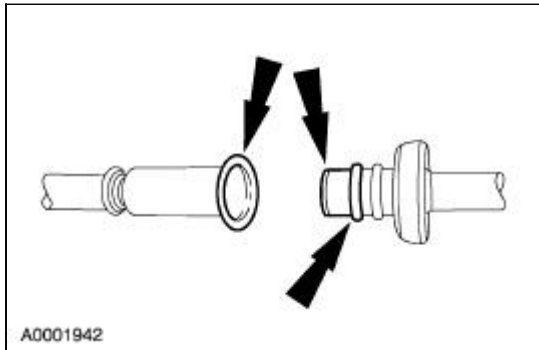
6. Remove the special tool.



Connect

1. Connect the fitting.
 - Inspect and clean both the coupling ends.

- Lubricate the O-ring seals with clean SAE 5W30 Motor Oil XO-5W30-QSP meeting Ford specification WSS-M2C153-G.
- Connect the fitting.
- Pull on the fitting to make sure it is fully engaged.
- Install the safety clip.



Fittings —R-Clip

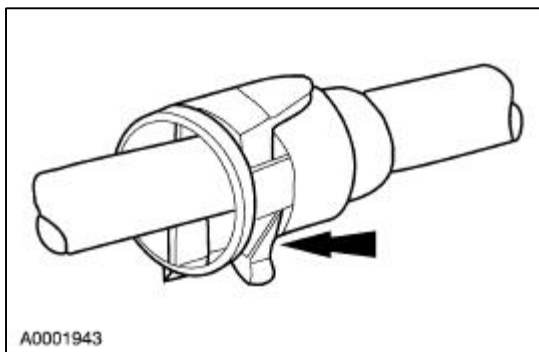
Removal

⚠ WARNING: Do not smoke or carry lighted tobacco or open flame of any type when working on or near any fuel-related component. Highly flammable mixtures are always present and may be ignited, resulting in possible personal injury.

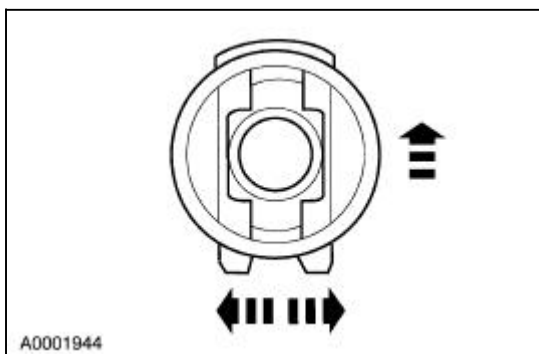
⚠ WARNING: Fuel in the fuel system remains under high pressure even when the engine is not running. Before replacing or disconnecting any of the fuel lines or fuel system components, the fuel system pressure must be relieved to prevent accidental spraying of fuel, causing personal injury or a fire hazard.

⚠ CAUTION: Do not use any tools. The use of tools may cause a deformity in the clip components which may cause fuel leaks.

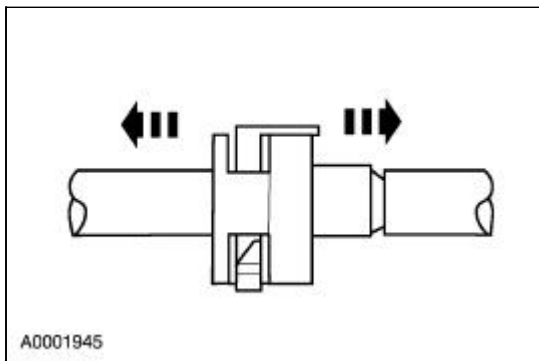
1. Remove the shipping tab by bending it downward.



2. Spread the R-clip legs and push the clip into the fitting.

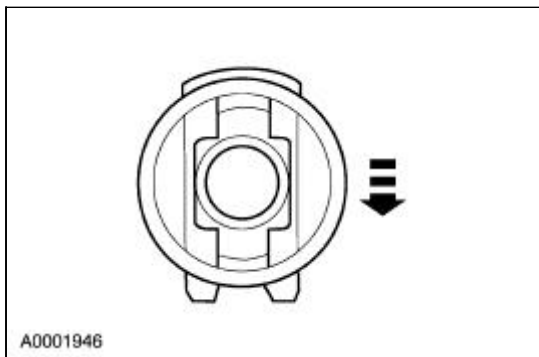


3. Separate the fitting from the tube.

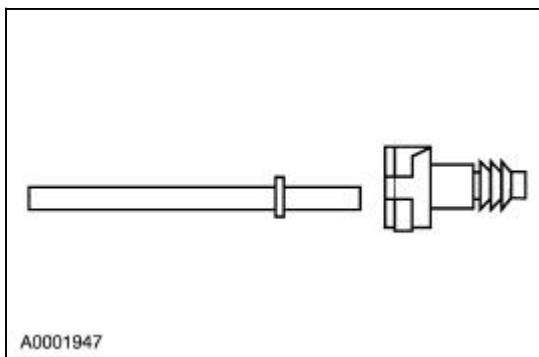


Installation

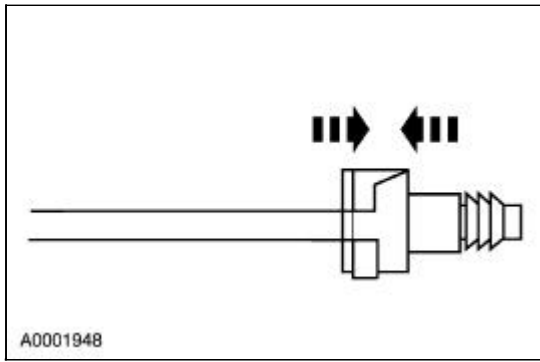
1. Inspect the fitting and the tube for damage. Remove any dirt or obstructions.
2. Apply a light coat of clean SAE 5W30 Motor Oil XO-5W30-QSP meeting Ford specification WSS-M2C153-G to the male tube end.
3. Insert the R-clip into the fitting.



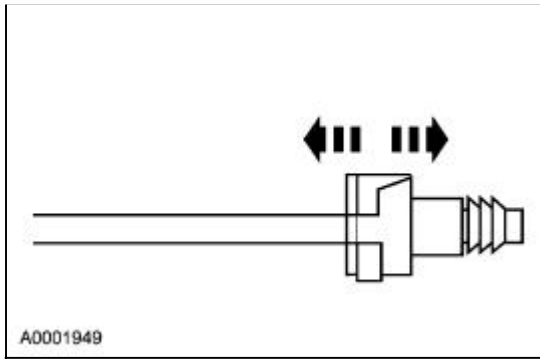
4. Align the tube and the fitting.



5. Insert the tube into the fitting and push together until a click is heard.




6. Pull on the connection to make sure it is fully engaged.



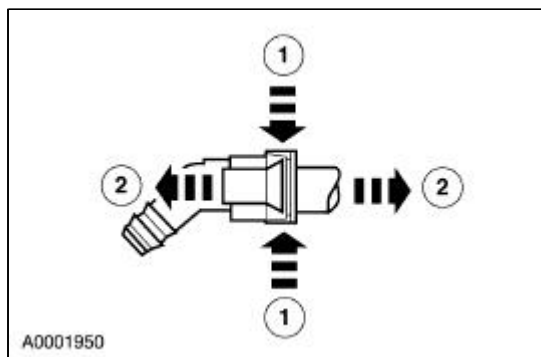
Fittings — Vapor Tube

Disconnect

1. Disconnect the battery ground cable. For additional information, refer to [Section 414-01](#).
2.  **WARNING:** The evaporative emission system contains fuel vapor and condensed fuel vapor. Although not present in large quantities, it still presents the danger of explosion or fire.

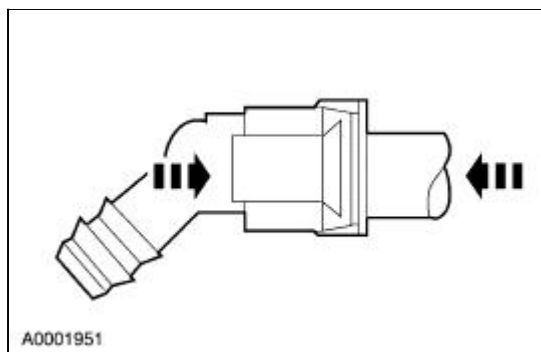
Disconnect the vapor tube from the fitting.

1. Squeeze the fitting.
2. Disconnect the vapor tube from the fitting.

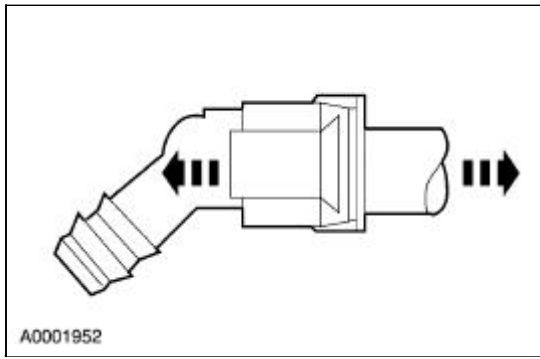


Connect

1. Inspect the fitting and the tube for damage.
2. Remove any dirt or obstructions.
3. Push the tube into the fitting until it snaps in place.



4. Pull on the connection to make sure the fitting is secure.



A0001952

General Specifications

Item	Specification
Capacity	
Fuel tank	68 liters (18 gallons)
Fuel pressure	
Engine running	207-447 kPa (30-65 psi)
Key on engine off	207-447 kPa (30-65 psi)
Lubricants	
Surfactant (Merpol)	ESE-M99B144-B
Petroleum	ESW-M1C115-A or ESB-M1C99-A

Torque Specifications

Description	Nm	lb-ft	lb-in
Exhaust heat shield nuts	10	—	89
Exhaust heat shield bolts	10	—	89
Fuel filter mounting bracket bolt	10	—	89
Fuel tank strap bolts	35	26	—
Fuel tank filler pipe bolt	12	9	—
Fuel delivery module lockring retainer nut	80	59	—

Fuel Tank and Lines

The fuel system consists of:

- the fuel tank (9002).
- the fuel tank filler pipe (9034) which contains a restrictor plate to permit only unleaded fuel to be pumped into the fuel tank.
- a 1/8 turn type fuel tank filler cap (9030).
- a fuel filter (9155) providing filtration to protect the fuel injectors.
- an electronic returnless fuel system.
- a single fuel line accommodating the returnless system.
- a jet pump module which maintains the fuel levels in both tank sides and contains a fuel level sensor.
 - a check valve which maintains system pressure after the pump is shut off.
- a fuel delivery module (9H307) which provides pressurized fuel to the engine and contains:
 - a fuel level sensor (9275).
 - an inlet filter.

The fuel pump is controlled by the powertrain control module (PCM) (12A650) which energizes the fuel pump relay. Electrical power to the pump is provided through the inertia fuel shutoff (IFS) switch (9341), which is located in the passenger compartment behind the lower A-pillar trim panel.

Fuel Tank and Lines

Refer to the Powertrain Control/Emissions Diagnosis (PC/ED) manual.

Tank

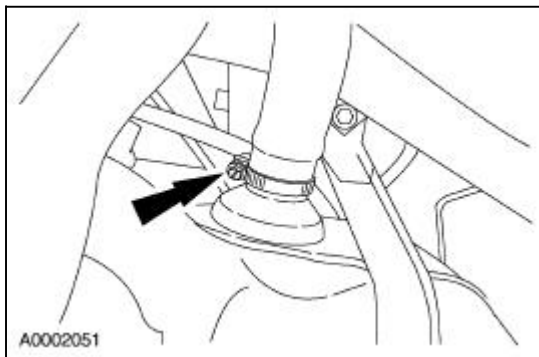
Removal

⚠ WARNING: Do not smoke or carry lighted tobacco or open flame of any type when working on or near any fuel-related component. Highly flammable mixtures are always present and may be ignited, resulting in possible personal injury.

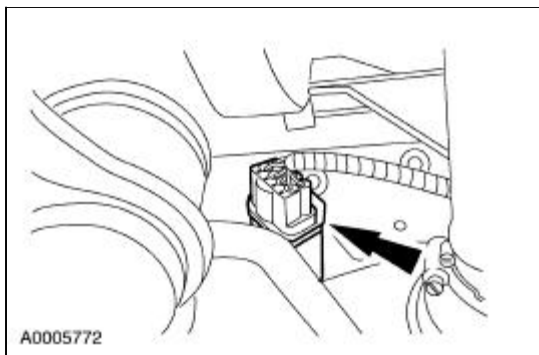
⚠ WARNING: Fuel in the fuel system remains under high pressure even when the engine is not running. Before repairing or disconnecting any of the fuel system components, the fuel system pressure must be relieved to prevent accidental spraying of fuel causing personal injury or a fire hazard.

1. Drain the fuel tank (9002). For additional information, refer to [Section 310-00](#).
2. Remove the driveshaft. For additional information, refer to [Section 205-01](#).
3. **⚠ CAUTION:** Some fuel will remain in filler pipe after draining the fuel tank. Carefully drain the filler pipe into an approved container.

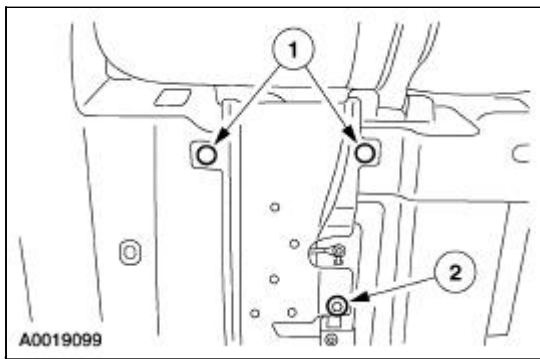
Loosen the hose clamp at the fuel tank filler pipe and disconnect the filler pipe.



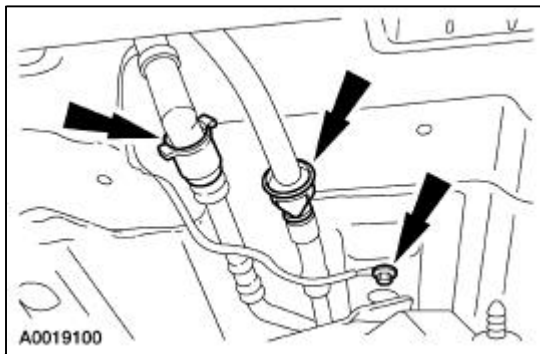
4. Disconnect the fuel tank electrical connector.



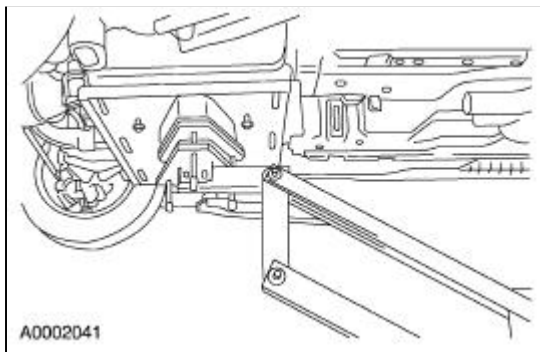
5. Position the fuel line shield aside.
 1. Remove the pin-type retainers.
 2. Remove the bolt.



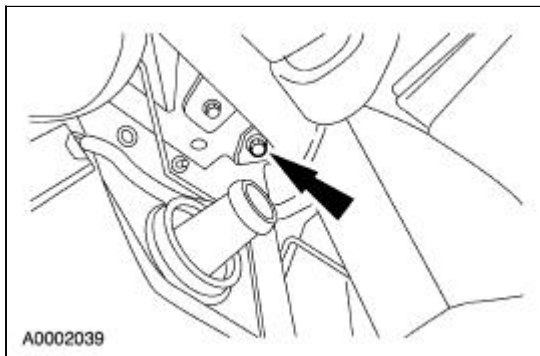
6. Disconnect the fuel delivery line and vapor tube located forward of the fuel tank on the left side.
 - Disconnect the ground strap.



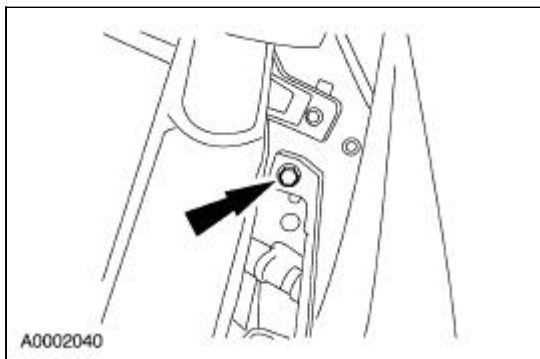
7. Position a suitable lifting device to support the fuel tank.



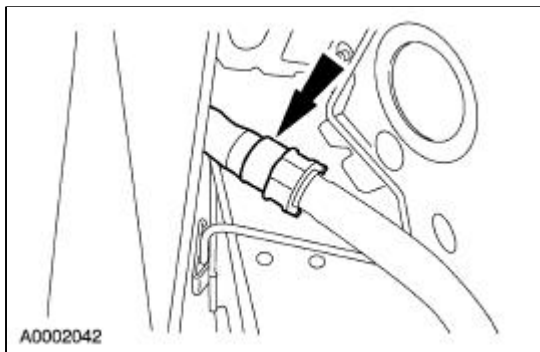
8. Remove the right fuel tank support strap bolt and position the fuel tank support strap aside.



9. Remove the left fuel tank support strap bolt and position the fuel tank support strap aside.



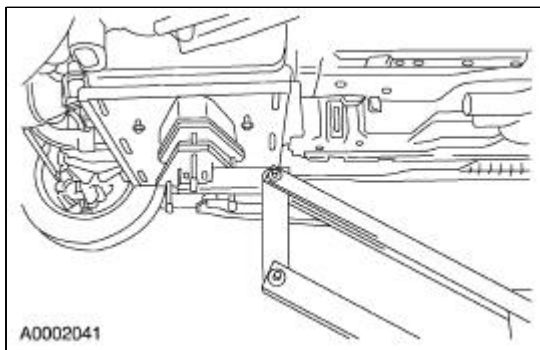
10. Partially lower the fuel tank and disconnect the vapor tube at the top rear of the fuel tank.



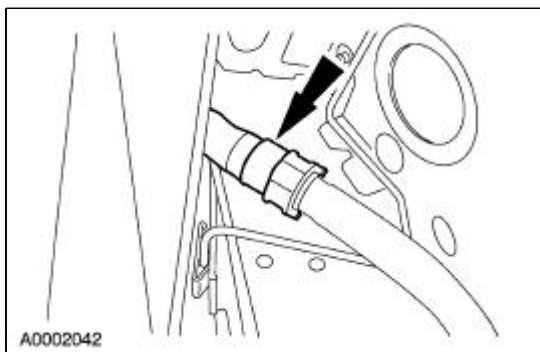
11. Lower the fuel tank.

Installation

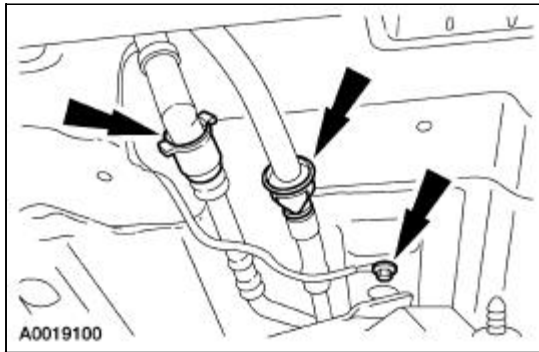
1. Raise the fuel tank slightly below the fully installed position.



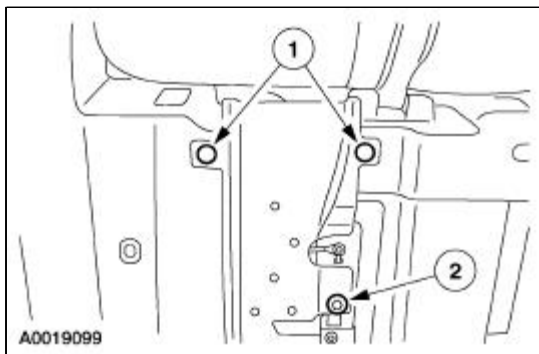
2. Connect the vapor tube at the top rear of the fuel tank.



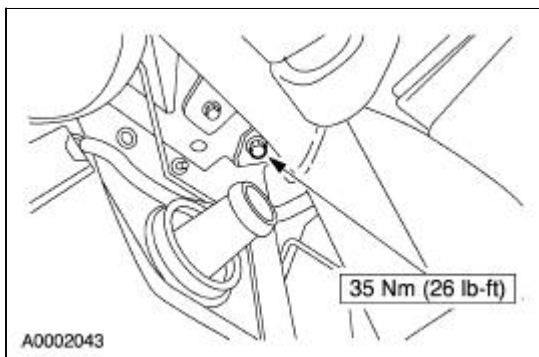
3. Connect the fuel delivery line and vapor tube.
 - Connect the ground strap.



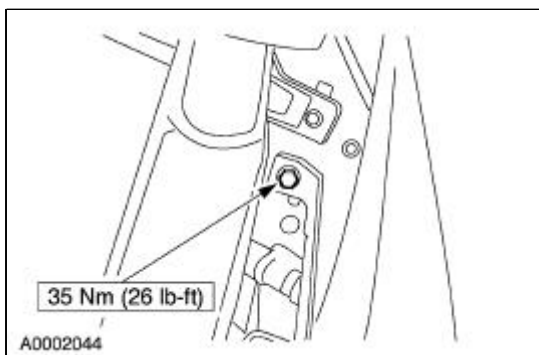
4. Install the fuel line shield.
 1. Install the pin-type retainers.
 2. Install the bolt.



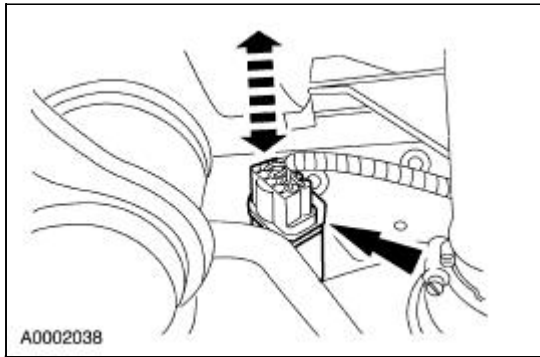
5. Raise the tank into position and install the right support strap and bolt.



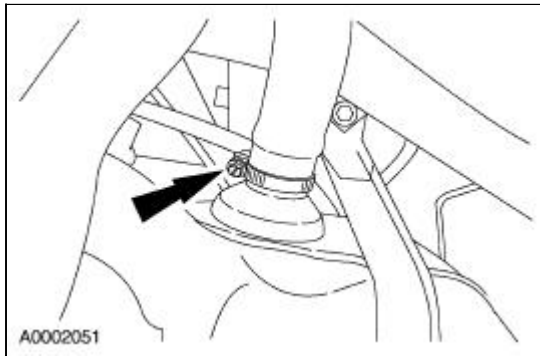
6. Install the left support strap and bolt. Remove the lifting device.



7. Connect the fuel tank electrical connector.



8. Connect the fuel tank filler pipe hose and tighten clamp.



9. Install the driveshaft. For additional information, refer to [Section 205-01](#).
10. **NOTE:** When the battery is disconnected and reconnected, some abnormal drive symptoms may occur while the vehicle relearns its adaptive strategy. The vehicle may need to be driven 16 km (10 miles) or more to relearn the strategy.

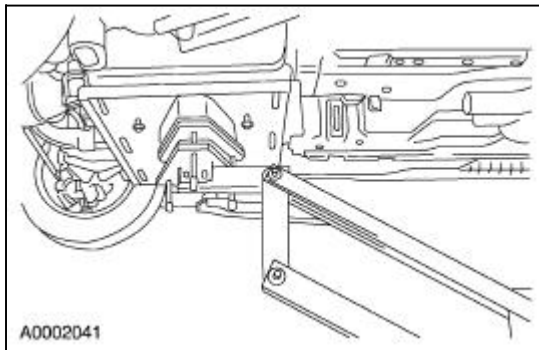
Connect the battery negative cable.

11. Turn the ignition key to the ON position to pressurize the fuel system.
 12. Visually inspect the fuel system for leaks.
-

Support Straps

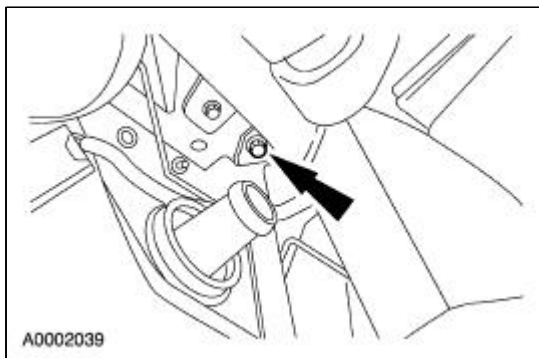
Removal and Installation

1. Position a suitable lifting device to support the fuel tank.

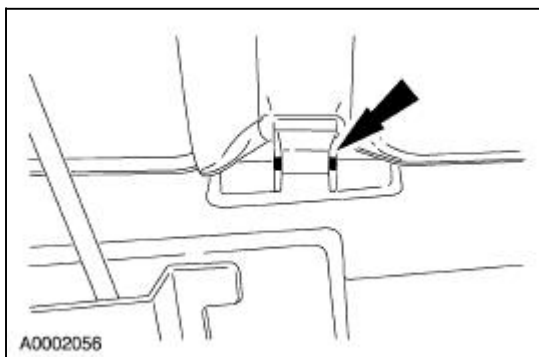


2. **NOTE:** Left support strap and pin shown, right side similar.

Remove the fuel tank support strap bolt.




3. Push the strap upward and align the retaining pin with the access hole. Remove the pin and the support strap.




4. To install, reverse the removal procedure.


Module —Fuel Delivery

Special Tool(s)

 ST2376-A	Fuel Sender Wrench 310-069
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Removal and Installation

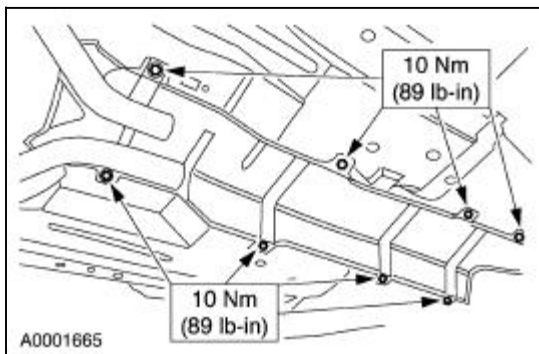
 **WARNING:** Do not smoke or carry lighted tobacco or open flame of any type when working on or near any fuel-related component. Highly flammable mixtures are always present and may be ignited, resulting in possible personal injury.

 **WARNING:** Fuel in the fuel system remains under high pressure even when the engine is not running. Before repairing or disconnecting any of the fuel system components, the fuel system pressure must be relieved to prevent accidental spraying of fuel, causing personal injury or a fire hazard.

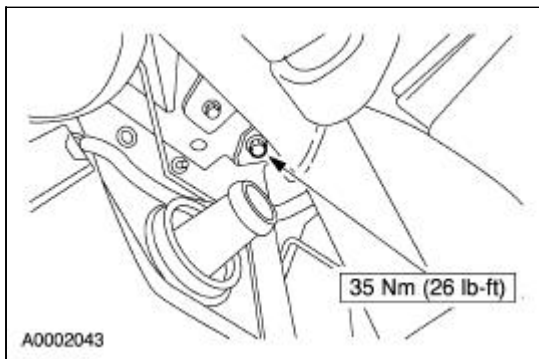
1. **NOTE:** It is not necessary to remove the fuel tank to carry out this procedure. The Fuel Delivery Module can be accessed under the rear seat bottom.

Drain the fuel tank (9002). For additional information, refer to [Section 310-00](#).

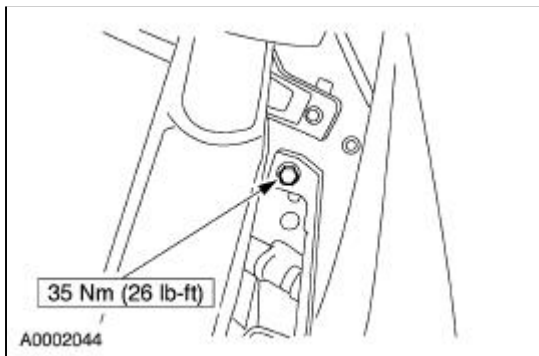
2. Raise and support the vehicle. For additional information, refer to [Section 100-02](#).
3. Remove the bolts and the nuts and position the exhaust heat shield on the exhaust system.



4. Loosen the right support strap approximately one inch.



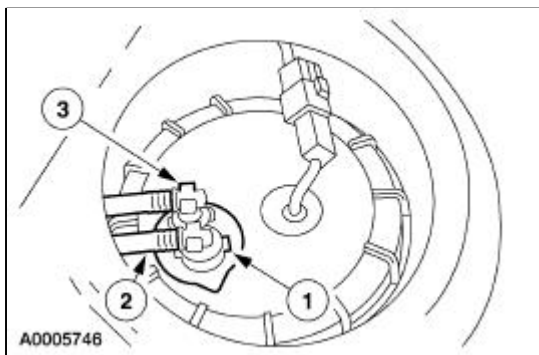
5. Loosen the left support strap approximately one inch.



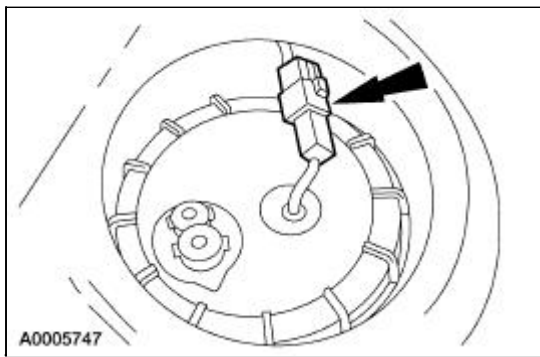
6. Lower the hoist.
7. **NOTE:** Make sure the fuel line connector is fully seated prior to compressing the release tabs.

Disconnect the module fuel line connectors.

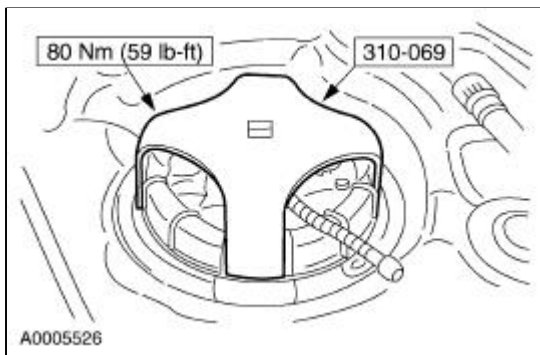
1. Press the release tabs on the module fitting.
2. Turn the fuel line slightly.
3. Pull straight up to remove the fuel line connector.



8. Disconnect the electrical connector.



9. Install the special tool and loosen the locking retainer nut.



10. Continue removing the locking retainer nut by hand.

11. Separate the fuel filter.

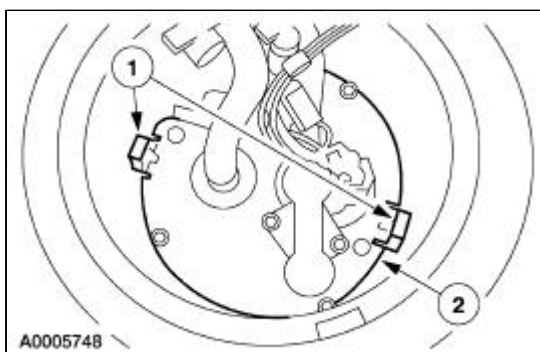
- Lift up on the module top flange and position it aside.
- Cut the tie strap securing the in tank filter to the locking tab of the module.

12.  **CAUTION: The fuel module must be handled carefully to avoid damage to the float arm and the filter during removal.**

NOTE: The module will contain some residual fuel. Lift straight up and out of the retainer cup and tilt while in tank (float side down) to drain some fuel out of the reservoir. Then straighten and lift straight up and out of the tank. Drain excess fuel into suitable container.

Remove the fuel delivery module.

1. Press the lock tabs and release the module from the tank mounting flange.
2. Remove the module from the tank.

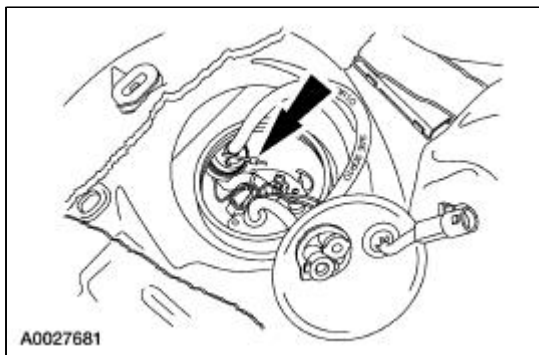
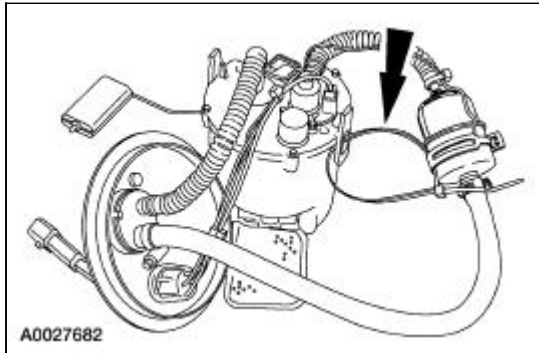


13. **NOTE:** New module assembly flange gaskets must be used. Gently position the module seal by hand and make sure it remains in position during installation. Align the module with the in-tank

retaining bracket and push down on the module until the latches snap into position onto bracket. Make sure the fuel line tube connectors are fully seated into the outlet connector fittings.


To install, reverse the removal procedure.

- Loosely install a new tie strap to secure the in tank filter to the locking tab of the module. Tighten the tie strap after the module is placed in the fuel tank.





Fuel Transfer Pump

Special Tool(s)

 ST2376-A	Fuel Sender Wrench 310-069
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Removal and Installation

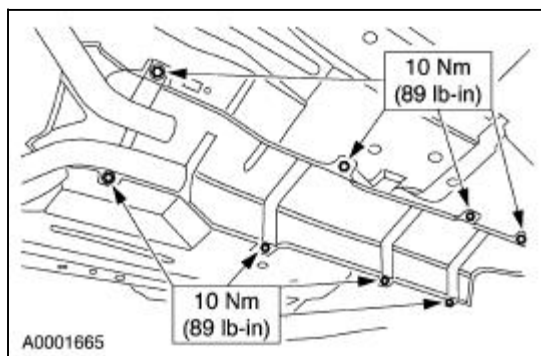
 **WARNING:** Do not smoke or carry lighted tobacco or open flame of any type when working on or near any fuel-related component. Highly flammable mixtures are always present and may be ignited, resulting in possible personal injury.

 **WARNING:** Fuel in the fuel system remains under high pressure even when the engine is not running. Before repairing or disconnecting any of the fuel system components, the fuel system pressure must be relieved to prevent accidental spraying of fuel, causing personal injury or a fire hazard.

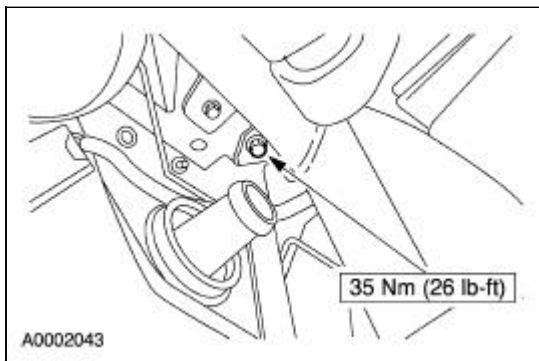
1. **NOTE:** It is not necessary to remove the fuel tank to carry out this procedure. The Fuel Transfer Pump can be accessed under the rear seat bottom.

Drain the fuel tank (9002). For additional information, refer to [Section 310-00](#).

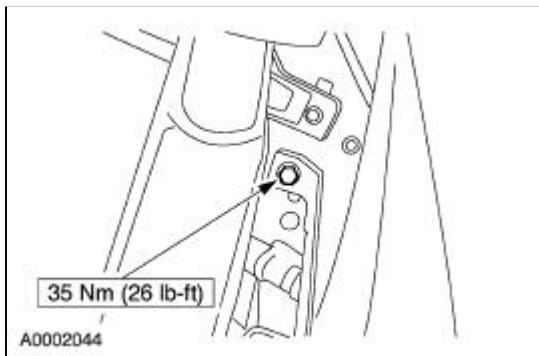
2. Raise and support the vehicle. For additional information, refer to [Section 100-02](#).
3. Remove the bolts and the nuts and position the exhaust heat shield on the exhaust system.



4. Loosen the right support strap approximately one inch.



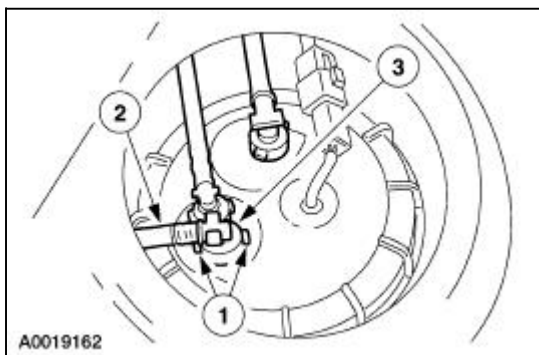
5. Loosen the left support strap approximately one inch.



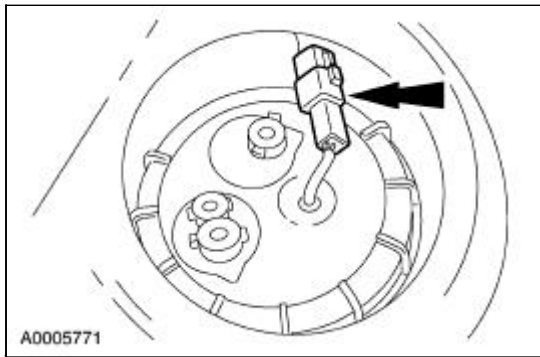
6. Lower the hoist.
7. **NOTE:** Make sure the fuel line connector is fully seated prior to compressing the the release tabs.

Disconnect the module fuel line connectors.

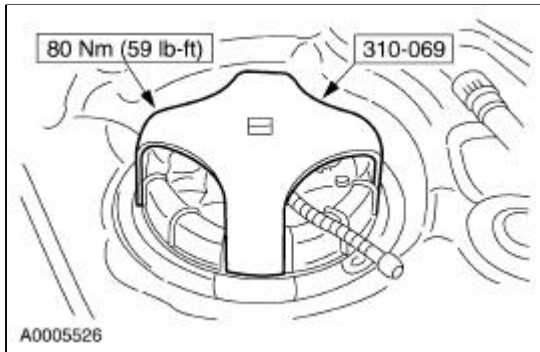
1. Press the release tabs on the module fitting.
2. Turn the fuel line slightly.
3. Pull straight up to remove the fuel line connector.



8. Disconnect the electrical connector.



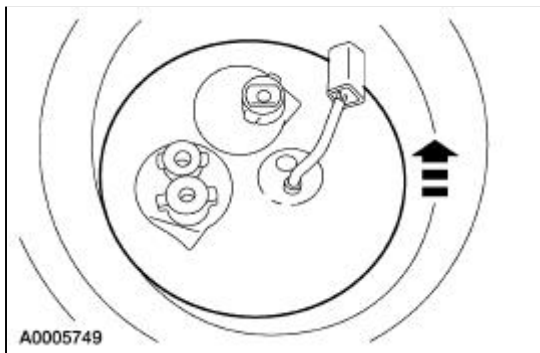
9. Install the special tool and loosen the locking retainer nut.



10. Continue removing the locking retainer nut by hand.

11.  **CAUTION:** The fuel module must be handled carefully to avoid damage to the float arm and the filter during removal.

Remove the fuel delivery module.



12. **NOTE:** New module assembly flange gaskets must be used. Gently position the module seal by hand and make sure it remains in position during installation. Make sure the fuel line tube connectors are fully seated into the outlet connector fittings.

To install, reverse the removal procedure.

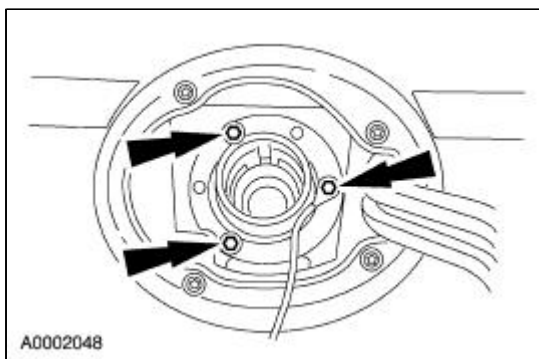
Filler Pipe

Removal and Installation

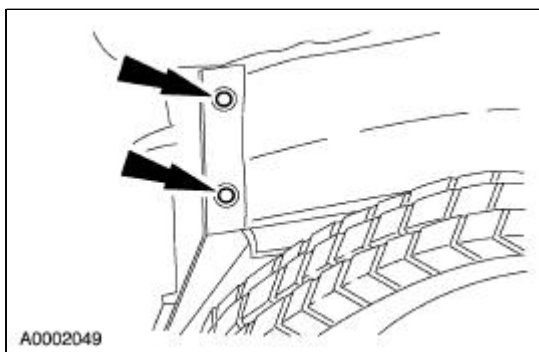
⚠ WARNING: Do not smoke or carry lighted tobacco or open flame of any type when working on or near any fuel-related component. Highly flammable mixtures are always present and may be ignited, resulting in possible personal injury.

⚠ WARNING: Fuel in the fuel system remains under high pressure even when the engine is not running. Before repairing or disconnecting any of the fuel system components, the fuel system pressure must be relieved to prevent accidental spraying of fuel, causing personal injury or a fire hazard.

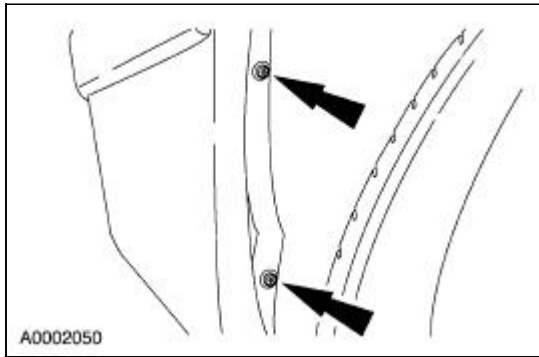
1. Disconnect the battery ground cable. For additional information, refer to [Section 414-01](#).
2. Relieve the fuel system pressure. For additional information, refer to [Section 310-00](#).
3. Drain the fuel tank (9002) until it is less than half full. For additional information, refer to [Section 310-00](#).
4. Remove the fuel filler cap.
5. Remove the bolts at the fuel filler neck housing.



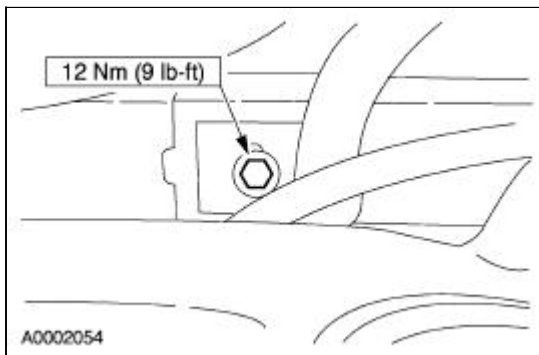
6. Raise the vehicle. For additional information, refer to [Section 100-02](#).
7. Remove the right rear inner wheel well pin-type retainers securing the splash shield.



8. Remove the right wheel well screws securing the splash shield.

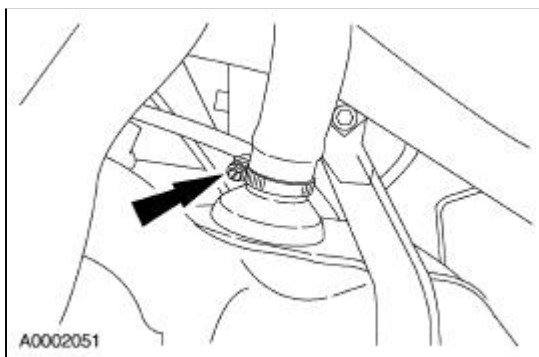


9. Remove the bolt at the filler pipe.



10.  **CAUTION:** Some fuel will remain in filler pipe after draining the fuel tank. Carefully drain the filler pipe into an approved container.

Loosen the hose clamp at the fuel tank filler pipe and disconnect the filler pipe.



11. Remove the filler pipe through the wheel well opening.
12. **NOTE:** Lubricate the fuel tank filler pipe end with a lubricant meeting Ford specification ESE-M99B144B for ease of installation.

NOTE: When the battery is disconnected and reconnected, some abnormal drive symptoms may occur while the vehicle relearns its adaptive strategy. The vehicle may need to be driven 16 km (10 miles) or more to relearn the strategy.

To install, reverse the removal procedure.

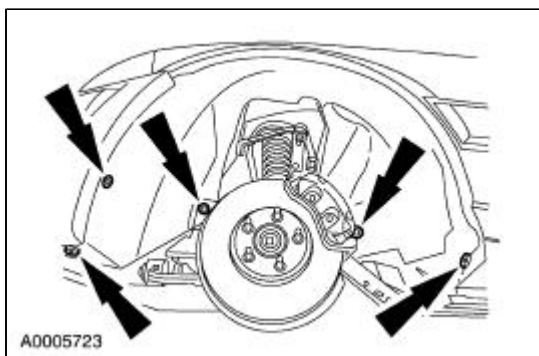
Filter

Removal and Installation

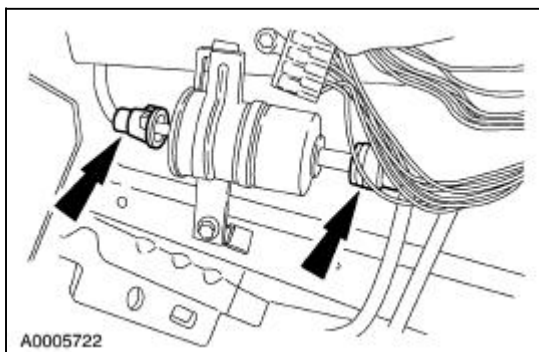
⚠ WARNING: Do not smoke or carry lighted tobacco or open flame of any type when working on or near any fuel-related component. Highly flammable mixtures are always present and may be ignited, resulting in possible personal injury.

⚠ WARNING: Fuel in the fuel system remains under high pressure even when the engine is not running. Before repairing or disconnecting any of the fuel system components, the fuel system pressure must be relieved to prevent accidental spraying of fuel, causing personal injury or a fire hazard.

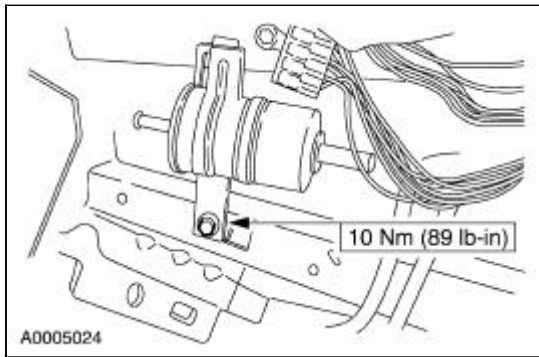
1. Disconnect the battery ground cable. For additional information, refer to [Section 414-01](#).
2. Relieve the fuel system pressure. For additional information, refer to [Section 310-00](#).
3. Raise the vehicle. For additional information, refer to [Section 100-02](#).
4. Remove the left front wheel and tire assembly. For additional information, refer to [Section 204-04](#).
5. Remove the left wheel well splash shield screws and pin-type fasteners.



6. Disconnect the fuel line R-clip fittings.



7. Remove the bolt at the fuel filter (9155) bracket and remove the filter.



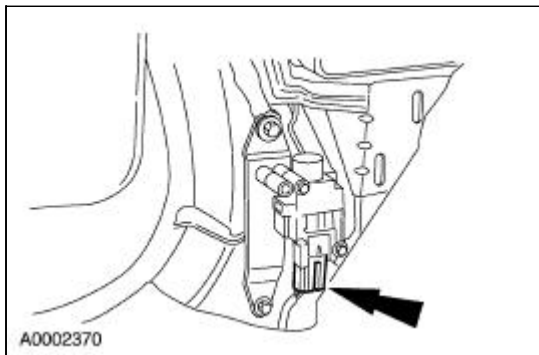
8. If necessary, separate the filter from the bracket for reuse.
9. **NOTE:** When the battery is disconnected and reconnected, some abnormal drive symptoms may occur while the vehicle relearns its adaptive strategy. The vehicle may need to be driven 16 km (10 miles) or more to relearn the strategy.

To install, reverse the removal procedure.

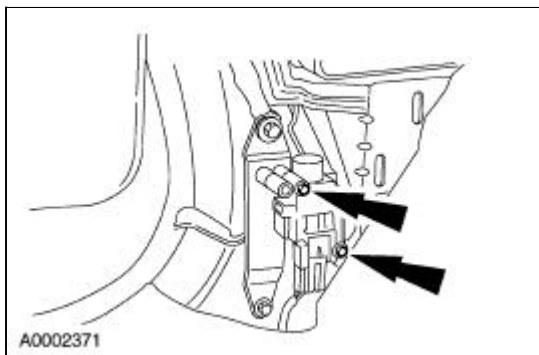
Inertia Fuel Shutoff (IFS) Switch

Removal and Installation

1. Remove the left hand lower A-pillar trim panel. For additional information, refer to [Section 501-05](#).
2. Disconnect the connector from the inertia fuel shutoff (IFS) switch (9341).



3. Remove the screws from the IFS switch and remove the switch.



4. To install, reverse the removal procedure.
-

Torque Specifications

Description	Nm	lb-in
Accelerator pedal and shaft-to-dash panel bolt and nut	9	80
Accelerator cable bracket bolts	9	80
Accelerator cable housing-to-dash panel bolts	9	80

Acceleration Control

The throttle is controlled by the accelerator cable (9A758) which is connected to the accelerator pedal and shaft (9726).

- The accelerator pedal and shaft should travel smoothly from the idle to the wide-open throttle (WOT) positions. Hesitation on return or prevention of return to the idle position must not occur.
 - Surrounding components such as wiring, hoses, sound insulator and floor covering must not contact the sliding inner member of the accelerator cable or the accelerator pedal and shaft.
 - The sliding inner member accelerator cable should not be lubricated and is not repairable.
-

Acceleration Control

Inspection and Verification

NOTE: Care should be exercised when carrying out a repair on or around the accelerator pedal and shaft or controls.

1. Inspect the accelerator pedal and shaft (9726) and the attached accelerator cable for damage or distortion which would bind or limit accelerator travel.
2. Inspect the accelerator cable (9A758) for kinks or fraying which may cause binding.
3. Inspect the engine idle speed adjustment to make sure of correct idle speed specification after any adjustment or repair.
4. Inspect the throttle body (9E926) for excessive wear or damage.

Symptom Chart

SYMPTOM CHART

Condition	Possible Sources	Action
<ul style="list-style-type: none"> ● Excessive effort needed to depress accelerator pedal and shaft 	<ul style="list-style-type: none"> ● Worn accelerator lever pivot bushing. ● Accelerator cable binding. ● Worn or damaged throttle body. 	<ul style="list-style-type: none"> ● INSTALL a new accelerator pedal and shaft. ● INSTALL a new accelerator cable. ● INSTALL a new throttle body . REFER to Section 303-04A or Section 303-04B .
<ul style="list-style-type: none"> ● Accelerator pedal and shaft feels rough or raspy 	<ul style="list-style-type: none"> ● Frayed or binding accelerator cable. ● Worn or damaged throttle body. 	<ul style="list-style-type: none"> ● INSTALL a new accelerator cable. ● INSTALL a new throttle body . REFER to Section 303-04A or Section 303-04B .
<ul style="list-style-type: none"> ● Accelerator pedal and shaft bind or stick 	<ul style="list-style-type: none"> ● Kinked accelerator cable. ● Foreign object caught in accelerator pedal. ● Worn or damaged throttle body. 	<ul style="list-style-type: none"> ● INSTALL a new accelerator cable. ● CHECK the accelerator pedal. ● INSTALL a new throttle body. REFER to Section 303-04A or Section 303-04B .
<ul style="list-style-type: none"> ● High engine idle speed 	<ul style="list-style-type: none"> ● Kinked accelerator cable. ● Foreign object 	<ul style="list-style-type: none"> ● INSTALL a new accelerator cable. ● CHECK the accelerator pedal.

	<p>caught in accelerator pedal.</p> <ul style="list-style-type: none">● Incorrect engine idle speed.	<ul style="list-style-type: none">● REFER to the Powertrain Control/Emissions Diagnosis (PC/ED) manual for diagnosis and testing of the idle control system.
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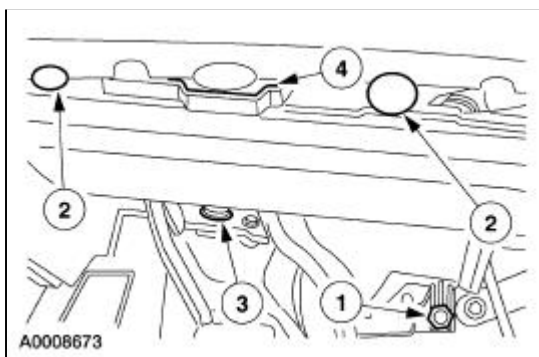


Accelerator Pedal and Shaft

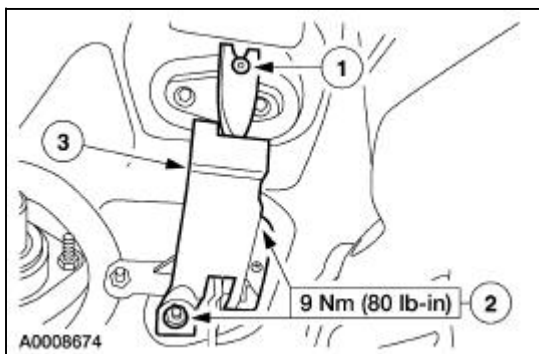
Removal and Installation

NOTE: LH drive shown, RH drive similar.

1. Remove the hush panel.
 1. Remove the nut.
 2. Remove the pin-type retainers.
 3. Disconnect the lamp from the hush panel.
 4. Remove the hush panel.



2. Remove the accelerator pedal and shaft.
 1. Disconnect the accelerator cable from the accelerator pedal and shaft.
 2. Remove the bolt and nut.
 3. Remove the accelerator pedal and shaft.



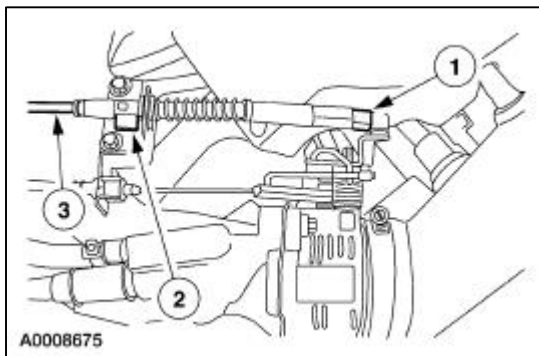
3. To install, reverse the removal procedure.

Accelerator Cable

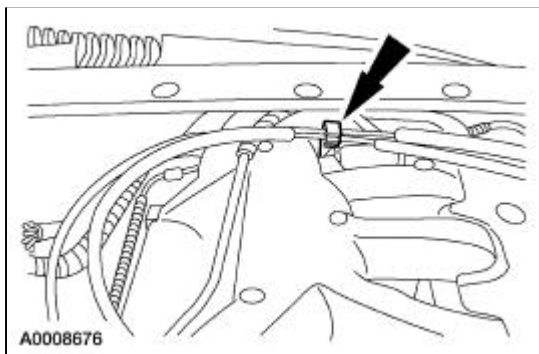
Removal and Installation

NOTE: 3.0L shown, 3.9L accelerator cable bracket is molded into the manifold. LH drive shown, RH drive similar.

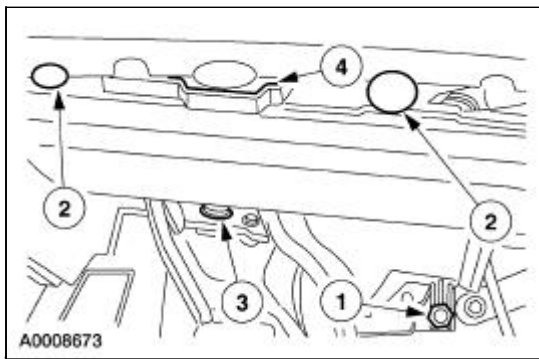
1. Using a trim tool, disconnect the accelerator cable from the throttle body lever and accelerator cable bracket.
 1. Disconnect the accelerator cable from the throttle body lever.
 2. Depress the lock tab and rotate the fitting 90 degrees counterclockwise.
 3. Slide the cable up and out of the bracket.



2. Disconnect the accelerator cable from the retaining clip.



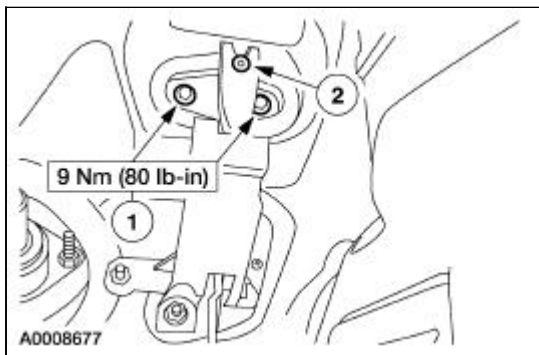
3. Remove the hush panel.
 1. Remove the nut.
 2. Remove the pin-type retainers.
 3. Disconnect the lamp from the hush panel.
 4. Remove the hush panel.




4.  **CAUTION: Be careful not to kink or nick the cable core wire.**

Remove the accelerator cable.

1. Remove the bolts.
2. Disconnect the accelerator cable and remove.



5.  **CAUTION: If the accelerator cable is to be reused, inspect the locking tabs of the cable end ball stud fitting. If the locking tabs are damaged or broken, a new accelerator cable must be installed.**

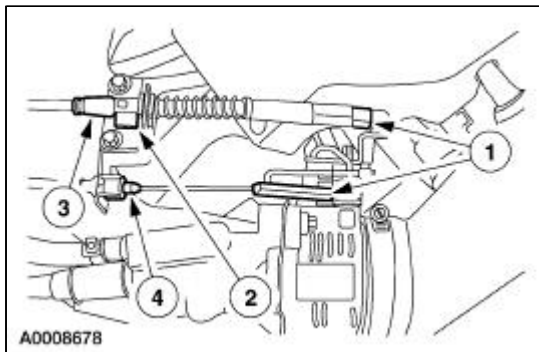
NOTE: The accelerator cable assembly may be supplied in two pieces. It will be necessary to snap the pieces together prior to installation.

To install, reverse the removal procedure.

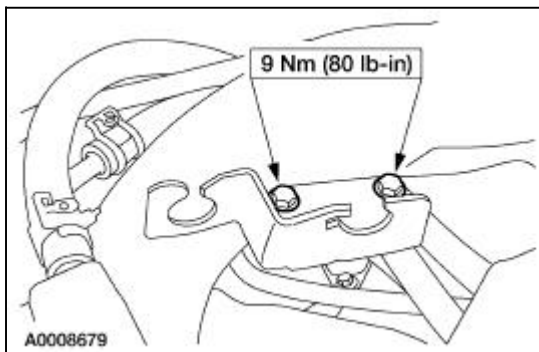
Accelerator Cable Bracket —3.0L

Removal and Installation

1. Disconnect the accelerator cable and speed control cable from the bracket.
 1. Disconnect the accelerator cable and speed control cable from the throttle levers.
 2. Depress the lock tab and rotate the fitting 90 degrees counter clockwise.
 3. Slide the cable up and out of the bracket.
 4. Depress the lock tabs and disconnect the speed control cable from the bracket.



2. Remove the bolts and the accelerator cable bracket.



3. To install, reverse the removal procedure.

Torque Specifications

Description	Nm	lb-in
Bracket to speed control servo bolts	9	80
Bracket mounting bolts	9	80



Speed Control

The vehicle speed control consists of the following components:

- powertrain control module (PCM)
 - speed control servo
 - speed control set telltale
 - speed control actuator switches
 - deactivator switch
 - brake pedal position (BPP) switch
 - clutch pedal position (CPP) switch (manual transmission only)
 - digital transmission range (DTR) sensor (automatic transmission only)
 - speed control actuator cable
-

Speed Control

Special Tool(s)

 ST1137-A	73III Automotive Meter 105-R0057 or equivalent
 ST2332-A	Worldwide Diagnostic System (WDS) 418-F224, New Generation STAR (NGS) Tester 418-F052, or equivalent diagnostic tool

Refer to Wiring Diagrams Section 310-03-00, Vehicle Speed Control for schematic and electrical information.

Principles of Operation

The speed control system is designed to maintain a selected vehicle speed between approximately 48 and 200 km/h (30 and 125 mph).

The electronic stepper motor (internal to the speed control servo) is controlled by turning the three phases of the motor ON and OFF in sequence. The sequence determines the motor direction (open throttle or closed throttle based on vehicle speed).

The speed control module is fully integrated into the powertrain control module (PCM). The PCM strategy uses engine control to accelerate smoothly. In instances where the vehicle tends to want to exceed set speed, the PCM will invoke an engine braking strategy to help maintain the desired vehicle speed.

Whenever the system is engaged and active, a speed control set indicator will be illuminated in the instrument cluster.

The brake pedal position (BPP) switch is normally closed to ground. When the brake pedal is applied with the speed control system engaged, the BPP switch closes to battery voltage, putting the vehicle speed control in stand-by mode.

NOTE: The deactivator switch is provided as an additional safety feature.

Normally, when the brake pedal is depressed, the PCM will deactivate the speed control system. Under increased brake pedal effort, the deactivator switch, a normally closed switch, will open and remove power to the speed control servo clutch, releasing the throttle independently of the PCM.

The clutch pedal position (CPP) switch is incorporated on vehicles equipped with manual transmissions. When the clutch pedal is applied with the vehicle speed control system engaged, the

normally closed switch opens and signals the PCM to deactivate the speed control.

The air bag sliding contact provides the electrical interface between the steering column wiring and the speed control actuator switches in the steering wheel.

The PCM sends an standard corporate protocol (SCP) output message to the instrument cluster to indicate when the vehicle speed control system is active.

Inspection and Verification

1. Verify the customer concern by operating the speed control to duplicate the condition.
2. Verify the speedometer operates correctly without speed control by test driving the vehicle. If the speedometer does not operate correctly, refer to [Section 413-01](#).
3. Verify the stoplamps operate correctly with the ignition switch in the OFF position. If the stoplamps do not operate correctly, refer to [Section 417-01](#).
4. Verify the parking brake is not applied and is operating correctly. If the parking brake is not operating correctly, refer to [Section 206-05](#).
5. Visually inspect for obvious signs of mechanical and electrical damage.

Visual Inspection Chart

Mechanical	Electrical
<ul style="list-style-type: none">● Speed control actuator cable● Throttle lever● Speed control servo	<ul style="list-style-type: none">● Central junction box (CJB) fuse 235 (5A)● Underhood auxiliary junction box (AJB) fuse 106 (15A)● Underhood AJB fuse 118 (40A)● Connections● Pins● Circuitry

6. If the concern remains after the inspection, connect the diagnostic tool to the data link connector (DLC) located beneath the instrument panel, and select the vehicle to be tested from the diagnostic tool menu. If the diagnostic tool does not communicate with the vehicle:
 - check that the program card is correctly installed.
 - check the connections to the vehicle.
 - check the ignition switch position.
7. If the diagnostic tool still does not communicate with the vehicle, refer to the diagnostic tool manual.
8. Carry out the DATA LINK DIAGNOSTIC TEST. If the diagnostic tool responds with:
 - CKT914, CKT915 or CKT70 = ALL ECUS NO RESP/NOT EQUIP, refer to [Section 418-00](#).
 - NO RESP/NOT EQUIP for PCM, go to Pinpoint Test A.
 - SYSTEM PASSED, retrieve and record the continuous diagnostic trouble codes (DTCs), erase the continuous DTCs and carry out the KOEO Test.

9. If the DTCs retrieved are related to the concern, go to PCM Diagnostic Trouble Code (DTC) Index to continue diagnostics.
10. If no DTCs related to the concern are retrieved, proceed to the Symptom Chart to continue diagnostics.

PCM Diagnostic Trouble Code (DTC) Index

NOTE: DTC P0703 and DTC P1572 must be repaired before any other DTC.

DTCs	Description	Source	Action
P0500	Vehicle Speed Error	PCM	REFER to Powertrain Control/Emissions Diagnosis (PC/ED) manual.
P1565	Speed Control Command Switches High/Out of Range	PCM	GO to Pinpoint Test C .
P1566	Speed Control Command Switches Low/Out of Range	PCM	GO to Pinpoint Test D .
P1567	NGSC Drive Fault	PCM	GO to Pinpoint Test E .
P1568	NGSC Servo Self-Test Failure	PCM	GO to Pinpoint Test F .
P1572	Brake On/Off Failure	PCM	GO to Pinpoint Test G .
P0703	Brake Switch Input Malfunction	PCM	GO to Pinpoint Test G .

Symptom Chart

Symptom Chart


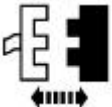

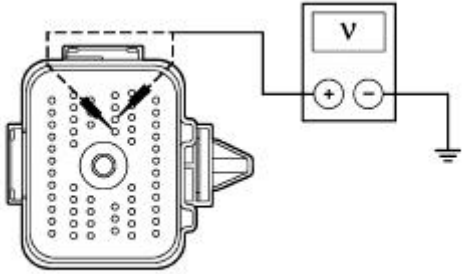
NOTE: Refer to Wiring Diagrams for connector numbers stated in the pinpoint test.

Condition	Possible Sources	Action
<ul style="list-style-type: none"> ● No communication with the powertrain control module (PCM) 	<ul style="list-style-type: none"> ● Underhood auxiliary junction box (AJB) fuse 118 (40A). ● Central junction box (CJB) fuses: <ul style="list-style-type: none"> ■ 204 (5A). ■ 207 (5A). ● Circuitry. ● PCM. 	<ul style="list-style-type: none"> ● GO to Pinpoint Test A.
<ul style="list-style-type: none"> ● Unable to enter self-test 	<ul style="list-style-type: none"> ● PCM. 	<ul style="list-style-type: none"> ● GO to Pinpoint Test B.
<ul style="list-style-type: none"> ● The speed control switch is inoperative—no DTCs 	<ul style="list-style-type: none"> ● Speed control actuator switch. 	<ul style="list-style-type: none"> ● INSTALL a new speed control actuator switch. REFER to Switch—Speed Control Actuator in this section.
<ul style="list-style-type: none"> ● The speed control indicator is always on 	<ul style="list-style-type: none"> ● Instrument cluster. 	<ul style="list-style-type: none"> ● REFER to Section 413-01.

<ul style="list-style-type: none"> ● The speed control is inoperative—no DTCs 	<ul style="list-style-type: none"> ● Circuitry. ● Parking brake switch. ● Clutch pedal position (CPP) switch (for manual transmission only). ● Digital transmission range (DTR) sensor (for automatic transmission only). ● Low battery voltage. 	<ul style="list-style-type: none"> ● GO to Pinpoint Test H.
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Pinpoint Test

PINPOINT TEST A: NO COMMUNICATION WITH THE POWERTRAIN CONTROL MODULE

CONDITIONS	DETAILS/RESULTS/ACTIONS
<p>A1 CHECK THE PCM POWER CIRCUITS</p>	
<p>1 </p> <p>2 </p> <p>PCM C175a</p> <p>3 </p> <p>4 </p> <p>A0003407</p>	<p>4 Measure the voltage between PCM C175a pin 32, circuit 15S-RE8 (GN/YE), harness side, and ground; and between PCM C175a pin 33, circuit 15S-RE21 (GN/OG), harness side, and ground.</p> <ul style="list-style-type: none"> ● Are the voltages greater than 10 volts? <p>→ Yes GO to A2.</p>

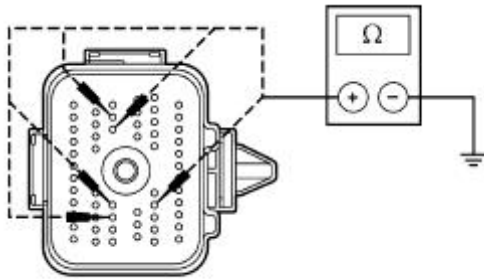
→ **No**
REPAIR the circuit. CLEAR the DTCs.
REPEAT the self-test.

A2 CHECK THE PCM GROUND CIRCUITS

1



2



A0004303

2 Measure the resistance between PCM C175a, and ground, as follows:

Pin	Circuit
24	31-RE8 (BK/YE)
25	31-RE21 (BK/RD)
26	31-RE26 (BK/RD)
27	31-RE25 (BK/RD)
43	91-RE27 (BN/YE)

• Are the resistances less than 5 ohms?

→ **Yes**
REFER to [Section 418-00](#).

→ **No**
REPAIR the circuit. CLEAR the DTCs.
REPEAT the self-test.


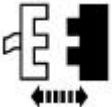

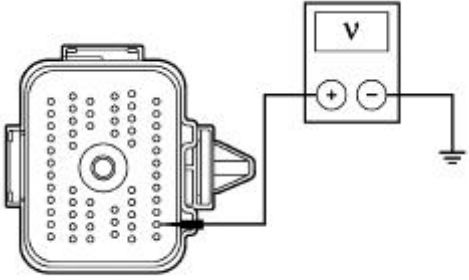

PINPOINT TEST B: UNABLE TO ENTER SELF-TEST

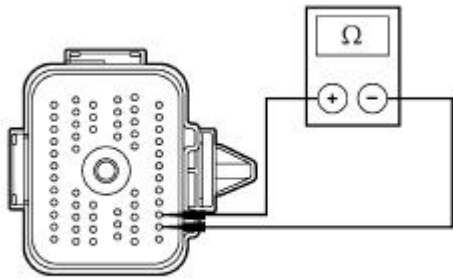
CONDITIONS	DETAILS/RESULTS/ACTIONS
B1 CHECK THE COMMUNICATION TO THE PCM	<p>1 Check the communication to the PCM.</p> <ul style="list-style-type: none"> • Does the diagnostic tool communicate with the PCM? <p>→ Yes GO to B2.</p> <p>→ No GO to Pinpoint Test A.</p>
B2 CHECK THE PCM COMMUNICATION PID	<p>1 Monitor the PCM SCINT_F PID.</p> <ul style="list-style-type: none"> • Does the PCM SCINT_F PID indicate NO? <p>→ Yes</p>

REFER to [Section 418-00](#).

→ **No**
INSTALL a new PCM. REFER to [Section 303-14](#). CLEAR the DTCs.
REPEAT the self-test.

PINPOINT TEST C: DTC P1565 —SPEED CONTROL COMMAND SWITCHES HIGH/OUT OF RANGE

CONDITIONS	DETAILS/RESULTS/ACTIONS
C1 CHECK FOR SHORT TO POWER	
<p>1 </p> <p>2  PCM C175a</p> <p>3 </p> <p>4  A0005461</p>	<p>4 Measure the voltage between PCM C175a pin 57, circuit 7PG-24 (YE/BU), harness side and ground.</p> <p>● Is any voltage present?</p> <p>→ Yes GO to C6.</p> <p>→ No GO to C2.</p>
C2 CHECK FOR OPEN CIRCUIT	
<p>1 </p> <p>2</p>	<p>2 Measure the resistance between PCM</p>



A0005462

C175a pin 57, circuit 7PG-24 (YE/BU), harness side, and PCM C175a pin 56, circuit 31S-PG24, (BK/OG), harness side.

- Is the resistance greater than 10,000 ohms?

→ **Yes**
GO to [C3](#).

→ **No**
INSTALL a new PCM. REFER to [Section 303-14](#). CLEAR the DTCs. REPEAT the self-test.

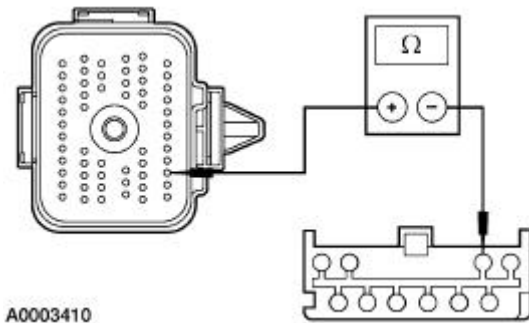
C3 CHECK CIRCUIT 31S-PG24 (BK/OG) FOR OPEN

1



Air Bag Sliding Contact C218a

2



A0003410

2

Measure the resistance between PCM C175a pin 56, circuit 31S-PG24 (BK/OG), harness side and air bag sliding contact C218a pin 8, circuit 31S-PG24 (BK/OG), harness side.

- Is the resistance less than 5 ohms?

→ **Yes**
GO to [C4](#).

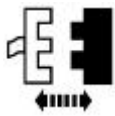
→ **No**
REPAIR the circuit. CLEAR the DTCs. REPEAT the self-test.

C4 CHECK THE AIR BAG SLIDING CONTACT

2

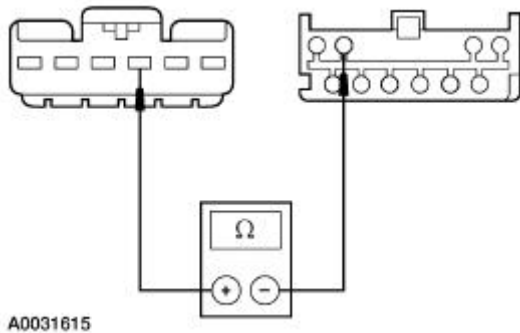
1

Remove the driver side air bag. Refer to [Section 501-20B](#).



Horn Switch C217

3



3

Measure the resistance between air bag sliding contact C218a pin 8, circuit 31S-PG24 (BK/OG), (component side), and horn switch C217 pin 3, harness side (top of the air bag sliding contact).

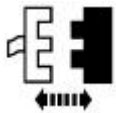
● Is the resistance less than 5 ohms?

→ **Yes**
GO to [C5](#).

→ **No**
INSTALL a new air bag sliding contact. REFER to [Section 501-20B](#). CLEAR the DTCs. REPEAT the self-test.

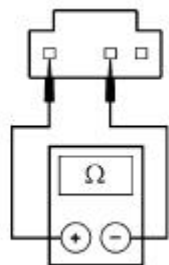
C5 CHECK THE SPEED CONTROL ACTUATOR SWITCHES

1



Speed Control Actuator Switch C203

2



2

Measure the resistance between speed control actuator switch pin 2 (component side), and speed control actuator switch pin 4 (component side).

● Is the resistance approximately 4.3k ohms?

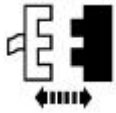
→ **Yes**
INSTALL a new horn switch. REFER to [Section 413-06](#). CLEAR the DTCs. REPEAT the self-test.

→ **No**
INSTALL a new speed control actuator

switch. REFER to [Switch—Speed Control Actuator](#) in this section. CLEAR the DTCs. REPEAT the self-test.

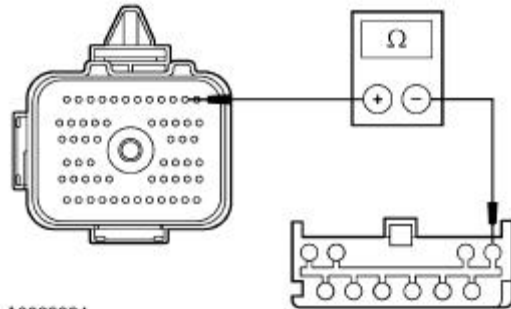
C6 CHECK THE AIR BAG SLIDING CONTACT

1



Air Bag Sliding Contact C218a

2



A0023264

2

Measure the resistance between PCM C175a pin 57, circuit 7PG-24 (YE/BU), harness side, and air bag sliding contact C218a pin 7, circuit 7PG-24 (YE/BU), harness side.

● Is the resistance less than 5 ohms?


→ Yes

INSTALL a new air bag sliding contact. REFER to [Section 501-20B](#). CLEAR the DTCs. REPEAT the self-test.

→ No

REPAIR the circuit. CLEAR the DTCs. REPEAT the self-test.

PINPOINT TEST D: DTC P1566—SPEED CONTROL COMMAND SWITCHES LOW/OUT OF RANGE

CONDITIONS	DETAILS/RESULTS/ACTIONS
D1 CHECK FOR SHORT TO GROUND OR STUCK ACTUATOR SWITCH	
<p>1</p> 	<p>2</p> <p>Monitor the PCM PIDs SET/ACL, COAST, RESUME, CANCEL, and SC_ON without depressing any speed control actuator switch.</p> <p>● Do any of the PCM PIDs indicate YES?</p> <p>→ Yes INSTALL a new speed control actuator</p>

switch. REFER to [Switch—Speed Control Actuator](#) in this section. CLEAR the DTCs. REPEAT the self-test.

→ **No**
GO to [D2](#).

D2 CHECK CIRCUIT 7-PG24 (YE/BU) AND 31S-PG24 (BK/OG)

1

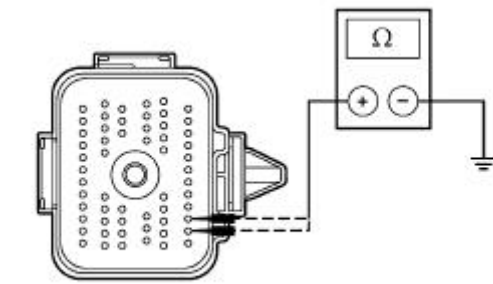


2



PCM C175a

3



A0005465

3 Measure the resistance between PCM C175a pin 57, circuit 7PG-24 (YE/BU), harness side, and ground; and between PCM C175a pin 56, circuit 31S-PG24 (BK/OG), harness side, and ground.

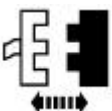
- Are the resistances greater than 10,000 ohms?

→ **Yes**
GO to [D5](#).

→ **No**
GO to [D3](#).

D3 CHECK THE HORN SWITCH FOR A SHORT

2

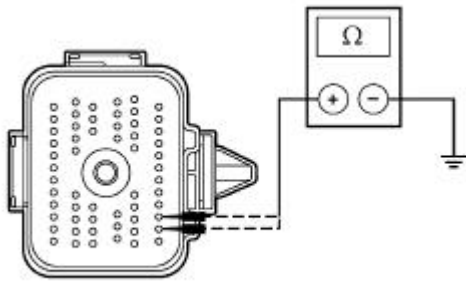


Horn Switch C217

3

1 Remove the driver side air bag. Refer to [Section 501-20B](#).

3 Measure the resistance between PCM C175a pin 57, circuit 7PG-24 (YE/BU), harness side, and ground; and between PCM C175a pin 56, circuit 31S-PG24 (BK/OG), harness side, and ground.



A0005465

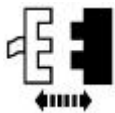
- Are the resistances greater than 10,000 ohms?

→ **Yes**
 INSTALL a new horn switch. REFER to [Section 413-06](#). CLEAR the DTCs. REPEAT the self-test.

→ **No**
 GO to [D4](#).

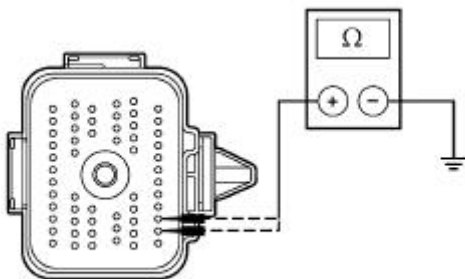
D4 CHECK THE AIR BAG SLIDING CONTACT

1



Air Bag Sliding Contact C218a

2



A0005465

- 2 Measure the resistance between PCM C175a pin 57, circuit 7PG-24 (YE/BU), harness side, and ground; and between PCM C175a pin 56, circuit 31S-PG24 (BK/OG), harness side, and ground.

- Are the resistances greater than 10,000 ohms?

→ **Yes**
 INSTALL a new air bag sliding contact. REFER to [Section 501-20B](#). CLEAR the DTCs. REPEAT the self-test.

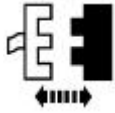
→ **No**
 REPAIR circuit 7-PG24 (YE/BU) and circuit 31S-PG24 (BK/OG) as necessary. CLEAR the DTCs. REPEAT the self-test.

D5 CHECK FOR A SHORT CIRCUIT

1

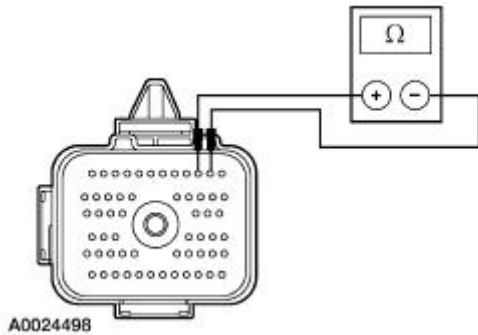


2



PCM C175a

3



3

Measure the resistance between PCM C175a pin 57, circuit 7-PG24 (YE/BU), harness side, and PCM C175a pin 56, circuit 31S-PG24 (BK/OG), harness side.

- Is the resistance greater than 10,000 ohms?

→ Yes

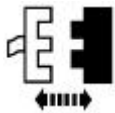
INSTALL a new PCM. REFER to [Section 303-14](#). CLEAR the DTCs. REPEAT the self-test.

→ No

GO to [D6](#).

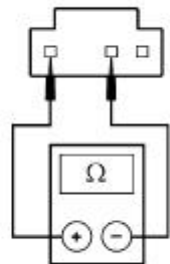
D6 CHECK THE SPEED CONTROL ACTUATOR SWITCH

1



Speed Control Actuator Switch C203

2



A0003411

2

Measure the resistance between speed control actuator switch pin 2 (component side), and speed control actuator switch pin 4 (component side).

- Is the resistance approximately 4.3k ohms?

→ Yes

GO to [D7](#).

→ **No**
INSTALL a new speed control actuator switch. REFER to [Switch—Speed Control Actuator](#) in this section. CLEAR the DTCs. REPEAT the self-test.

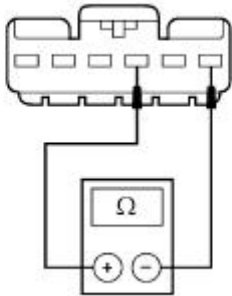
D7 CHECK THE HORN SWITCH

2



Horn Switch C217

3



A0031616

1 Remove the driver side air bag. Refer to [Section 501-20B](#).

3 Measure the resistance between horn switch C217 pin 1, harness side, and horn switch C217 pin 3, harness side.

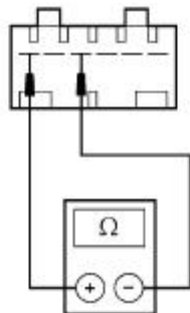
- Is the resistance greater than 10,000 ohms?

→ **Yes**
GO to [D8](#).

→ **No**
INSTALL a new horn switch. REFER to [Section 413-06](#). CLEAR the DTCs. REPEAT the self-test.

D8 CHECK THE AIR BAG SLIDING CONTACT FOR A SHORT

1




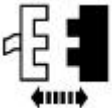

A0031617

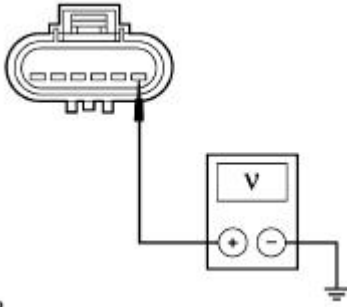
1 Measure the resistance between horn switch C217 pin 1 (component side), and horn switch C217 pin 3 (component side).

- Is the resistance greater than 10,000 ohms?

	<p>→ Yes REPAIR circuit 7-PG24 (YE/BU) and circuit 31S-PG24 (BK/OG) as necessary. CLEAR the DTCs. REPEAT the self-test.</p> <p>→ No INSTALL a new air bag sliding contact. REFER to Section 501-20B. CLEAR the DTCs. REPEAT the self-test.</p>
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PINPOINT TEST E: DTC P1567—NGSC DRIVER FAULT

CONDITIONS	DETAILS/RESULTS/ACTIONS
E1 CHECK THE PCM PIDS	
	<p>1 Test drive the vehicle above 48 km/h (30 mph) with and without the speed control engaged, while monitoring the PCM PID SCINT_F and SC_HW_F.</p> <ul style="list-style-type: none"> • Does either PCM PID SCINT_F or SC_HW_F indicate YES? <p>→ Yes If the PCM PID SCINT_F indicates YES, INSTALL a new PCM. REFER to Section 303-14. CLEAR the DTCs. REPEAT the self-test.</p> <p>If the PCM PID SC_HW_F indicates YES, GO to E2.</p> <p>→ No GO to E7.</p>
E2 CHECK CIRCUIT 15S-PG12 (GN/WH) FOR AN OPEN	
<p>1</p>  <p>2</p>  <p style="text-align: center;">Speed Control Servo C122</p> <p>3</p>  <p>4</p>	<p>4 Measure the voltage between speed control servo C122 pin 1, circuit 15S-PG12 (GN/WH), harness side, and ground.</p>



A0005468

- Is the voltage greater than 10 volts?

→ **Yes**
GO to [E3](#).

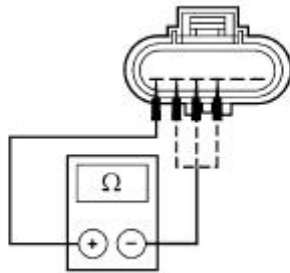
→ **No**
REPAIR the circuit. CLEAR the DTCs.
REPEAT the self-test.

E3 CHECK THE SPEED CONTROL SERVO

1



2



A0006460

2 Measure the resistance between speed control servo pins (component side), as follows:

Speed Control Servo	Speed Control Servo
Pin 1	Pin 2
Pin 1	Pin 3
Pin 1	Pin 4

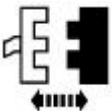
- Are the resistances between 2 and 3 ohms?

→ **Yes**
GO to [E4](#).

→ **No**
INSTALL a new speed control servo.
REFER to [Actuator—Speed Control Servo](#) in this section. CLEAR the DTCs.
REPEAT the self-test.

E4 CHECK THE SPEED CONTROL SERVO CIRCUITRY FOR SHORT TO POWER

1

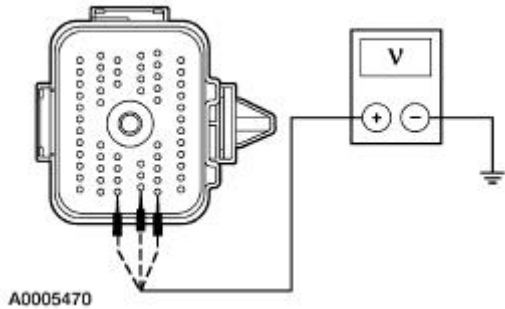


PCM C175a

2



3



3 Measure the voltage between PCM C175a, harness side and ground, as follows:

PCM C175a	Circuit
Pin 29	10-PG12 (GY/WH)
Pin 36	8-PG21 (WH/GN)
Pin 46	10-PG21 (GY/OG)

• Is any voltage present?

→ **Yes**
REPAIR the circuit(s). CLEAR the DTCs.
REPEAT the self-test.

→ **No**
GO to [E5](#).

E5 CHECK THE SPEED CONTROL SERVO CIRCUITRY FOR AN OPEN

1



2 Measure the resistance between PCM C175a, harness side, and speed control servo C122, harness side, as follows:

PCM C175a	Speed Control Servo C122	Circuit
Pin 29	Pin 4	10-PG12 (GY/WH)
Pin 36	Pin 3	8-PG21 (WH/GN)
Pin 46	Pin 2	10-PG21 (GY/OG)

• Are the resistances less than 5 ohms?

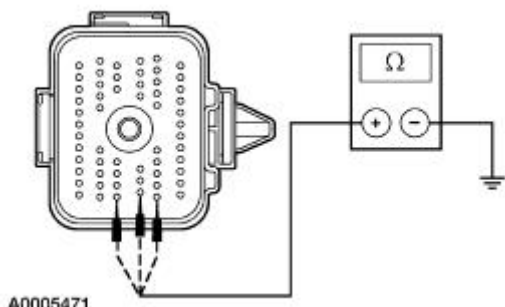
→ **Yes**
GO to [E6](#).

→ **No**

REPAIR the circuit(s). CLEAR the DTCs.
REPEAT the self-test.

E6 CHECK THE SPEED CONTROL SERVO CIRCUITRY FOR SHORT TO GROUND

1



1

Measure the resistance between PCM C175a, harness side, and ground, as follows:

PCM C175a	Circuit
Pin 29	10-PG12 (GY/WH)
Pin 36	8-PG21 (WH/GN)
Pin 46	10-PG21 (GY/OG)

• Are the resistances greater than 10,000 ohms?

→ **Yes**
GO to [E7](#).

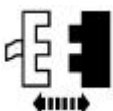
→ **No**
REPAIR the circuit(s). CLEAR the DTCs.
REPEAT the self-test.

E7 CHECK THE DEACTIVATOR SWITCH CIRCUITRY FOR AN OPEN

1

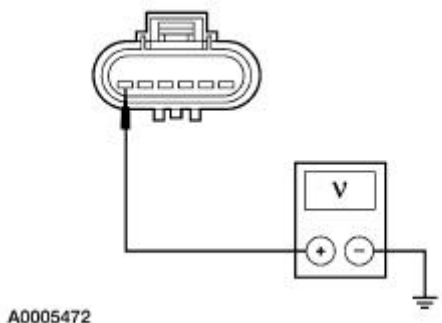


2



Speed Control Servo C122

3



3

Measure the voltage between speed control servo C122 pin 6, circuit 29S-PG16 (OG/YE), harness side, and ground.

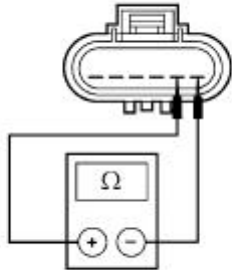
• Is the voltage greater than 10 volts?

→ **Yes**
GO to [E8](#).

→ **No**
REPAIR circuit 29S-PG16 (OG/YE) or circuit 29S-PG1 (OG/YE). CLEAR the DTCs. REPEAT the self-test.

E8 CHECK THE SPEED CONTROL SERVO

1



A0005473

1 Measure the resistance between speed control servo pin 5 (component side), and speed control servo pin 6 (component side).

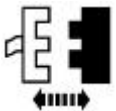
- Is the resistance between 20 and 30 ohms?

→ **Yes**
GO to [E9](#).

→ **No**
INSTALL a new speed control servo. REFER to [Actuator—Speed Control Servo](#) in this section. CLEAR the DTCs. REPEAT the self-test.

E9 CHECK CIRCUIT 8-PG12 (WH/VT) FOR SHORT TO POWER

1

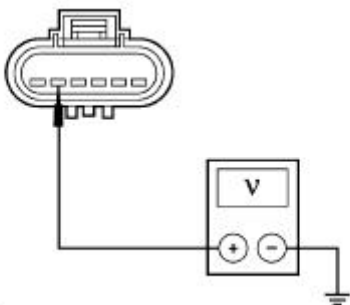


PCM C175a

2



3



A0005474

3 Measure the voltage between speed control servo C122 pin 5, circuit 8-PG12 (WH/VT), harness side, and ground.

- Is any voltage present?

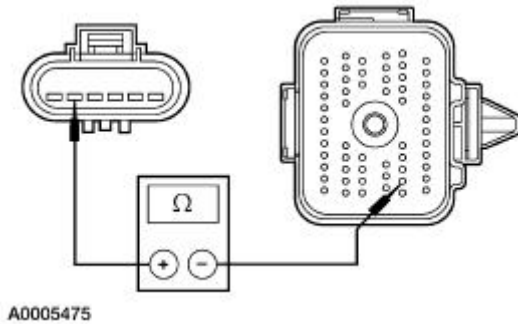
- **Yes**
REPAIR the circuit. CLEAR the DTCs.
REPEAT the self-test.
- **No**
GO to [E10](#).

E10 CHECK CIRCUIT 8-PG12 (WH/VT) FOR AN OPEN

1



2



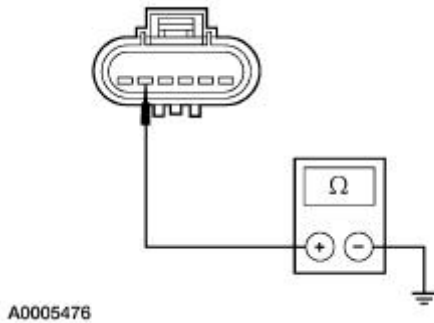
- 2 Measure the resistance between speed control servo C122 pin 5, circuit 8-PG12 (WH/VT), harness side, and PCM C175a pin 45, circuit 8-PG12 (WH/VT), harness side.

● **Is the resistance less than 5 ohms?**

- **Yes**
GO to [E11](#).
- **No**
REPAIR the circuit. CLEAR the DTCs.
REPEAT the self-test.

E11 CHECK CIRCUIT 8-PG12 (WH/VT) FOR SHORT TO GROUND

1



- 1 Measure the resistance between speed control servo C122 pin 5, circuit 8-PG12 (WH/VT), harness side, and ground.

● **Is the resistance greater than 10,000 ohms?**

- **Yes**
INSTALL a new PCM. REFER to [Section 303-14](#). CLEAR the DTCs. REPEAT the self-test.

→ **No**
 REPAIR the circuit. CLEAR the DTCs.
 REPEAT the self-test.

PINPOINT TEST F: DTC P1568—NGSC SERVO SELF-TEST FAILURE

CONDITIONS	DETAILS/RESULTS/ACTIONS
F1 CHECK THE SPEED CONTROL ACTUATOR CABLE	
	<p>1 Disconnect the speed control actuator cable at the throttle body.</p> <p>2 Check the speed control actuator cable slack by pulling the speed control cable end taut from within the speed control cable housing.</p> <p>● Is the speed control actuator cable slack greater than 0 mm (0 in) and less than 6 mm (0.24 in)?</p> <p>→ Yes GO to F2.</p> <p>→ No INSTALL a new speed control actuator cable. REFER to Actuator—Speed Control Servo in this section. CLEAR the DTCs. REPEAT the self-test.</p>
F2 CHECK FOR DAMAGE, STICKING OR BINDING SPEED CONTROL ACTUATOR CABLE	
	<p>1 Disconnect the speed control actuator cable from the speed control servo.</p> <p>2 Check the speed control actuator cable for damage, sticking or binding.</p> <p>● Is the speed control actuator cable OK?</p> <p>→ Yes GO to F3.</p> <p>→ No INSTALL a new speed control actuator cable. REFER to Actuator—Speed Control Servo in this section. CLEAR the DTCs. REPEAT the self-test.</p>
F3 CHECK THE SPEED CONTROL SERVO OUTPUT	
	<p>1 Check the speed control servo pulley for movement while triggering the on-demand self-test.</p> <p>● Does the speed control servo pulley move?</p>

- **Yes**
REFER to Powertrain Control/Emissions Diagnosis (PC/ED) manual.
- **No**
GO to [F4](#).

F4 CHECK THE SPEED CONTROL SERVO

1



2



Speed Control Servo C122

- 3 Measure the resistance between speed control servo pins (component side), as follows:

Speed Control Servo	Speed Control Servo	Expected Value
Pin 1	Pin 2	Between 2 and 3 ohms
Pin 1	Pin 3	Between 2 and 3 ohms
Pin 1	Pin 4	Between 2 and 3 ohms
Pin 5	Pin 6	Between 20 and 30 ohms

- Are the resistances OK?

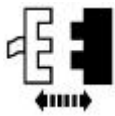
- **Yes**
GO to [F5](#).
- **No**
INSTALL a new speed control servo.
REFER to [Actuator—Speed Control Servo](#) in this section. CLEAR the DTCs.
REPEAT the self-test.

F5 CHECK THE SPEED CONTROL SERVO CIRCUITRY FOR SHORT TO POWER

1



2

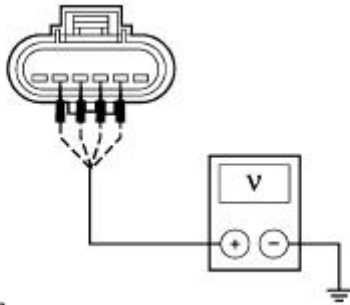


PCM C175a

3



4



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4 Measure the voltage between speed control servo C122, harness side and ground, as follows:

Speed Control Servo C122	Circuit
Pin 5	8-PG12 (WH/VT)
Pin 4	10-PG12 (GY/WH)
Pin 3	8-PG21 (WH/GN)
Pin 2	10-PG21 (GY/OG)

• Is any voltage present?

→ **Yes**
REPAIR the circuit(s). CLEAR the DTCs. REPEAT the self-test.

→ **No**
GO to [F6](#).

F6 CHECK THE SPEED CONTROL SERVO CIRCUITRY FOR AN OPEN CIRCUIT

1



2 Measure the resistance between PCM C175a, harness side and speed control servo C122, harness side, as follows:

PCM C175a	Speed control servo C122	Circuit
Pin 45	Pin 5	8-PG12 (WH/VT)
Pin 29	Pin 4	10-PG12 (GY/WH)
Pin 36	Pin 3	8-PG21 (WH/GN)
Pin 46	Pin 2	10-PG21

(GY/OG)

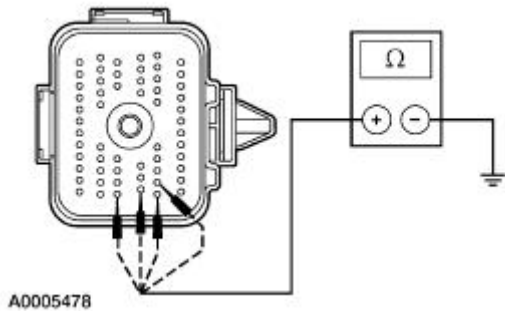
- Are the resistances less than 5 ohms?

→ **Yes**
GO to [F7](#).

→ **No**
REPAIR the circuit(s). CLEAR the DTCs.
REPEAT the self-test.

F7 CHECK THE SPEED CONTROL SERVO CIRCUITRY FOR SHORT TO GROUND

1



1 Measure the resistances between PCM C175a, harness side, and ground, as follows:

PCM C175a	Circuit
Pin 45	8-PG12 (WH/VT)
Pin 29	10-PG12 (GY/WH)
Pin 36	8-PG21 (WH/GN)
Pin 46	10-PG21 (GY/OG)

- Are the resistances greater than 10,000 ohms?

→ **Yes**
GO to [F8](#).

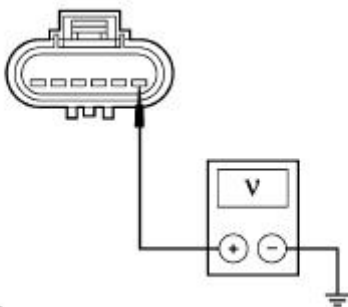
→ **No**
REPAIR the circuit(s). CLEAR the DTCs.
REPEAT the self-test.

F8 CHECK CIRCUIT 15S-PG12 (GN/WH) FOR AN OPEN

1



2

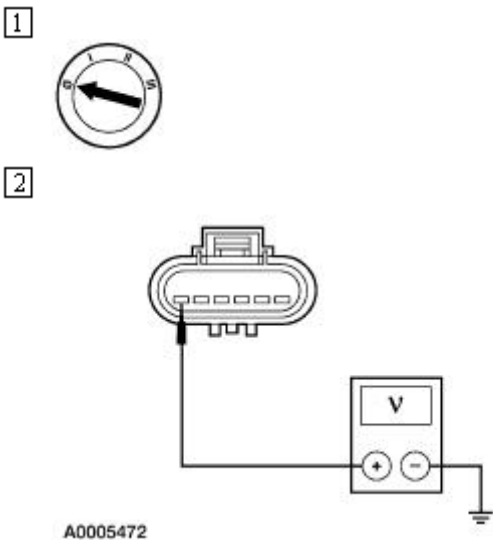


2 Measure the voltage between speed control servo C122 pin 1, circuit 15S-PG12 (GN/WH), harness side and ground.

- Is the voltage greater than 10 volts?


- **Yes**
GO to [F9](#).
- **No**
REPAIR the circuit. CLEAR the DTCs.
REPEAT the self-test.

F9 CHECK THE DEACTIVATOR SWITCH CIRCUITRY FOR AN OPEN



- 2 Measure the voltage between speed control servo C122 pin 6, circuit 29S-PG16 (OG/YE), harness side and ground.
- **Is the voltage greater than 10 volts?**
- **Yes**
INSTALL a new speed control servo.
REFER to [Actuator—Speed Control Servo](#) in this section. CLEAR the DTCs.
REPEAT the self-test.
 - **No**
REPAIR circuit 29S-PG16 (OG/YE) or circuit 29S-PG1 (OG/YE) as necessary.
CLEAR the DTCs. REPEAT the self-test.

PINPOINT TEST G: DTC P1572, DTC P0703—BRAKE ON/OFF FAILURE

CONDITIONS	DETAILS/RESULTS/ACTIONS
NOTE: Make sure the deactivator switch is correctly adjusted before proceeding.	
G1 MONITOR THE PCM PID BPA_SW	
<ul style="list-style-type: none"> 1  	<ul style="list-style-type: none"> 2 Monitor the PCM PID BPA_SW without depressing the brake pedal. <ul style="list-style-type: none"> • Does the PCM BPA_SW PID

indicate ON?

→ **Yes**
GO to [G2](#).

→ **No**
GO to [G5](#).

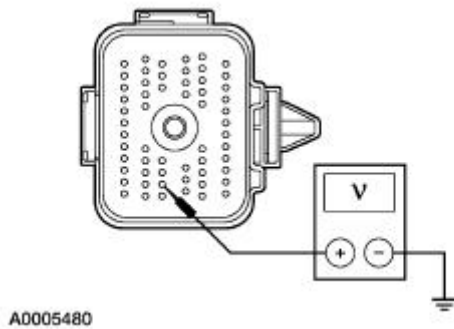
G2 CHECK FOR AN OPEN CIRCUIT

1



PCM C175a

2



2 Measure the voltage between PCM C175a pin 28, circuit 29S-RE21 (OG/GN), harness side and ground.

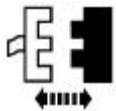
• Is the voltage greater than 10 volts?

→ **Yes**
INSTALL a new PCM. REFER to [Section 303-14](#). CLEAR the DTCs. REPEAT the self-test.

→ **No**
GO to [G3](#).

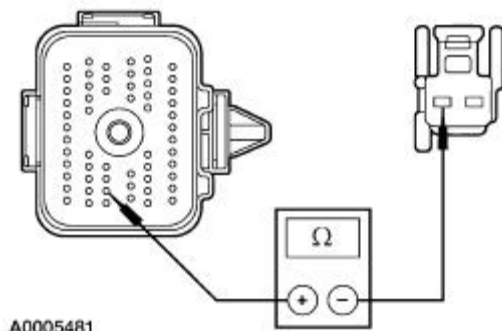
G3 CHECK CIRCUIT 29S-PG1 (OG/YE)

1



Deactivator Switch C277

2



2 Measure the resistance between PCM C175a pin 28, circuit 29S-RE21 (OG/GN), harness side, and deactivator switch C277 pin 2, circuit 29S-PG1 (OG/YE), harness side.

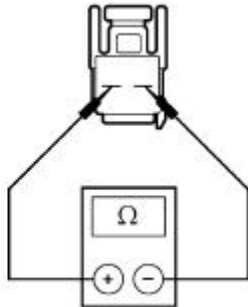
● Is the resistance less than 5 ohms?

→ **Yes**
GO to [G4](#).

→ **No**
REPAIR circuit 29S-RE21 (OG/GN) and circuit 29S-PG1 (OG/YE) as necessary. CLEAR the DTCs. REPEAT the self-test.

G4 CHECK THE DEACTIVATOR SWITCH

1



A0005482

1

Measure the resistance between deactivator switch pins, (component side) while depressing and releasing the brake pedal.

● Is the resistance less than 5 ohms with the brake pedal released and greater than 10,000 ohms with the brake pedal depressed?

→ **Yes**
REPAIR circuit 29-PG6 (OG/YE). CLEAR the DTCs. REPEAT the self-test.

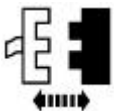
→ **No**
INSTALL a new deactivator switch. REFER to [Switch—Deactivator](#) in this section. CLEAR the DTCs. REPEAT the self-test.

G5 CHECK THE BRAKE PEDAL POSITION (BPP) INPUT TO PCM

1



2



PCM C175a

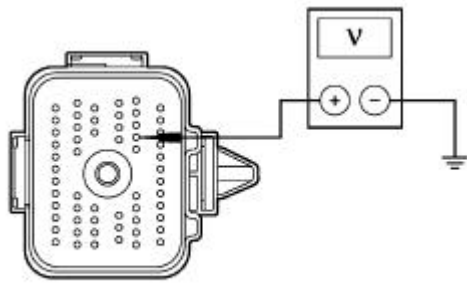
3



4

4

Measure the voltage between PCM C175a pin 40, circuit 29S-RE13 (OG), harness side and ground, while



A0005483

depressing the brake pedal.

- Is the voltage greater than 10 volts?



→ **Yes**

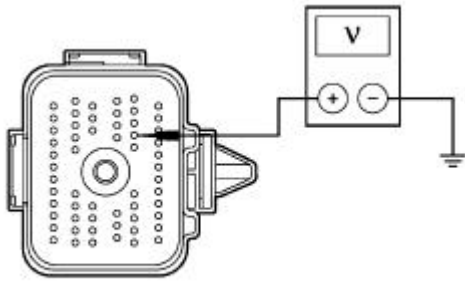
INSTALL a new PCM. REFER to [Section 303-14](#). CLEAR the DTCs. REPEAT the self-test.

→ **No**

REPAIR the circuit. CLEAR the DTCs. REPEAT the self-test.

PINPOINT TEST H: THE SPEED CONTROL IS INOPERATIVE—NO DTCs

CONDITIONS	DETAILS/RESULTS/ACTIONS
H1 CHECK THE PCM PID IDBRKSW	
	<p>1 Monitor the PCM PID IDBRKSW.</p> <ul style="list-style-type: none"> ● Does the PCM PID IDBRKSW indicate OFF? <p>→ Yes GO to H3.</p> <p>→ No GO to H2.</p>
H2 CHECK THE BPP INPUT TO THE PCM	
<p>1</p>  <p>2</p>  <p>PCM C175a</p> <p>3</p>	<p>3 Measure the voltage between PCM C175a pin 40, circuit 29S-RE13 (OG), harness side and ground.</p>



A0005483

- Is any voltage present?

→ Yes

REFER to [Section 417-01](#).

→ No

INSTALL a new PCM. REFER to [Section 303-14](#). CLEAR the DTCs. REPEAT the self-test.

H3 CHECK THE PCM PID PBA_SW

1 Monitor the PCM PID PBA_SW.

- Does the PCM PID PBA_SW indicate OFF with the parking brake released?

→ Yes

If equipped with a manual transmission, GO to [H4](#).

If equipped with an automatic transmission, GO to [H8](#).

→ No

REFER to [Section 413-01](#).

H4 CHECK THE PCM PID CPP

1 Monitor the PCM PID CPP.

- Does the PCM PID CPP indicate NO?

→ Yes

GO to [H11](#).

→ No

GO to [H5](#).

H5 CHECK THE CPP SWITCH

1

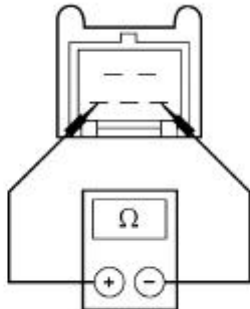


2



CPP Switch C258

3



A0005484

3

Measure the resistance between CPP switch pins 1 (component side), and CPP switch pin 3 (component side), while depressing and releasing the switch.

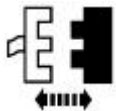
- Is the resistance less than 5 ohms in one direction and greater than 10,000 ohms in the other?

→ Yes
GO to [H6](#).

→ No
INSTALL a new CPP switch. REFER to [Section 303-14](#). CLEAR the DTCs. REPEAT the self-test.

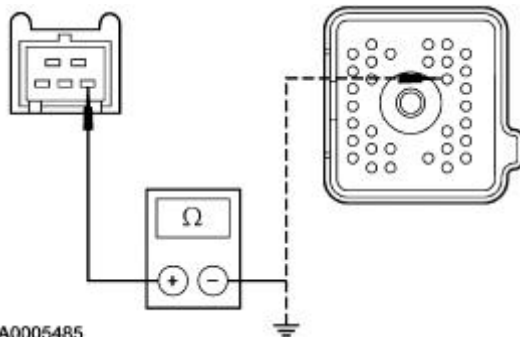
H6 CHECK CIRCUIT 8-TC18 (WH) FOR AN OPEN

1



PCM C175b

2



A0005485

2

Measure the resistance between CPP switch C258 pin 1, circuit 8-TC18 (WH), harness side, and PCM C175b pin 22, circuit 8-TC18 (WH), harness side; and between CPP switch C258 pin 1, circuit 8-TC18 (WH), harness side and ground.

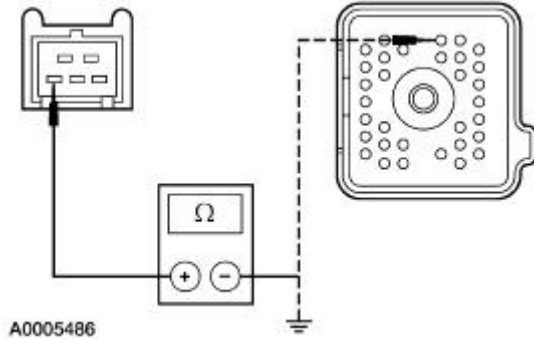
- Is the resistance less than 5 ohms between the CPP switch and PCM; and greater than 10,000 ohms between the CPP switch and ground?

→ Yes
GO to [H7](#).

→ **No**
REPAIR the circuit. CLEAR the DTCs.
REPEAT the self-test.

H7 CHECK CIRCUIT 9-RE8 (BN) AND CIRCUIT 9S-TC18

1



1

Measure the resistance between CPP switch C258 pin 3, circuit 9S-TC18 (BN), harness side, and PCM C175a pin 17, circuit 9-RE8 (BN), harness side; and between CPP switch C258 pin 3, circuit 9S-TC18 (BN), harness side, and ground.

- **Is the resistance less than 5 ohms between the CPP switch and PCM; and greater than 10,000 ohms between the CPP switch and ground?**

→ **Yes**
INSTALL a new PCM. REFER to [Section 303-14](#). CLEAR the DTCs. REPEAT the self-test.

→ **No**
REPAIR the circuit. CLEAR the DTCs.
REPEAT the self-test.

H8 CHECK THE DTR SENSOR

1

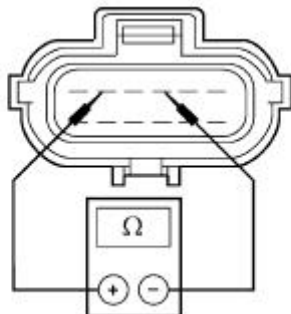


2



DTR Sensor C167

3



A0005487

3

Measure the resistance between DTR sensor pin 2 (component side), and DTR sensor pin 4 (component side), while placing the transmission selector in P and D5.

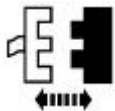
- Is the resistance less than 5 ohms when the transmission selector is in P and greater than 10,000 ohms when the transmission selector is in D5?

→ **Yes**
GO to [H9](#).

→ **No**
INSTALL a new DTR sensor. REFER to [Section 307-01](#). CLEAR the DTCs. REPEAT the self-test.

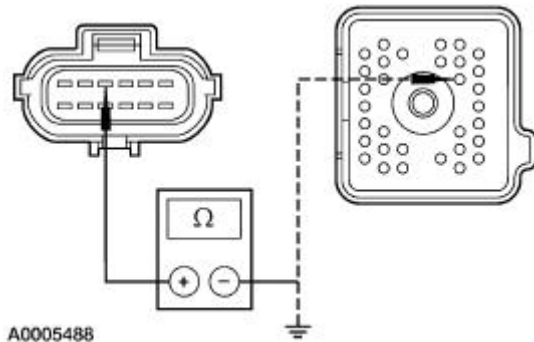
H9 CHECK CIRCUIT 8-TA40 (WH/GN) FOR AN OPEN

1



PCM C175b

2



2

Measure the resistance between DTR sensor C167 pin 4, circuit 8-TA40 (WH/GN), harness side, and PCM C175b pin 22, circuit 8-TA40 (WH/GN), harness side; and between DTR sensor C167 pin 4, circuit 8-TA40 (WH/GN), harness side and ground.

- Is the resistance less than 5 ohms between the DTR sensor and PCM; and greater than 10,000 ohms between the DTR sensor and ground?

→ **Yes**
GO to [H10](#).

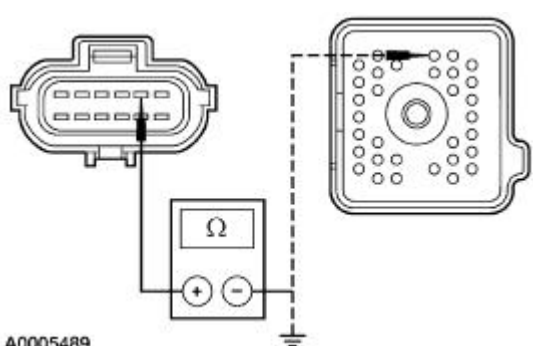
→ **No**
REPAIR the circuit. CLEAR the DTCs. REPEAT the self-test.

H10 CHECK CIRCUIT 9-TA1 (BN) AND CIRCUIT 9-TA18 (BN/YE)

1

1

Measure the resistance between DTR sensor C167 pin 2, circuit 9-TA18 (BN/YE), harness side, and PCM C175b pin 17, circuit 9-TA1 (BN/YE), harness side; and between DTR sensor C167 pin 2, circuit 9-TA18 (BN/YE), harness side, and ground.



- Is the resistance less than 5 ohms between the DTR sensor and PCM; and greater than 10,000 ohms between the DTR sensor and ground?

→ **Yes**
GO to [H11](#).

→ **No**
REPAIR the circuit. CLEAR the DTCs. REPEAT the self-test.

H11 CHECK THE PCM PID SCCS

1 Monitor the PCM PID SCCS, while depressing and releasing the speed control actuator switches. Refer to the PCM Parameter Identification (PID) Index.

- Does the PCM PID SCCS operate correctly?

→ **Yes**
GO to [H12](#).

→ **No**
INSTALL a new speed control actuator switch. REFER to [Switch—Speed Control Actuator](#) in this section. CLEAR the DTCs. REPEAT the self-test.

H12 CHECK THE PCM PID VBAT

1 Monitor the PCM PID VBAT.

- Does the PCM PID VBAT indicate greater than 10 volts with the engine running?

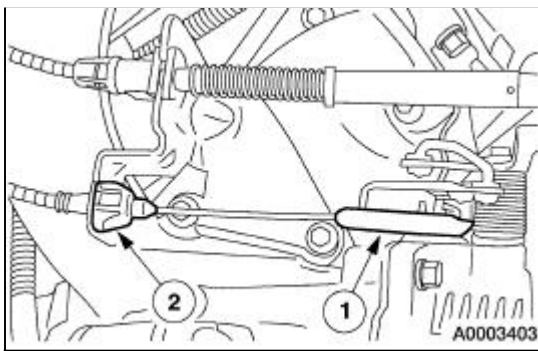
→ **Yes**
REFER to Powertrain Control/Emissions Diagnosis (PC/ED) manual.

→ **No**
REFER to [Section 414-00](#).

Actuator Cable

Removal and Installation

1. Remove the speed control servo. Refer to [Actuator—Speed Control Servo](#).
2. Remove the speed control actuator cable from the throttle lever.
 1. Detach the speed control actuator cable end from the throttle nail head by pushing forward.
 2. Remove the speed control actuator cable from the throttle bracket by squeezing locking ears and pulling forward.

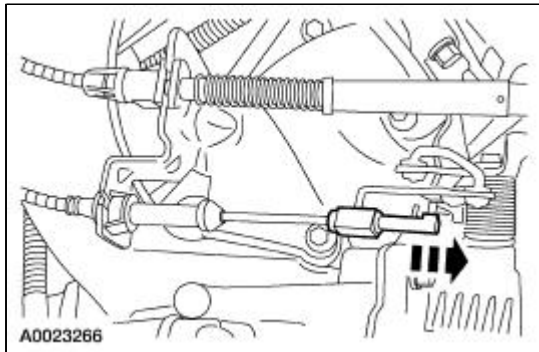


3. To install, reverse the removal procedure.
-

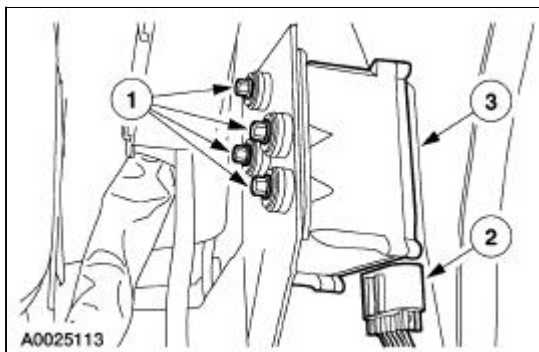
Actuator —Speed Control Servo

Removal

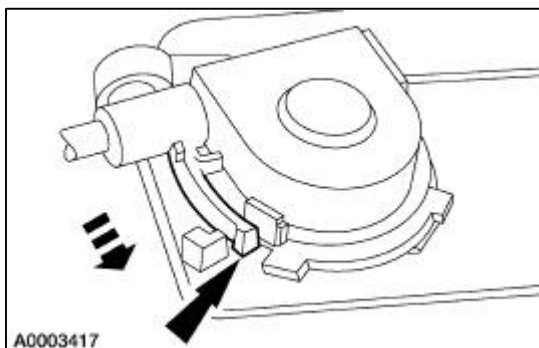
1. If equipped, remove the engine cover.
2. Detach the speed control actuator cable end from the throttle nailhead by pushing forward.



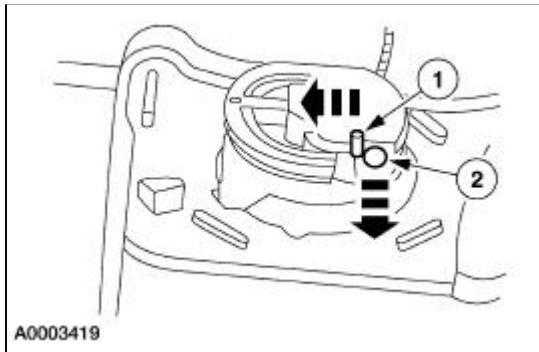
3. Remove the LF wheel and tire. For additional information, refer to [Section 204-04](#).
4. Remove the LF inner splash shield.
5. Position the speed control servo aside.
 1. Remove the bolts.
 2. Disconnect the electrical connector.
 3. Position the speed control servo aside.



6. Depress the locking tab and rotate the speed control actuator cable cap to remove.

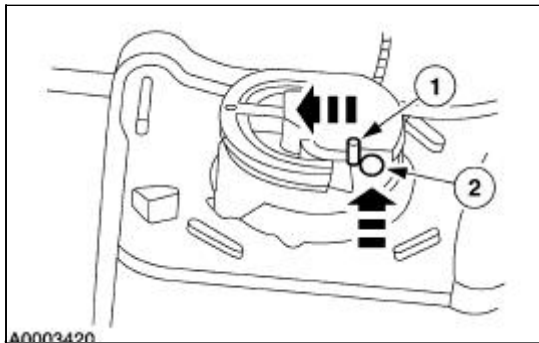



7. Disconnect the speed control actuator cable from the speed control servo pulley.
 1. Gently push the retaining spring.
 2. Disconnect the speed control cable slug from the speed control servo pulley.




Installation

1. Insert the speed control cable slug into the speed control servo pulley slot.
 1. Gently push the retaining spring.
 2. Insert the speed control cable slug completely into the speed control servo pulley slot.

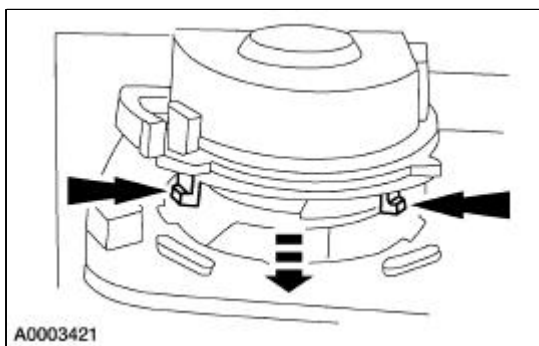


2.  **CAUTION:** It is necessary to squarely seat the speed control actuator cable cap and seal around the speed control servo pulley.

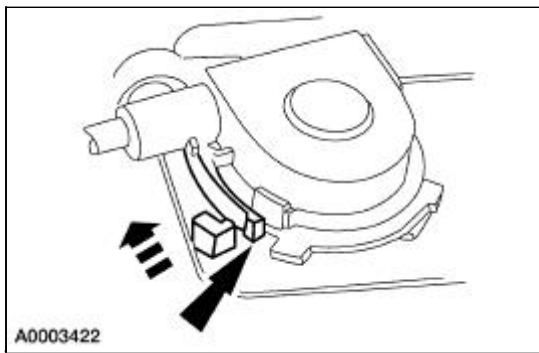
 **CAUTION:** Incorrect wrapping of the speed control actuator cable around the speed control servo pulley may result in high idle conditions.

NOTE: Make sure the rubber seal is fully seated onto the speed control actuator cable cap.

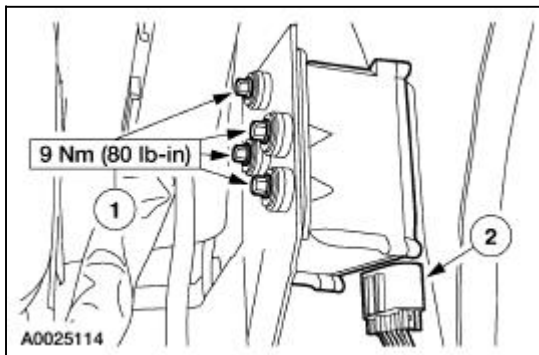
Align the speed control actuator cable cap tabs with the slots in the speed control servo housing.



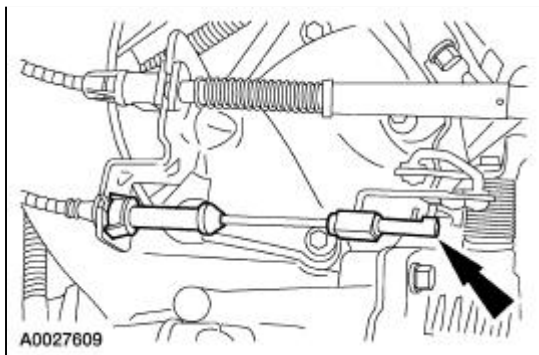
3. Rotate the speed control actuator cable cap until the locking tab engages.



4. Install the speed control servo.
 1. Install the bolts.
 2. Connect the electrical connector.



5. Install the LF inner splash shield.
6. Install the wheel and tire. For additional information, refer to [Section 204-04](#).
7. Attach the speed control actuator cable end to the throttle nailhead.



8. If equipped, install the engine cover.
-

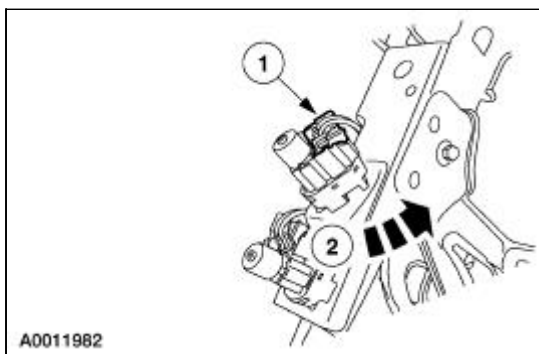
Switch —Deactivator

Removal

1. **NOTE:** Disconnect the footwell lamp electrical connector.

Remove the instrument panel insulator.

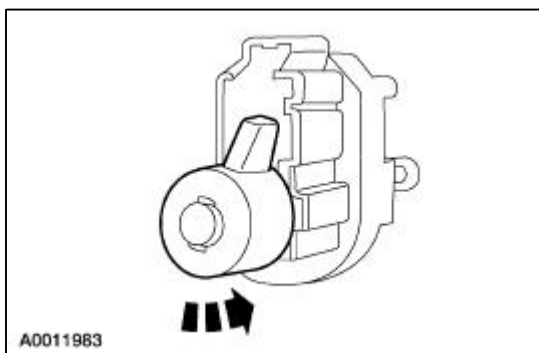
2. Remove the deactivator switch.
 1. Disconnect the electrical connector.
 2. Rotate and remove the deactivator switch.



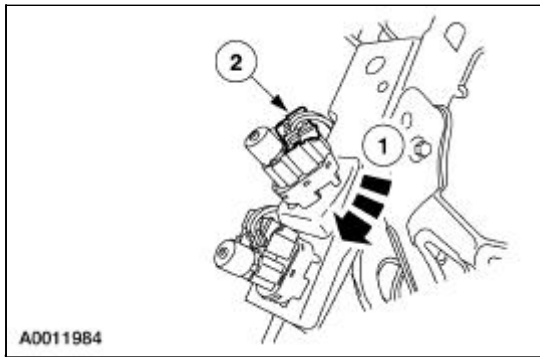
Installation

⚠ CAUTION: Initial installation of a deactivator switch allows for one adjustment. If additional adjustments are necessary, install a new switch.

1. Rotate the lock knob counterclockwise to the stop to unlock.



2. With the engine running, fully depress and hold the brake pedal.
3. Install the deactivator switch.
 1. Position the deactivator switch in the bracket and rotate clockwise.
 2. Connect the electrical connector.

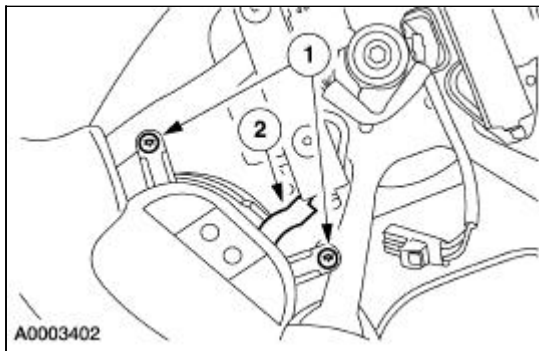


4. Slowly release the brake pedal.
-

Switch —Speed Control Actuator

Removal and Installation

1. Remove the driver side air bag; refer to [Section 501-20B](#).
2. Remove the speed control actuator switch.
 1. Remove the screws.
 2. Disconnect the electrical connector.



3. To install, reverse the removal procedure.
-

General Specifications


Item	Specification
A/C Compressor	
A/C compressor type	SC90V variable scroll
A/C compressor displacement	90 cc (5.5 cu in)
A/C compressor rotation	Clockwise
Magnetic Clutch	
Air gap between pulley and clutch plate	0.35-0.75 mm (0.014-0.030 in)
Coolant Hose Lubricant	
MERPOL®	ESE-M99B144-B
Refrigerant Lubricant	
PAG Refrigerant Compressor Oil (R-134a Systems) F7AZ-19589-DA (Motorcraft YN-12-C)	WSH-M1C231-B
Capacity	207 ml (7 oz)
Refrigerant	
R-134a Refrigerant YN-19	WSH-M17B19-A
Capacity	0.79 kg (28 oz)
Refrigerant System Cleaner	
A/C Systems Flushing Solvent F4AZ-19579-A	—
Evaporator Core Orifice	
	Thermostatic expansion valve (TXV) system
Color	N/A
Diameter	N/A
A/C Pressure Relief Valve ^a	
Open	3,792-4,137 kPa (550-600 psi)
A/C Cycling Switch	N/A
Pressure Cutoff Switch	N/A
A/C Pressure Sensor	Refer to the Powertrain Control/Emissions Diagnosis (PC/ED) manual.


^a Manifold gauge set pressures may vary slightly depending on the distance between the service gauge port valve and the A/C pressure relief valve locations.


Torque Specifications

Description	Nm	lb-in
Peanut fitting nut	8	71


Climate Control System

 **WARNING:** To avoid accidental deployment and possible injury, the air bag system backup power supply must be depleted before repairing any climate control components. To deplete the backup power supply, disconnect the battery ground cable and wait one minute.

 **WARNING:** Carbon monoxide is colorless, odorless and dangerous. If it is necessary to operate the engine with vehicle in a closed area such as a garage, always use an exhaust collector to vent the exhaust gases outside the closed area.

 **WARNING:** R-134a is classified as a safe refrigerant, but misuse can make it dangerous. The following precautions must be observed:

- Always wear safety goggles when repairing an air conditioning system.
- Avoid contact with liquid refrigerant R-134a. R-134a vaporizes at approximately -25°C (-13°F) under atmospheric pressure and it will freeze skin tissue.
- Never allow refrigerant R-134a gas to escape in quantity in an occupied space. R-134a is non-toxic, but it will displace the oxygen needed to support life.
- Never use a torch in an atmosphere containing R-134a gas. R-134a is non-toxic at all normal conditions, but when it is exposed to high temperatures, such as a torch flame, it decomposes. During decomposition it releases irritating and toxic gases (as described in the MSDS sheet from the manufacturer). Decomposition products are hydrofluoric acid, carbon dioxide and water.
- Do not allow any portion of the charged air conditioning system to become too hot. The pressure in an air conditioning system rises as the temperature rises and temperatures of approximately 85°C (185°F) can be dangerous.
- Allow the engine to cool sufficiently prior to carrying out maintenance or serious burns and injury can occur.

 **CAUTION:** To avoid damaging the vehicle or A/C components, the following precautions must be observed:

- The A/C refrigerant of all vehicles must be identified and analyzed prior to refrigerant charging. Failure to do so can contaminate the shop bulk refrigerant and other vehicles.
- Do not add R-12 refrigerant to an A/C system that requires the use of R-134a refrigerant. These two types of refrigerant must never be mixed. Doing so can damage the A/C system.
- Charge the A/C system with the engine running. Use the low-pressure side of the A/C system when charging to prevent refrigerant slugging from damaging the A/C compressor.
- Use only R-134a refrigerant. Due to environmental concerns, when the air conditioning system is drained, the refrigerant must be collected using refrigerant recovery/recycling equipment. Federal law **REQUIRES** that R-134a be recovered into appropriate recovery equipment and the process be conducted by qualified technicians who have been certified by an approved organization, such as MACS, ASI, etc. Use of a recovery machine dedicated to R-134a is necessary to reduce the possibility of oil and refrigerant incompatibility concerns. Refer to the instructions provided by the equipment manufacturer when removing refrigerant from or charging the air conditioning system.

- Refrigerant R-134a must not be mixed with air for leak testing or used with air for any other purpose above atmospheric pressure. R-134a is combustible when mixed with high concentrations of air and higher pressures.
- A number of manufacturers are producing refrigerant products that are described as direct substitutes for refrigerant R-134a. The use of any unauthorized substitute refrigerant can severely damage the A/C components. If repair is required, use only new or recycled refrigerant R-134a.



CAUTION: To avoid contamination of the A/C system:

- Never open or loosen a connection before discharging the system.
- When loosening a connection, if any residual pressure is evident, allow it to leak out before opening the fitting.
- Before charging, evacuate a system that has been opened to install a new component or a system that has discharged through leakage.
- Seal open fittings with a cap or plug immediately after disconnecting a component from the system.
- Clean the outside of the fittings thoroughly before disconnecting a component from the system.
- Do not remove the sealing caps from a new component until ready to install.
- Refrigerant oil will absorb moisture from the atmosphere if left uncapped. Do not open an oil container until ready to use, and install the cap immediately after using. Store the oil in a clean, moisture-free container.
- Install a new O-ring seal before connecting an open fitting. Coat the fitting and the O-ring seal with refrigerant oil before connecting.
- When installing a refrigerant line, avoid sharp bends. Position the line away from the exhaust or any sharp edges that can chafe the line.
- Tighten threaded fittings only to specifications. The steel and aluminum fittings used in the refrigerant system will not tolerate overtightening.
- When disconnecting a fitting, use a wrench on both halves of the fitting to prevent twisting of the refrigerant lines or tubes.
- Do not open a refrigerant system or uncap a new component unless it is as close as possible to room temperature. This will prevent condensation from forming inside a component that is cooler than the surrounding air.

The electronic automatic temperature control system maintains the selected vehicle interior temperature by heating and/or cooling the air.

- During A/C operation the system also reduces the relative humidity of the air.
- The driver may override the automatic mode of operation.

Principles of Operation

There are four main principles involved with the basic theory of operation:

- heat transfer
- latent heat of vaporization
- relative humidity
- effect of pressure on boiling or condensation

Heat Transfer

If two substances of different temperature are placed near each other, the heat in the warmer substance will transfer to the colder substance.

Latent Heat of Vaporization

When a liquid boils (converts to gas) it absorbs heat without raising the temperature of the resulting gas. When the gas condenses (converts back to a liquid), it gives off heat without lowering the temperature of the resulting liquid.

Relative Humidity

The amount of moisture (water vapor content) that the air can hold is directly related to the air temperature. The more heat there is in the air, the more moisture the air can hold. The lower the moisture content in the air, the more comfortable you feel. Removing moisture from the air lowers its relative humidity and improves personal comfort.

Effects of Pressure on Boiling or Condensation

As the pressure is increased on a liquid, the temperature at which the liquid boils (converts to gas) also increases. Conversely, when the pressure on a liquid is reduced, its boiling point is also reduced. When in the gas state, an increase in pressure causes an increase in temperature, while a decrease in pressure will decrease the temperature of the gas.

The Refrigerant Cycle

During stabilized conditions (air conditioning system shutdown), the refrigerant is in a vaporized state and pressures are equal throughout the system. When the A/C compressor is in operation it increases pressure on the refrigerant vapor, raising its temperature. The high-pressure and high-temperature vapor is then released into the top of the A/C condenser core.

The A/C condenser, being close to ambient temperature, causes the refrigerant vapor to condense into a liquid when heat is removed from the refrigerant by ambient air passing over the fins and tubing. The now liquid refrigerant, still at high pressure, exits from the bottom of the A/C condenser and enters the inlet side of the A/C receiver/drier. The receiver/drier is designed to remove moisture from the refrigerant.

The outlet of the receiver/drier is connected to the thermostatic expansion valve (TXV). The TXV provides the orifice which is the restriction in the refrigerant system and separates the high and low pressure sides of the A/C system. As the liquid refrigerant passes across this restriction, its pressure and boiling point are reduced.

The liquid refrigerant is now at its lowest pressure and temperature. As it passes through the A/C evaporator, it absorbs heat from the airflow passing over the plate/fin sections of the A/C evaporator. This addition of heat causes the refrigerant to boil (convert to gas). The now cooler air can no longer support the same humidity level of the warmer air and this excess moisture condenses on the exterior of the evaporator coils and fins and drains outside the vehicle.

The refrigerant cycle is now repeated with the A/C compressor again increasing the pressure and temperature of the refrigerant.

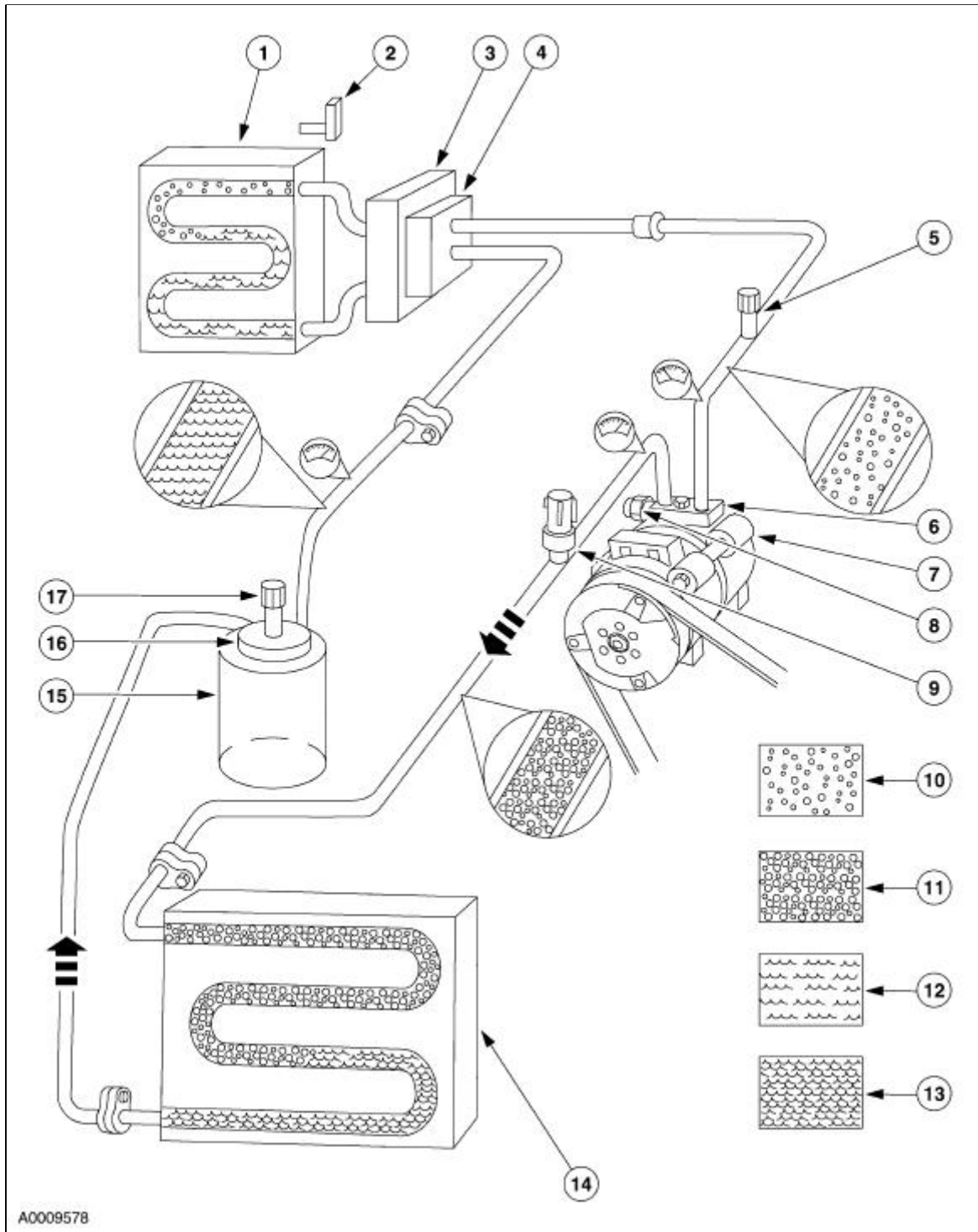
A thermistor which monitors the temperature of the air that has passed through the evaporator core controls A/C clutch cycling. If the temperature of the evaporator core discharge air is low enough to cause the condensed water vapor to freeze, the A/C clutch is disengaged by the vehicle powertrain control module (PCM).

The high-side line pressure is also monitored so that A/C compressor operation will be interrupted if the system pressure becomes too high or is determined to be too low (low charge condition).

The A/C compressor thermal protection switch will interrupt compressor operation if the compressor housing exceeds temperature limits.

The A/C compressor relief valve will open and vent refrigerant to relieve unusually high system pressure.

Clutch Cycling Thermostatic Expansion Valve Type Refrigerant System



Item	Part Number	Description
1	19860	A/C evaporator core

2	19C734	A/C evaporator core outlet temperature thermistor
3	19849	Thermostatic expansion valve
4	19835	Manifold and tube assembly—thermostatic expansion valve
5	19D701	A/C charge valve port (low side)
6	19D734	Manifold and tube assembly—A/C compressor
7	19703	A/C compressor
8	19D644	A/C pressure relief valve
9	19D594	A/C pressure transducer
10	—	Low pressure vapor
11	—	High pressure vapor
12	—	Low pressure liquid
13	—	High pressure liquid
14	19712	A/C condenser core
15	19959	A/C receiver/drier
16	19835	Manifold and tube assembly—receiver/drier
17	19D701	A/C charge valve port (high side)

Dual Automatic Temperature Control (DATC) Module Description

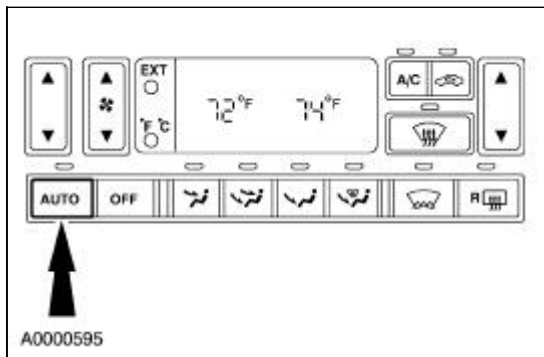
The DATC system automatically maintains a selected temperature for vehicle interior comfort and regulates the volume of airflow between the instrument panel registers, floor ducts, windshield defroster nozzle, and side window demisters. The system will automatically select between fresh and recirculated air with an optional manual override. The DATC system will also include a manual A/C override, blower speed override, and airflow direction overrides.

The dual temperature zone feature provides the driver and the front seat passenger with their own independent temperature set points. The DATC system provides both the driver and front seat passenger with their selected temperature for interior comfort. In situations where the difference between the driver and the front seat passenger set points are very large, the DATC will tend to favor the driver's setting and make the front seat passenger as comfortable as possible.

The driver and front seat passenger will not have independent air distribution mode or fan controls so the system is dual temperature only. In some cases the passenger temperature set point may influence the air distribution mode or blower speed in automatic mode.

System Air Flow

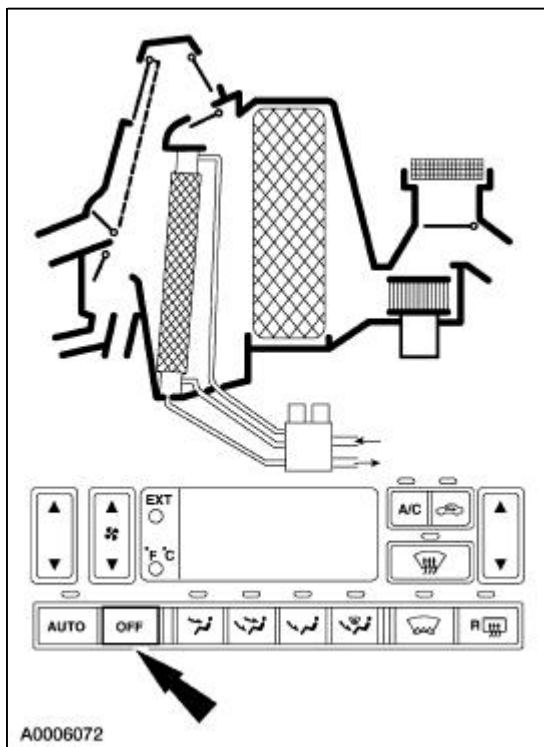
AUTO



When AUTO is selected:

- The temperature control setting(s) are manually set to the desired setting(s).
- The air inlet door actuator is automatically controlled by the DATC module, based on the temperature setting(s), but can be manually overridden by selecting the recirculation button.
- The panel door, floor door, defrost door and cold air bypass door actuators are automatically controlled by the DATC module based on the temperature setting(s), but can be manually overridden by selecting any of the air distribution buttons.
- The dual coolant control valve is automatically controlled by the DATC module based on the temperature setting(s).
- The A/C compressor is automatically controlled by the DATC module based on the temperature setting(s), but can be manually overridden by selecting the A/C button. The A/C compressor will not operate if the outside temperature is lower than approximately 2°C (35°F).
- The blower motor is on. The blower motor speed is automatically controlled by the DATC module based on the temperature setting(s), but can be manually overridden by adjusting the blower speed rocker button.

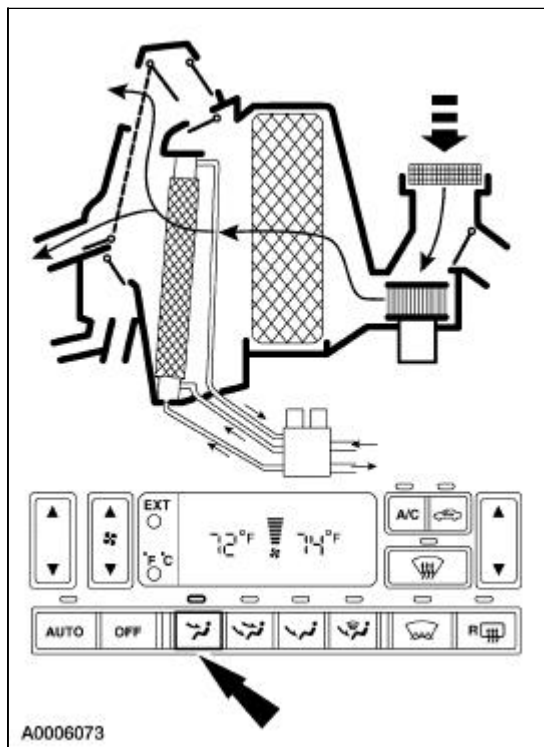
OFF



When OFF is selected:

- The air inlet door actuator positions the air inlet door to close off outside air from entering the passenger compartment.
- The floor door actuator positions the floor door in the open position, and the panel door actuator, defrost door actuator, and cold air bypass door actuator position the panel door, defrost door, and cold air bypass door in the closed positions. This closes off airflow to the defrost duct, the side window demisters, the floor duct and the instrument panel A/C registers.
- The dual coolant control valve is in the closed position, preventing the flow of hot coolant to the heater core.
- The blower motor is off.

PANEL

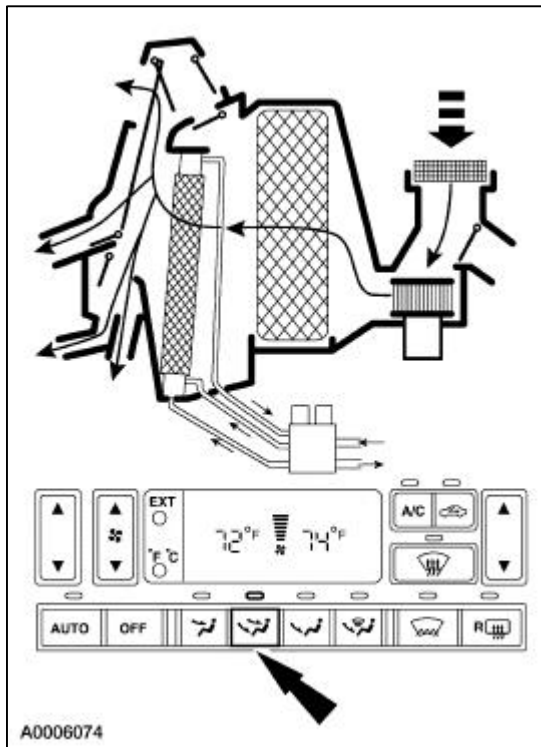


When PANEL is selected:

- The Recirc request button is enabled. If the Recirc request button is selected (indicator on), the air inlet door actuator positions the air inlet door to close off outside air from entering the passenger compartment. If the Recirc request button is not selected (indicator off), the air inlet door actuator positions the air inlet door to admit only outside air into the passenger compartment.
- The panel door actuator positions the panel door in the open position and the floor door and defrost door actuators position the floor door and defrost door in the closed position, directing airflow to the instrument panel A/C registers. The cold air bypass door actuator is automatically controlled by the DATC module based on the temperature setting(s).
- The dual coolant control valve is automatically controlled by the DATC module based on the temperature setting(s).
- The A/C request button is enabled. When the A/C request button is selected (indicator on), the A/C compressor will operate if the outside air temperature is above approximately 2°C (35°F). When the A/C request button is not selected (indicator off), the A/C compressor will not operate and the air cannot be cooled below the outside temperature.

- The blower motor is on.

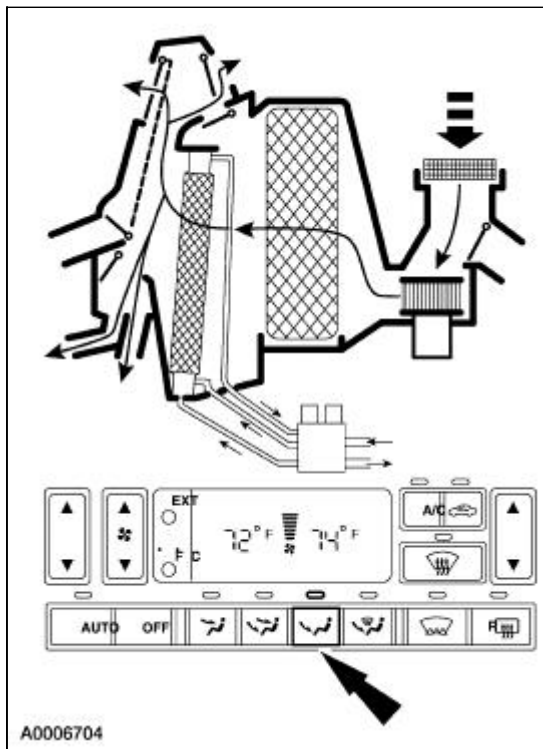
PANEL/FLOOR



When PANEL/FLOOR is selected:

- The Recirc request button is enabled. If the Recirc request button is selected (indicator on), the air inlet door actuator positions the air inlet door as to close off outside air from entering the passenger compartment. If the Recirc request button is not selected (indicator off), the air inlet door actuator positions the air inlet door to admit only outside air into the passenger compartment.
- The panel door and floor door actuators position the panel door and floor door in the open position and the defrost door actuator positions the defrost door in the closed position, directing airflow to the instrument panel A/C registers and the floor duct. The cold air bypass door actuator is automatically controlled by the DATC module based on the temperature setting(s).
- The dual coolant control valve is automatically controlled by the DATC module based on the temperature setting(s).
- The A/C request button is enabled. When the A/C request button is selected (indicator on), the A/C compressor will operate if the outside air temperature is above approximately 2°C (35°F). When the A/C request button is not selected (indicator off), the A/C compressor will not operate and the air cannot be cooled below the outside temperature.
- The blower motor is on.

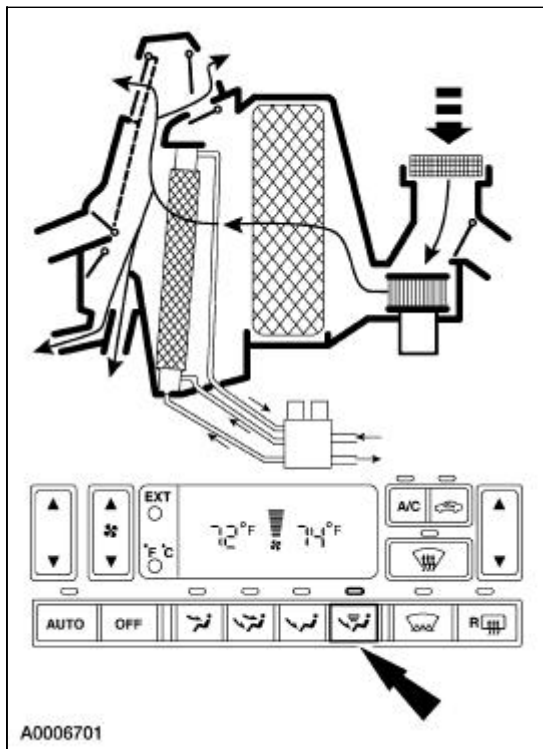
FLOOR



When FLOOR is selected:

- The Recirc request button is enabled. If the Recirc request button is selected (indicator on), the air inlet door actuator positions the air inlet door to close off outside air from entering the passenger compartment. If the Recirc request button is not selected (indicator off), the air inlet door actuator positions the air inlet door as to admit only outside air into the passenger compartment. The DATC will automatically revert to the outside air position after approximately 1 to 4 minutes to prevent window fogging.
- The floor door actuator positions the floor door in the open position and the panel door and defrost door actuators position the panel door and defrost door in the closed position, directing airflow to the floor duct. A small amount of airflow from the outboard instrument panel A/C registers will be present. The cold air bypass door actuator is automatically controlled by the DATC module based on the temperature setting(s).
- The dual coolant control valve is automatically controlled by the DATC module based on the temperature settings.
- The A/C request button is enabled. When the A/C request button is selected (indicator on), the A/C compressor will operate if the outside air temperature is above approximately 2°C (35°F). When the A/C request button is not selected (indicator off), the A/C compressor will not operate and the air cannot be cooled below the outside temperature.
- The blower motor is on.

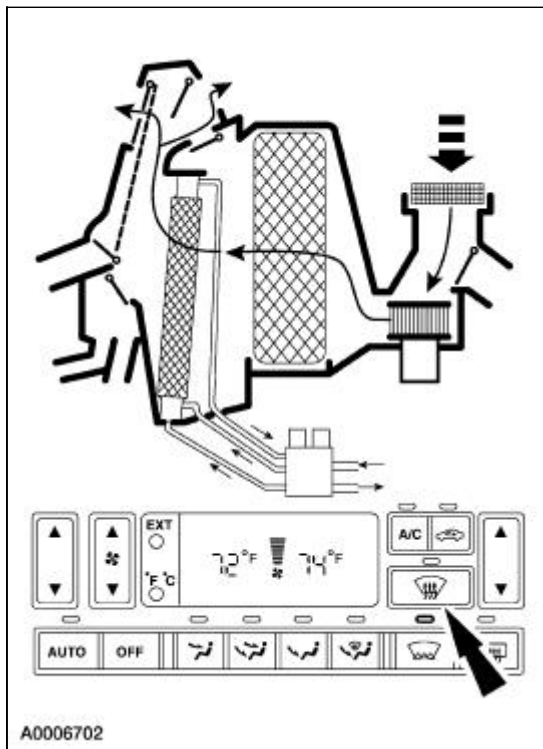
FLOOR/DEFROST



When FLOOR/DEFROST is selected:

- The Recirc request button is enabled. If the Recirc request button is selected (indicator on), the air inlet door actuator positions the air inlet door to close off outside air from entering the passenger compartment. If the Recirc request button is not selected (indicator off), the air inlet door actuator positions the air inlet door as to admit only outside air into the passenger compartment. The DATC will automatically revert to the outside air position after approximately 1 to 4 minutes to prevent window fogging.
- The floor door and defrost door actuators position the floor door and defrost door in the open position and the panel door actuator positions the panel door in the closed position, directing airflow to the floor duct, the windshield defroster ducts, and the side window demisters. A small amount of airflow from the outboard instrument panel A/C registers will be present. The cold air bypass door actuator is automatically controlled by the DATC module based on the temperature setting(s).
- The dual coolant control valve is automatically controlled by the DATC module based on the temperature settings.
- The A/C request button is enabled. When the A/C request button is selected (indicator on), the A/C compressor will operate if the outside air temperature is above approximately 2°C (35°F). When the A/C request button is not selected (indicator off), the A/C compressor will not operate and the air cannot be cooled below the outside temperature.
- The blower motor is on.

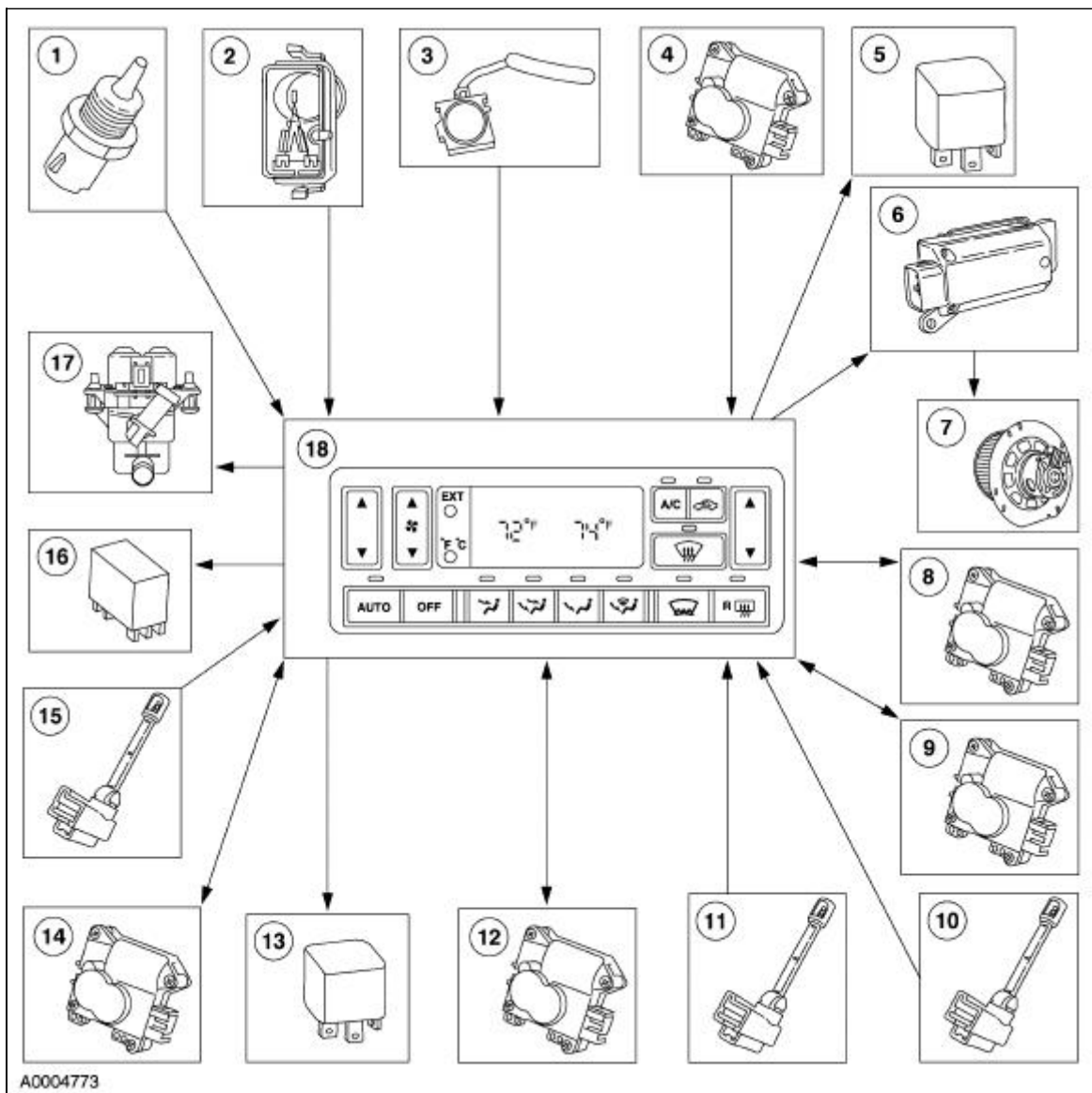
DEFROST



When DEFROST is selected:

- The Recirc request button is disabled. The air inlet door actuator positions the air inlet door to admit only outside air into the passenger compartment.
- The defrost door actuator positions the defrost door in the open position and the panel door, floor door, and cold air bypass door actuators position the panel door, floor door, and cold air bypass door in the closed position, directing airflow to the windshield defroster ducts and the side window demisters. A small amount of airflow from the outboard instrument panel A/C registers will be present.
- The dual coolant control valve is automatically controlled by the DATC module based on the temperature settings.
- The A/C request button is disabled. To reduce fogging, the A/C compressor will operate if the outside air temperature is above approximately 2°C (35°F).
- The blower motor is on.

Climate Control System Electrical Components—Directly Linked to DATC Module

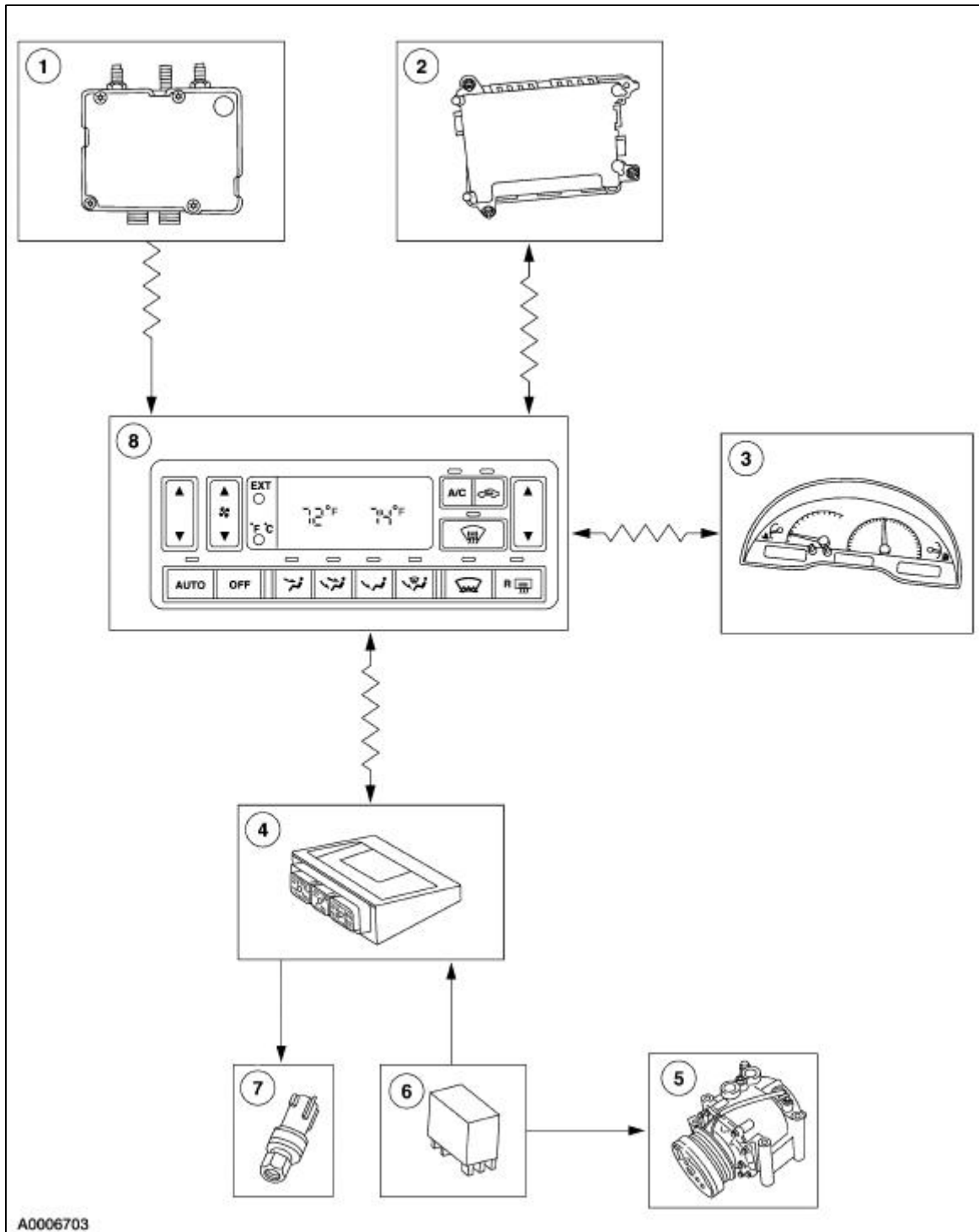


A0004773

Item	Part Number	Description
1	12A647	Ambient air temperature sensor
2	19C734	In-vehicle temperature control sensor
3	19E663	Dual sunload sensor
4	19E616	Panel door actuator
5	14N089	Blower motor ignition relay
6	19E624	Blower motor speed control
7	19805	Blower motor
7	18504	Blower wheel (not serviced with motor)
8	19E616	Air inlet door actuator
9	19E616	Cold air bypass door actuator
10	19C734	Passenger air discharge temperature sensor
11	19C734	Evaporator discharge air temperature sensor
12	19E616	Floor door actuator
13	14N089	Heated wiper park relay
14	19E616	Defrost door actuator

15	19C734	Driver air discharge temperature sensor
16	14N089	Electric water pump relay
17	18495	Dual coolant control valve
18	19980	Dual automatic temperature control module

Climate Control System Components — J1850 Communications Network (SCP) Linked



A0006703




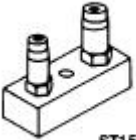


Item	Part Number	Description
1	2C219	ABS module

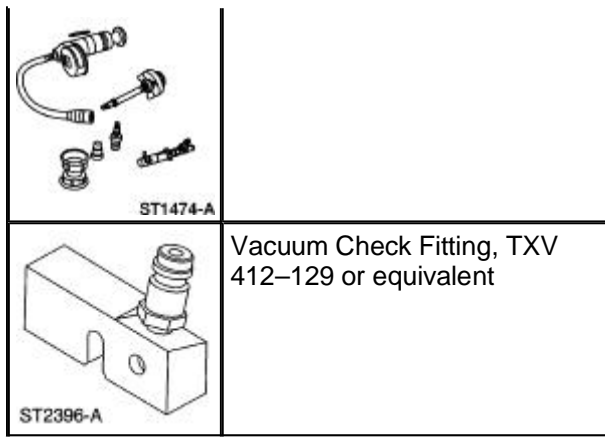
2	24994	Rear electronic module (REM)
3	10849	Instrument cluster module
4	12A696	Powertrain control module
5	19703	A/C compressor
6	14N089	A/C clutch relay
7	19D594	A/C pressure transducer
8	19980	Dual automatic temperature control module

Climate Control System

Refer to Wiring Diagrams Section [412-00](#) for schematic and connector information.

Special Tool(s)

 ST2332-A	Worldwide Diagnostic System (WDS) 418-224, New Generation STAR (NGS) Tester 418-F052, or equivalent scan tool
 ST1137-A	Fluke 77 III Automotive Meter 105-R0056 or equivalent
 ST1928-A	R-134a Manifold Gauge Set 176-R032A or equivalent
 ST1501-A	A/C Pressure Test Adapter 412-093 (T94P-19623-E)
 ST1252-A	Set, A/C Fittings 412-DS028 (014-00333, D93L-19703B) or equivalent
 ST2351-A	Refrigerant Leak Detector 216-00001 or equivalent
	Pressure Test Kit 014-R1072 or equivalent



Inspection and Verification

1. Verify the customer's concern by operating the climate control system to duplicate the condition.
2. Inspect to determine if one of the following mechanical or electrical concerns apply:

Visual Inspection Chart

Mechanical	Electrical
<ul style="list-style-type: none"> ● Loose, missing or damaged A/C compressor drive belt ● Loose or disconnected A/C clutch ● Broken or leaking refrigerant lines ● Obstructed in-vehicle temperature sensor ● Disconnected in-vehicle temperature aspirator hose ● A/C registers are not working (open/close) ● Front floor ducts not in place ● Incorrectly installed in-vehicle temperature sensor ● Incorrectly installed ambient air temperature sensor 	<ul style="list-style-type: none"> ● Fuse(s) ● Blower motor inoperative ● A/C compressor inoperative ● Circuit short/open. ● Disconnected, loose fitting, or incorrectly installed electrical connectors and pins ● Cooling fan inoperative ● Relays not functional or not installed

3. As pinpoint tests and measurements are being performed, be sure to inspect for any disconnected, loose fitting, or incorrectly installed component, module and in-line electrical connectors and pins.
4. If the inspection reveals obvious concerns that can be readily identified, repair as necessary.
5. If the concern remains after the inspection, connect the scan tool to the data link connector (DLC) located beneath the instrument panel and select the vehicle to be tested from the scan tool menu. If the vehicle selection cannot be entered:
 - check that the program card is correctly installed.
 - check the connections to the vehicle.
 - check the ignition switch position.
 - check that the battery voltage is greater than 9V.

If the scan tool still does not allow the vehicle selection to be entered, refer to the scan tool manual.

6. Carry out the Data Link Diagnostic Test using the scan tool. If the scan tool responds with:
 - CKT 914 and CKT 915 = ALL MODULE NO RESPONSE/NOT EQUIPPED, go to Module Communication Network Diagnostics in [Section 418-00](#) to diagnose the network concern.
 - If the powertrain control module (PCM) is not listed for a communication concern, turn the A/C controls to OFF and execute the self-test diagnostics for the PCM.
 - If the DATC module is not listed for a communication concern, execute the self-test diagnostics for the DATC module.
7. If any PCM or DATC DTCs are retrieved, and are related to the concern, go to the Powertrain Control Module Diagnostic Trouble Code (DTC) Index or the Dual Automatic Temperature Control (DATC) Module Diagnostic Trouble Code (DTC) Index in this section to continue the diagnostics.
8. If no DTCs related to the concern are retrieved, GO to [Symptom Chart](#) to continue the diagnostics.
9. If the DATC module cannot be accessed by the scan tool, [Go To Pinpoint Test A](#).

Dual Electronic Automatic Temperature Control (DATC) Module Diagnostic Trouble Codes—DTCs

If using the scan tool or front panel diagnostics to check for DATC DTCs:

1. Check continuous DTCs.
2. Run DATC self-test. Refer to Front Panel DATC Self-Test (On-demand Diagnostic Trouble Codes — DTCs).

General information:

- If the DTC is continuous only and does not appear in the self-test, this indicates an intermittent fault condition, such as a poor wiring connection or a loose terminal. If the DATC does not appear after running the self-test it may also indicate that the DTC may no longer exist.
- If the DTC is continuous and appears in the self-test, this indicates a hard fault. A hard fault suggests a permanent wiring failure, disconnected connector or component failure.

Front Panel DATC Module Self-Test (On-demand Diagnostic Trouble Codes—DTCs)

On-demand DTCs are those that are reported by an ECU when a failure is detected while executing a diagnostic test. For the DATC module this means that all faults (hard) that occur while the module is conducting a self-test shall be reported as an on-demand DTC.

- The DATC module self-test will not detect concerns associated with data link messages such as engine coolant temperature or vehicle speed signals. The scan tool must be used to retrieve these concerns.
- The vehicle interior temperature should be between 0-32°C (32-90°F) when carrying out the self-test. If the temperatures are not within the specified ranges, false temperature sensor DTCs may be displayed.

The DATC module self-test through the front panel display:

- can be initiated at any time. Normal operation of the system stops when the self-test is activated.
- is entered by pressing the OFF and FLOOR buttons simultaneously and then pressing the AUTO button within two seconds. The display will show counts of 1 to 25 in the center of the

display window. Record all DTCs displayed.

- concludes by reporting all on-demand DTCs. Follow the diagnostics procedure given under ACTION in the DTC index for each DTC given.
- reports individual on-demand DTCs as four-digit DTCs (less the alpha character).
- will calibrate all the mode doors and check all analog inputs. The DATC module will only report on-demand (hard) faults that occurred while the DATC module was conducting its self-test.
- will light all control panel display segments if no faults are detected.
- will report individual on-demand DTCs without the °C symbol lit.

To exit the self-test, press any button. This will clear all on-demand codes from the DATC module memory. If no button is pushed DTCs will continue to be displayed.

Upon exit from the self-test the DATC module returns to operational status. The DATC module executes a hard (cold boot) reset which places the DATC system in the OFF mode.

If a condition exists but no DTCs appear during the self-test, GO to [Symptom Chart](#) Condition: The DATC System Is Inoperative, Intermittent or Incorrect Operation.

Always exit the self-test before powering the system down (system turned OFF).

Front Panel DATC Module Display—Retrieve Continuous Diagnostic Trouble Codes (DTCs)

Continuous DTCs are fault codes recorded by the DATC module which have occurred during normal operation. For the DATC module this means that all faults (intermittent or hard) that occur while the module is in an operational state shall be reported as a continuous DTC.

- To retrieve continuous DTCs, press the OFF and PANEL buttons simultaneously, followed by pressing the AUTO button within two seconds.
- The DATC module will report all continuous DTCs to the vacuum fluorescent (VF) display.
- The DATC module will not carry out a self-test; it will only display continuous faults codes which are stored in memory.
- All VF display segments will light if no faults are detected.
- Individual continuous DTCs will be reported with the °C symbol lit.
- DTCs shall be reported as a four-digit DTC (less the alpha character).
- Pressing the front defrost button will exit the retrieve continuous DTCs mode and clear all continuous DTCs from DATC module memory.
- Pressing any other button (other than DEFROST) will exit the retrieve continuous DTCs mode and maintain all continuous DTCs in DATC module memory.
- Upon exit from the retrieve continuous DTCs mode the DATC module returns to operational status. The DATC module executes a hard (cold boot) reset which places the DATC system in the OFF mode.

Diagnostic Trouble Code Index

Powertrain Control Module (PCM) Diagnostic Trouble Code (DTC) Index

DTC	Description	Action
P1460	WOT A/C cutout internal driver malfunction	REFER to the Powertrain Control/Emissions Diagnosis (PC/ED) manual.
P1461	A/C pressure sensor circuit high input	REFER to the Powertrain Control/Emissions Diagnosis (PC/ED) manual.

P1462	A/C pressure sensor circuit low input	REFER to the Powertrain Control/Emissions Diagnosis (PC/ED) manual.
P1463	A/C pressure sensor insufficient pressure variation	REFER to the Powertrain Control/Emissions Diagnosis (PC/ED) manual.
P1469	Low A/C cycling period	REFER to the Powertrain Control/Emissions Diagnosis (PC/ED) manual.
P1474	Low speed fan internal driver failure	REFER to the Powertrain Control/Emissions Diagnosis (PC/ED) manual.
P1479	High speed fan internal driver failure	REFER to the Powertrain Control/Emissions Diagnosis (PC/ED) manual.
P1464	A/C demand out of self-test range	REFER to the Powertrain Control/Emissions Diagnosis (PC/ED) manual.

Dual Electronic Automatic Temperature Control (DATC) Module Diagnostic Trouble Code (DTC) Index

DTC	Run-Time (Intermittent) Faults or Self-Test (Hard) Faults	Description	Action to Take
B1242	1242	Recirculation door actuator circuit failure	Go To Pinpoint Test C .
B1251	1251	In-vehicle temperature sensor circuit open	Go To Pinpoint Test D .
B1253	1253	In-vehicle temperature sensor circuit short to ground	Go To Pinpoint Test D .
B1255	1255	Ambient air temperature sensor open	Go To Pinpoint Test F .
B1257	1257	Ambient air temperature sensor short to ground	Go To Pinpoint Test F .
B1259	1259	A/C solar radiation sensor open circuit	Go To Pinpoint Test G .
B1261	1261	A/C solar radiation sensor circuit short to ground	Go To Pinpoint Test G .
B1262	1262	Defrost door actuator circuit failure	Go To Pinpoint Test C .
B1263	1263	Panel door actuator circuit failure	Go To Pinpoint Test C .
B1264	1264	Floor door actuator circuit failure	Go To Pinpoint Test C .
B1265	1265	Cold air bypass door actuator circuit failure	Go To Pinpoint Test C .
B1342	1342	ECU defective	INSTALL a new DATC module.
B1676	1676	Battery voltage out of range	REFER to Section 414-00 .
B1946	1946	Evaporator discharge temperature sensor open circuit	Go To Pinpoint Test E .
B1947	1947	Evaporator discharge temperature sensor circuit	Go To Pinpoint Test E .

		short to ground	
B1966	1966	Driver heater core discharge temperature sensor open circuit	Go To Pinpoint Test E .
B1967	1967	Driver heater core discharge temperature sensor short circuit	Go To Pinpoint Test E .
B2428	2428	Passenger heater core discharge temperature sensor open circuit	Go To Pinpoint Test E .
B2429	2429	Passenger heater core discharge temperature sensor short circuit	Go To Pinpoint Test E .
B2477	2477	Module configuration failure	RECONFIGURE the DATC module. REFER to Section 418-01 .
U1041	5041	SCP invalid or missing data for function read vehicle speed	REFER to the Powertrain Control/Emissions Diagnosis (PC/ED) manual.
U1073	5073	SCP invalid or missing data for engine coolant	REFER to the Powertrain Control/Emissions Diagnosis (PC/ED) manual.
U1027	5027	SCP invalid or missing data for engine rpm	REFER to the Powertrain Control/Emissions Diagnosis (PC/ED) manual.
U1178	5178	SCP invalid or missing data for voice command	This code will only appear if the vehicle is equipped with voice command.
U1222	5222	SCP invalid or missing data for interior lamps	REFER to Section 417-02 .

Symptom Chart

Symptom Chart


Condition	Possible Sources	Action
<ul style="list-style-type: none"> No communication with the dual automatic temperature control (DATC) module 	<ul style="list-style-type: none"> Fuse. Circuitry. DATC module communication network. DATC module not connected. 	<ul style="list-style-type: none"> Go To Pinpoint Test A .
<ul style="list-style-type: none"> The DATC system is inoperative, intermittent or incorrectly operating 	<ul style="list-style-type: none"> Circuitry. Input sensors or erratic input signals. Charging system. In car temperature control sensor hose and elbow (No aspiration). Air trapped in heater coolant circuits. 	<ul style="list-style-type: none"> Go To Pinpoint Test B .

	<ul style="list-style-type: none"> ● Missing or invalid SCP messages. 	
<ul style="list-style-type: none"> ● Incorrect/erratic direction of airflow from outlets 	<ul style="list-style-type: none"> ● Circuitry. ● Door actuator. ● Airflow door binding or stuck. ● DATC module. ● Door actuator arm not connected to the door crank. 	<ul style="list-style-type: none"> ● Go To Pinpoint Test C.
<ul style="list-style-type: none"> ● Insufficient, erratic, or no heat 	<ul style="list-style-type: none"> ● Circuitry. ● Low engine coolant level. ● Air trapped in heater coolant circuit. ● Plugged or partially plugged heater core. ● Bypass door actuator binding or stuck open. ● Coolant control valve. ● DATC module. 	<ul style="list-style-type: none"> ● Go To Pinpoint Test H.
<ul style="list-style-type: none"> ● Insufficient heat during engine idle 	<ul style="list-style-type: none"> ● Low engine coolant level. ● Cold engine. ● Bypass door actuator binding or stuck. ● Auxiliary coolant pump (V8 only). ● Engine coolant thermostat. 	<ul style="list-style-type: none"> ● Go To Pinpoint Test L.
<ul style="list-style-type: none"> ● Full heat only in all modes 	<ul style="list-style-type: none"> ● Fuse(s). ● Circuitry. ● Coolant control valve. ● DATC module. 	<ul style="list-style-type: none"> ● Go To Pinpoint Test J.
<ul style="list-style-type: none"> ● The dual temperature control is inoperative/does not operate correctly 	<ul style="list-style-type: none"> ● Circuitry. ● DATC module configuration. ● DATC module. ● Coolant control valve. ● Low coolant level. ● Air trapped in coolant circuit. ● Incorrect heater hose connections. ● Air temperature sensors. 	<ul style="list-style-type: none"> ● Go To Pinpoint Test K.
<ul style="list-style-type: none"> ● The air conditioning (A/C) is inoperative/does not operate correctly 	<ul style="list-style-type: none"> ● Fuse(s). ● Circuitry. ● A/C clutch relay. ● Evaporator discharge temperature sensor. ● A/C system discharged or low charge. ● A/C pressure transducer. 	<ul style="list-style-type: none"> ● Go To Pinpoint Test L.

	<ul style="list-style-type: none"> ● DATC module. ● PCM. 	
<ul style="list-style-type: none"> ● The air conditioning (A/C) is always on 	<ul style="list-style-type: none"> ● Circuitry. ● A/C control. ● A/C clutch relay. ● Evaporator air discharge sensor. ● DATC module. ● PCM 	<ul style="list-style-type: none"> ● Go To Pinpoint Test M.
<ul style="list-style-type: none"> ● The blower motor is inoperative 	<ul style="list-style-type: none"> ● Circuitry. ● Blower motor. ● Blower motor speed control. ● Blower motor relay. ● DATC module. 	<ul style="list-style-type: none"> ● Go To Pinpoint Test N.
<ul style="list-style-type: none"> ● The blower motor does not operate correctly 	<ul style="list-style-type: none"> ● Blower motor speed control. ● DATC module. ● Circuitry. 	<ul style="list-style-type: none"> ● Go To Pinpoint Test O.
<ul style="list-style-type: none"> ● The temperature set point does not repeat after turning the ignition switch off 	<ul style="list-style-type: none"> ● Fuse. ● Circuitry. ● DATC module. 	<ul style="list-style-type: none"> ● Go To Pinpoint Test P.
<ul style="list-style-type: none"> ● The temperature display will not switch between Celsius and Fahrenheit 	<ul style="list-style-type: none"> ● DATC module. 	<ul style="list-style-type: none"> ● INSTALL a new DATC module. REFER to Section 412-04 . TEST the system for normal operation.
<ul style="list-style-type: none"> ● The exterior temperature display does not function correctly 	<ul style="list-style-type: none"> ● Circuitry. ● DATC module. ● Ambient temperature sensor. ● Ambient temperature sensor mounting. ● Missing or invalid vehicle speed SCP signal. 	<ul style="list-style-type: none"> ● Go To Pinpoint Test Q.

Pinpoint Tests

PINPOINT TEST A: NO COMMUNICATION WITH THE DUAL AUTOMATIC TEMPERATURE CONTROL (DATC) MODULE

CONDITIONS	DETAILS/RESULTS/ACTIONS
A1 CHECK THE CJB FUSE 220 (10A)	
<p>1</p> 	<p>2 Turn the headlights on.</p>

● Does the DATC backlighting come on?

→ Yes
GO to [A2](#).

→ No
INSTALL a new fuse. TEST the system for normal operation.

A2 CHECK THE CJB FUSE 214 (10A)

1



● Does the vacuum fluorescent (VF) display and indicators come on when DATC buttons are pushed?

→ Yes
GO to [A3](#).

→ No
INSTALL a new fuse. TEST the system for normal operation.

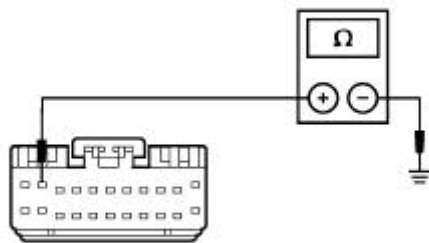
A3 CHECK CIRCUIT 31-FA10 (BK) FOR AN OPEN

1



DATC Module C228a

2



A0002036

2 Measure the resistance between DATC module C228a pin 2, circuit 31-FA10 (BK), harness side and ground.

● Is the resistance less than 5 ohms?

→ Yes
GO to [A4](#).

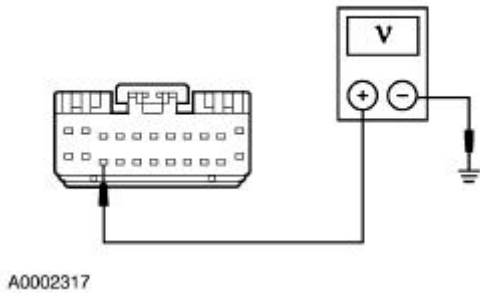
→ No
REPAIR circuit 31-FA10 (BK). TEST the system for normal operation.

A4 CHECK CIRCUIT 29-FA10 (OG/GN) FOR VOLTAGE

1



2



2 Measure the voltage between DATC module C228a pin 14, circuit 29-FA10 (OG/GN), harness side and ground.

● Is the voltage greater than 10 volts?

→ **Yes**
GO to [A5](#).

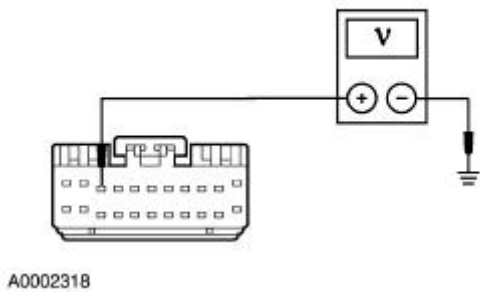
→ **No**
REPAIR circuit 29-FA10 (OG/GN). TEST the system for normal operation.

A5 CHECK CIRCUIT 20-FA10 (PK/OG) FOR VOLTAGE

1



2




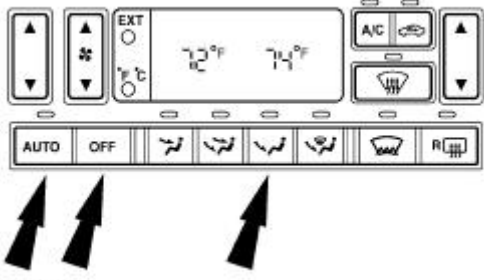

2 Measure the voltage between DATC module C228a pin 3, circuit 20-FA10 (PK/OG), harness side and ground.

● Is the voltage greater than 10 volts?

→ **Yes**
REFER to [Section 418-00](#) to diagnose the network concern.

→ **No**
REPAIR circuit 20-FA10 (PK/OG). TEST the system for normal operation.

PINPOINT TEST B: THE DATC SYSTEM IS INOPERATIVE, INTERMITTENT OR INCORRECT OPERATION

CONDITIONS	DETAILS/RESULTS/ACTIONS
B1 REQUEST CONTINUOUS CODES AND CARRY OUT THE DATC MODULE SELF-TEST	
<p>1</p>  <p>2</p>  <p>A0002319</p>	<p>2</p> <p>Carry out the DATC module self-test and retrieve continuous DTCs. Record the DTCs displayed, if any.</p> <ul style="list-style-type: none"> • Are any DTCs displayed? <p>→ Yes REFER to the DATC Module Diagnostic Trouble Code (DTC) Index. CARRY OUT the necessary diagnosis and REPAIR as necessary.</p> <p>→ No GO to B2.</p>
B2 CHECK THE DISPLAY	
NOTE: If after the self-test there are no DTCs, the DATC will display ALL segments.	
<p>1</p>  <p>A0002401</p>	<p>1</p> <p>Observe the function symbols displayed.</p> <ul style="list-style-type: none"> • Is the display correct and complete without any missing elements? <p>→ Yes EXIT the self-test by pressing any button. GO to B3.</p>

→ **No**
INSTALL a new DATC module. REFER to [Section 412-04](#) . TEST the system for normal operation.

B3 VERIFY AUTOMATIC OPERATION

1



2



A0002320

2 Press the AUTO button.

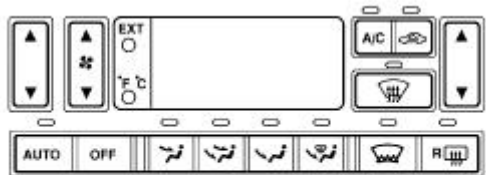
- Does the indicator above the AUTO button illuminate and the selected temperature for both the driver and passenger appear in the display window?

→ **Yes**
GO to [B4](#) .

→ **No**
INSTALL a new DATC module. REFER to [Section 412-04](#) . TEST the system for normal operation.

B4 CHECK THE OFF POSITION

2



A0003980

1 Make sure the A/C system is operating and the blower motor is running.

2 Press the OFF button.

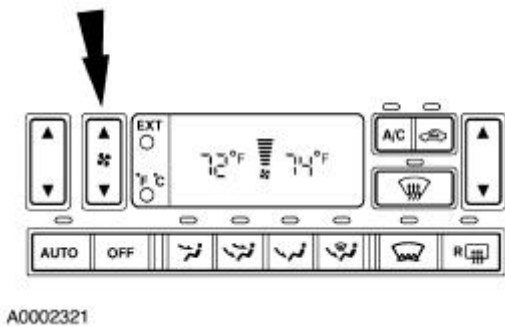
- Does the temperature set point display turn off or revert to the external temperature, do all indicator lights turn off, and the

blower motor turn off?

- **Yes**
GO to [B5](#).
- **No**
If the indicator lights do not turn off, INSTALL a new DATC module. REFER to [Section 412-04](#). If the blower motor does not turn off, [Go To Pinpoint Test Q](#).

B5 CHECK THE BLOWER SPEED MANUAL OVERRIDE OPERATION

1



1

Press the blower motor speed override control fully up and down.

- **Does the blower motor vary from high to low speed and does the bar graph display vary with the blower speed?**

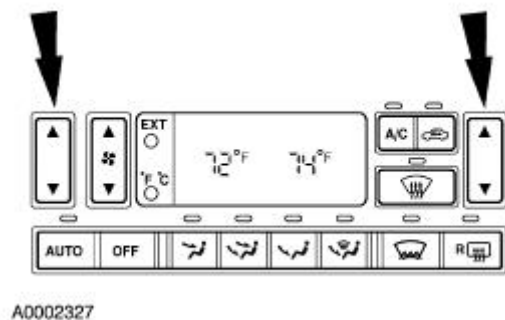
- **Yes**
GO to [B6](#).
- **No**
[Go To Pinpoint Test O](#).

B6 CHECK THE TEMPERATURE SET SWITCHES

NOTE: When carrying out this pinpoint test step, allow time for the system to respond.

NOTE: The passenger temperature select is inoperative when the driver setpoint is 16°C (60°F) or 32°C (90°F).

1



1

With the engine at operating temperature, select PANEL mode. Press the driver and passenger temperature set buttons for warmer and cooler temperatures.

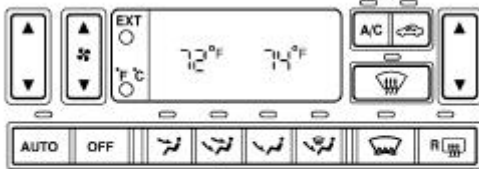
- **Does each temperature display vary and does each air temperature vary as higher and lower temperatures are selected?**

→ **Yes**
GO to [B7](#).

→ **No**
[Go To Pinpoint Test H.](#)

B7 VERIFY THE PANEL FLOOR MODE SWITCH.

1



A0002402

1 Press the panel floor override button.

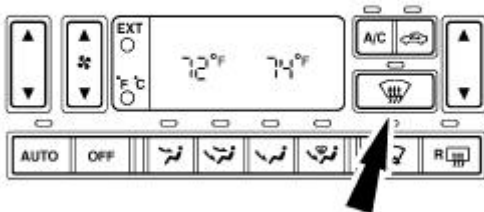
- Does the indicator light above the button illuminate and is air discharged from both the panel and floor ducts?

→ **Yes**
GO to [B8](#).

→ **No**
If indicator does not turn on, INSTALL a new DATC module. REFER to [Section 412-04](#). TEST the system for normal operation. If airflow is not correct, [Go To Pinpoint Test C.](#)

B8 VERIFY THE FRONT DEFROST OVERRIDE OPERATION

1



A0002322

1 Press the override button for front defrost operation.

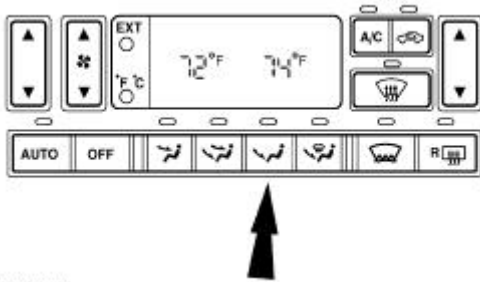
- Does the indicator light above the button illuminate and is air being discharged from the windshield defroster nozzle and the side window demisters?

→ **Yes**
GO to [B9](#).

→ **No**
If indicator does not turn on, INSTALL a new DATC module. REFER to [Section 412-04](#). TEST the system for normal operation. If airflow is not correct, [Go To Pinpoint Test C](#).

B9 VERIFY THE FLOOR OVERRIDE OPERATION

1



A0002323

1 Press the override button for floor operation.

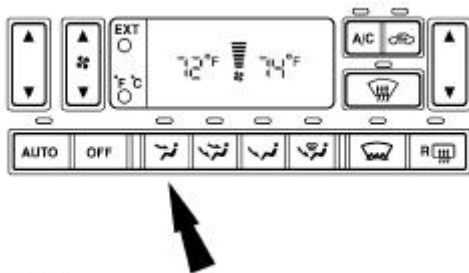
- Does the indicator light above the button illuminate and is air being discharged from the floor duct?

→ **Yes**
GO to [B10](#).

→ **No**
If indicator does not turn on, INSTALL a new DATC module. REFER to [Section 412-04](#). TEST the system for normal operation. If airflow is not correct, [Go To Pinpoint Test C](#).

B10 VERIFY THE PANEL OVERRIDE OPERATION

1



A0002324

1 Press the override button for panel operation.

- Does the indicator light above the button illuminate and is air being discharged from the instrument panel registers and the rear seat A/C register?

→ **Yes**
GO to [B11](#).

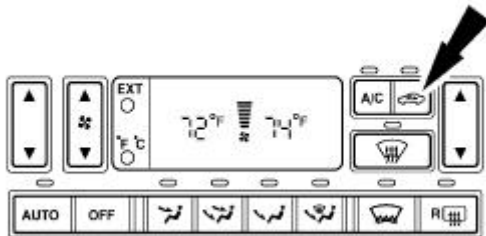
→ **No**

If indicator does not turn on, INSTALL a new DATC module. REFER to [Section 412-04](#). TEST the system for normal operation. If airflow is not correct, [Go To Pinpoint Test C](#).

B11 VERIFY RECIRC OPERATION

NOTE: Recirc does not operate in floor/defrost or defrost modes.

1



A0003981

1

With panel override selected, press the override button for recirc operation.

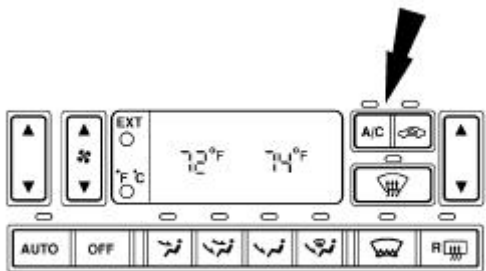
- Does the indicator light above the button illuminate and does the recirc door move to the alternate position?

→ **Yes**
GO to [B12](#).

→ **No**
If the indicator does not turn on, INSTALL a new DATC module. REFER to [Section 412-04](#). TEST the system for normal operation. If airflow is not correct, [Go To Pinpoint Test C](#).

B12 VERIFY A/C CLUTCH ENGAGEMENT AND DISENGAGEMENT IN THE A/C MODE

1



A0002325

1

With the engine running and panel override selected, press the override button for A/C operation.

- Does the indicator light above the button turn on or off and does the A/C clutch engage or disengage when the A/C override button is pressed?

→ **Yes**
GO to [B13](#).

→ **No**
[Go To Pinpoint Test L.](#)

B13 VERIFY HEATED WIPER PARK OPERATION

1



A0003962

1 With the engine running, press the heated wiper park button.

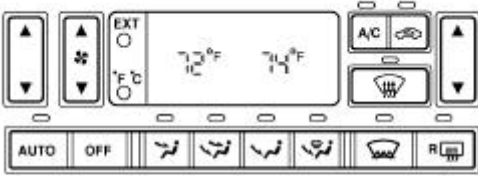
- Does the indicator light above the button illuminate and does the wiper rest relay engage?

→ **Yes**
GO to [B14.](#)

→ **No**
REFER to [Section 501-11.](#)

B14 VERIFY REAR DEFROST OPERATION

1



A0002326

1 With the engine running, press the rear defrost button.

- Does the indicator illuminate and does the rear window defrost?

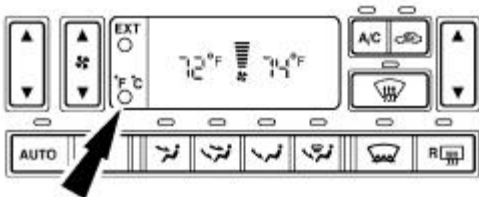
→ **Yes**
GO to [B15.](#)

→ **No**
REFER to [Section 501-11.](#)

B15 VERIFY °F °C OPERATION

1

1 Repeatedly press the °F °C button.



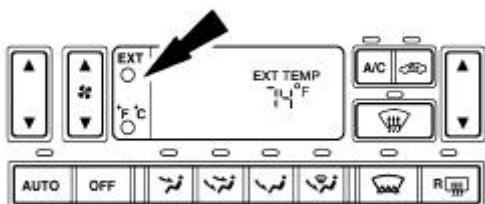
A0003983

- Does the display alternate between °F to °C or °C to °F as the button is pressed?

- **Yes**
GO to [B16](#).
- **No**
INSTALL a new DATC module. REFER to [Section 412-04](#). TEST the system for normal operation.

B16 VERIFY EXT BUTTON OPERATION

1



A0006071

- 1 Press the EXT button.

- Does the display alternate between external air temperature and the set point displays?

- **Yes**
GO to [B17](#).
- **No**
[Go To Pinpoint Test Q](#).

B17 RECHECK DATC MODULE CONFIGURATION

2





PID CNFG Data

- 1 Enter Module Identification mode.
- 2 Read PID CNFG data 1.

	<ul style="list-style-type: none"> ● Does the data read 4N_3N_2Y? <p>→ Yes The test is complete. The system is functioning normally.</p> <p>→ No RECONFIGURE the DATC module. REFER to Section 418-01.</p>
--	--

PINPOINT TEST C: INCORRECT/ERRATIC DIRECTION OF AIRFLOW FROM OUTLETS

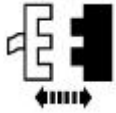
CONDITIONS	DETAILS/RESULTS/ACTIONS
C1 REQUEST CONTINUOUS DTCs AND CARRY OUT THE DATC SELF-TEST	
<p>1</p> 	<p>2 Request Continuous DTCs and carry out the DATC Module Self-Test. Record the DTCs displayed, if any.</p> <ul style="list-style-type: none"> ● Were any DTCs displayed? <p>→ Yes Record any DTCs displayed. GO to C3.</p> <p>→ No GO to C2.</p>
C2 CHECK THE ACTUATOR DOOR AND LINKAGE	
	<p>1 Inspect the actuator door and linkage for a binding or sticking condition.</p> <ul style="list-style-type: none"> ● Was a condition found? <p>→ Yes REPAIR the door or linkage. REFER to Section 412-02. TEST the system for normal operation.</p> <p>→ No INSTALL a new DATC module. REFER to Section 412-04. TEST the system for normal operation.</p>
C3 CHECK THE DOOR ACTUATOR OPEN OPERATION	
<p>1</p> 	

2



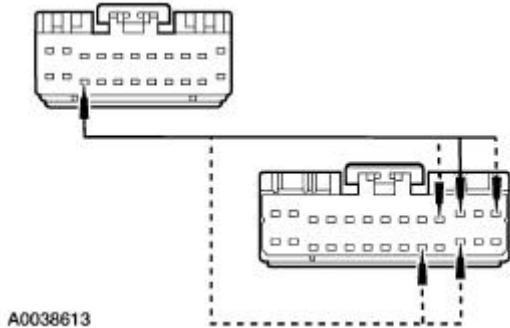
DATC Module C228a

3



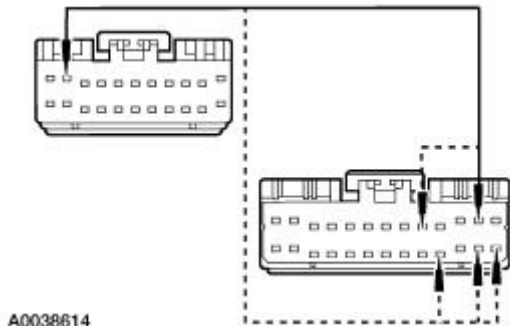
DATC Module C228b

4



A0038613

5



A0038614

4

Connect a fused jumper wire between DATC module C228a pin 14, circuit 29-FA10 (OG/GN), harness side and harness side of the connector/pin indicated below that corresponds to the recorded DTC(s).

DTC	Pin	Circuit	Actuator/ Door
B1265	C228b-11	32-FB2 (WH/RD)	Cold Air Bypass
B1242	C228b-10	32-FB8 (WH/RD)	Air Recirculation
B1262	C228b-13	32-FB5 (WH/BK)	Defrost
B1263	C228b-24	32-FB7 (WH)	Panel Mode
B1264	C228b-22	32-FB6 (WH/VT)	Floor Mode

5

Connect a fused jumper wire between DATC module C228a pin 2, circuit 31-FA10 (BK), harness side and harness side of the connector/pin indicated below that corresponds to the recorded DTC(s).

DTC	Pin	Circuit	Actuator/ Door
B1265	C228b-12	33-FB2 (YE/RD)	Cold Air Bypass
B1242	C228b-9	33-FB8 (YE/RD)	Air Recirculation
B1262	C228b-26	33-FB5 (YE/BK)	Defrost
B1263	C228b-25	33-FB7 (YE)	Panel Mode
B1264	C228b-23	33-FB6 (YE/VT)	Floor Mode

- Does the actuator motor move in the open direction?

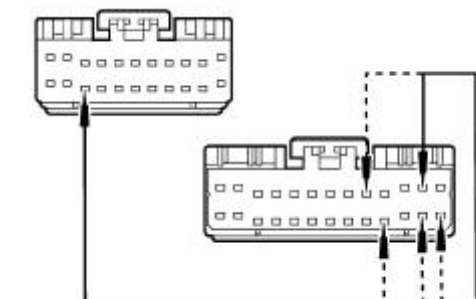
→ Yes

GO to [C4](#).

→ **No**
GO to [C5](#).

C4 CHECK THE DOOR ACTUATOR CLOSE OPERATION

1



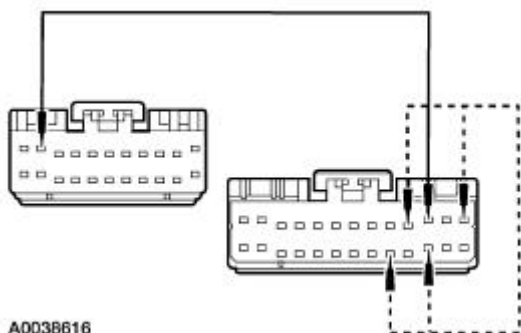
A0038615

1

Connect a fused jumper wire between DATC module C228a pin 14, circuit 29-FA10 (OG/GN), harness side and harness side of the connector/pin indicated below that corresponds to the recorded DTC(s).

DTC	Pin	Circuit	Actuator/Door
B1265	C228b-12	33-FB2 (YE/RD)	Cold Air Bypass
B1242	C228b-9	33-FB8 (YE/RD)	Air Recirculation
B1262	C228b-26	33-FB5 (YE/BK)	Defrost
B1263	C228b-25	33-FB7 (YE)	Panel Mode
B1264	C228b-23	33-FB6 (YE/VT)	Floor Mode

2



A0038616

2

Connect a fused jumper wire between DATC module C228a pin 2, circuit 31-FA10 (BK), harness side and harness side of the connector/pin indicated below that corresponds to the recorded DTC(s).

DTC	Pin	Circuit	Actuator/Door
B1265	C228b-11	32-FB2 (WH/RD)	Cold Air Bypass
B1242	C228b-10	32-FB8 (WH/RD)	Air Recirculation
B1262	C228b-13	32-FB5 (WH/BK)	Defrost
B1263	C228b-24	32-FB7 (WH)	Panel Mode
B1264	C228b-22	32-FB6 (WH/VT)	Floor Mode

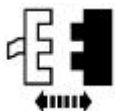
- Does the actuator motor move in the closed direction?

→ **Yes**
GO to [C11](#).

→ **No**
GO to [C5](#).

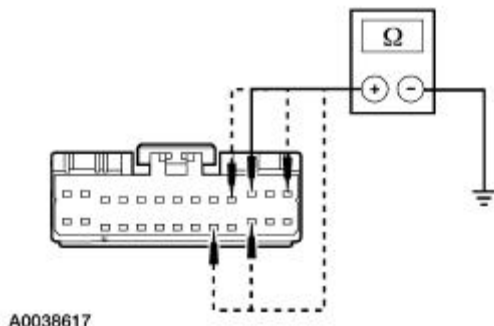
C5 CHECK ACTUATOR MOTOR OPEN CIRCUIT FOR A SHORT TO GROUND

1



Affected Actuator

2



2

Measure the resistance between the harness side of the connector/pin indicated below that corresponds to the recorded DTC(s) and ground.

DTC	Pin	Circuit
B1265	C228b-11	32-FB2 (WH/RD)
B1242	C228b-10	32-FB8 (WH/RD)
B1262	C228b-13	32-FB5 (WH/BK)
B1263	C228b-24	32-FB7 (WH)
B1264	C228b-22	32-FB6 (WH/VT)

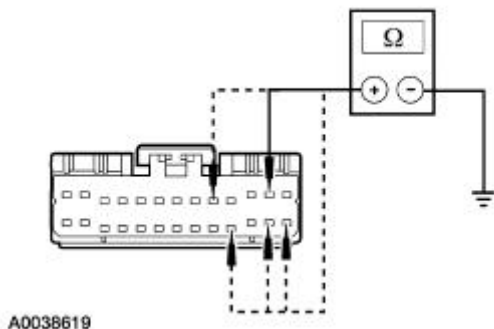
● Is the resistance greater than 10,000 ohms?

→ **Yes**
GO to [C6](#).

→ **No**
REPAIR the affected circuit for a short to ground. TEST the system for normal operation.

C6 CHECK ACTUATOR MOTOR CLOSE CIRCUIT FOR A SHORT TO GROUND

1



1

Measure the resistance between the harness side of the connector/pin indicated below that corresponds to the recorded DTC(s) and ground.

DTC	Pin	Circuit
B1265	C228b-12	33-FB2 (YE/RD)
B1242	C228b-9	33-FB8 (YE/RD)
B1262	C228b-26	33-FB5 (YE/BK)
B1263	C228b-25	33-FB7 (YE)
B1264	C228b-23	33-FB6 (YE/VT)

● Is the resistance greater than 10,000 ohms?

→ **Yes**
GO to [C7](#).

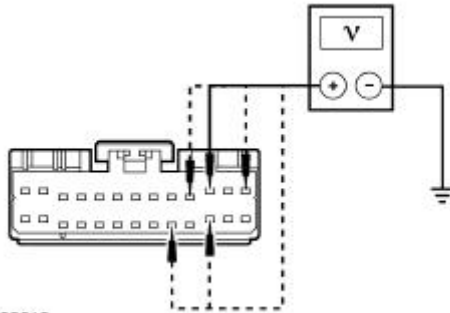
→ **No**
REPAIR the affected circuit for a short to ground. TEST the system for normal operation.

C7 CHECK ACTUATOR MOTOR OPEN CIRCUIT FOR A SHORT TO POWER

1



2



A0038618

2 Measure the voltage between the harness side of the connector/pin indicated below that corresponds to the recorded DTC(s) and ground.

DTC	Pin	Circuit
B1265	C228b-11	32-FB2 (WH/RD)
B1242	C228b-10	32-FB8 (WH/RD)
B1262	C228b-13	32-FB5 (WH/BK)
B1263	C228b-24	32-FB7 (WH)
B1264	C228b-22	32-FB6 (WH/VT)

● Is voltage present?

→ Yes

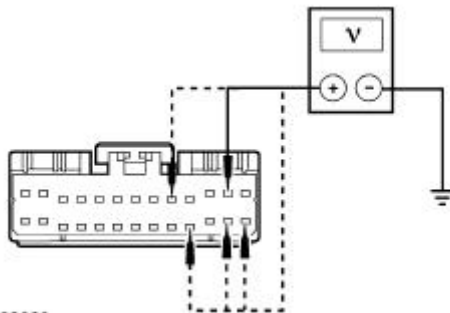
REPAIR the affected circuit for a short to power. TEST the system for normal operation.

→ No

GO to [C8](#).

C8 CHECK ACTUATOR MOTOR CLOSE CIRCUIT FOR A SHORT TO POWER

1



A0038620

1 Measure the voltage between the harness side of the connector/pin indicated below that corresponds to the recorded DTC(s) and ground.

DTC	Pin	Circuit
B1265	C228b-12	33-FB2 (YE/RD)
B1242	C228b-9	33-FB8 (YE/RD)
B1262	C228b-26	33-FB5 (YE/BK)
B1263	C228b-25	33-FB7 (YE)
B1264	C228b-23	33-FB6 (YE/VT)

● Is voltage present?

→ Yes

REPAIR the affected circuit for a short to power. TEST the system for normal operation.

→ No

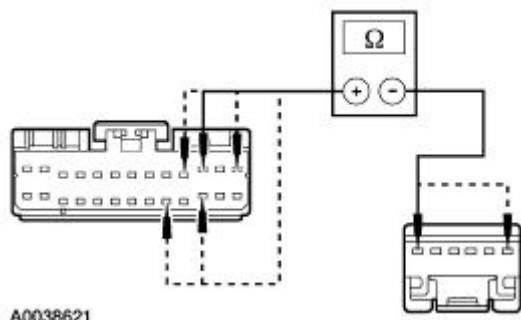
GO to [C9](#).

C9 CHECK ACTUATOR MOTOR OPEN CIRCUIT FOR AN OPEN

1



2



A0038621

2

Measure the resistance between the harness side of the connectors/pins indicated below that corresponds to the recorded DTC(s).

DTC	Pin	Circuit	Pin
B1265	C228b-11	32-FB2 (WH/RD)	C295-1
B1242	C228b-10	32-FB8 (WH/RD)	C289-6
B1262	C228b-13	32-FB5 (WH/BK)	C232-6
B1263	C228b-24	32-FB7 (WH)	C236-6
B1264	C228b-22	32-FB6 (WH/VT)	C234-1

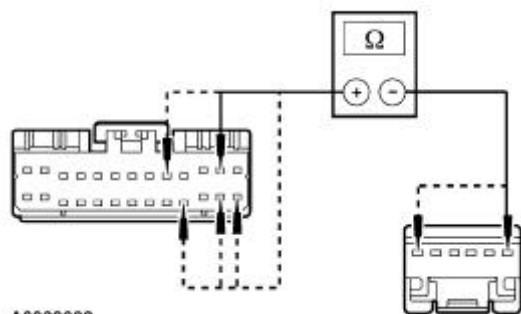
● Is the resistance less than 5 ohms?

→ **Yes**
GO to [C10](#).

→ **No**
REPAIR the affected circuit for an open.
TEST the system for normal operation.

C10 CHECK ACTUATOR MOTOR CLOSE CIRCUIT FOR AN OPEN

1



A0038622

1

Measure the resistance between the harness side of the connectors/pins indicated below that corresponds to the recorded DTC(s).

DTC	Pin	Circuit	Pin
B1265	C228b-12	33-FB2 (YE/RD)	C295-6
B1242	C228b-9	33-FB8 (YE/RD)	C289-1
B1262	C228b-26	33-FB5 (YE/BK)	C232-1
B1263	C228b-25	33-FB7 (YE)	C236-1
B1264	C228b-23	33-FB6 (YE/VT)	C234-6

● Is the resistance less than 5 ohms?

→ **Yes**
INSPECT for binding or stuck linkage/door. If no condition is found, INSTALL a new door

actuator. REFER to [Section 412-04](#). TEST the system for normal operation.

→ **No**
REPAIR the affected circuit for an open.
TEST the system for normal operation.

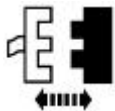
C11 CHECK THE FEEDBACK POTENTIOMETER TOTAL RESISTANCE

1



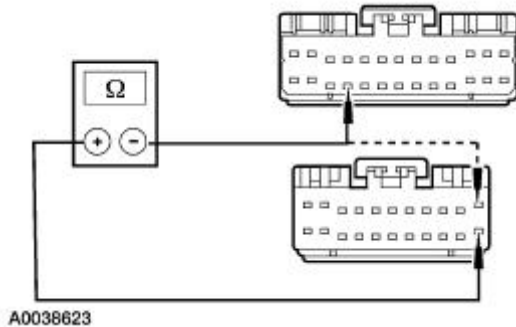
Affected Actuator

2



Actuators Not Affected

3



A0038623

3 Measure the resistance between the harness side of the connectors/pins indicated below that corresponds to the recorded DTC(s).

DTC	Pin	Circuit	Pin	Circuit
B1265	C228a-11	9-FA1 (BN)	C228a-22	7-FA1 (YE)
B1242	C228a-11	9-FA1 (BN)	C228a-22	7-FA1 (YE)
B1262	C228b-17	9-FA2 (BN/RD)	C228a-22	7-FA1 (YE)
B1263	C228b-17	9-FA2 (BN/RD)	C228a-22	7-FA1 (YE)
B1264	C228b-17	9-FA2 (BN/RD)	C228a-22	7-FA1 (YE)

● Is the resistance between 5,000 and 6,000 ohms?

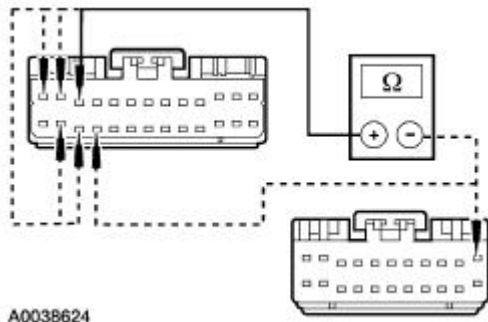
→ **Yes**
GO to [C12](#).

→ **No**
If the resistance is greater than 6,000 ohms, GO to [C14](#).
If the resistance is less than 5,000 ohms, GO to [C22](#).

C12 CHECK POTENTIOMETER LOW SIDE RESISTANCE

1

1 Measure the resistance between the harness side of the connectors/pins indicated below that corresponds to the recorded DTC(s).



A0038624

DTC	Pin	Circuit	Pin	Circuit
B1265	C228a-11	9-FA1 (BN)	C228b-2	8-FB2 (WH/RD)
B1242	C228a-11	9-FA1 (BN)	C228b-15	8-FB8 (WH/RD)
B1262	C228b-17	9-FA2 (BN/RD)	C228a-1	8-FB5 (WH/BK)
B1263	C228b-17	9-FA2 (BN/RD)	C228b-3	8-FB7 (WH)
B1264	C228b-17	9-FA2 (BN/RD)	C228b-16	8-FB6 (WH/VT)

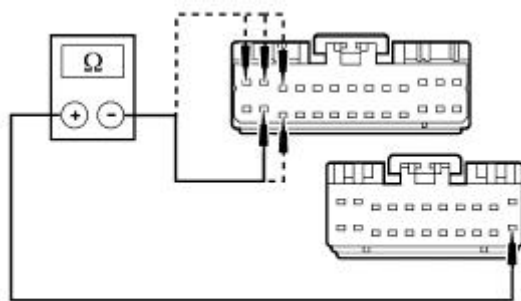
● Is the resistance between 250 and 5,250 ohms?

→ **Yes**
GO to [C13](#).

→ **No**
If the resistance is greater than 5,250 ohms, GO to [C15](#).
If the resistance is less than 250 ohms, GO to [C23](#).

C13 CHECK POTENTIOMETER HIGH SIDE RESISTANCE

1



A0038625

1

Measure the resistance between the harness side of the connectors/pins indicated below that corresponds to the recorded DTC(s).

DTC	Pin	Circuit	Pin	Circuit
B1265	C228a-22	7-FA1 (YE)	C228b-2	8-FB2 (WH/RD)
B1242	C228a-22	7-FA1 (YE)	C228b-15	8-FB8 (WH/RD)
B1262	C228b-22	7-FA1 (YE)	C228b-1	8-FB5 (WH/BK)
B1263	C228b-22	7-FA1 (YE)	C228b-3	8-FB7 (WH)
B1264	C228b-22	7-FA1 (YE)	C228b-16	8-FB6 (WH/VT)

● Is the resistance between 250 and 5,250 ohms?

→ **Yes**
GO to [C17](#).

→ **No**
If the resistance is greater than 5,250 ohms,
GO to [C14](#).
If the resistance is less than 250 ohms, GO to
[C24](#).

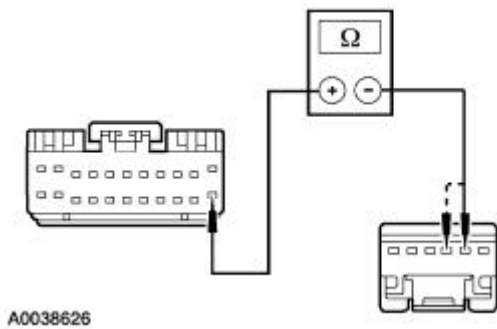
C14 CHECK THE ACTUATOR REFERENCE CIRCUIT FOR AN OPEN

1



Affected Actuator

2



2 Measure the resistance between the harness side of the connectors/pins indicated below that corresponds to the recorded DTC(s).

DTC	Pin	Circuit	Pin	Circuit
B1265	C228a-22	7-FA1 (YE)	C295-5	7-FB2 (YE/RD)
B1242	C228a-22	7-FA1 (YE)	C289-4	7-FB8 (YE/RD)
B1262	C228b-22	7-FA1 (YE)	C232-4	7-FB5 (YE/BK)
B1263	C228b-22	7-FA1 (YE)	C236-4	7-FB7 (YE)
B1264	C228b-22	7-FA1 (YE)	C234-5	7-FB6 (YE/VT)

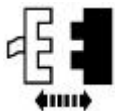
● **Is the resistance less than 5 ohms?**

→ **Yes**
GO to [C15](#).

→ **No**
REPAIR the affected circuit for an open.
TEST the system for normal operation.

C15 CHECK THE ACTUATOR RETURN CIRCUIT FOR AN OPEN

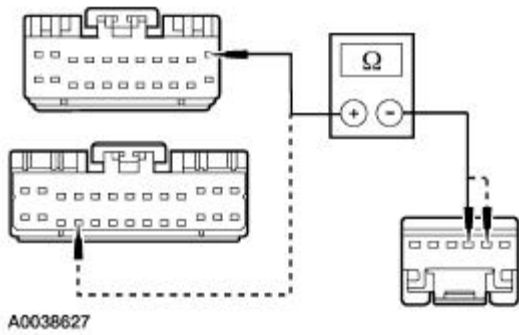
1



Affected Actuator

2

2 Measure the resistance between the harness side of the connectors/pins indicated below that corresponds to the recorded DTC(s).



A0038627

DTC	Pin	Circuit	Pin	Circuit
B1265	C228a-11	9-FA1 (BN)	C295-4	9-FB2 (BN/RD)
B1242	C228a-11	9-FA1 (BN)	C289-5	9-FB8 (BN/RD)
B1262	C228b-17	9-FA2 (BN/RD)	C232-5	9-FB5 (BN/YE)
B1263	C228b-17	9-FA2 (BN/RD)	C236-5	9-FB7 (BN)
B1264	C228b-17	9-FA2 (BN/RD)	C234-4	9-FB6 (BN/WH)

● Is the resistance less than 5 ohms?

→ **Yes**
GO to [C16](#).

→ **No**
REPAIR the affected circuit for an open.
TEST the system for normal operation.

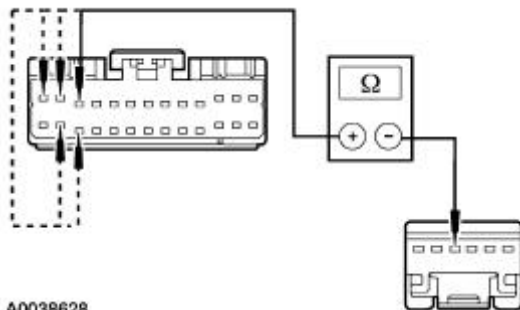
C16 CHECK THE ACTUATOR FEEDBACK CIRCUIT FOR AN OPEN

1



Affected Actuator

2



A0038628

2 Measure the resistance between the harness side of the connectors/pins indicated below that corresponds to the recorded DTC(s).

DTC	Pin	Circuit	Pin
B1265	C228b-2	8-FB2 (WH/RD)	C295-3
B1242	C228b-15	8-FB8 (WH/RD)	C289-3
B1262	C228b-1	8-FB5 (WH/BK)	C232-3
B1263	C228b-3	8-FB7 (WH)	C236-3
B1264	C228b-16	8-FB6 (WH/VT)	C234-3

● Is the resistance less than 5 ohms?

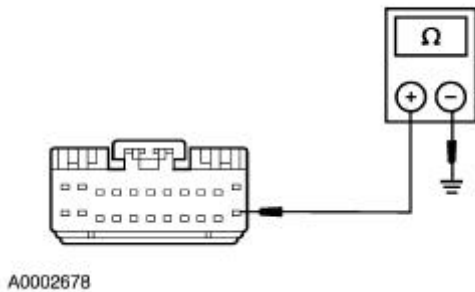
→ **Yes**

INSTALL a new door actuator. REFER to [Section 412-04](#). TEST the system for normal operation.

→ **No**
REPAIR the affected circuit for an open. TEST the system for normal operation.

C17 CHECK THE ACTUATOR REFERENCE CIRCUIT FOR A SHORT TO GROUND

1



1

Measure the resistance between DATC module C228a pin 22, circuit 7-FA1 (YE), harness side and ground.

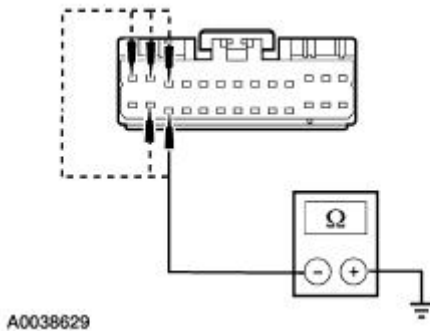
● Is the resistance greater than 10,000 ohms?

→ **Yes**
GO to [C18](#).

→ **No**
REPAIR the affected circuit for a short to ground. TEST the system for normal operation.

C18 CHECK THE ACTUATOR FEEDBACK CIRCUIT FOR A SHORT TO GROUND

1



1

Measure the resistance between the harness side of the connector/pin indicated below that corresponds to the recorded DTC(s) and ground.

DTC	Pin	Circuit
B1265	C228b-2	8-FB2 (WH/RD)
B1242	C228b-15	8-FB8 (WH/RD)
B1262	C228b-1	8-FB5 (WH/BK)
B1263	C228b-3	8-FB7 (WH)
B1264	C228b-16	8-FB6 (WH/VT)

● Is the resistance greater than 10,000 ohms?

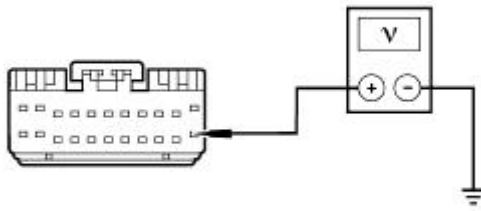
→ **Yes**
GO to [C19](#).

→ **No**
REPAIR the affected circuit for a short to ground. TEST the system for normal operation.

operation.

C19 CHECK THE ACTUATOR REFERENCE CIRCUIT FOR A SHORT TO POWER

1



A0038630

1 Measure the voltage between DATC module C228a pin 22, circuit 7-FA1 (YE), harness side and ground.

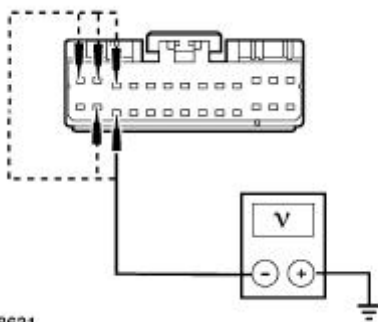
● Is voltage present?

→ **Yes**
REPAIR the affected circuit for a short to power. TEST the system for normal operation.

→ **No**
GO to [C20](#).

C20 CHECK THE ACTUATOR FEEDBACK CIRCUIT FOR A SHORT TO POWER

1



A0038631

1 Measure the voltage between the harness side of the connector/pin indicated below that corresponds to the recorded DTC(s) and ground.

DTC	Pin	Circuit
B1265	C228b-2	8-FB2 (WH/RD)
B1242	C228b-15	8-FB8 (WH/RD)
B1262	C228b-1	8-FB5 (WH/BK)
B1263	C228b-3	8-FB7 (WH)
B1264	C228b-16	8-FB6 (WH/VT)

● Is voltage present?

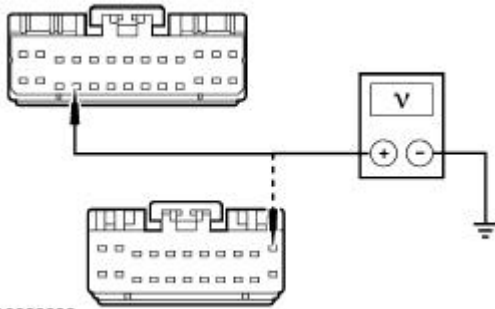
→ **Yes**
REPAIR the affected circuit for a short to power. TEST the system for normal operation.

→ **No**
GO to [C21](#).

C21 CHECK THE ACTUATOR RETURN CIRCUIT FOR A SHORT TO POWER

1

1 Measure the voltage between the harness side of the connector/pin indicated below that corresponds to the recorded DTC(s) and ground.



A0038632

DTC	Pin	Circuit
B1265	C228a-11	9-FA1 (BN)
B1242	C228a-11	9-FA1 (BN)
B1262	C228b-17	9-FA2 (BN/RD)
B1263	C228b-17	9-FA2 (BN/RD)
B1264	C228b-17	9-FA2 (BN/RD)

● **Is voltage present?**

→ **Yes**

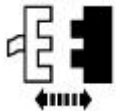
REPAIR the affected circuit for a short to power. TEST the system for normal operation.

→ **No**

INSTALL a new DATC module. REFER to [Section 412-04](#). TEST the system for normal operation.

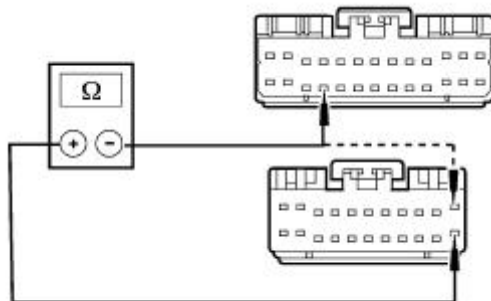
C22 CHECK THE FEEDBACK POTENTIOMETER TOTAL RESISTANCE SHORT TOGETHER

1



Affected Actuator

2



A0038623

2

Measure the resistance between the harness side of the connectors/pins indicated below that corresponds to the recorded DTC(s).

DTC	Pin	Circuit	Pin	Circuit
B1265	C228a-11	9-FA1 (BN)	C228a-22	7-FA1 (YE)
B1242	C228a-11	9-FA1 (BN)	C228a-22	7-FA1 (YE)
B1262	C228b-17	9-FA2 (BN/RD)	C228a-22	7-FA1 (YE)
B1263	C228b-17	9-FA2 (BN/RD)	C228a-22	7-FA1 (YE)
B1264	C228b-17	9-FA2 (BN/RD)	C228a-22	7-FA1 (YE)

● **Is the resistance less than 5 ohms?**

→ **Yes**

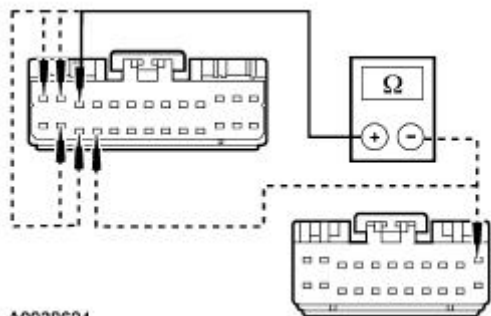
REPAIR the affected circuits for a short together. TEST the system for normal

operation.

→ **No**
 INSTALL a new door actuator. REFER to [Section 412-04](#). TEST the system for normal operation.

C23 CHECK POTENTIOMETER LOW SIDE RESISTANCE SHORT TOGETHER

1



1 Measure the resistance between the harness side of the connectors/pins indicated below that corresponds to the recorded DTC(s).

DTC	Pin	Circuit	Pin	Circuit
B1265	C228a-11	9-FA1 (BN)	C228b-2	8-FB2 (WH/RD)
B1242	C228a-11	9-FA1 (BN)	C228b-15	8-FB8 (WH/RD)
B1262	C228b-17	9-FA2 (BN/RD)	C228b-1	8-FB5 (WH/BK)
B1263	C228b-17	9-FA2 (BN/RD)	C228b-3	8-FB7 (WH)
B1264	C228b-17	9-FA2 (BN/RD)	C228b-16	8-FB6 (WH/VT)

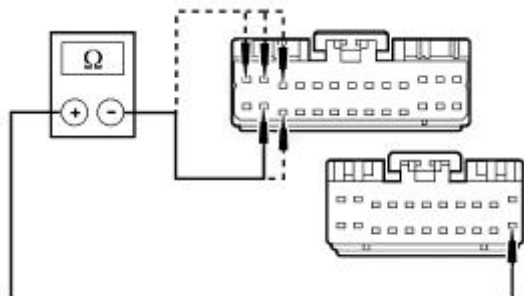
● Is the resistance less than 5 ohms?

→ **Yes**
 REPAIR the affected circuits for a short together. TEST the system for normal operation.

→ **No**
 INSTALL a new door actuator. REFER to [Section 412-04](#). TEST the system for normal operation.

C24 CHECK POTENTIOMETER HIGH SIDE RESISTANCE SHORT TOGETHER

1



1 Measure the resistance between the harness side of the connectors/pins indicated below that corresponds to the recorded DTC(s).

DTC	Pin	Circuit	Pin	Circuit
B1265	C228a-22	7-FA1 (YE)	C228b-2	8-FB2 (WH/RD)
B1242	C228a-22	7-FA1 (YE)	C228b-15	8-FB8 (WH/RD)
B1262	C228b-22	7-FA1 (YE)	C228b-	8-FB5 (WH/

			1	BK)
B1263	C228b-22	7-FA1 (YE)	C228b-3	8-FB7 (WH)
B1264	C228b-22	7-FA1 (YE)	C228b-16	8-FB6 (WH/VT)

● Is the resistance less than 5 ohms?



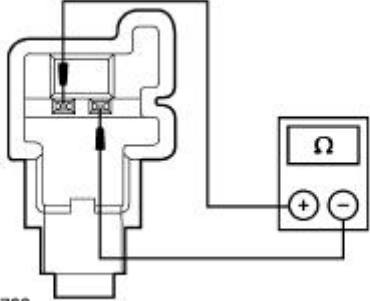
→ **Yes**

REPAIR the affected circuits for a short together. TEST the system for normal operation.

→ **No**

INSTALL a new door actuator. REFER to [Section 412-04](#). TEST the system for normal operation.

PINPOINT TEST D: DTC B1251: DTC B1253 IN-VEHICLE TEMPERATURE SENSOR NOT OPERATING CORRECTLY

CONDITIONS	DETAILS/RESULTS/ACTIONS
D1 CHECK THE SENSOR RESISTANCE	
<p>1 </p> <p>2  In-Vehicle Temperature Sensor C233</p> <p>3  A0004766</p>	<p>3 Measure the resistance between in-vehicle temperature sensor terminals.</p> <p>● Is the resistance within the specified values for these temperature ranges: 10-20°C (50-68°F) 37,000-58,000 ohms; 20-30°C (68-86°F) 24,000-37,000 ohms; 30-</p>

40°C (86-104°F) 16,000-24,000 ohms?

→ **Yes**
GO to [D2](#).

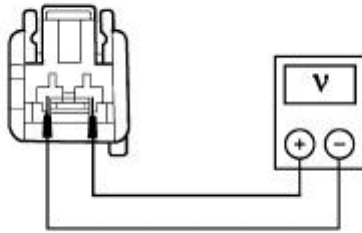
→ **No**
INSTALL a new in-vehicle temperature sensor. REFER to [Section 412-04](#). TEST the system for normal operation.

D2 CHECK THE DATC SENSOR OUTPUT VOLTAGE

1



2



A0001977

2 Measure the voltage between in-vehicle temperature sensor C233, circuits 9-FA48 (BN/GN), harness side and 8-FA48 (WH/GN), harness side.

● **Is the voltage between 4.7 and 5.1 volts?**

→ **Yes**
GO to [D6](#).

→ **No**
If DTC B1253 is present, GO to [D3](#).

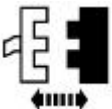
If DTC B1251 is present, GO to [D4](#).

D3 CHECK CIRCUIT 8-FA48 (WH/GN) FOR A SHORT

1



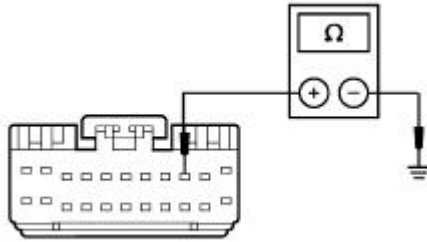
2



DATC Module C228a

3

3 Measure the resistance between DATC module C228a pin 9, circuit 8-FA48 (WH/GN), harness side and ground.



A0001979

- Is the resistance greater than 10,000 ohms?

→ **Yes**
GO to [D6](#).

→ **No**
REPAIR circuit 8-FA48 (WH/GN). TEST the system for normal operation.

D4 CHECK CIRCUIT 8-FA48 (WH/GN) FOR AN OPEN

1

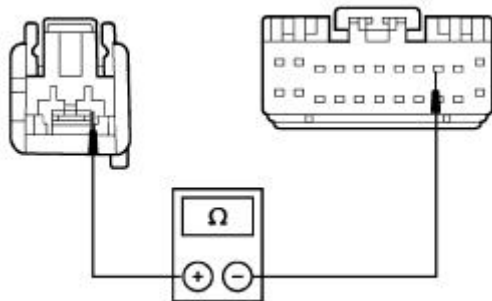


2



DATC Module C228b

3



A0001978

- 3 Measure the resistance between DATC module C228b pin 9, circuit 8-FA48 (WH/GN), harness side and the in-vehicle temperature sensor C233 circuit 8-FA48 (WH/GN), harness side.

- Is the resistance less than 5 ohms?

→ **Yes**
GO to [D5](#).

→ **No**
REPAIR circuit 8-FA48 (WH/GN). TEST the system for normal operation.

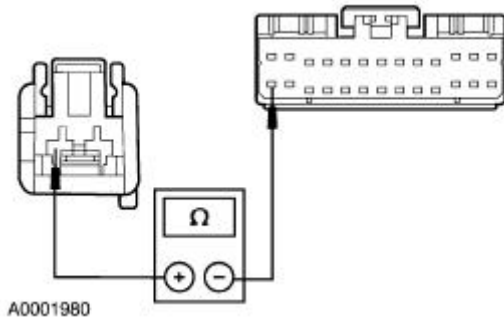
D5 CHECK CIRCUIT 9-FA48 (BN/GN) FOR AN OPEN

1



DATC Module C228b

2



2

Measure the resistance between DATC pin C228b pin 14, circuit 9-FA48 (BN/GN), harness side and the in-vehicle temperature sensor C233 circuit 9-FA48 (BN/GN), harness side.

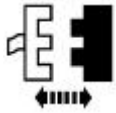
● **Is the resistance less than 5 ohms?**

→ **Yes**
GO to [D6](#).

→ **No**
REPAIR circuit 9-FA48 (BN/GN). TEST the system for normal operation.

D6 INSPECT THE CONNECTIONS

1



DATC Module C228a

2



DATC Module C228b

3


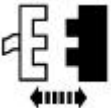
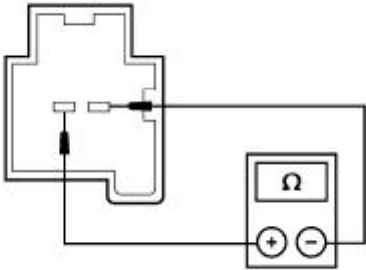
Inspect the in-vehicle temperature sensor connector pins and DATC module C228b pin 14, circuit 9-FA48 (BN/GN), harness side and DATC module C228a pin 9, circuit 8-FA48 (WH/GN), harness side for signs of damage, loose fits or incorrect installation.

● **Are the connector pins undamaged and installed correctly?**

→ **Yes**
RECONNECT the sensor and rerun self-test. If DTC is still present, INSTALL a new DATC module. REFER to [Section 412-04](#). TEST the system for normal operation.

→ **No**
 REPAIR the damaged or loose connector pins. TEST the system for normal operation.

PINPOINT TEST E: EVAPORATOR OR HEATER CORE DISCHARGE AIR TEMPERATURE SENSORS NOT OPERATING CORRECTLY

CONDITIONS	DETAILS/RESULTS/ACTIONS																												
<p>NOTE: Evaporator core, driver side heater core and passenger side heater core discharge air temperature sensors have the same diagnostic procedure.</p>																													
<p>E1 CHECK THE SENSOR RESISTANCE</p>																													
<p>1</p>  <p>2</p>  <p>Sensor</p> <p>3</p>  <p>A0004761</p>	<p>2</p> <p>Refer to the table and disconnect the sensor associated with the DTCs recorded from the DATC module self-test:</p> <table border="1"> <thead> <tr> <th>Sensor</th> <th>Condition</th> <th>DTC</th> <th>Connector</th> </tr> </thead> <tbody> <tr> <td>Evap air discharge</td> <td>Open</td> <td>B1946</td> <td>C296</td> </tr> <tr> <td>Evap air discharge</td> <td>Short</td> <td>B1947</td> <td>C296</td> </tr> <tr> <td>Driver air</td> <td>Open</td> <td>B1966</td> <td>C255</td> </tr> <tr> <td>Driver air</td> <td>Short</td> <td>B1967</td> <td>C255</td> </tr> <tr> <td>Passenger air</td> <td>Open</td> <td>B2428</td> <td>C235</td> </tr> <tr> <td>Passenger air</td> <td>Short</td> <td>B2429</td> <td>C235</td> </tr> </tbody> </table> <p>3</p> <p>Measure the resistance between sensor terminals.</p> <ul style="list-style-type: none"> Is the resistance within the specified values for these temperature ranges: 10-20°C (50-68°F) 37,000-58,000 ohms; 20-30°C (68-86°F) 24,000-37,000 ohms; 30-40°C (86-104°F) 16,000-24,000 ohms? 	Sensor	Condition	DTC	Connector	Evap air discharge	Open	B1946	C296	Evap air discharge	Short	B1947	C296	Driver air	Open	B1966	C255	Driver air	Short	B1967	C255	Passenger air	Open	B2428	C235	Passenger air	Short	B2429	C235
Sensor	Condition	DTC	Connector																										
Evap air discharge	Open	B1946	C296																										
Evap air discharge	Short	B1947	C296																										
Driver air	Open	B1966	C255																										
Driver air	Short	B1967	C255																										
Passenger air	Open	B2428	C235																										
Passenger air	Short	B2429	C235																										

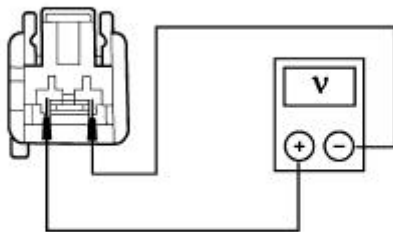
- **Yes**
GO to [E2](#).
- **No**
INSTALL a new sensor. TEST the system for normal operation.

E2 CHECK THE DATC SENSOR OUTPUT VOLTAGE

1



2



A0004762

2 Refer to the following chart and measure the voltage between temperature sensor harness side circuits.

Connector	Circuit	Circuit
C296	8-FA44 (WH/RD)	9-FA44 (BN/RD)
C255	8-FA51 (WH/BK)	9-FA51 (BN/YE)
C235	8-FA47 (WH/GN)	9-FA47 (BN/GN)

● Is the voltage between 4.7 and 5.1 volts?

- **Yes**
GO to [E6](#).
- **No**
If DTC B1946, B1966 or B2428 is present, GO to [E3](#).

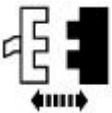
If DTC B1947, B1967 or B2429 is present, GO to [E4](#).

E3 CHECK THE REFERENCE CIRCUIT FOR AN OPEN

1



2

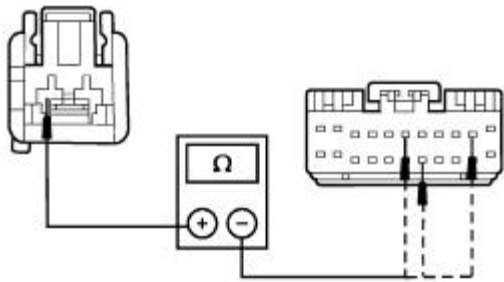


DATC Module C228a

3

3 Refer to the following chart and measure the resistance of the reference circuit between DATC module C228a and the sensor connector.

				DATC
--	--	--	--	-------------



A0004763

Sensor	Connector	Circuit	C228b Pin
Evap Discharge	C296	8-FA44 (WH/RD)	10
Passenger Side	C255	8-FA51 (WH/BK)	6
Driver	C235	8-FA47 (WH/GN)	18

● Is the resistance less than 5 ohms?

→ **Yes**
GO to [E5](#).

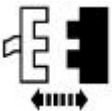
→ **No**
REPAIR the affected circuit. TEST the system for normal operation.

E4 CHECK THE REFERENCE CIRCUIT FOR A SHORT TO GROUND

1

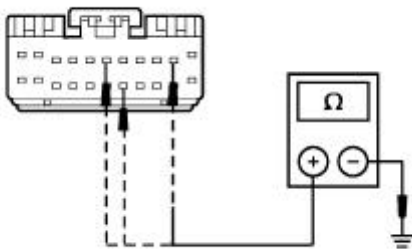


2



DATC Module C228a

3



A0004764

3 Refer to the following chart and measure the resistance of the sensor reference circuit between DATC module C228b and ground.

Temperature Sensor	DATC Module C228b Pin	Circuit
Evaporator Core	10	8-FA44 (WH/RD)
Passenger	6	8-FA51 (WH/BK)
Driver	18	8-FA47 (WH/GN)

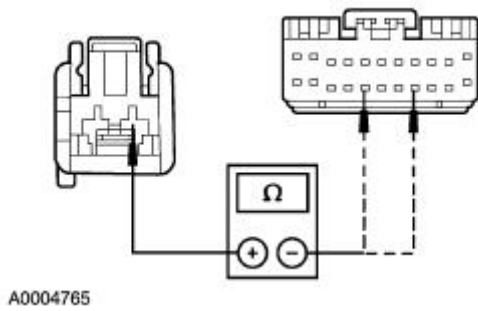
● Is the resistance greater than 10,000 ohms?

→ **Yes**
GO to [E6](#).

→ **No**
REPAIR the affected circuit. TEST the system for normal operation.

E5 CHECK RETURN CIRCUIT FOR AN OPEN

1



1

Refer to the following chart and measure the resistance of the return circuit between sensor and DATC module C228a for an open.

Sensor Connector	DATC Module C228b Pin	Circuit
Evap/C296	16	9-FA44 (BN/RD)
Passenger/C255	19	9-FA51 (BN/YE)
Driver/C235	19	9-FA47 (BN/GN)

- Is the resistance less than 5 ohms?

→ **Yes**
GO to [E6](#).

→ **No**
REPAIR the affected circuit. TEST the system for normal operation.

E6 INSPECT THE CONNECTIONS

1

NOTE: If inspecting the evaporator core discharge air temperature sensor, also inspect the in-line connector C260 for correct installation or damaged pins.

Refer to the following chart and inspect the temperature sensor pins and DATC module pins for signs of damage, loose fits or incorrect installation.


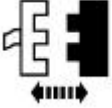
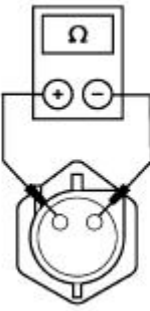

Temperature Sensor	Connector
Evaporator Core	C296 and C260
Heater Core RH	C255
Heater Core LH	C235

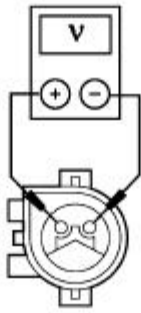
- Are the connector pins undamaged and installed correctly?

→ **Yes**
RECONNECT the connectors and RERUN the self-test. If the DTCs are still present, INSTALL a new DATC module. REFER to [Section 412-04](#). TEST the system for normal operation.

→ **No**
REPAIR the damaged or loose connector pins. TEST the system for normal operation.

PINPOINT TEST F: DTC B1255 OR B1257 — AMBIENT AIR TEMPERATURE SENSOR CIRCUIT OPEN OR SHORT TO GROUND

CONDITIONS	DETAILS/RESULTS/ACTIONS
F1 CHECK THE AMBIENT TEMPERATURE SENSOR RESISTANCE	
<p>1 </p> <p>2  Ambient Temperature Sensor C132</p> <p>3  A0002817</p>	<p>3 Measure the resistance between ambient temperature sensor terminals.</p> <ul style="list-style-type: none"> ● Is the resistance within the specified values for these temperature ranges: 10-20°C (50-68°F) 37,000-58,000 ohms; 20-30°C (68-86°F) 24,000-37,000 ohms; 30-40°C (86-104°F) 16,000-24,000 ohms? <p>→ Yes GO to F2.</p> <p>→ No INSTALL a new A/C ambient air temperature sensor. REFER to Section 412-04. TEST the system for normal operation.</p>
F2 CHECK THE DATC SENSOR OUTPUT VOLTAGE	
<p>1 </p> <p>2</p>	<p>2 Measure the voltage between ambient temperature sensor C132, circuits 8-FA49 (WH/VT), harness side and 9-FA49 (BN/WH), harness side.</p>



A0002818

● Is the voltage between 4.7 and 5.1 volts?

→ **Yes**
GO to [F6](#).

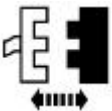
→ **No**
If DTC B1255, GO to [F3](#).
If DTC B1257, GO to [F4](#).

F3 CHECK CIRCUIT 8-FA49 (WH/VT) FOR AN OPEN

1

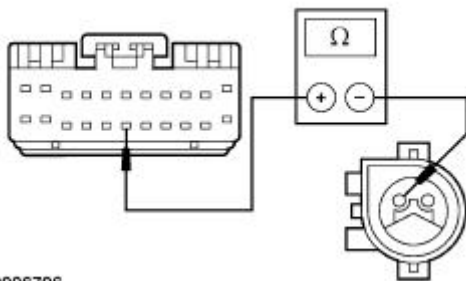


2



DATC Module C228a

3



A0006706

3 Measure the resistance between DATC module C228a pin 17, circuit 8-FA49 (WH/VT), harness side and ambient temperature sensor connector C132 circuit 8-FA49 (WH/VT), harness side.

● Is the resistance less than 5 ohms?

→ **Yes**
GO to [F5](#).

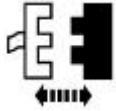
→ **No**
REPAIR circuit 8-FA49 (WH/VT). TEST the system for normal operation.

F4 CHECK CIRCUIT 8-FA49 (WH/VT) FOR A SHORT

1

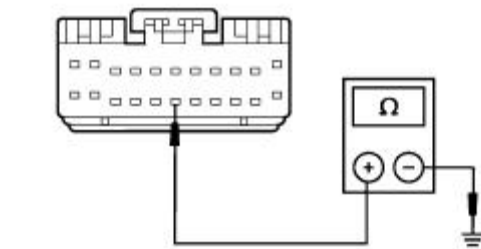


2



DATC Module C228a

3



A0001983

3

Measure the resistance between DATC module C228a pin 17, circuit 8-FA49 (WH/VT), harness side and ground.

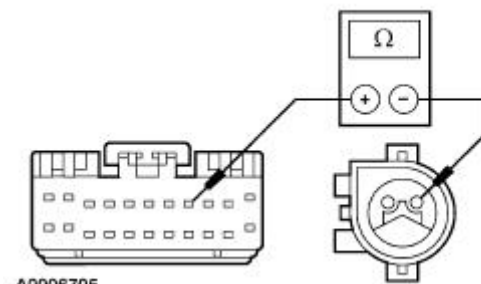
● Is the resistance greater than 10,000 ohms?

→ **Yes**
GO to [F6](#).

→ **No**
REPAIR circuit 8-FA49 (WH/VT). TEST the system for normal operation.

F5 CHECK CIRCUIT 9-FA49 (BN/WH) FOR AN OPEN

1



A0006705

1

Measure the resistance between DATC module C228a pin 8, circuit 9-FA49 (BN/WH), harness side and the ambient temperature sensor connector C132 circuit 9-FA49 (BN/WH), harness side.

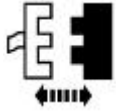
● Is the resistance less than 5 ohms?

→ **Yes**
GO to [F6](#).

→ **No**
REPAIR circuit 9-FA49 (BN/WH). TEST the system for normal operation.

F6 INSPECT THE CONNECTIONS

1



DATC Module C228a

2

Inspect the A/C ambient temperature sensor connector pins, in-line connector C264 pin 8, circuit 8-FA49 (WH/VT) and pin 7, circuit 9-FA49 (BN/WH) and DATC module C228a pin 17, circuit 8-FA49 (WH/VT), harness side and pin 8, circuit 9-FA49 (BN/WH), harness side for signs of damage, loose fits or incorrect installation.

- **Are the connector pins undamaged and installed correctly?**


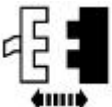
→ **Yes**

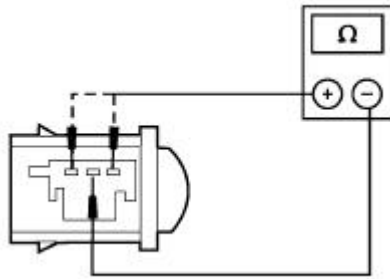
RECONNECT the connector and RERUN the self-test. If the DTCs are still present, INSTALL a new DATC module. REFER to [Section 412-04](#) . TEST the system for normal operation.

→ **No**

REPAIR the damaged or loose connector pins. TEST the system for normal operation.

PINPOINT TEST G: DTC B1259 OR B1261 — SOLAR RADIATION SENSOR CIRCUIT OPEN OR SHORT TO GROUND

CONDITIONS	DETAILS/RESULTS/ACTIONS
G1 CHECK THE SOLAR RADIATION SENSOR RESISTANCE	
<p>1</p>  <p>2</p>  <p>Solar Radiation Sensor C286</p> <p>3</p>	<p>3 NOTE: Connect the ground lead of the multimeter to the sensor ground terminal.</p> <p>Measure the resistance between each solar radiation sensor terminal and the ground terminal.</p>



A0003985

- Are the resistances between 39,000 and 41,000 ohms?

→ **Yes**
GO to [G2](#).

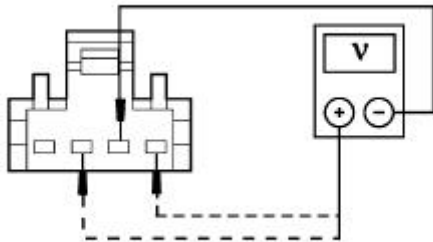
→ **No**
INSTALL a new A/C solar radiation sensor. TEST the system for normal operation.

G2 CHECK THE DATC OUTPUT VOLTAGE

1



2



A0002819

- 2 Measure the voltage between solar radiation C286, circuits 8-FA53 (WH/BU), harness side and 9-FA53 (BN/BU), harness side and between circuits 10-FA53 (GY/VT), harness side and 9-FA53 (BN/BU), harness side.

- Are the voltages between 4.7 and 5.1 volts?

→ **Yes**
GO to [G8](#).

→ **No**
If DTC B1259 is present, GO to [G5](#).

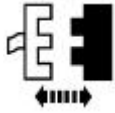
If DTC B1261 is present, GO to [G3](#).

G3 CHECK CIRCUIT 10-FA53 (GY/VT) FOR A SHORT TO GROUND

1

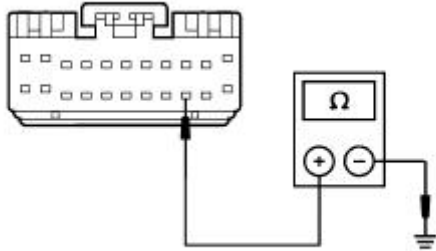


2



DATC Module C228a

3



A0001987

3 Measure the resistance between DATC module C228a pin 20, circuit 10-FA53 (GY/VT), harness side and ground.

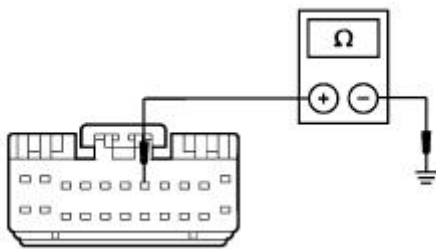
● Is the resistance greater than 10,000 ohms?

→ Yes
GO to [G4](#).

→ No
REPAIR circuit 10-FA53 (GY/VT). TEST the system for normal operation.

G4 CHECK CIRCUIT 8-FA53 (WH/BU) FOR A SHORT TO GROUND

1



A0003986

1 Measure the resistance between DATC module C228a pin 7, circuit 8-FA53 (WH/BU), harness side and ground.

● Is the resistance greater than 10,000 ohms?

→ Yes
GO to [G8](#).

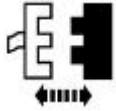
→ No
REPAIR circuit 8-FA53 (WH/BU). TEST the system for normal operation.

G5 CHECK CIRCUIT 10-FA53 (GY/VT) FOR AN OPEN

1

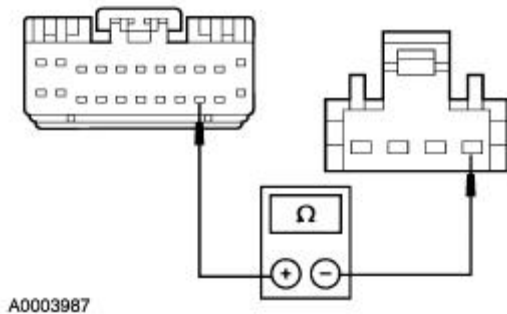


2



DATC Module C228a

3



A0003987

3

Measure the resistance between DATC module C228a pin 20, circuit 10-FA53 (GY/VT), harness side and solar radiation sensor C286 circuit 10-FA53 (GY/VT), harness side.

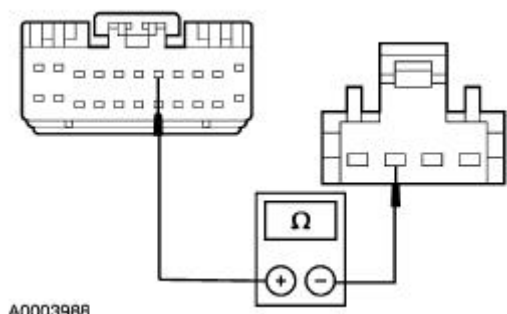
- Is the resistance less than 5 ohms?

→ **Yes**
GO to [G6](#).

→ **No**
REPAIR circuit 10-FA53 (GY/VT). TEST the system for normal operation.

G6 CHECK CIRCUIT 8-FA53 (WH/BU) FOR AN OPEN

1



A0003988

1

Measure the resistance between DATC module C228a pin 7, circuit 8-FA53 (WH/BU), harness side and the solar radiation sensor C286 circuit 8-FA53 (WH/BU), harness side.

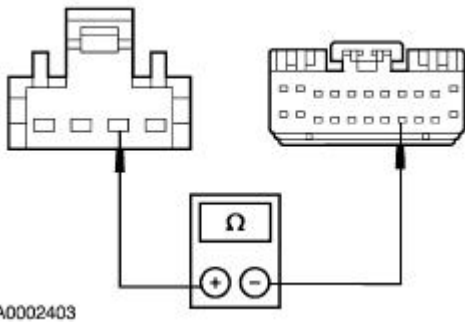
- Is the resistance less than 5 ohms?

→ **Yes**
GO to [G7](#).

→ **No**
REPAIR circuit 8-FA53 (WH/BU). TEST the system for normal operation.

G7 CHECK THE RETURN CIRCUIT FOR AN OPEN

1



1 Measure the resistance between DATC module C228a pin 19, circuit 9-FA3 (BN/RD), harness side and solar radiation C286, circuit 9-FA53 (BN/BU), harness side.

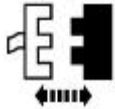
● Is the resistance less than 5 ohms?

→ **Yes**
GO to [G8](#).

→ **No**
REPAIR the affected circuit. TEST the system for normal operation.

G8 INSPECT THE CONNECTIONS

1



DATC Module C228a


2 Inspect the solar radiation sensor C286, in-line connector C219 pin 1, circuit 8-FA53 (WH/BU) and pin 3, circuit 10-FA53 (GY/VT) and DATC module C228a pin 20, circuit 10-FA53 (GY/VT), harness side, pin 7, circuit 8-FA53 (WH/BU), harness side, and pin 19, circuit 9-FA3 (BN/RD), harness side for signs of damage, loose fits or incorrect installation.

● Are the connector pins undamaged and installed correctly?

→ **Yes**
RECONNECT the connectors and RERUN the self-test. If the DTC is still present, INSTALL a new DATC module. REFER to [Section 412-04](#). TEST the system for normal operation.

→ **No**
REPAIR the damaged or loose connector pins. TEST the system for normal operation.

PINPOINT TEST H: INSUFFICIENT, ERRATIC, OR NO HEAT

CONDITIONS	DETAILS/RESULTS/ACTIONS
<p>⚠ CAUTION: The coolant control valve jumper harness-to-engine compartment wiring harness connector halves are identified as C134. Make sure to carefully identify the correct half of the connector before carrying out any electrical measurements. Failure to do so can result in damage to the DATC module.</p>	
<p>H1 CHECK FOR CORRECT COOLANT LEVEL</p>	
<p>1</p> 	<p>2 Check the engine coolant level with the engine at cold and hot temperatures.</p> <ul style="list-style-type: none"> ● Is the engine coolant at the correct level (both cold and hot)? <p>→ Yes GO to H4.</p> <p>→ No GO to H2.</p>
<p>H2 CHECK THE ENGINE COOLING SYSTEM FOR LEAKS</p>	
<p>⚠ WARNING: Never remove the pressure relief cap under any condition while the engine is operating. Failure to follow these instructions can result in damage to the cooling system or engine, or can result in personal injury. To avoid having scalding hot coolant or steam blow out of the cooling system, use extreme care when removing the pressure relief cap from a hot degas bottle. Wait until the engine has cooled, then wrap a thick cloth around the pressure relief cap and turn it slowly one turn (counterclockwise). Step back while the pressure is released from the cooling system. When certain all the pressure has been released, use the cloth to remove the pressure relief cap.</p>	
	<p>1 Fill and bleed the engine cooling system. Refer to Section 303-03.</p> <p>2 Pressure check the engine cooling system, including the pressure relief cap. Refer to Section 303-03.</p> <ul style="list-style-type: none"> ● Does the engine cooling system, including the pressure relief cap, hold pressure? <p>→ Yes GO to H3.</p> <p>→ No REPAIR the engine cooling system leak. TEST the system for normal operation.</p>
<p>H3 VERIFY THE FAULT WAS A LOW ENGINE COOLANT LEVEL</p>	
<p>NOTE: When carrying out this test step, allow time for the system to respond.</p>	

1




2 With the engine at normal operating temperature, set the DATC module driver and passenger side temperature settings to full hot (32°C [90°F]) and note the discharge air temperature.

● Is the discharge air temperature at full hot?

→ **Yes**
Test is complete.

→ **No**
GO to [H4](#).

H4 BLEED THE ENGINE COOLING SYSTEM

 **WARNING:** Never remove the pressure relief cap under any condition while the engine is operating. Failure to follow these instructions can result in damage to the cooling system or engine, or can result in personal injury. To avoid having scalding hot coolant or steam blow out of the cooling system, use extreme care when removing the pressure relief cap from a hot degas bottle. Wait until the engine has cooled, then wrap a thick cloth around the pressure relief cap and turn it slowly one turn (counterclockwise). Step back while the pressure is released from the cooling system. When certain all the pressure has been released, use the cloth to remove the pressure relief cap.

NOTE: When carrying out this test step, allow time for the system to respond.

1 Bleed the engine cooling system. Refer to [Section 303-03](#).


2 With the engine at normal operating temperature, set the DATC module driver and passenger side temperature settings to full hot (32°C [90°F]) and note the discharge air temperature.

● Is the discharge air temperature at full hot?

→ **Yes**
Test is complete.

→ **No**
GO to [H5](#).

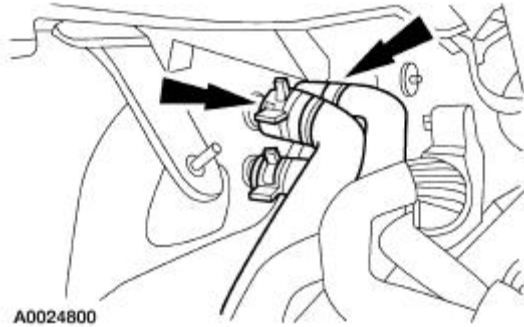
H5 CHECK FOR HOT COOLANT AT THE HEATER CORE INLET HOSES

 **WARNING:** The heater core inlet hoses will become too hot to handle and can cause serious burns if the system is working correctly. Failure to follow these instructions can result in personal injury.

1



2



2 Carefully feel both heater core inlet hoses.

● Are both heater core inlet hoses too hot to handle?

→ **Yes**
CARRY OUT the heater core component test. REFER to Heater Core under Component Tests in this section to determine whether a plugged or partially plugged condition exists.

→ **No**
GO to [H6](#).

H6 CHECK THE COOLANT CONTROL VALVE

NOTE: Disconnecting the coolant control valve defaults the DATC system to full hot.

NOTE: When carrying out this test step, allow time for the system to respond.

1



Coolant Control Valve Jumper Harness and Engine Compartment Wiring Harness C134

2



3 **NOTE:** For 3.9L engines, run the engine at 3,000 rpm to compensate for the disconnected auxiliary coolant pump.

With the engine at normal operating temperature, set the DATC module driver and passenger side settings to full hot (32°C [90°F]) and note the discharge air temperature.

● Is the discharge air temperature at full hot?

→ **Yes**
GO to [H8](#).

→ **No**
GO to [H7](#).

H7 CHECK THE THERMOSTAT

1



2 Carry out the thermostat component test. Refer to [Section 303-03](#).

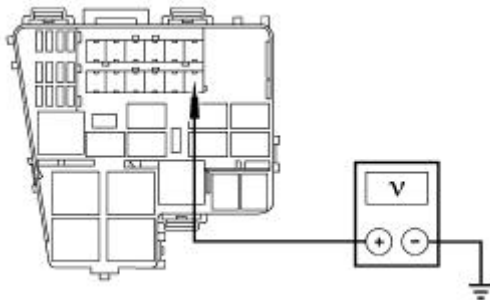
● Is the thermostat operating correctly?

→ **Yes**
INSTALL a new coolant control valve.
TEST the system for normal operation.

→ **No**
INSTALL a new thermostat. TEST the system for normal operation.

H8 CHECK SOURCE VOLTAGE FOR TESTING

1



1 Measure the voltage between the underhood auxiliary junction box (UAJB) fuse terminal F124, circuit 30-KA23 (RD/OG) and ground.


● Is the voltage greater than 10 volts?

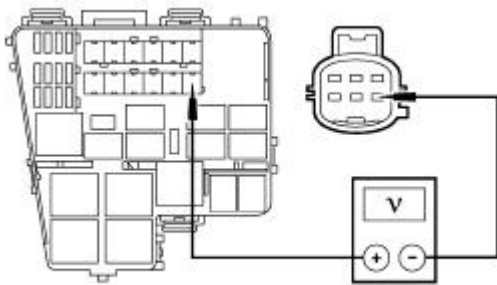
→ **Yes**
GO to [H9](#).

→ **No**
REPAIR circuit 30-KA23 (RD/OG). GO to [H9](#).

H9 CHECK THE DATC GROUND SIGNAL CIRCUIT 91S-FB4 (BN/GN)

1

1  **CAUTION:** Do not short the engine compartment wiring harness C134 pins 3 or 6 to pins 1



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or 4. Damage to the DATC module can result if this occurs.

Measure the voltage between the UAJB fuse terminal F124, circuit 30-KA23 (RD/OG) and the engine compartment wiring harness C134 pin 6, circuit 91S-FB4 (BN/GN).

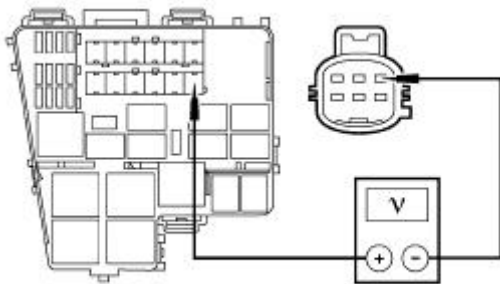
- Is the voltage greater than 10 volts?

→ **Yes**
GO to [H11](#).


→ **No**
GO to [H10](#).

H10 CHECK THE DATC GROUND SIGNAL CIRCUIT 91S-FB3 (BN/BU)

1



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- 1  **CAUTION: Do not short the engine compartment wiring harness C134 pins 3 or 6 to pins 1 or 4. Damage to the DATC module can result if this occurs.**

Measure the voltage between the UAJB fuse terminal F124, circuit 30-KA23 (RD/OG) and the engine compartment wiring harness C134 pin 3, circuit 91S-FB3 (BN/BU).

- Is the voltage greater than 10 volts?

→ **Yes**
GO to [H12](#).

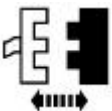
→ **No**
GO to [H13](#).

H11 CHECK CIRCUIT 91S-FB4 (BN/GN) FOR A SHORT TO GROUND

1



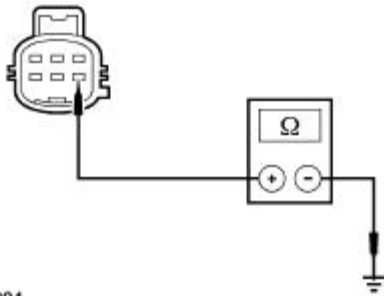
2



DATC Module C228b

3

- 3  **CAUTION: Do not short the**



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engine compartment wiring harness C134 pins 3 or 6 to pins 1 or 4. Damage to the DATC module can result if this occurs.

Measure the resistance between the engine compartment wiring harness C134 pin 6, circuit 91S-FB4 (BN/GN) and ground.

- **Is the resistance greater than 10,000 ohms?**

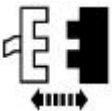
- **Yes**
INSTALL a new DATC module. TEST the system for normal operation.
- **No**
REPAIR circuit 91S-FB4 (BN/GN). TEST the system for normal operation.

H12 CHECK CIRCUIT 91S-FB3 (BN/BU) FOR A SHORT TO GROUND

1

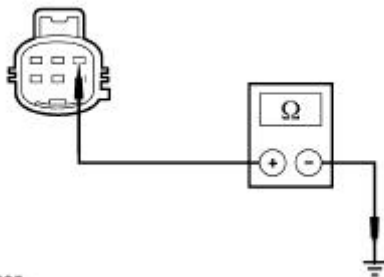


2




DATC Module C228b

3



A0024805

- 3  **CAUTION: Do not short the engine compartment wiring harness C134 pins 3 or 6 to pins 1 or 4. Damage to the DATC module can result if this occurs.**

Measure the resistance between the engine compartment wiring harness C134 pin 3, circuit 91S-FB3 (BN/BU) and ground.

- **Is the resistance greater than 10,000 ohms?**

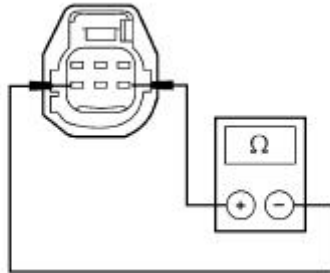
- **Yes**
INSTALL a new DATC module. TEST the system for normal operation.
- **No**
REPAIR circuit 91S-FB3 (BN/BU). TEST the system for normal operation.

H13 CHECK THE COOLANT CONTROL VALVE SOLENOID RESISTANCE

1

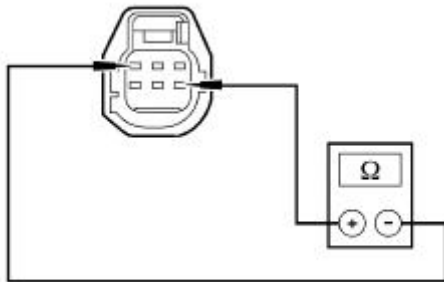


2



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3



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2

Measure the resistance between the coolant control valve jumper harness C134 pin 4, circuit 30-FB3 (RD/OG) and pin 6, circuit 91S-FB4 (BN/GN).

3

Measure the resistance between the coolant control valve jumper harness C134 pin 4, circuit 30-FB3 (RD/OG) and pin 3, circuit 91S-FB3 (BN/BU).

- **Do both resistances measure between 10-23 ohms?**

→ **Yes**

INSTALL a new coolant control valve.
TEST the system for normal operation.

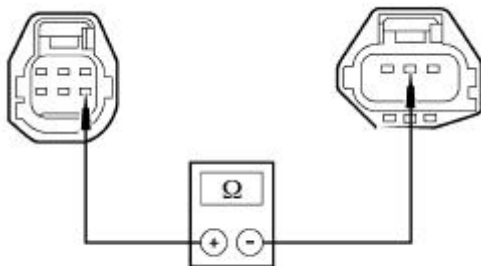
→ **No**

If the resistance is greater than 23 ohms, GO to [H14](#).

If the resistance is less than 10 ohms, GO to [H15](#).

H14 CHECK THE COOLANT CONTROL VALVE JUMPER HARNESS

1

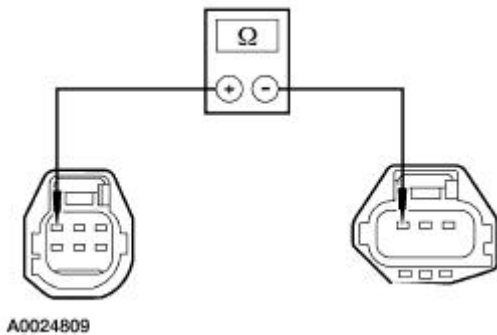


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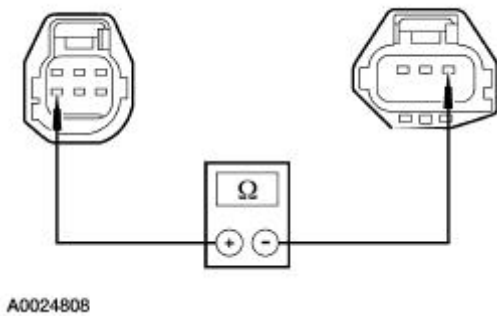
1

Measure the resistance between the coolant control valve jumper harness C134 pin 4, circuit 30-FB3 (RD/OG) and the coolant control valve C1034 pin 2, circuit 30-FB3 (RD/OG).

2



3



2

Measure the resistance between the coolant control valve jumper harness C134 pin 3, circuit 91S-FB3 (BN/BU) and the coolant control valve C1034 pin 3, circuit 91S-FB3 (BN/BU).

3

Measure the resistance between the coolant control valve jumper harness C134 pin 6, circuit 91S-FB4 (BN/GN) and the coolant control valve C1034 pin 1, circuit 91S-FB4 (BN/GN).

• **Are the resistances less than 5 ohms?**

→ **Yes**

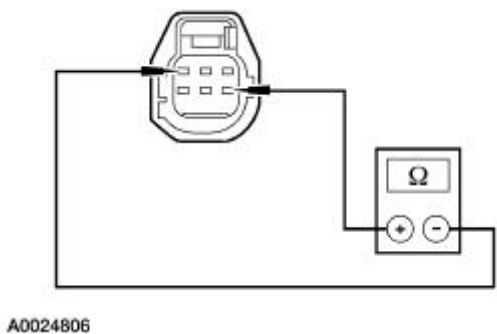
INSTALL a new coolant control valve.
TEST the system for normal operation.
If system operation is still not correct,
INSTALL a new DATC module.

→ **No**

REPAIR the affected circuit(s) of the coolant control valve jumper harness.
TEST the system for normal operation.

H15 CHECK THE COOLANT CONTROL VALVE JUMPER HARNESS CIRCUITS 91S-FB3 (BN/BU) AND 91S-FB4 (BN/GN) FOR A SHORT TO VOLTAGE

1



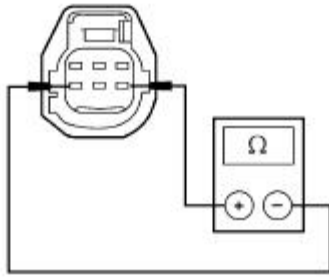
2

1

Measure the resistance between the coolant control valve jumper harness C134 pin 3, circuit 91S-FB3 (BN/BU) and pin 4, circuit 30-FB3 (RD/OG).

2

Measure the resistance between the coolant control valve jumper harness C134 pin 6, circuit 91S-FB4 (BN/GN) and pin 4, circuit 30-FB3 (RD/OG).




A0007541

- Are the resistances greater than 10,000 ohms?

→ **Yes**
 INSTALL a new coolant control valve.
 TEST the system for normal operation.

→ **No**
 REPAIR the affected circuit(s) of the coolant control valve jumper harness.
 TEST the system for normal operation.
 If system operation is still not correct,
 INSTALL a new DATC module.

PINPOINT TEST I: INSUFFICIENT HEAT DURING ENGINE IDLE— 3.9L ENGINE

CONDITIONS	DETAILS/RESULTS/ACTIONS
I1 CARRY OUT THE DATC MODULE SELF-TEST	
<p>1</p> 	<p>2 Carry out the DATC module self-test and retrieve continuous DTCs. Refer to Climate Control System. Record the DTCs displayed, if any.</p> <ul style="list-style-type: none"> ● Are any DTCs displayed? <p>→ Yes REFER to the DATC Module Diagnostic Trouble Code (DTC) Index. CARRY OUT the necessary diagnosis and REPAIR as necessary.</p> <p>→ No GO to I2.</p>
I2 RECHECK DATC MODULE CONFIGURATION	
	<p>1 Enter Module Identification mode.</p>

2



PID CNFG Data

2

Read PID CNFG data 1.

- Does the data read 4N_3N_2Y?

→ Yes

GO to [13](#).

→ No

RECONFIGURE the DATC module.
REFER to [Section 418-01](#).

13 CHECK THE COOLANT LEVEL

1

Check the coolant level with the engine at hot and cold temperatures.

- Is the engine coolant at the correct level (hot and cold)?

→ Yes

GO to [14](#).

→ No

REFILL the system and PRESSURE TEST for leaks. REFER to [Section 303-03](#). In addition, if the coolant level had dropped below the "MIN" level, SET the system to MAX heat and RUN the engine at 3,000 rpm for 3 to 5 minutes until hot air blows from the outlets. RECHECK coolant level. GO to [14](#).

14 CHECK FOR AUXILIARY COOLANT PUMP OPERATION

1



2



3

In the active command mode, request Climate Control System and select Pump/VCB or set driver side temperature to 32°C (90°F).

- Can the auxiliary cooling pump be heard running or be felt running?

→ Yes

System is operating correctly.

→ **No**
GO to [15](#).

15 CHECK THE AUXILIARY PUMP MOTOR

1



2

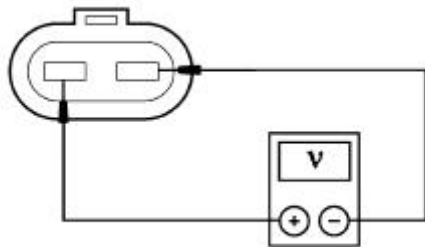


Auxiliary Coolant Pump C163

3



5



A0002330

4 Make sure the active command Pump/VBC is still selected or the driver side temperature is set to 32°C (90°F).

5 Measure the voltage between auxiliary coolant pump C163, circuit 30S-FB1 (RD/YE), harness side and circuit 31-FB1 (BK), harness side.

● **Is the voltage greater than 10 volts?**

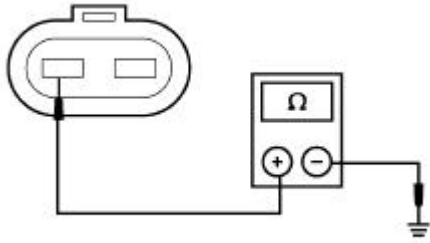
→ **Yes**
INSPECT terminals for damage and correct installation. If pins are installed correctly, INSTALL a new auxiliary coolant pump. REFER to [Section 412-02](#). TEST the system for normal operation.

→ **No**
GO to [16](#).

16 CHECK CIRCUIT 31-FB1 (BK) FOR AN OPEN

1

1 Measure the resistance between auxiliary coolant pump C163, circuit 31-FB1 (BK), harness side and ground.



A0002331

● Is the resistance less than 5 ohms?

→ **Yes**
GO to [17](#).

→ **No**
REPAIR circuit 31-FB1 (BK). TEST the system for normal operation.

17 CHECK THE AUXILIARY COOLANT PUMP RELAY

1

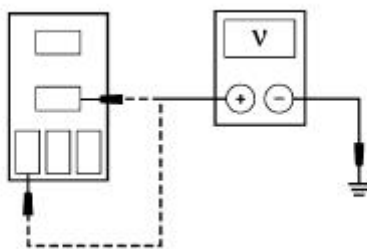


2



Auxiliary Coolant Pump Relay C1005

3



A0006707

3 Measure the voltage between CJB auxiliary coolant pump relay pins 2 and 5, circuit 30-FA74A (RD), harness side and ground.

● Is the voltage greater than 10 volts?

→ **Yes**
GO to [18](#).

→ **No**
REPAIR circuit 30-FA74A (RD). TEST the system for normal operation.

18 CARRY OUT THE RELAY COMPONENT TEST

1 Carry out the relay component test.

Refer to Wiring Diagrams Section [700-09](#) for schematic and connector information.

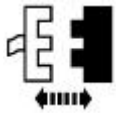
● **Is the relay OK?**

→ **Yes**
GO to [I9](#).

→ **No**
INSTALL a new auxiliary coolant pump relay. REFER to [Section 412-04](#). TEST the system for normal operation.

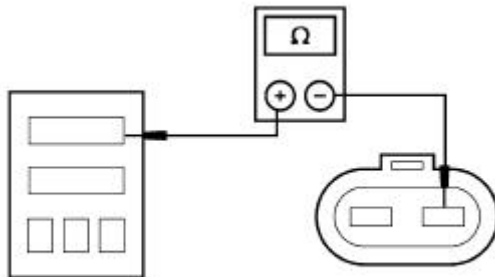
I9 CHECK CIRCUIT 30S-FB1 (RD/YE) FOR AN OPEN

1



Auxiliary Coolant Pump Relay C1005

2



A0002334

2

Measure the resistance between auxiliary coolant pump C163, circuit 30S-FB1 (RD/YE), harness side and auxiliary coolant pump relay pin 3, circuit 30S-FB1 (RD/YE), harness side.

● **Is the resistance less than 5 ohms?**

→ **Yes**
GO to [I10](#).

→ **No**
REPAIR circuit 30S-FB1 (RD/YE). TEST the system for normal operation.

I10 CHECK THE DATC MODULE

1



2



Auxiliary Coolant Pump Relay C1005

3



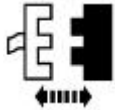
Auxiliary Coolant Pump C163

4



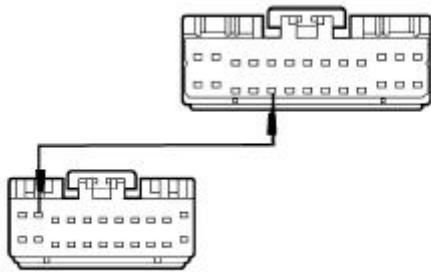
DATC Module C228b

5



DATC Module C228a

6



A0002332

6

Connect a fused jumper wire between DATC module C228b pin 18, circuit 91S-FA76 (BN/BU), harness side and DATC module C228a pin 2, circuit 31-FA10 (BK), harness side.

• Does the auxiliary coolant pump motor operate?

→ Yes

INSPECT all connectors and terminals, RECONNECT the connectors, and TEST the system for normal operation. If condition still exists, INSTALL a new DATC module. REFER to [Section 412-04](#). TEST the system for normal operation.

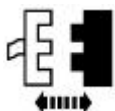
→ No

GO to [I11](#).

I11 CHECK CIRCUIT 91S-FA76 (BK/OG) FOR A SHORT TO POWER

NOTE: If a short to power is found, it is necessary to install a new DATC module.

1

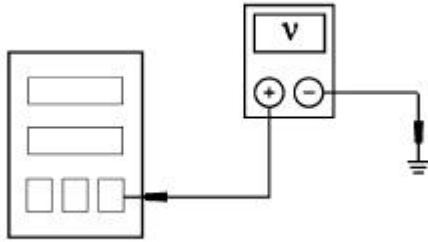


Auxiliary Coolant Pump Relay C1005

2

2

Measure the voltage between auxiliary coolant pump relay pin 2, circuit 91S-FA76 (BK/OG), harness side and ground.



A0002333

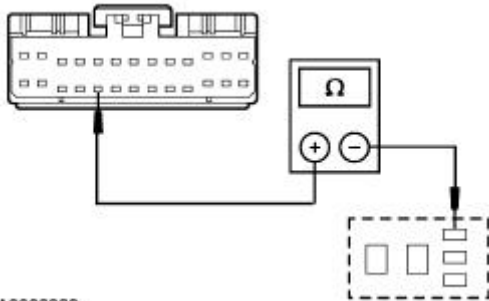
- Is any voltage present?

→ **Yes**
REPAIR circuit 91S-FA76 (BK/OG).
INSTALL a new DATC module. REFER to [Section 412-04](#) . TEST the system for normal operation.

→ **No**
GO to [I12](#) .

I12 CHECK CIRCUIT 91S-FA76 (BK/OG) FOR AN OPEN

1



A0003989

1


Measure the resistance between auxiliary coolant pump relay circuit 91S-FA76 (BK/OG), harness side and DATC module C228b pin 18, circuit 91S-FA76 (BK/OG), harness side.

- Is the resistance less than 5 ohms?

→ **Yes**
INSPECT all connectors and terminals,
RECONNECT the connectors and TEST the system. If condition still exists,
INSTALL a new DATC module. REFER to [Section 412-04](#) . TEST the system for normal operation.

→ **No**
REPAIR circuit 91S-FA76 (BK/OG). TEST the system for normal operation.

PINPOINT TEST J: FULL HEAT ONLY IN ALL MODES

CONDITIONS	DETAILS/RESULTS/ACTIONS
	CAUTION: The coolant control valve jumper harness-to-engine compartment wiring

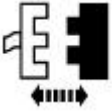
harness connector halves are identified as C134. Make sure to carefully identify the correct half of the connector before carrying out any electrical measurements. Failure to do so can result in damage to the DATC module.

J1 CHECK CIRCUIT 30-FB3 (RD/OG)

1

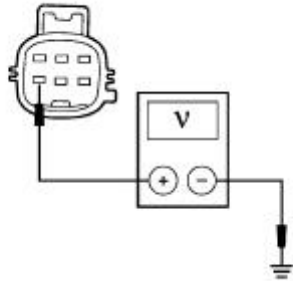


2




Coolant Control Valve Jumper Harness and Engine Compartment Wiring Harness C134

3



A0007536

3  **CAUTION: Do not short the engine compartment wiring harness C134 pins 3 or 6 to pins 1 or 4. Damage to the DATC module can result if this occurs.**

Measure the voltage between the engine compartment wiring harness C134 pin 4, circuit 30-FB3 (RD/OG) and ground.

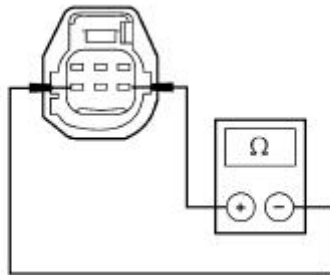
- Is the voltage greater than 10 volts?

→ **Yes**
GO to [J2](#).

→ **No**
REPAIR circuit 30-FB3 (RD/OG) or circuit 30-FA1 (RD). TEST the system for normal operation.

J2 CHECK THE COOLANT CONTROL VALVE DRIVER SIDE SOLENOID RESISTANCE

1



A0007541

1 Measure the resistance between the coolant control valve jumper harness C134 pin 4, circuit 30-FB3 (RD/OG) and pin 6, circuit 91S-FB4 (BN/GN).

- Does the resistance measure between 10-23 ohms?

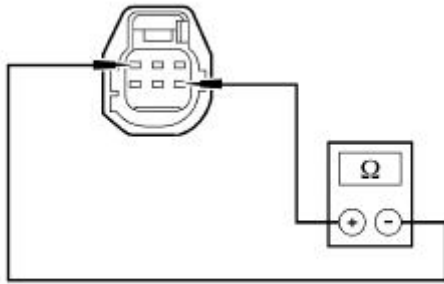
→ **Yes**
GO to [J3](#).

→ **No**
If the resistance is greater than 23 ohms, GO to [J7](#).

If the resistance is less than 10 ohms,
GO to [J9](#).

J3 CHECK THE COOLANT CONTROL VALVE PASSENGER SIDE SOLENOID RESISTANCE

1



A0024806

1

Measure the resistance between the coolant control valve jumper harness C134 pin 4, circuit 30-FB3 (RD/OG) and pin 3, circuit 91S-FB3 (BN/BU).

● **Does the resistance measure between 10-23 ohms?**

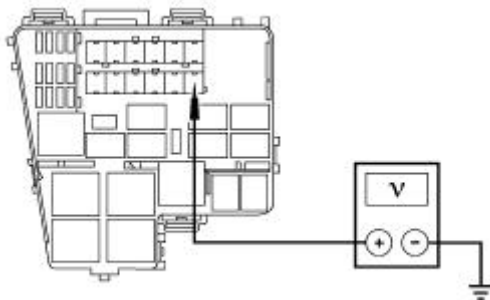
→ **Yes**
GO to [J4](#).

→ **No**
If the resistance is greater than 23 ohms, GO to [J8](#).

If the resistance is less than 10 ohms,
GO to [J10](#).

J4 CHECK SOURCE VOLTAGE FOR TESTING

1



A0024801

1

Measure the voltage between the underhood auxiliary junction box (UJAB) fuse terminal F124, circuit 30-KA23 (RD/OG) and ground.

● **Is the voltage greater than 10 volts?**

→ **Yes**
GO to [J5](#).

→ **No**

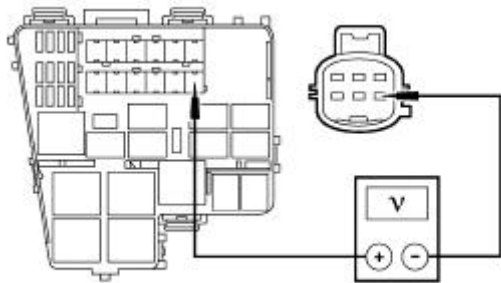
REPAIR circuit 30-KA23 (RD/OG). GO to [J5](#).

J5 CHECK THE DATC GROUND SIGNAL CIRCUIT 91S-FB4 (BN/GN)

1




3



A0024802

2 Press the PANEL button and set the driver and passenger side temperature settings to full cool on the DATC module.

3  **CAUTION: Do not short the engine compartment wiring harness C134 pins 3 or 6 to pins 1 or 4. Damage to the DATC module can result if this occurs.**

Measure the voltage between the UAJB fuse terminal F124, circuit 30-KA23 (RD/OG) and the engine compartment wiring harness C134 pin 6, circuit 91S-FB4 (BN/GN).

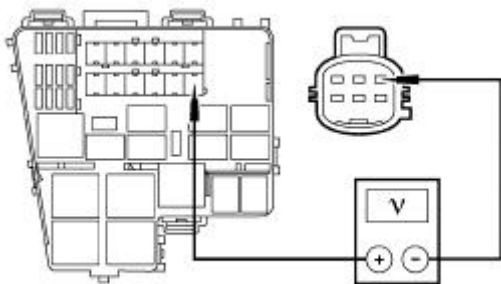
● Is the voltage greater than 10 volts?

→ Yes
GO to [J6](#).


→ No
GO to [J11](#).

J6 CHECK THE DATC GROUND SIGNAL CIRCUIT 91S-FB3 (BN/BU)

1



A0024803

1  **CAUTION: Do not short the engine compartment wiring harness C134 pins 3 or 6 to pins 1 or 4. Damage to the DATC module can result if this occurs.**

Measure the voltage between the UAJB fuse terminal F124, circuit 30-KA23 (RD/OG) and the engine compartment wiring harness C134 pin 3, circuit 91S-FB3 (BN/BU).

● Is the voltage greater than 10 volts?

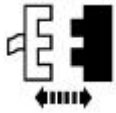
→ Yes
INSTALL a new coolant control valve.
TEST the system for normal operation.

→ No

GO to [J12](#).

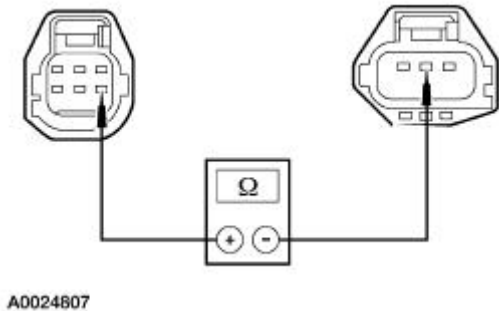
J7 CHECK THE COOLANT CONTROL VALVE JUMPER HARNESS CIRCUITS 30-FB3 (RD/OG) AND 91S-FB3 (BN/BU)

1



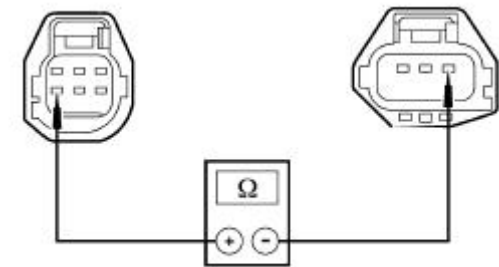
Coolant Control Valve C1034

2



A0024807

3



A0024808

2

Measure the resistance between the coolant control valve jumper harness C134 pin 4, circuit 30-FB3 (RD/OG) and the coolant control valve C1034 pin 2, circuit 30-FB3 (RD/OG).

3

Measure the resistance between the coolant control valve jumper harness C134 pin 6, circuit 91S-FB4 (BN/GN) and the coolant control valve C1034 pin 1, circuit 91S-FB4 (BN/GN).

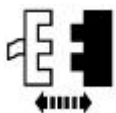
● **Are the resistances less than 5 ohms?**

→ **Yes**
INSTALL a new coolant control valve.
TEST the system for normal operation.

→ **No**
REPAIR the affected circuit(s) of the coolant control valve jumper harness.
TEST the system for normal operation.

J8 CHECK THE COOLANT CONTROL VALVE JUMPER HARNESS CIRCUITS 30-FB3 (RD/OG) AND 91S-FB3 (BN/BU)

1

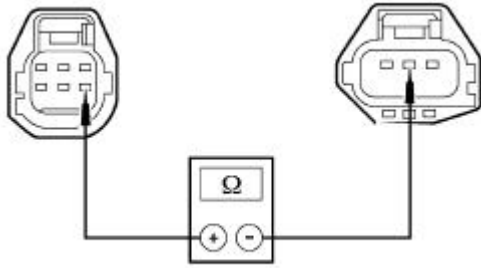


Coolant Control Valve C1034

2

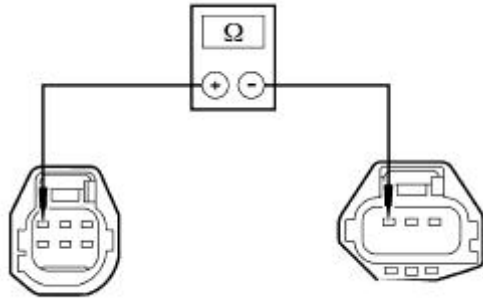
2

Measure the resistance between the coolant control valve jumper harness C134 pin 4, circuit 30-FB3 (RD/OG)



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3



A0024809

and the coolant control valve C1034 pin 2, circuit 30-FB3 (RD/OG).

3 Measure the resistance between the coolant control valve jumper harness C134 pin 3, circuit 91S-FB3 (BN/BU) and the coolant control valve C1034 pin 3, circuit 91S-FB3 (BN/BU).

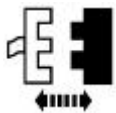
- Are the resistances less than 5 ohms?

→ **Yes**
INSTALL a new coolant control valve.
TEST the system for normal operation.

→ **No**
REPAIR the affected circuit(s) of the coolant control valve jumper harness.
TEST the system for normal operation.

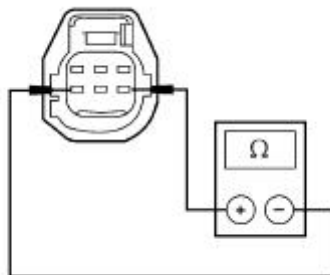
J9 CHECK THE COOLANT CONTROL VALVE JUMPER HARNESS CIRCUIT 91S-FB4 (BN/GN) FOR A SHORT

1



Coolant Control Valve C1034

2



A0007541

2 Measure the resistance between the coolant control valve jumper harness C134 pin 6, circuit 91S-FB4 (BN/GN) and pin 4, circuit 30-FB3 (RD/OG).

- Is the resistance greater than

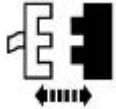
10,000 ohms?

→ **Yes**
INSTALL a new coolant control valve.
TEST the system for normal operation.

→ **No**
REPAIR the affected circuit(s). TEST
the system for normal operation.

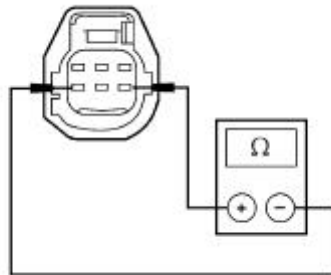
J10 CHECK THE COOLANT CONTROL VALVE JUMPER HARNESS CIRCUIT 91S-FB3 (BN/BU) FOR A SHORT

1



Coolant Control Valve C1034

2



A0007541

2 Measure the resistance between the coolant control valve jumper harness C134 pin 3, circuit 91S-FB3 (BN/BU) and pin 4, circuit 30-FB3 (RD/OG).

• **Is the resistance greater than 10,000 ohms?**

→ **Yes**
INSTALL a new coolant control valve.
TEST the system for normal operation.

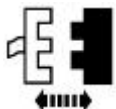
→ **No**
REPAIR the affected circuit(s). TEST
the system for normal operation.

J11 CHECK CIRCUIT 91S-FB4 (BN/GN) FOR AN OPEN

1



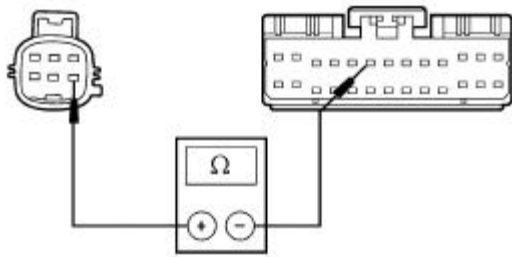
2



DATC Module C228b

3

3 Measure the resistance between the engine compartment wiring harness C134 pin 6, circuit 91S-FB4 (BN/GN) and the DATC module C228b pin 6,



A0007542

circuit 91S-FB4 (BN/GN).

- Is the resistance less than 5 ohms?

→ **Yes**
GO to [J13](#).

→ **No**
REPAIR circuit 91S-FB4 (BN/GN).
TEST the system for normal operation.

J12 CHECK CIRCUIT 91S-FB3 (BN/BU) FOR AN OPEN

1

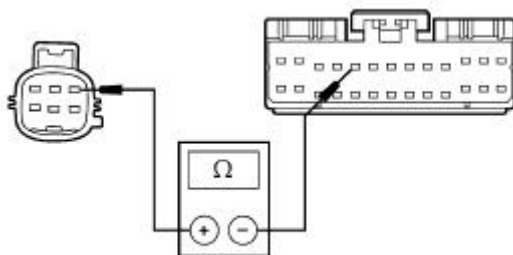


2



DATC Module C228b

3



A0007544

- 3 Measure the resistance between the engine compartment wiring harness C134 pin 3, circuit 91S-FB3 (BN/BU) and the DATC module C228b pin 5, circuit 91S-FB3 (BN/BU).

- Is the resistance less than 5 ohms?

→ **Yes**
GO to [J14](#).

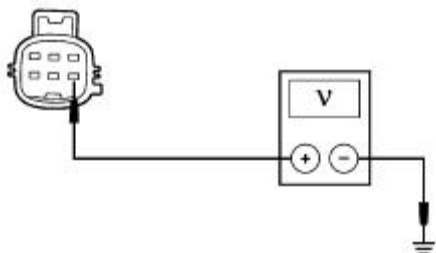
→ **No**
REPAIR circuit 91S-FB3 (BN/BU).
TEST the system for normal operation.

J13 CHECK CIRCUIT 91S-FB4 (BN/GN) FOR A SHORT TO VOLTAGE

1



2



A0007543

2

⚠ CAUTION: Do not short the engine compartment wiring harness C134 pins 3 or 6 to pins 1 or 4. Damage to the DATC module can result if this occurs.

Measure the voltage between the engine compartment wiring harness C134 pin 6, circuit 91S-FB4 (BN/GN) and ground.

● **Is voltage present?**

→ **Yes**
REPAIR circuit 91S-FB4 (BN/GN). If system operation is still not correct, INSTALL a new DATC module. TEST the system for normal operation.

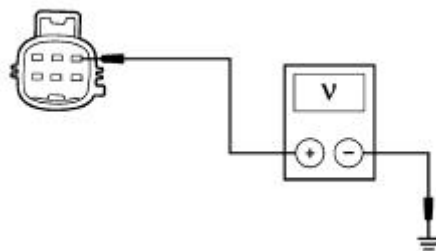
→ **No**
GO to [J15](#).

J14 CHECK CIRCUIT 91S-FB3 (BN/BU) FOR A SHORT TO VOLTAGE

1



2



A0007545

2

⚠ CAUTION: Do not short the engine compartment wiring harness C134 pins 3 or 6 to pins 1 or 4. Damage to the DATC module can result if this occurs.

Measure the voltage between the engine compartment wiring harness C134 pin 3, circuit 91S-FB3 (BN/BU) and ground.

● **Is voltage present?**

→ **Yes**
REPAIR circuit 91S-FB3 (BN/BU). If system operation is still not correct, INSTALL a new DATC module. TEST the system for normal operation.

→ **No**
GO to [J16](#).

J15 CHECK THE COOLANT CONTROL VALVE JUMPER HARNESS CIRCUIT 91S-FB4 (BN/GN) FOR A SHORT TO VOLTAGE

1

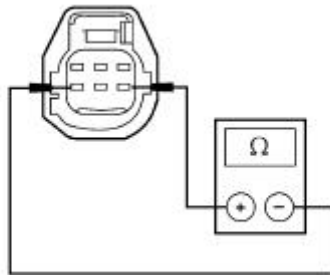


2



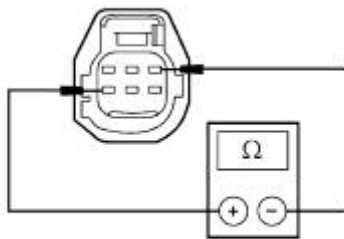
Coolant Control Valve C1034

3



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4



A0006758

3 Measure the resistance between the coolant control valve jumper harness C134 pin 6, circuit 91S-FB4 (BN/GN) and pin 4, circuit 30-FB3 (RD/OG).

4 **NOTE:** Carry out this step only on vehicles equipped with a 3.9L engine.

Measure the resistance between the coolant control valve jumper harness C134 pin 6, circuit 91S-FB4 (BN/GN) and pin 1, circuit 30S-FB1 (RD/YE).

● Are the resistances greater than 10,000 ohms?

→ **Yes**
INSTALL a new DATC module. TEST the system for normal operation.

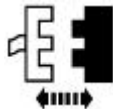
→ **No**
REPAIR the affected circuit(s) of the coolant control valve jumper harness. If system operation is still not correct, INSTALL a new DATC module. TEST the system for normal operation.

J16 CHECK THE COOLANT CONTROL VALVE JUMPER HARNESS CIRCUIT 91S-FB3 (BN/BU) FOR A SHORT TO VOLTAGE

1

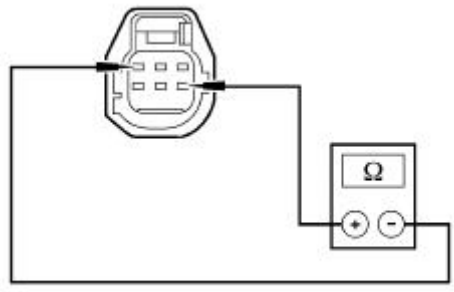


2



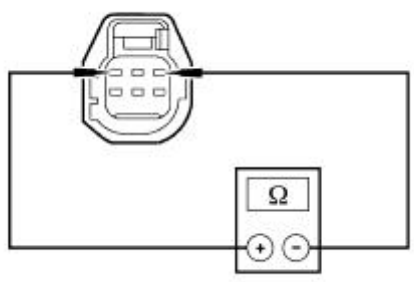
Coolant Control Valve C1034

3



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4



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3

Measure the resistance between the coolant control valve jumper harness C134 pin 3, circuit 91S-FB3 (BN/BU) and pin 4, circuit 30-FB3 (RD/OG).

4

NOTE: Carry out this step only on vehicles equipped with a 3.9L engine.

Measure the resistance between the coolant control valve jumper harness C134 pin 3, circuit 91S-FB3 (BN/BU) and pin 1, circuit 30S-FB1 (RD/YE).

- Are the resistances greater than 10,000 ohms?


→ **Yes**

INSTALL a new DATC module. TEST the system for normal operation.

→ **No**

REPAIR the affected circuit(s) of the coolant control valve jumper harness. If system operation is still not correct, INSTALL a new DATC module. TEST the system for normal operation.

PINPOINT TEST K: THE DUAL TEMPERATURE CONTROL IS INOPERATIVE/DOES NOT OPERATE CORRECTLY

CONDITIONS	DETAILS/RESULTS/ACTIONS
	CAUTION: The coolant control valve jumper harness-to-engine compartment wiring

harness connector halves are identified as C134. Make sure to carefully identify the correct half of the connector before carrying out any electrical measurements. Failure to do so can result in damage to the DATC module.

K1 CHECK COOLANT SYSTEM

- 1 Check the coolant level with the engine at hot and cold temperatures.
- **Is the engine coolant at the correct level (hot and cold)?**
- **Yes**
GO to [K2](#).
- **No**
REFILL the cooling system and PRESSURE TEST for leaks. REFER to [Section 303-03](#). In addition, if the coolant level has dropped below the "MIN" level, SET the system to MAX heat and RUN the engine at 3,000 rpm for 3 to 5 minutes to remove air from the system. RECHECK coolant level.

K2 VERIFY A/C OPERATION

1



- 2 Press the OFF button then press the A/C button on the DATC panel.
- **Does the A/C clutch engage?**
- **Yes**
GO to [K3](#).
- **No**
[Go To Pinpoint Test L](#).

K3 VERIFY THE CONCERN

NOTE: When carrying out this test step, allow time for the system to respond.

- 1 With the engine at normal operating temperature, select PANEL mode and A/C on the DATC module.
- 2 Using the driver side temperature control, set the driver side temperature to 16°C (60° F) and then set to 32°C (90° F).
- **Do both the driver side and passenger side air temperatures go to full cool then to full heat?**
- **Yes**

GO to [K4](#).

→ **No**

If driver side only does not go to full cool and then full heat, GO to [K9](#). If passenger side only does not go to full cool and then full heat, GO to [K12](#). If both sides have only full heat, [Go To Pinpoint Test J](#). If both sides have only full cool, [Go To Pinpoint Test H](#).

K4 CHECK MODULE CONFIGURATION

2



PID CNFG Data

1 Enter Module Identification mode.

2 Read PID CNFG data 1.

- Does PID CNFG data read ON and 4N_3N_2Y?

→ **Yes**

GO to [K5](#).

→ **No**

RECONFIGURE the DATC module. REFER to [Section 418-01](#).

K5 REQUEST CONTINUOUS CODES AND CARRY OUT THE DATC SELF-TEST

1 Request Continuous DTCs and carry out the DATC Module Self-Test. Refer to [Climate Control System](#). Record the DTCs displayed, if any.

- Are any DTCs displayed?

→ **Yes**

REFER to the DATC Module Diagnostic Trouble Code (DTC) Index. CARRY OUT the necessary diagnosis and REPAIR as necessary.

→ **No**

GO to [K6](#).

K6 CHECK THE TEMPERATURE SENSORS FOR CORRECT INSTALLATION

1



2 Check the driver side, passenger side, evaporator core, and ambient air temperature sensors for correct installation.

3 Check the in-vehicle temperature sensor and venturi hose for correct installation.

● Are the sensors installed correctly?

→ Yes
GO to [K7](#).

→ No
CORRECT the sensor installation. TEST the system for normal operation.

K7 CHECK FOR CORRECT HEATER HOSE CONNECTIONS

NOTE: The hose assembly that connects to the inboard port on the coolant control valve connects to the inboard port (driver side) on the heater core.

1 Check the heater hose connections for correct installation. Refer to [Section 412-02](#).

● Are the heater hoses installed correctly?

→ Yes
GO to [K8](#).

→ No
CORRECT the heater hose installation. TEST the system for normal operation.

K8 CHECK THE DRIVER SIDE TEMPERATURE CONTROL

NOTE: When carrying out this test step, allow time for the system to respond.

1 Select panel and A/C modes.

2 Set the passenger side temperature to 24° C (75° F).

3 Using the driver side temperature control buttons, set the temperature to 19° C (65° F) and then to 29° C (85° F).

● Does the driver side temperature decrease and then increase?

→ Yes
GO to [K9](#).

→ No
If the driver side air temperature has full cool only, GO to [K10](#).

If the driver side air temperature has full heat only, GO to [K11](#).

K9 CHECK THE PASSENGER SIDE TEMPERATURE CONTROL

NOTE: When carrying out this test step, allow time for the system to respond.

1 Select PANEL and A/C modes.

2 Set the driver side temperature to 24° C (75° F).

3 Using the passenger side temperature control buttons, set the temperature to 19° C (65° F) and then to 29° C (85° F).

- **Does the passenger side air temperature decrease and then increase?**

→ **Yes**
The system is operating correctly.

→ **No**
If the passenger side air temperature has full cool only, GO to [K10](#).

If the passenger side air temperature has full heat only, GO to [K11](#).

K10 CHECK FOR CORRECT COOLANT FLOW TO THE HEATER CORE

2



1 Remove the passenger side cowl cover.

3 With the engine running at normal operating temperature and the DATC module set to 32° C (90° F), see if both inlet heater hoses are too hot to handle.

- **Are both inlet heater hoses too hot to handle?**

→ **Yes**
GO to [K12](#).

→ **No**
[Go To Pinpoint Test H](#).

K11 CHECK CORRECT COOLANT CONTROL VALVE OPERATION

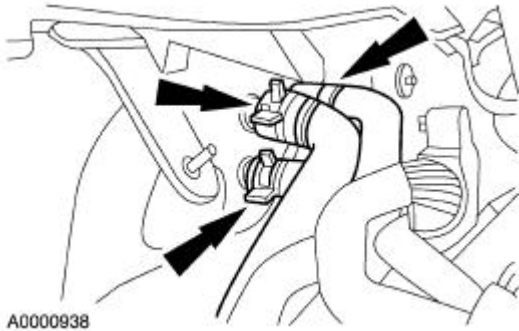


WARNING: The heater core inlet hoses will become too hot to handle and can cause serious burns if the system is working correctly. Failure to follow these instructions can result in personal injury.

2

1 Remove the passenger side cowl cover.

2 Clamp off the three heater hoses going to the heater core, as close to the heater core as possible.



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3



4 Set the DATC module to 16° C (60° F).

● Is cooling restored?

→ Yes

Concern is with coolant control valve operation. [Go To Pinpoint Test J](#).

→ No

GO to [K12](#).

K12 CHECK CIRCUITS 8-FA51 (WH/BK) AND 8-FA47 (WH/GN)

1



2



Passenger Side Discharge Air Temperature Sensor C255

3



Driver Side Discharge Air Temperature Sensor C235

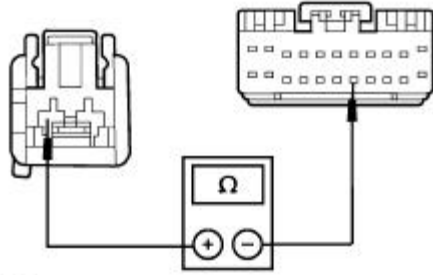
4



DATC Module C228a

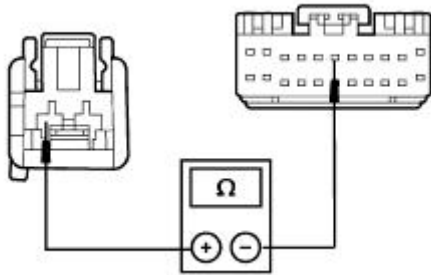
5

5 Measure the resistance between the passenger side discharge air temperature sensor C255, circuit 8-FA51 (WH/BK) and the DATC module C228a pin 18, circuit 8-FA51 (WH/BK).



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6



A0004988

6

Measure the resistance between the driver side discharge air temperature sensor C235, circuit 8-FA47 (WH/GN) and the DATC module C228a pin 6, circuit 8-FA47 (WH/GN).

- Are the resistances less than 5 ohms?

→ Yes

RECHECK all connections, RECONNECT and RETEST the system. If the condition still exists, INSTALL a new DATC module. TEST the system for normal operation.

→ No

CHECK to make sure that circuit 8-FA47 (WH/GN) is connected to DATC module C228a pin 6 and that circuit 8-FA51 (WH/BK) is connected to DATC module C228a pin 18. REPAIR as required. TEST the system for normal operation.

PINPOINT TEST L: THE AIR CONDITIONING (A/C) IS INOPERATIVE/DOES NOT OPERATE CORRECTLY

CONDITIONS	DETAILS/RESULTS/ACTIONS
NOTE: The ambient temperature must be above 0° C (32° F) to permit the A/C compressor to operate.	
L1 VERIFY CUSTOMER COMPLAINT	
	<ol style="list-style-type: none"> 1 Make sure the engine is at operating temperature. 2 Select panel and A/C modes. <ul style="list-style-type: none"> • Is full heat present in all

temperature settings?

→ **Yes**
[Go To Pinpoint Test J.](#)

→ **No**
GO to [L2.](#)

L2 CARRY OUT THE PCM AND DATC MODULE SELF-TESTS

1



2



3 Carry out the PCM self-test. Record any DTCs displayed.

4 Carry out the DATC module self-test and retrieve continuous DTCs. Refer to [Climate Control System](#). Record the DTCs displayed, if any.

● **Were any DTCs displayed?**

→ **Yes**
REFER to the PCM or DATC Module Diagnostic Trouble Code (DTC) Index. CARRY OUT the necessary diagnosis and REPAIR as necessary.

→ **No**
GO to [L3.](#)

L3 CHECK THE PID WACF WITH THE A/C OFF

NOTE: When PCM PID WACF is YES, this is the same fault as DTC P1460.

1



3



PCM PID WACF

2 Press the OFF button on the DATC module.

● **Does the PCM PID WACF read YES?**

- **Yes**
REFER to the Powertrain Control/Emissions Diagnosis (PC/ED) manual to continue the diagnosis.
- **No**
GO to [L4](#).

L4 CHECK PID WACF WITH THE A/C ON

NOTE: When PCM PID WACF is YES, this is the same fault as DTC P1460.

1



3



PCM PID WACF

- 2 Press the DATC PANEL and A/C override button. Make sure the A/C indicator LED is on.

● **Does the PCM PID WACF read YES?**

- **Yes**
REFER to the Powertrain Control/Emissions Diagnosis (PC/ED) manual to continue the diagnosis.
- **No**
GO to [L5](#).

L5 CHECK PID ACCS WITH THE A/C ON

1



PID EXT_FT2

2



PID ACPEVAP

5

- 1 Make sure PID EXT_FT2 reading is greater than 0°C (32°F).
- 2 Make sure that the PID ACPEVAP reading is greater than 2°C (35°F).
- 3 Make sure the engine is at idle.
- 4 Press the DATC PANEL and the A/C override buttons. Make sure the A/C indicator LED is on.



PCM PID ACCS

- Does the PCM PID ACCS read ON?

→ **Yes**
GO to [L6](#).

→ **No**
INSTALL a new DATC module. REFER to [Section 412-04](#). TEST the system for normal operation.

L6 CHECK PID WAC WITH THE A/C ON

2



PCM PID WAC

1 Press the DATC PANEL and the A/C override button. Make sure the A/C indicator LED is on.

- Does the PID WAC read ON?

→ **Yes**
GO to [L7](#).

→ **No**
REFER to the Powertrain Control/Emissions Diagnosis (PC/ED) manual to continue the diagnosis.

L7 CHECK THE REFRIGERANT SYSTEM PRESSURE

1



2 Connect the manifold set to the service ports. Refer to [Manifold Gauge Set Connection](#) in this section.

- Is the pressure between 345 kPa (50 psi) and 1,724 kPa (250 psi)?

→ **Yes**
GO to [L8](#).

→ **No**
CHECK the system for refrigerant system leaks. REPAIR as necessary.

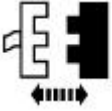
TEST the system for normal operation.

L8 CHECK FOR POWER TO THE A/C RELAY

1



2

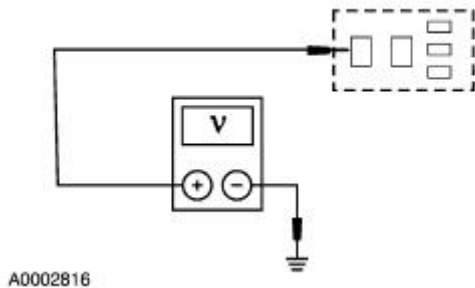


A/C Clutch Relay

3



4



4 Measure the voltage between A/C clutch relay C1008 pin 3, circuit 30-FA79 (RD/OG), harness side and ground.

● Is the voltage greater than 10 volts?

→ Yes
GO to [L13](#).

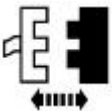
→ No
GO to [L9](#).

L9 CHECK UAJB FUSE 101 (10A)

1



2



UAJB Fuse 101 (10A)

● Is UAJB fuse 101 (10A) OK?

→ Yes
REPAIR circuit 30-FA79 (RD) for an

open. TEST the system for normal operation.

→ **No**
GO to [L10](#).

L10 CHECK CIRCUIT 30-FA79 (RD) FOR A SHORT TO GROUND

1



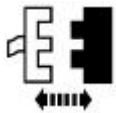
A/C Clutch Relay C1008

2



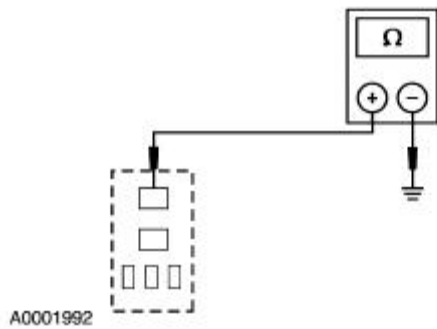
Auxiliary Coolant Pump C1005 (3.9L only)

3



Coolant Control Valve Jumper Harness and Engine Compartment Wiring Harness C134

4



4 Measure the resistance between at A/C clutch relay pin 3, circuit 30-FA79 (RD), harness side and ground.

● **Is the resistance greater than 10,000 ohms?**

→ **Yes**
GO to [L11](#).

→ **No**
REPAIR circuit 30-FA79 (RD) or circuit 30-FA74 (RD). TEST the system for normal operation.

L11 CHECK A/C CLUTCH RELAY

1 Carry out the relay component test. Refer to

Refer to Wiring Diagrams Section [700-09](#) for schematic and connector information.

● Is the relay OK?

→ **Yes**
GO to [L12](#).

→ **No**
INSTALL a new relay. TEST the system for normal operation.

L12 CHECK CIRCUIT 15S-FA6 (GN/YE) FOR A SHORT TO GROUND

1



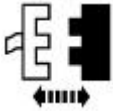
A/C Clutch Relay C1008

2



UAJB Fuse 101 (10A)

3



A/C Clutch C100

4



5 Push the A/C button.

● Does UAJB fuse 101 (10A) open?

→ **Yes**
REPAIR circuit 15S-FA6 (GN/YE).
TEST the system for normal operation.

→ **No**
If V6 engine, REPAIR circuit 30-FA74/30-FBB3 for a short to ground.
TEST the system for normal operation.
If V8 engine, [Go To Pinpoint Test I](#).

L13 CHECK A/C CLUTCH RELAY C1008

1 Carry out the relay component test.
Refer to

Refer to Wiring Diagrams Section [700-09](#) for schematic and connector information.

● IS the relay OK?

→ **Yes**
GO to [L14](#).

→ **No**
INSTALL a new relay. TEST the system for normal operation.

L14 CHECK THE A/C CLUTCH INPUT

1



2



A/C Clutch Relay

3

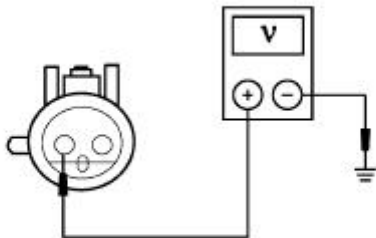


A/C Clutch Field Coil C100

4



5



A0001957

5 With the engine running measure the voltage between A/C clutch field coil C100, circuit 15S-FA6 (GN/YE), harness side and ground.

● Is the voltage greater than 10 volts?

→ **Yes**
GO to [L15](#).

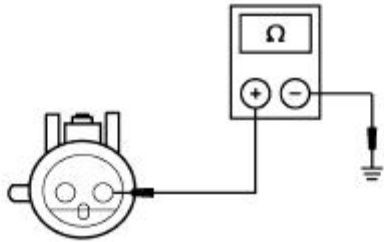
→ **No**
REPAIR circuit 15S-FA6 (GN/YE).
TEST the system for normal operation.

L15 CHECK THE A/C CLUTCH GROUND CIRCUIT FOR AN OPEN

1



2



A0001959

2 Measure the resistance between A/C clutch C100, circuit 31-FA6 (BK), harness side and ground.

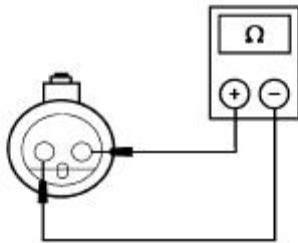
● Is the resistance 5 ohms or less?

→ **Yes**
GO to [L16](#).

→ **No**
REPAIR circuit 31-FA6 (BK). TEST the system for normal operation.

L16 CHECK THE A/C CLUTCH FIELD COIL RESISTANCE

1



A0003990

1 Measure the resistance between A/C clutch field coil terminals.

● Is the resistance greater than 6 ohms?

→ **Yes**
INSTALL a new A/C clutch field coil. REFER to [Section 412-03](#).

→ **No**
GO to [L17](#).



L17 CHECK THE CLUTCH AIR GAP

1 Check the A/C clutch air gap. Refer to [A/C Clutch Air Gap Adjustment](#) in this section.

● Is the air gap within specifications?

	<p>→ Yes RECONNECT all connectors. START vehicle and select A/C and PANEL modes. If UAJB fuse 101 opens, install a new A/C clutch field. REFER to Section 412-03.</p> <p>→ No ADJUST the air gap. TEST the system for normal operation.</p>
--	---

PINPOINT TEST M: THE AIR CONDITIONING (A/C) IS ALWAYS ON

CONDITIONS	DETAILS/RESULTS/ACTIONS
M1 CARRY OUT THE PCM AND DATC MODULE SELF-TESTS	
<p>1 </p> <p>2 </p>	<p>3 Carry out the PCM self-test. Record any DTCs.</p> <p>4 Carry out the DATC module self-test and retrieve continuous DTCs. Refer to Climate Control System under Diagnosis and Testing in this section. Record the DTCs displayed, if any.</p> <ul style="list-style-type: none"> • Are any PCM or DATC DTCs displayed? <p>→ Yes REFER to the PCM or DATC Module Diagnostic Trouble Code (DTC) Index. CARRY OUT the necessary diagnosis and REPAIR as necessary.</p> <p>→ No GO to M2.</p>
M2 CHECK DATC BUTTONS	
	<p>1 With the engine running, toggle between DATC OFF button and the A/C button.</p> <ul style="list-style-type: none"> • DOES the A/C indicator light turn on when the A/C button is pushed and off when the OFF button is pushed?

→ **Yes**
GO to [M3](#).

→ **No**
INSTALL a new DATC module. REFER to [Section 412-04](#). TEST the system for normal operation.

M3 CHECK PCM PID ACCS

1



PCM PID ACCS

2



3 Push the DATC OFF button, then push the A/C button.

- **Does the A/C indicator light turn off and on and the PCM PID ACCS continue to read ON?**

→ **Yes**
RERUN the Data Link Diagnostic Test.

→ **No**
GO to [M4](#).

M4 CHECK PID WACF WITH THE A/C OFF

1



3



PCM PID WACF

2 Push the DATC OFF button.

- **Does PCM PID WACF read YES?**

→ **Yes**
REPAIR circuit 91S-FA79 (BK/OG) for a short to ground. TEST the system for normal operation.

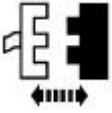
→ **No**
GO to [M5](#).

M5 CHECK FOR POWER ALWAYS ON CIRCUIT 15S-FA6 (GN/YE)

1



2

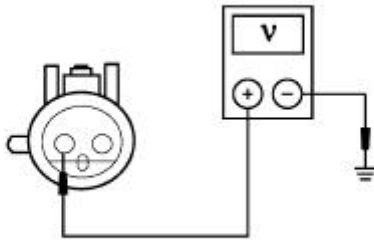


A/C Clutch C100

3



5



A0001957

4 Make sure the DATC is in the OFF position.

5 Measure the voltage between A/C clutch field coil C100, circuit 15S-FA6 (GN/YE), harness side and ground.

• Is the voltage greater than 10 volts?

→ Yes
GO to [M6](#).

→ No
CHECK the A/C clutch air gap. REFER to [A/C Clutch Air Gap Adjustment](#) in this section.

M6 CHECK THE A/C CLUTCH RELAY

1



2





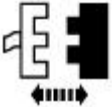

A/C Clutch Relay

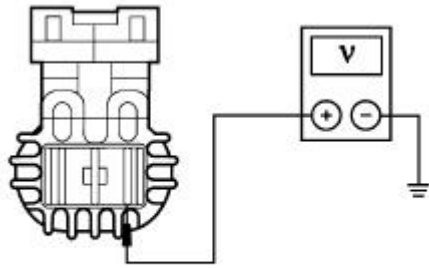
3



	<p>4 Carry out the relay component test. Refer to the Wiring Diagram Manual.</p> <ul style="list-style-type: none"> ● Is the relay OK? <p>→ Yes REPAIR circuit 15S-FA6 (GN/YE) for a short to the power. TEST the system for normal operation.</p> <p>→ No INSTALL a new A/C clutch relay. TEST the system for normal operation.</p>
--	--

PINPOINT TEST N: THE BLOWER MOTOR IS INOPERATIVE

CONDITIONS	DETAILS/RESULTS/ACTIONS
N1 VERIFY THE BLOWER MOTOR OPERATION	
<p>1</p> 	<p>2 Press the PANEL button on the DATC module. Adjust the blower motor setting to LO and then to HI.</p> <ul style="list-style-type: none"> ● Is the blower motor inoperative in all settings? <p>→ Yes GO to N2.</p> <p>→ No Go To Pinpoint Test O.</p>
N2 CHECK FOR VOLTAGE TO THE BLOWER MOTOR	
<p>1</p>  <p>2</p>  <p style="text-align: center;">Blower Motor C288</p> <p>3</p>  <p>4</p>	<p>4 Measure the voltage between the blower</p>



AM0416-A

motor C288, circuit 30S-FA18 (RD/BK) and ground.

● Is the voltage greater than 10 volts?

→ **Yes**
GO to [N3](#).

→ **No**
GO to [N8](#).

N3 CHECK CIRCUIT 31-FA45 (BK)

1

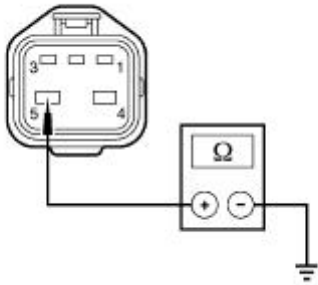


2



Blower Motor Speed Control C297

3



A0032576

3 Measure the resistance between the blower motor speed control C297 pin 5, circuit 31-FA45 (BK) and ground.

● Is the resistance less than 5 ohms?

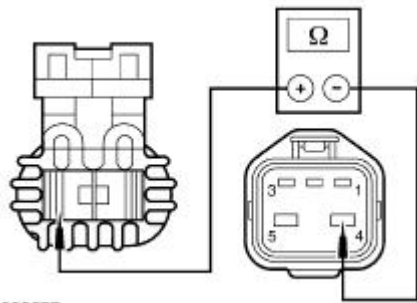
→ **Yes**
GO to [N4](#).

→ **No**
REPAIR circuit 31-FA45 (BK). TEST the system for normal operation.

N4 CHECK CIRCUIT 31S-FA18 (BK/RD)

1

1 Measure the resistance between the blower motor C288, circuit 31S-FA18



A0032577

(BK/RD) and the blower motor speed control C297 pin 4, circuit 31S-FA18 (BK/RD).

● Is the resistance less than 5 ohms?

→ **Yes**
GO to [N5](#).

→ **No**
REPAIR circuit 31S-FA18 (BK/RD). TEST the system for normal operation.

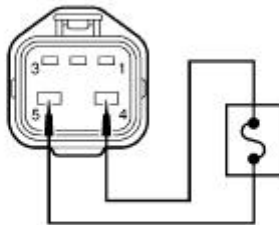
N5 CHECK THE BLOWER MOTOR

1



Blower Motor C288

2



A0032579

3



2 Connect a fused jumper lead between the blower motor speed control C297 pin 4, circuit 31S-FA18 (BK/RD) and pin 5, circuit 31-FA45 (BK).

● Does the blower motor operate?

→ **Yes**
GO to [N6](#).

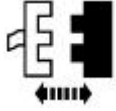
→ **No**
INSTALL a new blower motor. TEST the system for normal operation.

N6 CHECK CIRCUIT 10-FA45 (GY/VT) FOR AN OPEN OR SHORT TO GROUND

1

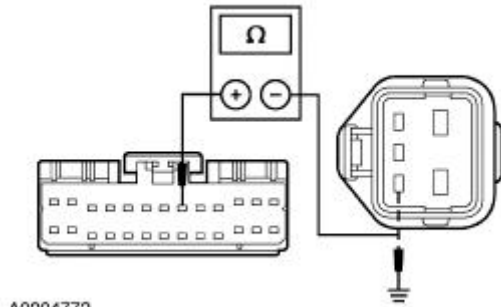


3



DATC Module C228b

4



2 Removed the fused jumper lead from the blower motor speed control C297.

4 Measure the resistance between the DATC module C228b pin 8, circuit 10-FA45 (GY/VT) and the blower motor speed control C297 pin 3, circuit 10-FA45 (GY/VT), and measure the resistance between the DATC module C228b pin 8, circuit 10-FA45 (GY/VT) and ground.

- Is the resistance less than 5 ohms between the DATC module and the blower motor speed control and greater than 10,000 ohms between the DATC module and ground?

→ Yes
GO to [N7](#).

→ No
REPAIR circuit 10-FA45 (GY/VT). TEST the system for normal operation.

N7 CHECK THE DATC MODULE OUTPUT

1



DATC Module C228b

2



Blower Motor Speed Control C297

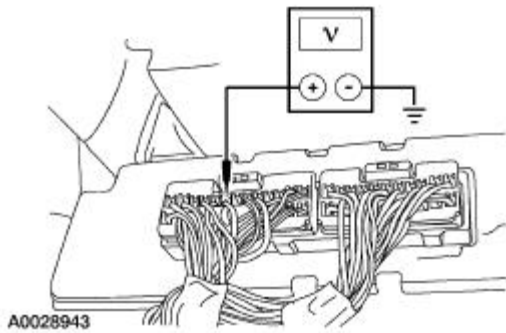
3



4

3 Adjust the blower motor speed to HI (7 bars).

4 Measure the voltage between the DATC module C228b pin 8, circuit 10-FA45



(GY/VT) and ground by back-probing the DATC module C228b.

- Is the voltage within 2 volts of battery voltage?

→ **Yes**
 INSTALL a new blower motor speed control. TEST the system for normal operation.

→ **No**
 INSTALL a new DATC module. TEST the system for normal operation.

N8 CHECK CIRCUIT 30S-FA18 (RD/BK)

1

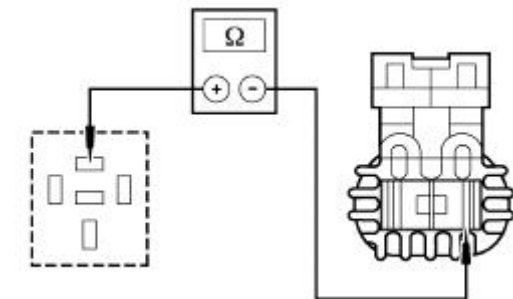


2



Blower Motor Relay C1011

3



A0032572

3 Measure the resistance between the blower motor relay C1011 socket pin 87, circuit 30S-FA18 (RD/BK) and the blower motor C288, circuit 30S-FA18 (RD/BK).

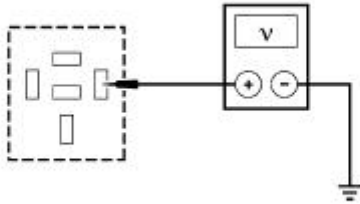
- Is the resistance less than 5 ohms?

→ **Yes**
 GO to [N9](#).

→ **No**
 REPAIR circuit 30S-FA18 (RD/BK). TEST the system for normal operation.

N9 CHECK CIRCUIT 30-FA24A (RD/OG)

1



A0020210

1

Measure the voltage between the blower motor relay C1011 socket pin 86, circuit 30-FA24A (RD/OG) and ground.

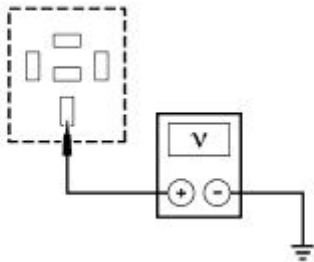
● Is the voltage greater than 10 volts?

→ **Yes**
GO to [N10](#).

→ **No**
REPAIR circuit 30-FA24A (RD/OG).
TEST the system for normal operation.

N10 CHECK CIRCUIT 30-FA24 (RD/OG)

1



A0032581

1

Measure the voltage between the blower motor relay C1011 socket pin 30, circuit 30-FA24 (RD/OG) and ground.

● Is the voltage greater than 10 volts?

→ **Yes**
GO to [N11](#).

→ **No**
REPAIR circuit 30-FA24 (RD/OG). TEST
the system for normal operation.

N11 CHECK THE DATC MODULE OUTPUT

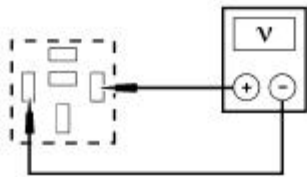
1



2

2

Measure the voltage between the blower motor relay C1011 socket pin 86, circuit 30-FA24A (RD/OG) and socket pin 85, circuit 31S-FA23 (BK/BU).



A0034149

● Is the voltage greater than 10 volts?

→ **Yes**
 INSTALL a new blower motor relay. TEST the system for normal operation.

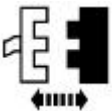
→ **No**
 GO to [N12](#).

N12 CHECK CIRCUIT 31S-FA23 (BK/BU) FOR SHORT TO VOLTAGE

1



2

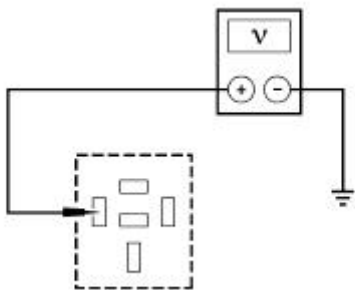


DATC Module C228b

3



4



A0013862

4 Measure the voltage between the blower motor relay C1011 socket pin 85, circuit 31S-FA23 (BK/BU) and ground.

● Is voltage present?

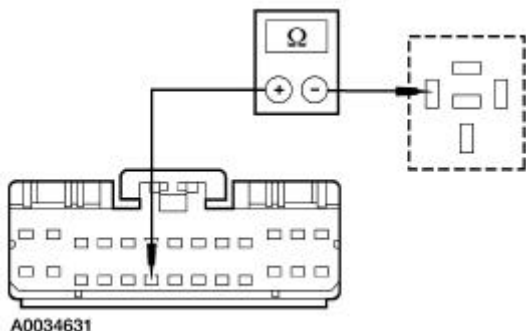
→ **Yes**
 REPAIR circuit 31S-FA23 (BK/BU). TEST the system for normal operation.

→ **No**

GO to [N13](#).

N13 CHECK CIRCUIT 31S-FA23 (BK/BU)

1



1

Measure the resistance between the DATC module C228b pin 19, circuit 31S-FA23 (BK/BU) and the blower motor relay C1011 socket pin 85, circuit 31S-FA23 (BK/BU).

● **Is the resistance less than 5 ohms?**



→ **Yes**

INSTALL a new DATC module. TEST the system for normal operation.

→ **No**

REPAIR circuit 31S-FA23 (BK/BU). TEST the system for normal operation.

PINPOINT TEST O: THE BLOWER MOTOR DOES NOT OPERATE CORRECTLY

CONDITIONS	DETAILS/RESULTS/ACTIONS
O1 VERIFY THE BLOWER MOTOR OPERATION	
<p>1</p> 	<p>2</p> <p>Press the PANEL button on the DATC module. Adjust the blower motor setting to LO and then to HI.</p> <p>● Does the blower motor operate at any setting?</p> <p>→ Yes GO to O2.</p> <p>→ No Go To Pinpoint Test N.</p>
O2 CHECK CIRCUIT 31S-FA18 (BK/RD)	
<p>1</p> 	

2



Blower Motor Speed Control C297

3



● Does the blower motor operate?

→ **Yes**
REPAIR circuit 31S-FA18 (BK/RD). TEST the system for normal operation.

→ **No**
GO to [O3](#).

O3 CHECK THE BLOWER MOTOR SPEED CONTROL

1



2



Blower Motor Speed Control C297

3



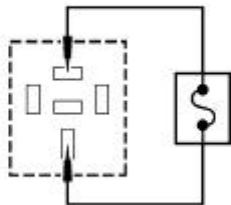
DATC Module C228a and C228b

4



Blower Motor Relay C1011

5



5 Connect a fused jumper lead between the blower motor relay C1011 socket pin 30, circuit 30-FA24 (RD/OG) and socket pin 87, circuit 30S-FA18 (RD/BK).

● **Does the blower motor operate?**

→ **Yes**
 INSTALL a new blower motor speed control. TEST the system for normal operation.

→ **No**
 GO to [O4](#).

O4 CHECK THE BLOWER MOTOR SPEED CONTROL CIRCUITS FOR AN OPEN

1

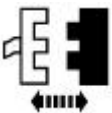


2



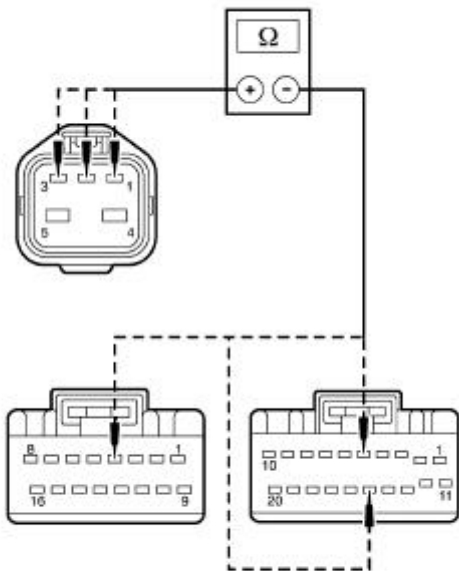
Blower Motor Relay C1011

3



Blower Motor Speed Control C297

4



A0033861

4 Measure the resistance between the blower motor speed control C297 :

- pin 1, circuit 8-FA45 (WH/BU) and the DATC module C228a pin 5, circuit 8-FA45 (WH/BU).
- pin 2, circuit 9-FA45 (BN/BU) and the DATC module C228a pin 15, circuit 9-FA45 (BN/BU).
- pin 3, circuit 10-FA45 (GY/VT) and the DATC module C228b pin 8, circuit 10-FA45 (GY/VT).

● **Are the resistances less than 5 ohms?**

→ **Yes**
 GO to [O5](#).

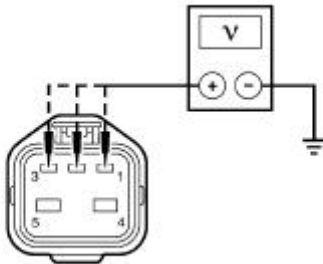
→ **No**
REPAIR the affected circuit. TEST the system for normal operation.

O5 CHECK THE BLOWER MOTOR SPEED CONTROL CIRCUITS FOR A SHORT TO VOLTAGE

1



2



A0033862

2 Measure the voltage between the blower motor speed control C297:

- pin 1, circuit 8-FA45 (WH/BU) and ground.
- pin 2, circuit 9-FA45 (BN/BU) and ground.
- pin 3, circuit 10-FA45 (GY/VT) and ground.

● **Is voltage present?**

→ **Yes**
REPAIR the affected circuit. TEST the system for normal operation.

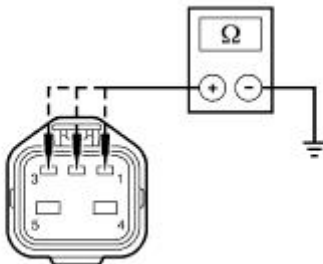
→ **No**
GO to [O6](#).

O6 CHECK THE BLOWER MOTOR SPEED CONTROL CIRCUITS FOR A SHORT TO GROUND

1



2



A0033863

2 Measure the resistance between the blower motor speed control C297:

- pin 1, circuit 8-FA45 (WH/BU) and ground.
- pin 2, circuit 9-FA45 (BN/BU) and ground.
- pin 3, circuit 10-FA45 (GY/VT) and ground.

● **Are the resistances greater than 10,000 ohms?**

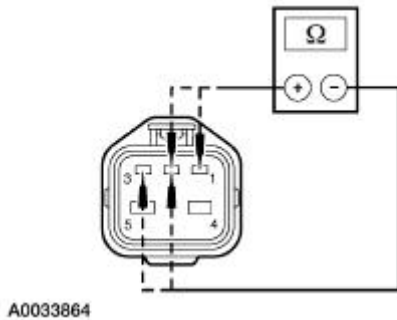
→ **Yes**

GO to [07](#).

→ **No**
REPAIR the affected circuit. TEST the system for normal operation.

07 CHECK THE BLOWER MOTOR SPEED CONTROL CIRCUITS FOR SHORTS

1



1 Measure the resistance between the blower motor speed control C297:

- pin 1, circuit 8-FA45 (WH/BU) and pin 2, circuit 9-FA45 (BN/BU).
- pin 1, circuit 8-FA45 (WH/BU) and pin 3, circuit 10-FA45 (GY/VT).
- pin 2, circuit 9-FA45 (BN/BU) and pin 3, circuit 10-FA45 (GY/VT).

● **Are the resistances greater than 10,000 ohms?**

→ **Yes**
GO to [08](#).

→ **No**
REPAIR the affected circuits. TEST the system for normal operation.

08 CHECK THE DATC MODULE HIGH BLOWER OUTPUT

1



DATC Module C228a and C228b

2



Blower Motor Speed Control C297

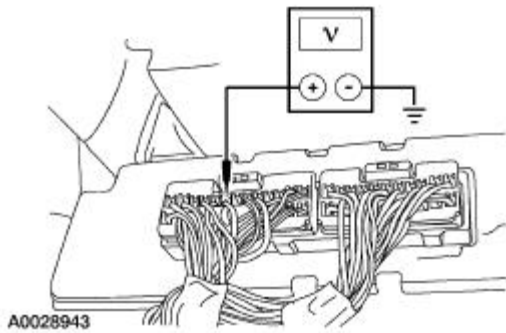
3



4

3 Adjust the blower motor speed to HI (7 bars).

4 Measure the voltage between the DATC module C228b pin 8, circuit 10-FA45 (GY/VT) and ground by back-probing the DATC module C228b.



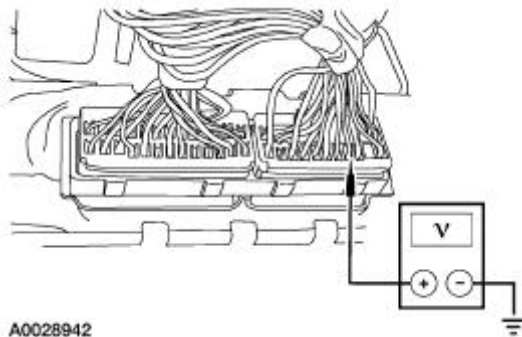
- Is the voltage within 2 volts of battery voltage?

→ **Yes**
GO to [O9](#).

→ **No**
INSTALL a new DATC module. TEST the system for normal operation.

O9 CHECK THE DATC MODULE BLOWER CONTROL OUTPUT

2



1 Adjust the blower motor speed to LO (1 bar).

2 Measure the voltage between the DATC module C228a pin 15, circuit 9-FA45 (BN/BU) and ground by back-probing the DATC module C228a.

- Is the voltage greater than 1 volt?

→ **Yes**
INSTALL a new blower motor speed control. TEST the system for normal operation.

→ **No**
INSTALL a new DATC module. TEST the system for normal operation.

PINPOINT TEST P: THE TEMPERATURE SET POINT DOES NOT REPEAT AFTER TURNING THE IGNITION SWITCH OFF

CONDITIONS	DETAILS/RESULTS/ACTIONS
P1 DUPLICATE THE PROBLEM	

NOTE: Some vehicles are shipped with a transit relay. Make sure the transit relay packaged in the trunk is not installed.

2



4



1 Set the driver side temperature to 72° F and the passenger side temperature to 74°F.

3 Wait 5 seconds.

• Do the set points repeat?

→ **Yes**
The system is operating correctly.

→ **No**
GO to [P2](#).

P2 CHECK THE MEMORY BACKUP SUPPLY TO THE DATC MODULE

1

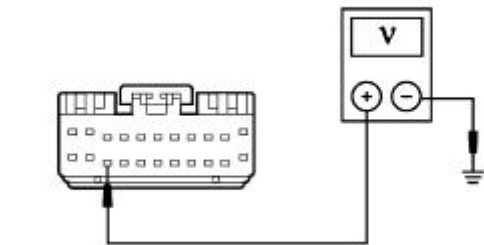


2



DATC Module C228a

3



A0002317

3 Measure the voltage between DATC module C228a pin 14, circuit 29-FA10 (OG/GN), harness side and ground.

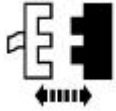
• Is the voltage greater than 10 volts?

→ **Yes**
INSTALL a new DATC module. REFER to [Section 412-04](#). TEST the system for normal operation.

→ **No**
GO to [P3](#).

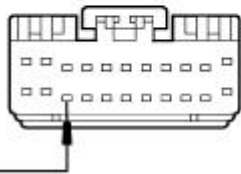
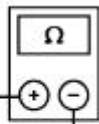
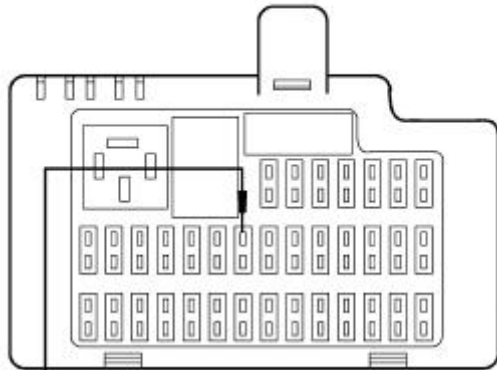
P3 CHECK CIRCUIT 29-FA10 (OG/GN) FOR AN OPEN

1



CJB Fuse 220 (10A)

2



A0002328

2

Measure the resistance between CJB fuse 214 (10A) socket at circuit 29-FA10 (OG/GN), harness side and DATC module C228b pin 14, circuit 29-FA10 (OG/GN), harness side.

● **Is the resistance less than 5 ohms?**

→ **Yes**

REPAIR circuit 20-DD6 (PK/WH) for an open. TEST the system for normal operation.

→ **No**

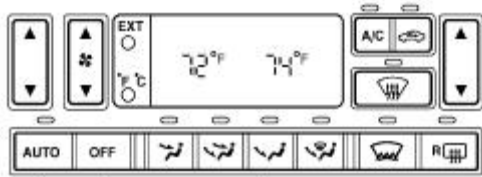
REPAIR the circuit. TEST the system for normal operation.

PINPOINT TEST Q: THE EXTERIOR TEMPERATURE DISPLAY DOES NOT FUNCTION CORRECTLY

CONDITIONS	DETAILS/RESULTS/ACTIONS
Q1 CARRY OUT THE DATC MODULE SELF-TEST	
1	



2



A0002319

2 Carry out the DATC module self-test and retrieve continuous DTCs. Refer to [Climate Control System](#) . Record the DTCs displayed, if any.

• Are any DTCs displayed?

→ **Yes**
REFER to the DATC Module Diagnostic Trouble Code (DTC) Index. CARRY OUT the necessary diagnosis and REPAIR as necessary.

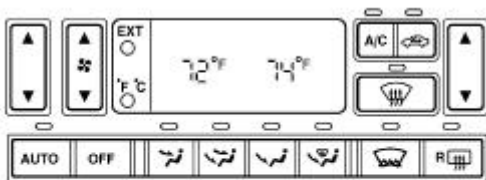
→ **No**
GO to [Q2](#) .

Q2 CHECK THE EXTERIOR TEMPERATURE DISPLAY

1



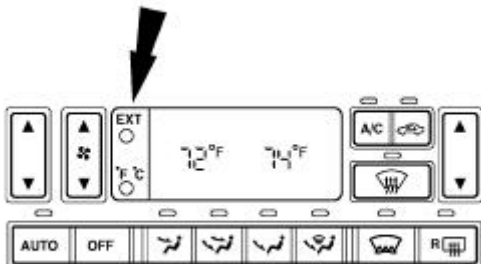
2



A0002320

2 Press the AUTO button.

3



A0002425

3 Press and repress the EXT button.

	<ul style="list-style-type: none"> ● Did the display alternate between interior set temperatures and exterior temperatures? <p>→ Yes GO to Q3.</p> <p>→ No INSTALL a new DATC module. REFER to Section 412-04. TEST the system for normal operation.</p>
Q3 VERIFY ACCURACY OF AMBIENT AIR TEMPERATURE SENSOR	
	<p>1 Check the mounting of the sensor and note the ambient temperature.</p> <ul style="list-style-type: none"> ● Does the temperature displayed match the ambient temperature? <p>→ Yes System is working correctly.</p> <p>→ No INSTALL a new sensor. REFER to Section 412-04. TEST the system for normal operation.</p>

Component Tests

Heater Core



WARNING: Carbon monoxide is colorless, odorless and dangerous. If it is necessary to operate the engine with the vehicle in a closed area such as a garage, always use an exhaust collector to vent the exhaust gases outside the closed area.

1. **NOTE:** Testing of returned heater cores reveals that a large percentage of heater cores are good and did not require the installation of a new heater core. If a heater core leak is suspected, the heater core must be tested by following the plugged heater core component test before the heater core pressure test. Carry out a system inspection by checking the heater system thoroughly as follows:

Inspect for evidence of coolant leakage at the heater hose to heater core attachments. A coolant leak in the heater hose could follow the heater core tube to the heater core and appear as a leak in the heater core.

2. **NOTE:** Spring-type clamps are installed as original equipment. Installation and overtightening of non-specification clamps can cause leakage at the heater hose connection and damage the heater core.

Check the integrity of the heater hose clamps.

Heater Core—Plugged



WARNING: The heater core inlet hose will become too hot to handle if the system is working correctly.

1. Check to see that the engine coolant is at the correct level.
2. Start the engine and turn on the heater.
3. When the engine coolant reaches operating temperature, feel the heater core outlet hose to see if it is hot.
If it is not hot:
 - the heater core may have an air pocket.
 - the heater core may be plugged.
 - the thermostat may not be working correctly.

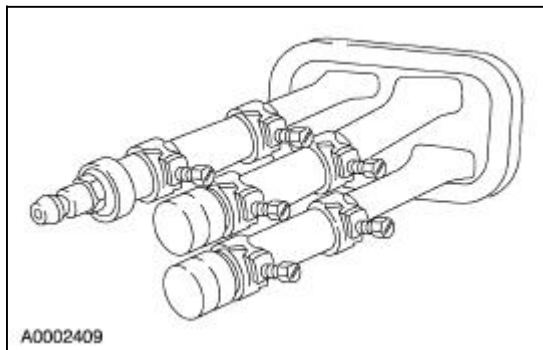
Heater Core—Pressure Test

Use the Pressure Test Kit to carry out the pressure test.

1. **NOTE:** Due to space limitations, a bench test may be necessary for pressure testing.

Drain the coolant from the cooling system.

2. Disconnect the heater hoses from the heater core. For additional information, refer to [Section 412-02](#).
3. Install a short piece of heater hose, approximately 101 mm (4 inches) long on each heater core tube.
4. Fill the heater core and heater hoses with water and install the two plugs BT-7422-B and the adapter BT-7422-A from the Pressure Test Kit. Secure the heater hoses, plug and adapter with hose clamps.

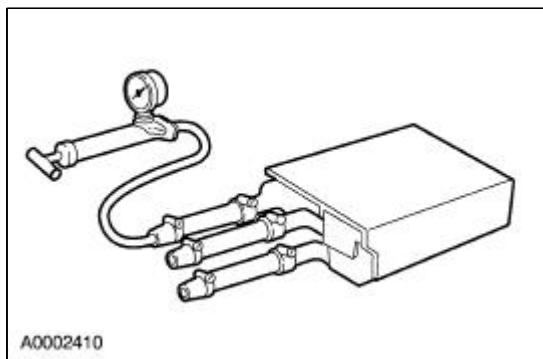


5. Attach the pump and gauge assembly from the Pressure Test Kit to the adapter.
6. Close the bleed valve at the base of the gauge. Pump 241 kPa (35 psi) of air pressure into the heater core.
7. Observe the pressure gauge for a minimum of three minutes.
8. If the pressure drops, check the heater hose connections to the core tubes for leaks. If the

heater hoses do not leak, remove the heater core from the vehicle and carry out the bench test.

Heater Core—Bench Test

1. Remove the heater core from the vehicle. For additional information, refer to [Section 412-02](#).
2. Drain all of the coolant from the heater core.
3. Connect the 101 mm (4 inch) test heater hoses with plug and adapter to the core tubes. Then connect the Pressure Test Kit to the adapter.
4. Apply 241 kPa (35 psi) of air pressure to the heater core. Submerge the heater core in water.
5. If a leak is observed, install a new heater core.



Evaporator/Condenser Core—On-Vehicle Leak Test

1. Discharge and recover the refrigerant. For additional information, refer to [Air Conditioning \(A/C\) System Recovery, Evacuation and Charging](#) in this section.
2. Disconnect the suspect evaporator core or condenser core from the A/C system. For additional information, refer to [Section 412-03](#).
3. Clean the manifold fittings.
4. Connect the appropriate test fittings from the Set, A/C Fittings to the condenser core tube connections.
5. Connect the Vacuum Check Fitting, TXV to the thermostatic expansion valve.
6. **NOTE:** The automatic shut-off valves on some gauge set hoses do not open when connected to the test fittings. If available, use hoses without shut-off valves. If hoses with shut-off valves are used, make sure the valve opens when attached to the test fittings or install an adapter which will activate the valve. The test is not valid if the shut-off valve does not open.

Connect the red and blue hoses from the R-134a Manifold Gauge Set to the test fittings on the evaporator core or condenser core. Connect the yellow hose to a known good vacuum pump.

7. Open both gauge set valves and start the vacuum pump. Allow the vacuum pump to operate for a minimum of 45 minutes after the gauge set low pressure gauge indicates 101 kPa (30 in-Hg). The 45 minute evacuation is necessary to remove any refrigerant from oil left in the evaporator core or condenser core. If the refrigerant is not completely removed from the oil, outgassing will degrade the vacuum and appear as a refrigerant leak.

8. If the low pressure gauge reading will not drop to 101 kPa (30 in-Hg) when the valves on the gauge and manifold set are open and the vacuum pump is operating, close the gauge set valves and observe the low pressure gauge. If the pressure rises rapidly to zero, a large leak is indicated. Recheck the test fitting connections and gauge set connections before installing a new evaporator core or condenser core.
9. After evacuating for 45 minutes, close the gauge set valves and stop the vacuum pump. Observe the low pressure gauge; it should remain at the 101 kPa (30 in-Hg) mark.
 - If the low pressure gauge reading rises 34 or more kPa (10 or more in-Hg) of vacuum from the 101 kPa (30 in-Hg) position in 10 minutes, a leak is indicated.
 - If a very small leak is suspected, wait 30 minutes and observe the vacuum gauge.
 - If a small amount of vacuum is lost, operate the vacuum pump with gauge valves open for an additional 30 minutes to remove any remaining refrigerant from the oil in the evaporator core or condenser core. Then recheck for loss of vacuum.
 - If a very small leak is suspected, allow the system to sit overnight with vacuum applied and check for vacuum loss.
10. If the evaporator core or condenser core does leak, as verified by the above procedure, install a new evaporator core or condenser core. For additional information, refer to [Section 412-03](#).

A/C Compressor—External Leak Test

1. Install the A/C Pressure Test Adapter on the port of the A/C compressor using the existing manifold retaining bolt.
 2. Connect the high and low pressure lines of a manifold gauge set or a refrigerant recovery/recycling station such as the R-134a A/C service center to the corresponding fittings on the A/C Pressure Test Adapter.
 3. Attach the center hose of a manifold gauge set to a refrigerant container standing in an upright position.
 4. Hand-rotate the compressor shaft 10 complete revolutions to distribute the oil inside the A/C compressor.
 5. Open the low pressure gauge valve, the high pressure gauge valve and the valve on the refrigerant container to allow the refrigerant vapor to flow into the A/C compressor.
 6. Using the Refrigerant Leak Detector, check for leaks at the compressor shaft.
 7. If a shaft or external leak is found, install a new A/C compressor. For additional information, refer to [Section 412-03](#).
 8. When the leak test is complete, recover the refrigerant from the compressor.
-

Air Conditioning (A/C) System Check — Retail Procedure

NOTE: This Retail Procedure is not eligible for claiming on Ford paid repairs (warranty and ESP).

NOTE: The engine should be run at idle for 10 minutes with the air conditioning on and set to MAX A/C before carrying out this retail procedure.

NOTE: Read and follow all of the Warnings, Cautions and Notes at the beginning of this section before continuing.

1. Visual inspection

Open the hood and visually inspect the heating and air conditioning systems for the following:

- Coolant reservoir for correct coolant level
- Heater hoses for deterioration or loose connections
- Radiator and condenser for debris or damaged fins restricting airflow, loose mounting or connections
- Accessory drive belt(s) and cooling fan(s) for wear or physical damage
- Refrigerant lines and connections for physical damage or loose connections
- Compressor for physical damage or loose connections
- Suction accumulator/drier for physical damage or loose connections
- Wiring and connectors for excessive wear, loose or damaged connections, or incorrect routing

2. A/C refrigerant analysis

- Carry out air conditioning refrigerant analysis. For additional information, refer to [Refrigerant Identification Testing](#) in this section.
- If the refrigerant fails the analysis, discontinue diagnosis and make recommendations for repairs.
- If the refrigerant passes the analysis, carry out the air conditioning system check.

3. Air conditioning system check

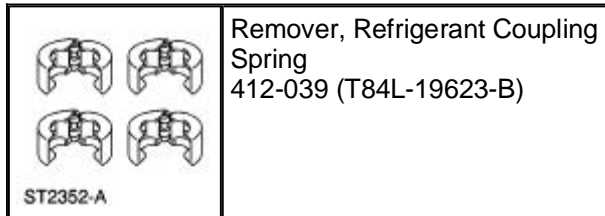
- Connect manifold gauge set or charging station with gauges to refrigerant system.
- With the vehicle in park, parking brake set, thermometer installed in center panel vent, and air conditioning system on and set to MAX A/C, start the engine.
- Record air refrigerant system pressures while running the engine at 1,500 rpm and allow engine to return to idle.
- Operate the blower motor in all control positions and check for correct blower speed changes.
- With the blower motor on HI, operate air discharge mode selector in all positions and check for correct airflow in each position.
- Operate the temperature blend selector in all positions and check for correct change in discharge temperature. Check the air discharge temperature with the selector in the coolest position and the air conditioning on and set to MAX A/C to determine if the air discharge temperature is acceptable for the current ambient air temperature.
- Carry out the EATC self-test (if applicable).
If the refrigerant system pressures were low, carry out the refrigerant system leak test.

4. Refrigerant system leak test

- Use either an ultraviolet (UV) or an electronic leak detector to check for leaks at all refrigerant lines, connections, and components.
After all tests have been completed, report all findings and recommended repairs to your service advisor before carrying out further diagnostic procedures.
-

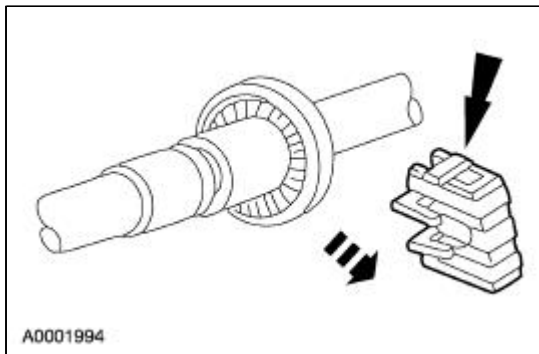
Spring Lock Coupling

Special Tool(s)

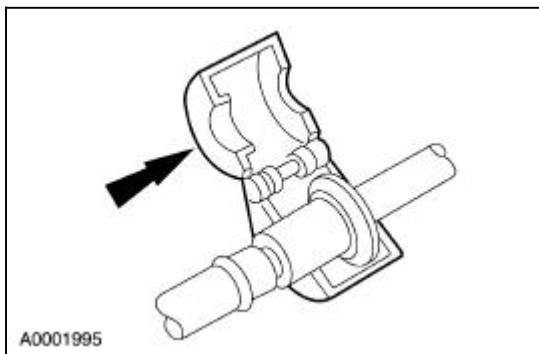


Disconnect

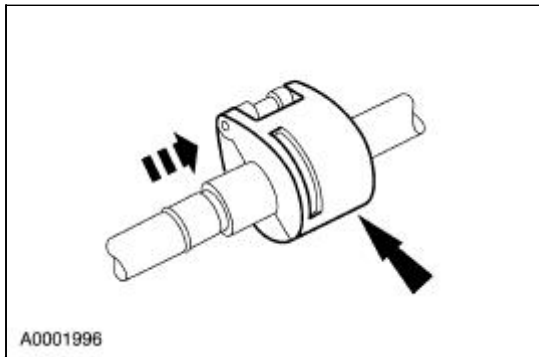
1. Remove the A/C tube lock coupling clip (19E746), if equipped.



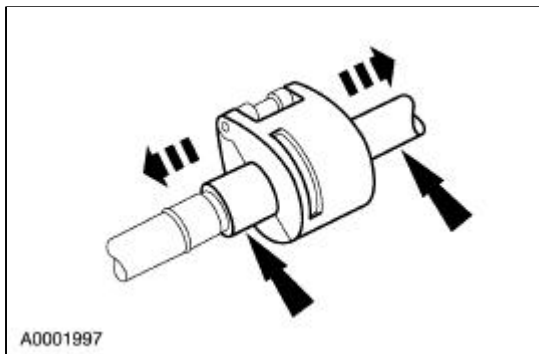
2. Fit the special tool to the spring lock coupling.




3. Push the tool into the cage opening to release the female fitting from the A/C tube lock coupling spring (19E576).

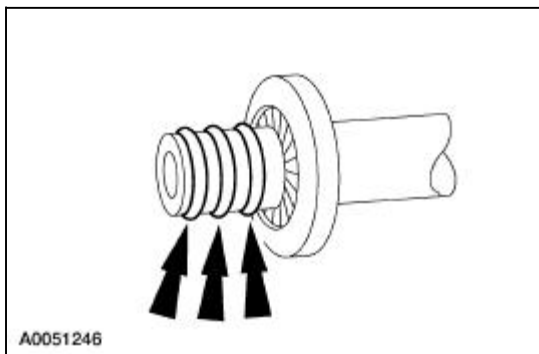



4. Pull the spring lock coupling fittings apart.



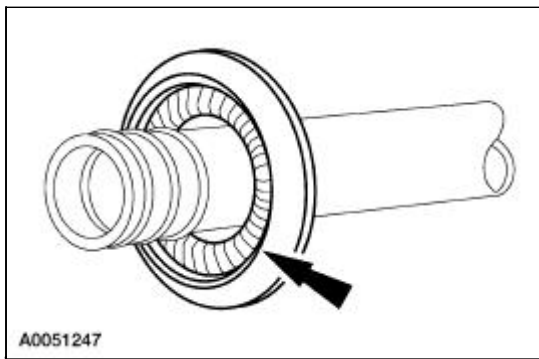
5.  **CAUTION:** Do not use metal tools to remove the O-ring seals. They can cause axial scratches across the O-ring seal grooves, resulting in refrigerant leaks.

Remove the O-ring seals with a non-metallic tool.



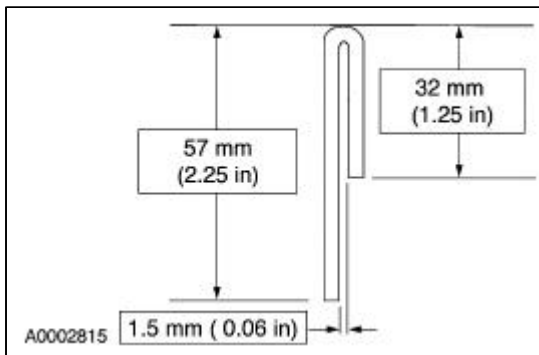
6.  **CAUTION:** Do not use a screwdriver or similar tool to remove the A/C tube lock coupling spring; this can cause axial scratches across the O-ring seal grooves resulting in refrigerant leaks.

Remove the A/C tube lock coupling spring with a small hooked wire.



Cleaning

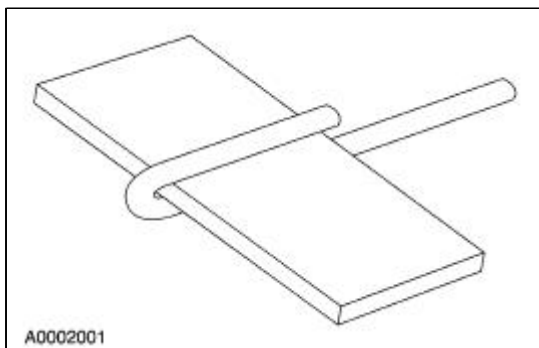
1. Fabricate a cleaning tool from a 1/8 inch diameter brazing rod.




2. Cut an abrasive pad from maroon colored 3M Scotch Brite® with the dimensions corresponding to the coupling size.

Coupling Size	Pad Size
3/8 inch	25 x 50 mm (1 x 2 inch)
1/2 inch	25 x 50 mm (1 x 2 inch)
5/8 inch	25 x 76 mm (1 x 3 inch)
3/4 inch	25 x 102 mm (1 x 4 inch)

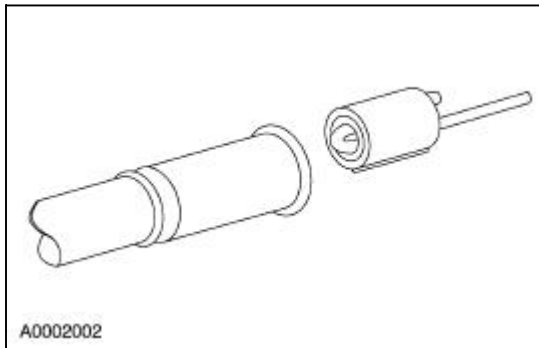
3. Assemble the pad to the tool.



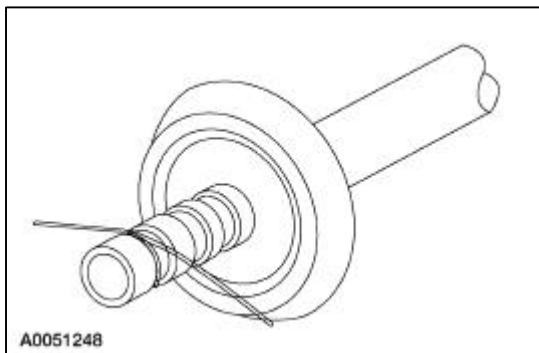
4. Coat the abrasive pad with PAG Refrigerant Compressor Oil (R-134a Systems) or equivalent.
5. Roll the pad on the tool and install it in a variable speed drill motor.
6.  **CAUTION: Maintain low speed drill rotation when inserting or removing the cleaning**

tool to prevent axial scratches which may cause future leaks.

Polish for one minute at moderate speed (less than 1,500 rpm) or until the surface is clean and free of scratches or foreign material.



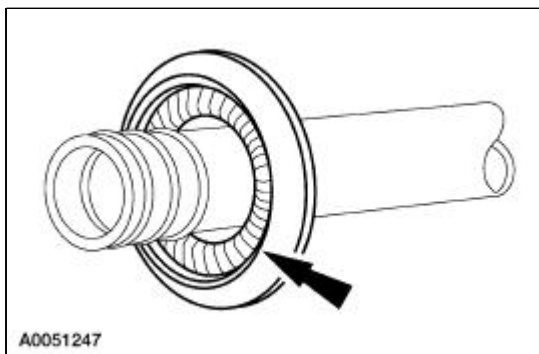
7. Clean the fitting with a lint-free cloth.
8. Inspect the surface for grooves or scratches. If grooves and scratches are still present, install a new component.
9. Clean the O-ring seal grooves with a 300 mm (12 inch) length of natural fiber string.
 - Loop the string around the grooves and pull the string back and forth.



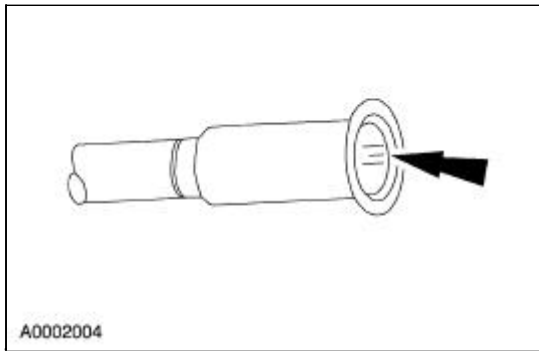
10. Remove any foreign material from the grooves with a lint-free cloth.

Connect

1. Install the A/C tube lock coupling spring.



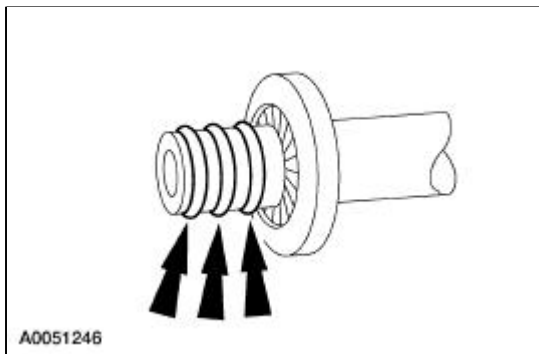
2. Lubricate the inside of the coupling with PAG Refrigerant Compressor Oil (R-134a Systems) or equivalent.



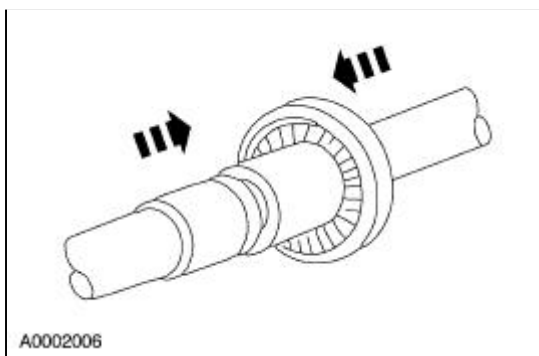
3.  **CAUTION:** Use only the new O-ring seals. The use of any O-ring seals other than those specified in the Ford Master Parts Catalog may result in intermittent leakage during vehicle operation.

Install the O-ring seals.

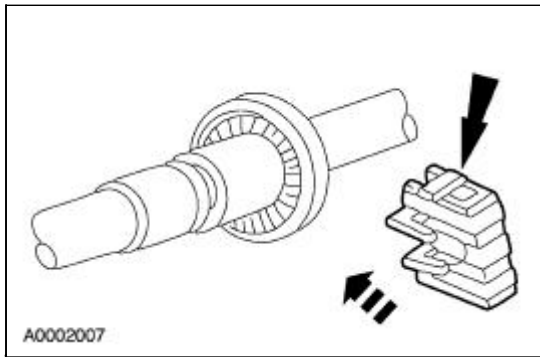
- Lubricate the O-ring seals with PAG Refrigerant Compressor Oil (R-134a Systems) or equivalent.



4. Connect the spring lock coupling fittings with a twisting motion until the A/C tube lock coupling spring snaps over the flared end of the female fitting.



5. Install the A/C tube lock coupling clip.



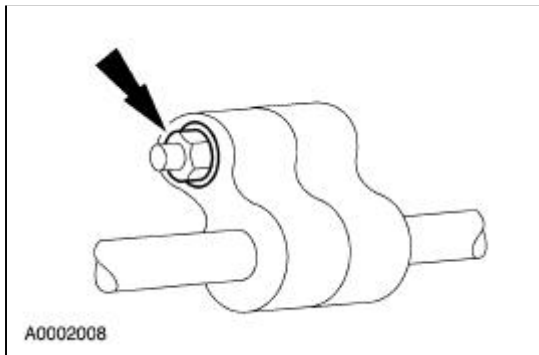
A0002007

Air Conditioning Line (Peanut) Fitting

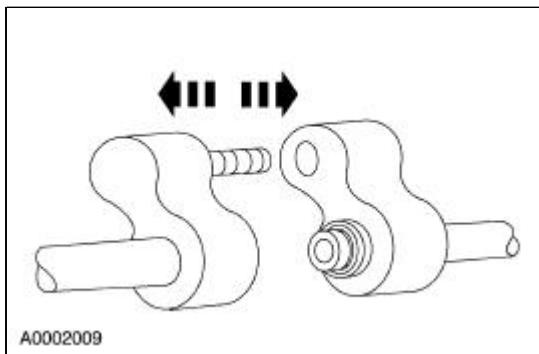
Disconnect


1.  **CAUTION:** Support the female fitting with a wrench to prevent the tubes from twisting.

Remove the nut from the peanut fitting.

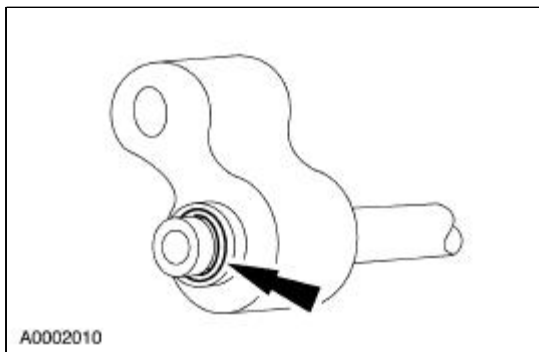


2. Pull the peanut fitting apart.




3.  **CAUTION:** Do not use metal tools to remove the O-ring seal. They can cause axial scratches across the O-ring seal groove, resulting in refrigerant leaks.

Remove the O-ring seal with a non-metallic tool.

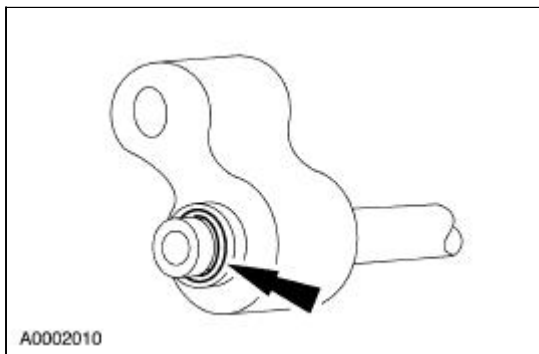


Connect

1. Clean all dirt or foreign material from the fittings.
2.  **CAUTION:** Use only the new O-ring seals. The use of any O-ring seals other than those specified in the Ford Master Parts Catalog may result in intermittent leakage during vehicle operation.

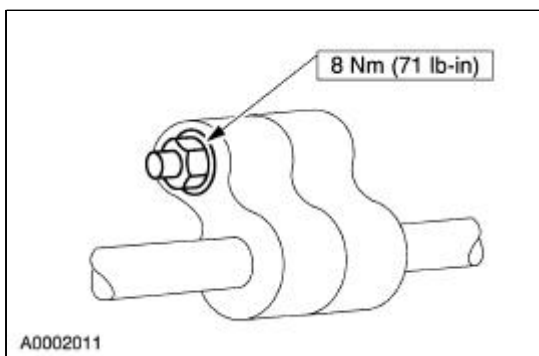
Install the O-ring seal.

- Lubricate the O-ring seal with PAG Refrigerant Compressor Oil (R-134a Systems) F7AZ-19589-DA (Motorcraft YN-12-C) or equivalent meeting Ford specification WSH-M1C231-B.





3. Lubricate the inside of the fittings with PAG Refrigerant Compressor Oil (R-134a Systems) F7AZ-19589-DA (Motorcraft YN-12-C) or equivalent meeting Ford specification WSH-M1C231-B.
4. **NOTE:** When correctly assembled, the male and female fittings should be flush.

Assemble the male and female fittings together.



Heater Hose Coupling


Special Tool(s)


 ST1648-A	Remover, Heater Hose Inlet Tube 412-042 (T85T-18539-AH)
 ST2589-A	Disconnect Tool, Heater Hose 412-127

Material

Item	Specification
MERPOL® —	ESE-M99B144-B

Disconnect

 **CAUTION:** Do not attempt to install a new bushing, spacer or O-rings in the heater hose coupling; damage to the heater hose coupling can result. If the heater hose coupling is the cause of a coolant leak, the affected heater hose must be replaced as an assembly.

-  **WARNING:** The engine must be off, fully cool and the cooling system fully depressurized before attempting to disconnect any heater water hoses. Failure to comply with this warning can result in serious injury or burns from hot liquid escaping out of the engine cooling system.

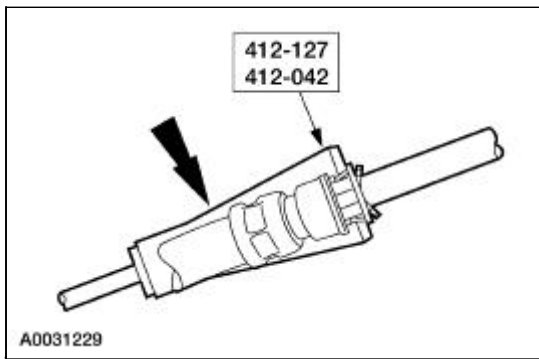
Depressurize the engine cooling system.

- Push the heater hose toward the tube to fully expose the locking tabs.

- NOTE:** When compressing the white coupling retainer with the special tool, the special tool must be perpendicular to and on the highest point of the coupling.

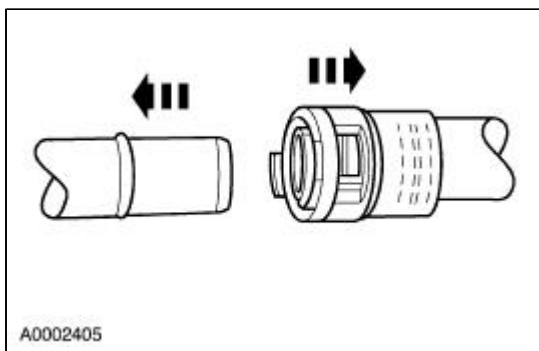
NOTE: If the heater hose coupling is accessible, the retainer tabs can be compressed by hand to disconnect the heater hose.

Push the special tool over the coupling retainer windows to compress the retainer locking tabs.

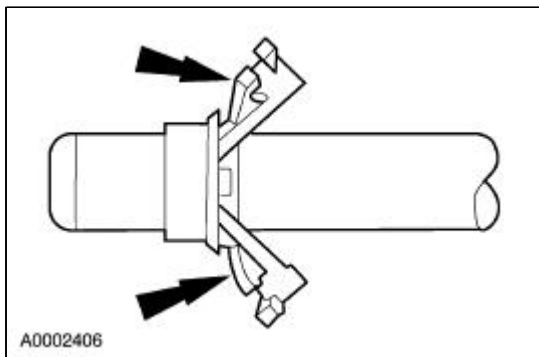


4. **NOTE:** A slight twisting motion while pulling on the heater water hose may be necessary to assist in the removal.

Pull the heater hose away from the heater core tube.

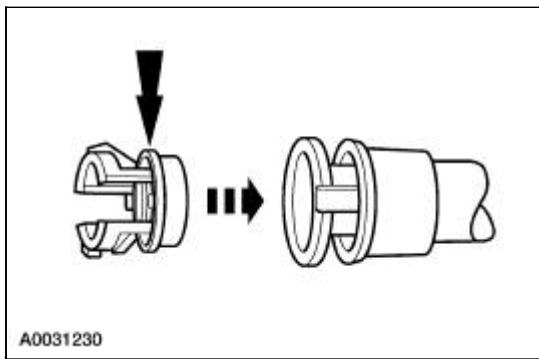


5. Spread the retainer tabs apart and slide the retainer off the tube.
 - Discard the retainer.

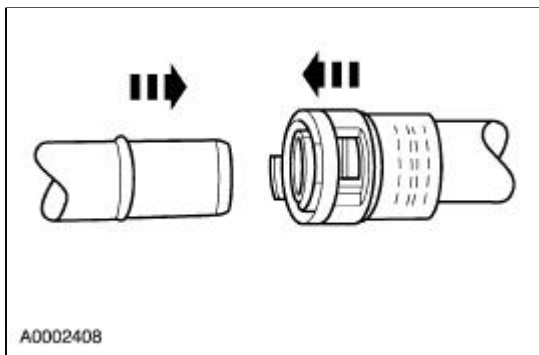


Connect

1. Clean the tubes and lubricate with coolant hose lubricant or plain water.
2. Install a new coupling retainer (18D434) into the heater hose coupling housing.



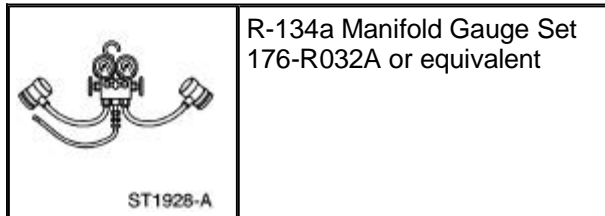
3. Push the heater hose coupling onto the tube.



4. Make sure the heater hose coupling is fully engaged by lightly pulling on the heater hose.
-

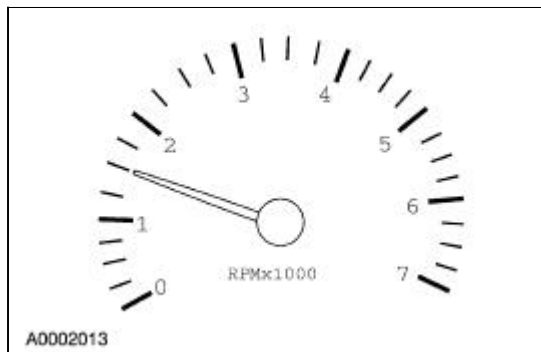
Refrigerant System Tests

Special Tool(s)



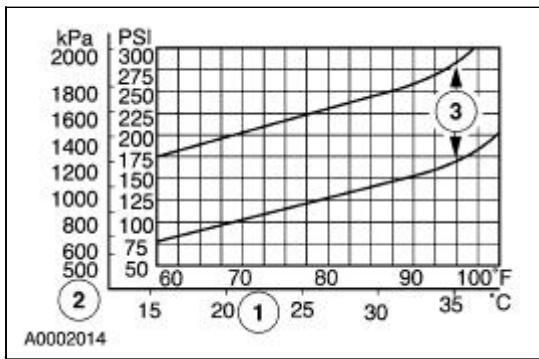
1. Connect the R-134a Manifold Gauge Set. For additional information, refer to [Manifold Gauge Set Connection](#) in this section.
2. Adjust the climate controls for maximum cooling.
 - Start the engine.
 - Select MAX A/C operation.
 - Set the blower motor speed to maximum.
3. Stabilize the in-vehicle temperature at 21-27°C (70-80°F).
4. **NOTE:** When the ambient temperatures exceed 38°C (100°F), do not run the engine above normal idle speed.

Maintain the engine speed at 1,500 rpm.



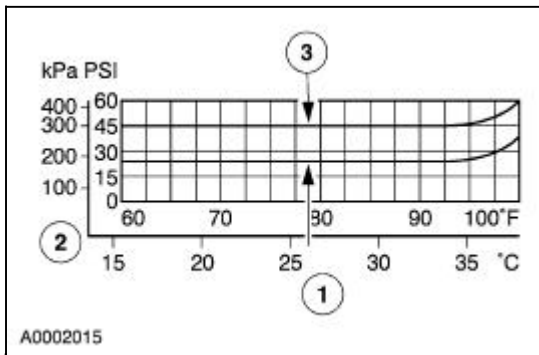
5. Determine the compressor discharge (high) pressure.
 1. Record the ambient temperature.
 2. Record the discharge (high) pressure.
 3. **NOTE:** In ambient temperatures between 38-43°C (100-110°F), the system performance pressures will be the same as those for ambient temperatures shown on the chart in the 32-38°C (90-100°F) range.

The system performance is acceptable when the pressure reading falls between the upper and lower limits shown.



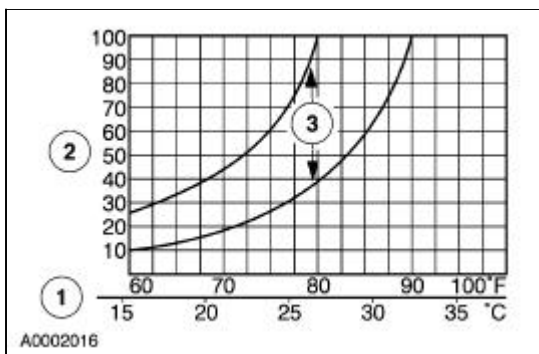
6. Determine the compressor suction (low) pressure.
 1. Record the ambient temperature.
 2. Record the suction (low) pressure.
 3. **NOTE:** In ambient temperatures between 38-43°C (100-110°F), the system performance pressures will be the same as those for ambient temperatures shown on the chart in the 32-38°C (90-100°F) range.

The system performance is acceptable when the pressure reading falls between the upper and lower limits shown.



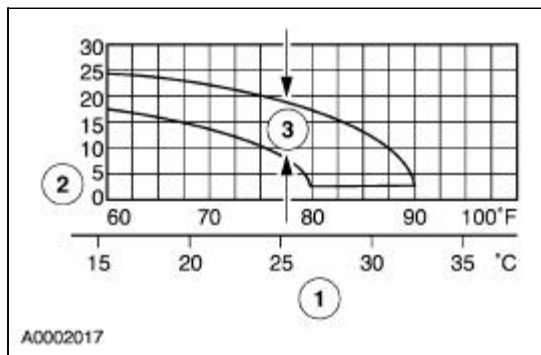
7. Determine the A/C clutch ON time.
 1. Record the ambient temperature.
 2. Record the A/C clutch ON time in seconds.
 3. **NOTE:** When the ambient temperature is above 26°C (80°F), the A/C clutch may not cycle.

The system performance is acceptable when the recorded time falls between the upper and lower limits shown.



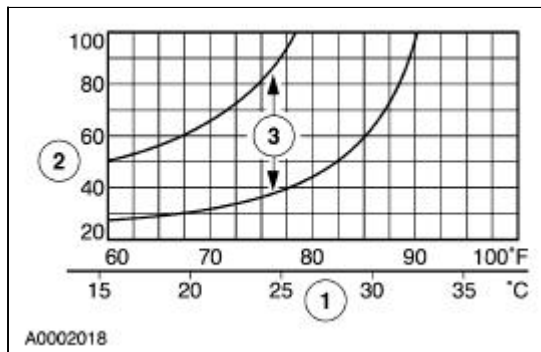
8. Determine the A/C clutch OFF time.
 1. Record the ambient temperature.
 2. Record the A/C clutch OFF time in seconds.
 3. **NOTE:** When the ambient temperature is above 26°C (80°F), the A/C clutch may not cycle.

The system performance is acceptable when the recorded time falls between the upper and lower limits shown.



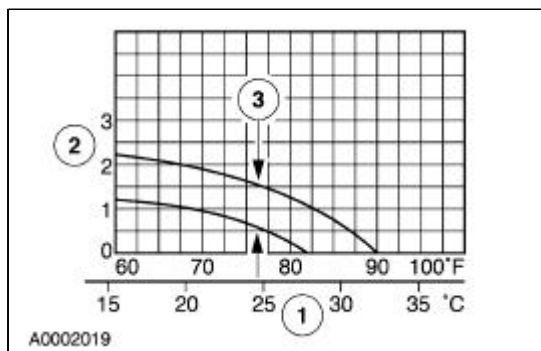
9. Determine the total A/C clutch cycle time.
 1. Record the ambient temperature.
 2. Record the time the A/C clutch is engaged plus the time it is disengaged (time ON plus time OFF).
 3. **NOTE:** When the ambient temperature is above 26°C (80°F), the A/C clutch may not cycle.

The system performance is acceptable when the recorded time falls between the upper and lower limits shown.



10. Determine the A/C clutch cycle rate per minute.
 1. Record the ambient temperature.
 2. Record the number of A/C clutch cycles occurring in one minute.
 3. **NOTE:** When the ambient temperature is above 26°C (80°F), the A/C clutch may not cycle.

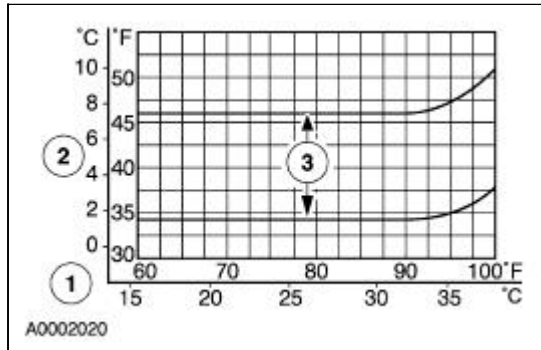
The system performance is acceptable when the recorded number of cycles falls between the upper and lower limits shown.



11. Determine the center A/C register discharge temperature.
 1. Record the ambient temperature.

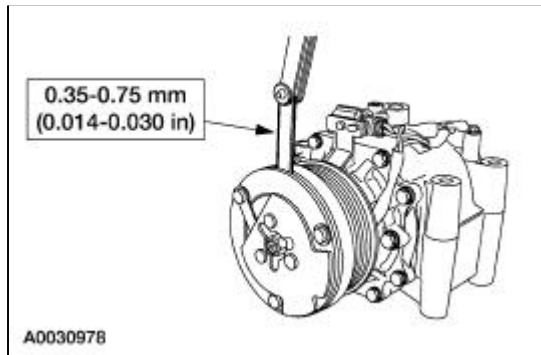
2. Record the center A/C register discharge temperature.
3. **NOTE:** In ambient temperatures between 38-43°C (100-110°F), the A/C register discharge temperatures will be the same as those for ambient temperatures shown on the chart in the 32-38°C (90-100°F) range.

The system performance is acceptable when the center A/C register discharge temperature falls between the upper and lower limits shown.



A/C Clutch Air Gap Adjustment

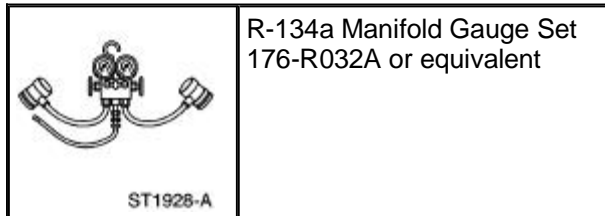
1. Check the A/C clutch air gap at three equally spaced places between the clutch hub and the A/C clutch pulley.



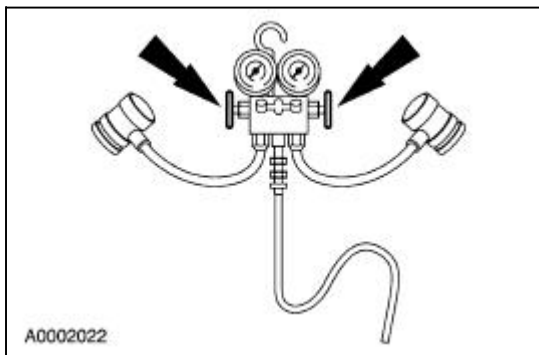
2. Remove the A/C clutch. Add or remove spacers between the A/C clutch and the compressor shaft until clearance is within specifications. For additional information, refer to [Section 412-03](#).
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Manifold Gauge Set Connection

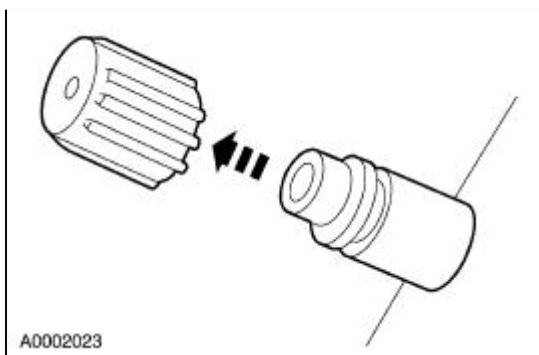
Special Tool(s)



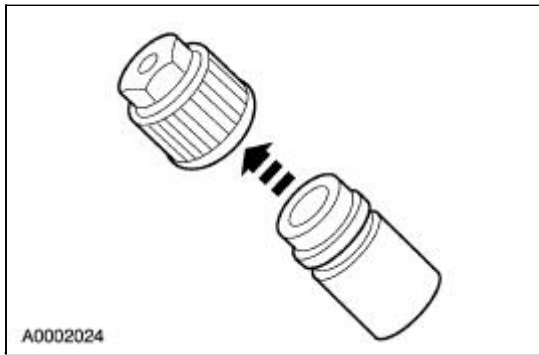
1. Turn both valves on the R-134a Manifold Gauge Set clockwise to close the low- and high-pressure hoses to the center manifold and center hose.



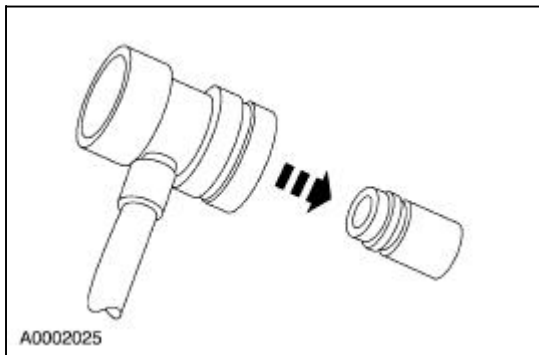
2. Remove the A/C charging valve cap (19D702) from the low-pressure service gauge port valve.



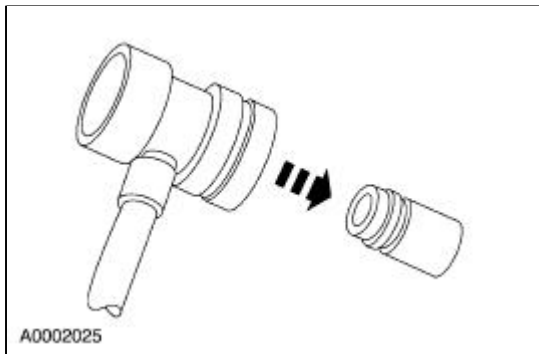
3. Remove the A/C charging valve cap from the high-pressure service gauge port valve.



4. Connect the R-134a Manifold Gauge Set low-pressure hose and the R-134a low side quick disconnect to the low-pressure service gauge port valve.

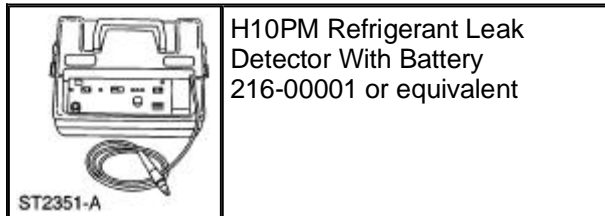


5. Connect the R-134a Manifold Gauge Set high-pressure hose and the R-134a high side quick disconnect to the high-pressure service gauge port valve.



Electronic Leak Detection

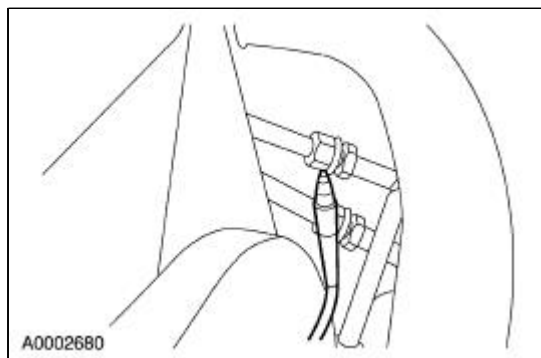
Special Tool(s)



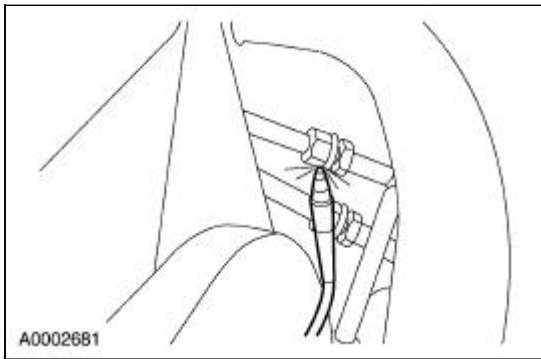
⚠ CAUTION: Good ventilation is necessary in the area where electronic A/C leak testing is to be carried out. If the surrounding air is contaminated with refrigerant gas, the leak detector will indicate this gas all the time. Odors from other chemicals such as antifreeze, diesel fuel, disc brake cleaner, or other cleaning solvents can cause the same problem. A fan, even in a well-ventilated area, is very helpful in removing small traces of contamination from the air that might affect the leak detector.

1. **NOTE:** The system pressure should be between 413-551 kPa (60-80 psi) at 24°C (75°F) with the engine off.

Leak test the refrigerant system using the Refrigerant Leak Detector. Follow the instructions included with the leak detector for handling and operation techniques.










2. If a leak is found, discharge and recover the refrigerant. For additional information, refer to [Air Conditioning \(A/C\) System Recovery, Evacuation and Charging](#) in this section.
 - Repair the system.
 - Test the system for normal operation.



Fluorescent Dye Leak Detection

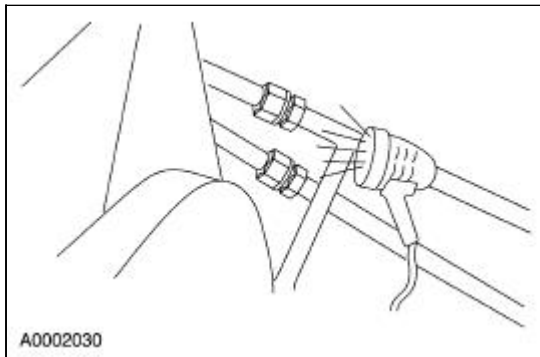
Special Tool(s)

 ST1834-A	R-134a Refrigerant Service Center 023-00153 or equivalent
 ST1261-A	120 Watt UV Spot Lamp 164-R0721 or equivalent
 ST1705-B	R-134a Fluorescent Dye Injector 164-R0775 or equivalent
 ST2651-A	High Intensity UV Lamp — 12 Volt 164-R6000
 ST2650-A	R-134a Leak Detection Dye 164-R6060
 ST1928-A	R-134a Manifold Gauge Set 176-R032A
 ST2649-A	Deluxe Injector Loop Kit 219-00069

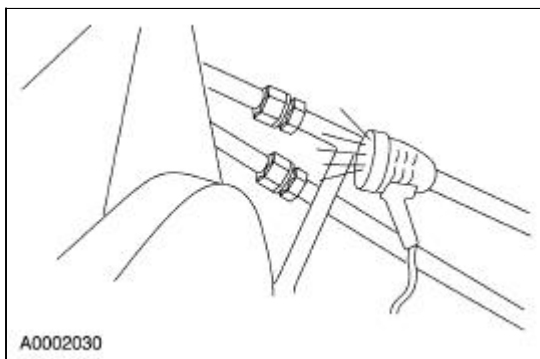
Fluorescent Dye Detection

NOTE: Ford Motor Company vehicles are produced with R-134a fluorescent dye installed in the refrigerant system from the factory. The location of leaks can be pinpointed by the bright yellow-green glow of the fluorescent dye under a UV lamp. Since more than one leak can exist, make sure to inspect each component, line, and fitting in the refrigerant system for a leak.

1. Check for leaks using the special tool.
 - Inspect all components, lines, and fittings of the refrigerant system.



2. If a leak is found, recover the refrigerant. For additional information, refer to Air Conditioning (A/C) System Recovery, Evacuation and Charging in this section.
3. Repair the refrigerant system leak(s).
4. Evacuate and charge the refrigerant system. For additional information, refer to Air Conditioning (A/C) System Recovery, Evacuation and Charging in this section.
5. After the leak(s) is/are repaired, remove any traces of fluorescent dye with a general purpose oil solvent.
6. Verify the repair by running the vehicle for a short period of time and rechecking the area of the leak with the special tool.



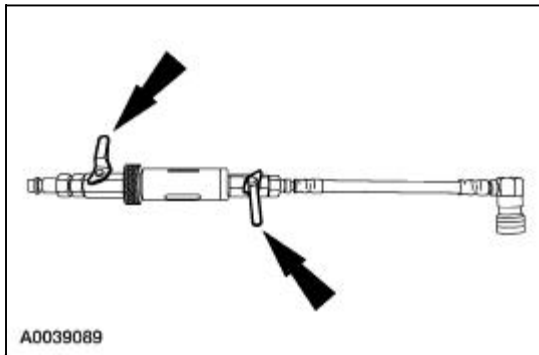
Fluorescent Dye Injection — Using an A/C Refrigerant Center and Dye Injector

NOTE: Before using the R-134a fluorescent dye injector for the first time, refer to the manufacturers instructions on evacuation of any non-condensable gasses from the hoses.

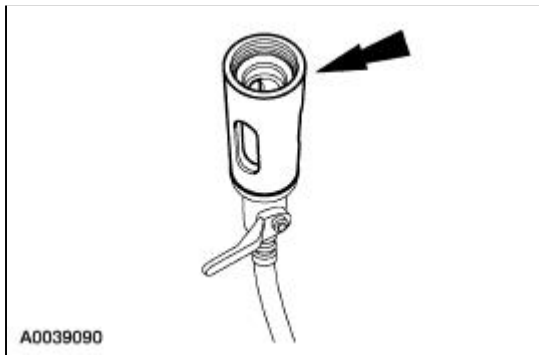
NOTE: Only connect the R-134a fluorescent dye injector to a manifold and gauge set or R-134a service center when fluorescent dye is to be injected. The R-134a fluorescent dye injector has a one way check valve that will prevent refrigerant system recovery and evacuation.

NOTE: Refrigerant system pressure should be between 413-551 kPa (60-80 psi) at 24°C (75°F) with the engine off.

1. Install an R-134a A/C refrigerant service center or a manifold and gauge set. For additional information, refer to Manifold and Gauge Set Connection in this section.
2. Verify that the valves on the special tool are closed.



3. Fill the special tool reservoir with 7 ml (0.25 oz) of fluorescent dye.



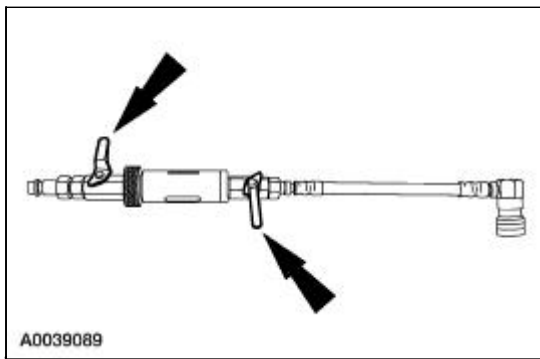
4. Install the special tool between the low-pressure service gauge port valve and the R-134a refrigerant service center or manifold gauge set.
5. Open all valves and inject the fluorescent dye into the refrigerant system.
6. When fluorescent dye injection is complete, close all valves.
7. Recover the refrigerant from the R-134a fluorescent dye injector.
8. Remove the fluorescent dye injector from the low-pressure service gauge port valve and the R-134a A/C refrigerant service center or manifold gauge set.

Fluorescent Dye Injection — Using a Dye Injector Loop Kit

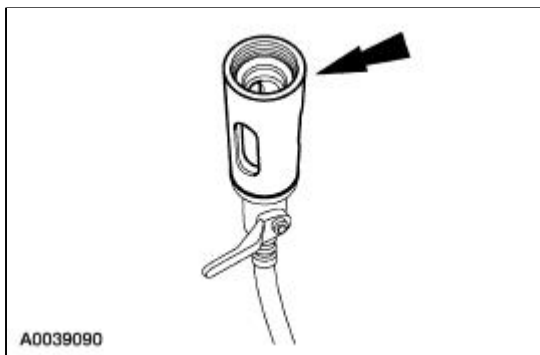
NOTE: Before using the R-134a fluorescent dye injector for the first time, refer to the equipment manufacturers instructions on evacuation of non-condensable gasses from the hoses.

NOTE: Refrigerant system pressure should be between 413-551 kPa (60-80 psi) at 24°C.


1. Verify that the valves on the special tool are closed.



2. Fill the special tool reservoir with 7 ml (0.25 oz) of fluorescent dye.

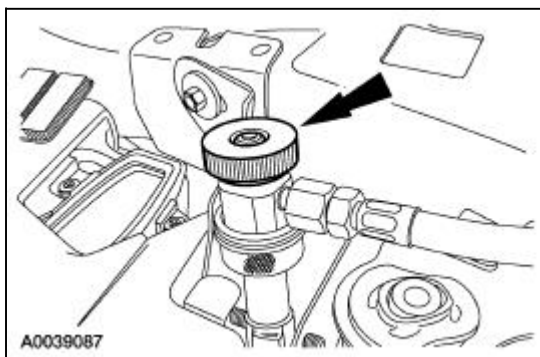


3. Install the special tool between the high-pressure and low-pressure service gauge port valves.

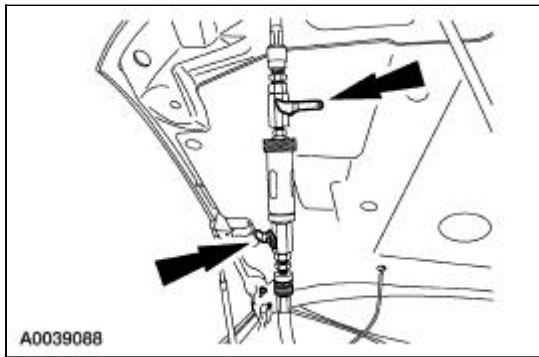
4.  **CAUTION: Make sure all tools and hoses are clear of the engine cooling fan and drive belt before starting the engine.**

Start the engine.

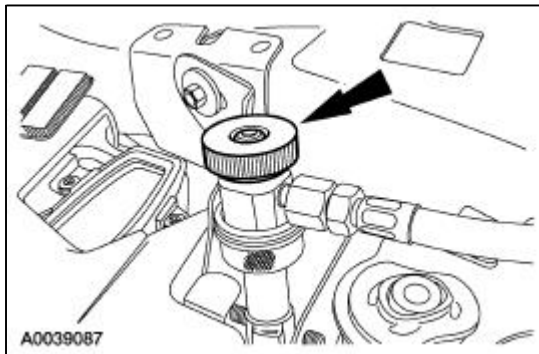
5. Open the high-pressure service valve.



6. Open the special tool valves and inject the fluorescent dye into the refrigerant system.

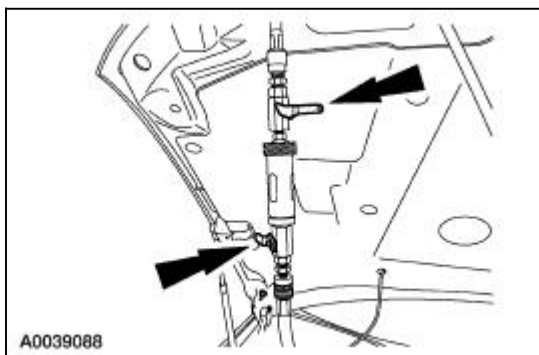


7. Close the high-pressure service valve to allow the pressure inside the special tool to equalize with the suction side of the refrigerant system.



8. **NOTE:** Close the valves on the special tool while the A/C compressor is operating.

Close the valves on the special tool.




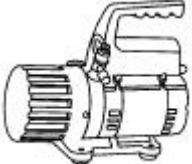
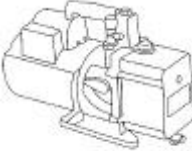


9. **NOTE:** Leave all valves on the special tool closed when not in use.

Disconnect the high-pressure and low-pressure service valves and remove the special tool from the vehicle.

Air Conditioning (A/C) System Recovery, Evacuation and Charging

Special Tool(s)

 <p>ST1228-A</p>	<p>R-134a A/C Refrigerant Center 176-00002 or equivalent</p>
 <p>ST1834-A</p>	<p>R-134a A/C Refrigerant Center 023-00153 or equivalent</p>
 <p>ST1928-A</p>	<p>R-134a Manifold Gauge Set 176-R032A or equivalent</p>
 <p>ST1685-A</p>	<p>1.2 CFM Vacuum Pump 023-00162 or equivalent</p>
 <p>ST1686-A</p>	<p>4.0 CFM Vacuum Pump 023-00163 or equivalent</p>

Refrigerant System Recovery

NOTE: Ford Motor Company recommends use of an A/C service center to carry out recovery, evacuation, and charging of the refrigerant system. If an A/C service center is not available, refrigerant system recovery, evacuation, and charging may be accomplished using a separate recovery station, vacuum pump, charging cylinder, and manifold gauge set.

1. Prior to recovering the refrigerant system, you must verify the purity of the refrigerant. For additional information, refer to [Refrigerant Identification Testing](#) in this section.
2. **NOTE:** Some R-134a service centers require the use of an A/C manifold gauge set. For additional information, refer to [Manifold Gauge Set Connection](#) in this section.

Connect an R-134a A/C service center to the low- and high-pressure service gauge port valves.

3. Recover the refrigerant from the system following the operating instructions provided by the equipment manufacturer.
4. Once the service center has recovered the vehicle A/C system refrigerant, close the service center inlet valve (if equipped). Then switch off the power supply.
5. Allow the vehicle A/C system to remain closed for about two minutes. Observe the system vacuum level as shown on the gauge. If the vacuum does not decrease, disconnect the refrigerant center hose(s).
6. If the system vacuum does decrease, repeat Steps 2 through 5 until the vacuum level remains stable for two minutes.
7. Carry out the required repairs.

Refrigerant System Evacuation

NOTE: Ford Motor Company recommends use of an A/C service center to carry out recovery, evacuation, and charging of the refrigerant system. If an A/C service center is not available, refrigerant system recovery, evacuation, and charging may be accomplished using a separate recovery station, vacuum pump, charging cylinder, and manifold gauge set.

1. Connect an R-134a service center to the low- and high-pressure service gauge port valves.
2. Evacuate the system until the low-pressure gauge reads at least 99.4 kPa (29.5 in-Hg) of vacuum and as close to 101.1 kPa (30 in-Hg) as possible. Continue to operate the vacuum pump for a minimum of 45 minutes.
3. Turn off the vacuum pump. Observe the low-pressure gauge for five minutes to make sure that the system vacuum is held. If vacuum is not held for five minutes, leak test the system, service the leak, and evacuate the system again.


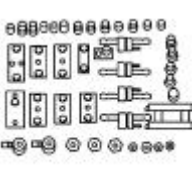
Refrigerant System Charging

NOTE: Ford Motor Company recommends use of an A/C service center to carry out recovery, evacuation, and charging of the refrigerant system. If an A/C service center is not available, refrigerant system recovery, evacuation, and charging may be accomplished using a separate recovery station, vacuum pump, charging cylinder, and manifold gauge set.


1. Correctly oil match the system to verify that the correct amount of refrigerant oil is present in the system. For additional information, refer to [Refrigerant Oil Adding](#) in this section.
 2. Charge the system with the specified amounts of refrigerant oil and refrigerant.
 3. When no more refrigerant is being drawn into the system, start the engine and select MAX A/C operation. Adjust the blower motor speed to the maximum and allow the remaining refrigerant to be drawn into the system. Continue to add refrigerant into the system until the specified weight of R-134a has been added. Close the charging cylinder valve and allow the system to pull any remaining refrigerant from the hose. When the low-pressure drops to approximately 207 kPa (30 psi), close the charging hose valve.
-


Air Conditioning (A/C) System Flushing


Special Tool(s)

 ST2466-A	A/C Flush and Purge Machine 219-00022 (part of 219-00023) or equivalent
 ST2469-A	A/C Flush and Purge Fitting Kit 219-00024 (part of 219-00023) or equivalent

 **WARNING:** Use extreme care and observe all safety and service precautions related to the use of refrigerants.

 **WARNING:** Due to refrigerant hazards, always wear safety goggles and non-penetrable gloves when working on or flushing A/C systems.

 **CAUTION:** An A/C refrigerant analyzer must be used before the recovery of any vehicle's A/C refrigerant. Failure to do so puts the shop's bulk refrigerant at risk of contamination. If the vehicle's A/C refrigerant is contaminated, refer the customer to the service facility that carried out the last A/C service. If the customer wishes to pay the additional cost, use the A/C recovery equipment that is designated for recovering contaminated A/C refrigerant. All contaminated A/C refrigerant must be disposed of as hazardous waste. For all equipment, follow the equipment manufacturer's procedures and instructions.

 **CAUTION:** Suction accumulator/drier, muffler, hoses, thermal expansion valve, and fixed orifice tube should be removed when flushing the A/C system. Internal plumbing of these devices makes it impossible to correctly remove any residual-flushing agent. Except for the hoses, these components are typically discarded after A/C system contamination. Hoses can normally be reused unless they are clogged with foreign material. The 3.785 liters (1 gallon) of A/C Systems Flushing Solvent F4AZ-19579-A and FL1-A filter used in A/C Flush and Purge Machine 219-00022 are intended for use on one vehicle only. They may be used to flush both the A/C condenser core and the A/C evaporator core on an individual vehicle, but under no circumstances should they be used on more than one vehicle.

1. **NOTE:** Prior to using the A/C Flush and Purge Machine 219-00022 for the first time, review the operating instructions.

NOTE: Only the A/C Flush and Purge Machine kit 219-00023, which includes A/C Flush and Purge Machine 219-00022, A/C Flush and Purge Fitting Kit 219-00024, and the Ford Part number F4AZ-19579-A A/C Systems Flushing Solvent, is approved for use on Ford vehicles. No other flushing device or solvent is approved for flushing heat exchangers. Use of any other flusher or solvent may cause damage to the A/C system and the flushing unit.

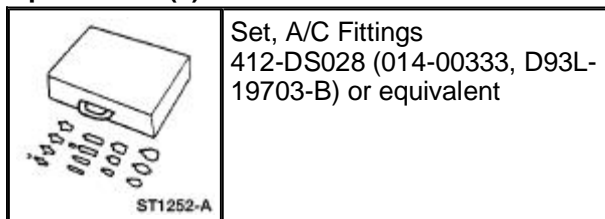
Ford Motor Company has approved a procedure to provide technicians with a non-CFC method of flushing contaminated A/C system heat exchangers, A/C evaporator core, and A/C condenser core. The procedure allows the specific components to be cleaned and flushed while installed in their normal in-vehicle location. The types of contamination flushed include particle matter that results from A/C compressor or desiccant failure within the suction accumulator/drier and gummy residue that can form when refrigerant oil is overheated during A/C compressor seizure. The flushing process is a two-step procedure that involves the use of an A/C Flush and Purge Machine 219-00022 to:

- Circulate the flushing solvent through the heat exchanger in the reverse direction of normal refrigerant flow (back-flushing). Particulate matter picked up during flushing is filtered from the returning solvent before the solvent is returned to the reservoir for continued circulation.
 - Remove the flushing solvent from the heat exchanger. In this step of the procedure, pressurized air 621-862 kPa (90-125 psi) is used to push and evaporate any remaining flush solvent from the heat exchanger.
2. Discharge the A/C system. Observe all safety precautions. For additional information, refer to the procedure in this section.
 3. Disconnect the refrigerant lines from the heat exchanger(s) to be flushed.
 4. Connect the A/C Flush and Purge Machine 219-00022 and A/C Flush and Purge Fitting Kit 219-00024 to the heat exchanger to be flushed. Do not flush through the A/C evaporator core orifice, mufflers or hoses. Internal plumbing and material make-up of these components make it impossible to correctly remove foreign material or residual flushing solvent.
 5. Use 3.785 liters (one gallon) of A/C Systems Flushing Solvent part number F4AZ-19579-A to flush the heat exchanger for a minimum of 15 minutes. The flush solvent may be used for one or both heat exchangers in the A/C system. However, the flush solvent is intended for one vehicle only. The filter used on the flushing unit is also intended for use on one vehicle only.
 6. Flush the component for a minimum of 15 minutes.
 7. Apply 621-862 kPa (90-125 psi) pressurized air to the component for a minimum of 30 minutes. The 30-minute purge time is required to force and evaporate all residual solvent from the A/C system component. Failure to successfully remove all residual solvent within the component can result in system damage when reconnected and operated. Dispose of the used flush solvent and filter in accordance with local, state and federal emissions.
 8. **NOTE:** A/C system filtering as described in this section is optional if system flushing is carried out. However, the filter kit use is recommended after flushing if the A/C system contamination is extensive.

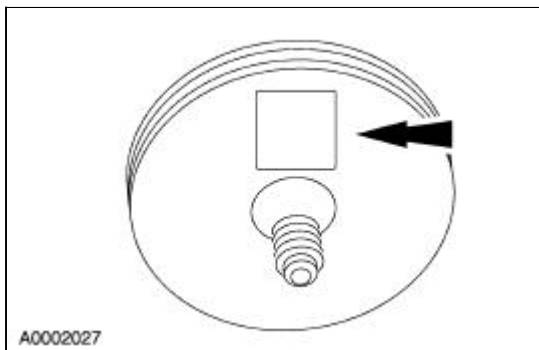
Install a new A/C evaporator core orifice in any vehicle being serviced for A/C compressor or desiccant failure.
 9. Install new refrigerant hoses if clogged with foreign material.
 10. Reconnect the heat exchanger being serviced.
 11. Add additional refrigerant oil as required. For additional information, refer to the procedure in this section.
 12. Evacuate, leak test and charge the A/C system. For additional information, refer to the procedure in this section.
 13. Check the system for normal operation.

Refrigerant System Filtering After A/C Component Replacement

Special Tool(s)



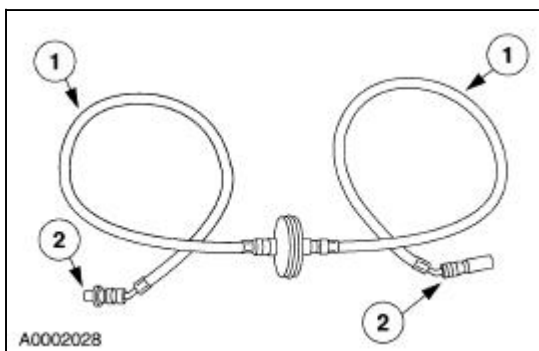
1. Install the new A/C compressor. For additional information, refer to [Section 412-03](#).
2. Install the new receiver/drier. For additional information, refer to [Section 412-03](#).
3. Install the new thermostatic expansion valve. For additional information, refer to [Section 412-03](#).
4. Orient the filter inlet toward the A/C condenser core.



5. **NOTE:** The pancake filter is not permanently installed and will be removed at the end of this procedure.

Temporarily install the pancake filter between the A/C condenser core and the condenser to evaporator tube (19835).

1. Use flexible refrigerant hose of 17,238 kPa (2,500 psi) burst rating.
2. Make the connections using the R-12/R-134a Air Conditioning Test Fitting Set.



6. Correctly oil match the system. For additional information, refer to [Refrigerant Oil Adding](#) in this section.
 7. Evacuate and charge the system. For additional information, refer to [Air Conditioning \(A/C\) System Recovery, Evacuation and Charging](#) in this section.
 8. Check all refrigerant system hoses, lines and the position of the newly installed filters to be sure they do not interfere with other engine compartment components. If necessary, use tie straps to make adjustments.
 9. Provide adequate airflow to the front of the vehicle (with a fan, if necessary). Select A/C operation and set the blower motor speed to maximum. Start the engine and let it idle briefly. Make sure the A/C system is operating correctly.
 10. Gradually bring the engine up to 1,200 rpm by running it at lower rpms for short periods (first at 800 rpm, then at 1,000 rpm). Set the engine at 1,200 rpm and run it for one hour with the A/C system operating.
 11. Stop the engine.
 12. Recover the refrigerant from the system. For additional information, refer to [Air Conditioning \(A/C\) System Recovery, Evacuation and Charging](#) in this section.
 13. Remove the fittings, flexible hoses and pancake filter from between the A/C condenser core and the condenser to evaporator tube.
 14. Discard the pancake filter. It can be used one time only.
 15. Reconnect the condenser to evaporator tube to the A/C condenser core.
 16. Evacuate and charge the system. For additional information, refer to [Air Conditioning \(A/C\) System Recovery, Evacuation and Charging](#) in this section.
-

Refrigerant Oil Adding



CAUTION: During normal A/C operation, oil is circulated through the system with the refrigerant, and a small amount is retained in each component. If certain components of the system are removed, some of the refrigerant oil will go with the component. To maintain the original total oil charge, it is necessary to compensate for the oil lost by adding oil to the system with the new part.

NOTE: Installation of new components such as the A/C pressure transducer do not require additional oil.

1. **NOTE:** New A/C compressors are shipped without compressor oil.

Rotate the A/C compressor shaft six to eight revolutions while collecting the oil in a clean measuring device.

- If the amount of oil drained from the old A/C compressor is between 90-150 ml (3-5 ounces), pour the same amount plus 30 ml (1 ounce) of clean PAG Refrigerant Compressor Oil (R-134a Systems) F7AZ-19589-DA (Motorcraft YN-12-C) or equivalent meeting Ford specification WSH-M1C231-B into the new A/C compressor.
 - If the amount of oil that was removed from the old A/C compressor is greater than 150 ml (5 ounces), pour the same amount drained of clean PAG Refrigerant Compressor Oil (R-134a Systems) F7AZ-19589-DA (Motorcraft YN-12-C) or equivalent meeting Ford specification WSH-M1C231-B into the new A/C compressor.
 - If the amount of oil that was removed from the old A/C compressor is less than 90 ml (3 ounces), pour 90 ml (3 ounces) of clean PAG Refrigerant Compressor Oil (R-134a Systems) F7AZ-19589-DA (Motorcraft YN-12-C) or equivalent meeting Ford specification WSH-M1C231-B into the new A/C compressor.
2. For the receiver/drier, drill one 12.7 mm (0.5 in) hole in the receiver/drier cylinder and drain the oil into a calibrated container.
 - Add a quantity of new oil to match that drained from the old receiver/drier plus 59 ml (2 ounces) of clean PAG Refrigerant Compressor Oil (R-134a Systems) F7AZ-19589-DA (Motorcraft YN-12-C) or equivalent meeting Ford specification WSH-M1C231-B.
 3. For the A/C evaporator core add 30 ml (1 ounce) of clean PAG Refrigerant Compressor Oil (R-134a Systems) F7AZ-19589-DA (Motorcraft YN-12-C) or equivalent meeting Ford specification WSH-M1C231-B to the receiver/drier inlet tube.
 4. For the A/C condenser core, add 30 ml (1 ounce) of clean PAG Refrigerant Compressor Oil (R-134a Systems) F7AZ-19589-DA (Motorcraft YN-12-C) or equivalent meeting Ford specification WSH-M1C231-B to the A/C condenser core or the receiver/drier inlet tube.
 5. Add 20 ml (.75 ounces) of clean PAG Refrigerant Compressor Oil (R-134a Systems) F7AZ-19589-DA (Motorcraft YN-12-C) or equivalent meeting Ford specification WSH-M1C231-B to the receiver/drier inlet tube when carrying out each of the following repairs:
 - installation of a new TXV
 - installation of a new A/C compressor pressure relief valve (19D644)
 - installation of a new refrigerant line
 - repair of an O-ring seal leak
 - repair of a charge port leak

Inspection and Assembly Requirements —Following An A/C Compressor Failure



CAUTION: To prevent refrigerant system contamination and possible failure of the new A/C compressor, carry out the following procedures:

1. Install a new thermostatic expansion valve (TXV). For additional information, refer to [Section 412-03](#).
2. Remove the A/C compressor. For additional information, refer to [Section 412-03](#).
 - Drain the residual refrigerant oil from the A/C compressor and measure the volume for correct system oil matching. For additional information, refer to [Refrigerant Oil Adding](#) in this section.
3. **NOTE:** The thermostatic expansion valve cannot be cleaned and a new thermostatic expansion valve must be installed.

Remove the receiver/drier. For additional information, refer to [Section 412-03](#).

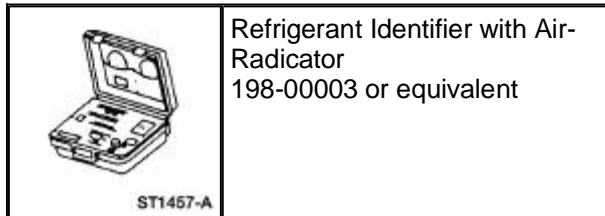
- Drain the residual refrigerant oil from the receiver/drier and measure the volume for correct oil system matching. For additional information, refer to [Refrigerant Oil Adding](#) in this section.
4. **NOTE:** System flushing is the preferred method of cleaning. However, if flushing equipment is not available, carry out system filtering.

Carry out an A/C system flushing or filtering procedure:

- If A/C system flushing equipment is available, clean the A/C condenser core by flushing. For additional information, refer to [Air Conditioning \(A/C\) System Flushing](#) in this section.
 - If A/C system flushing equipment is not available, carry out a system filtering procedure. For additional information, refer to [Refrigerant System Filtering After A/C Component Replacement](#) in this section.
5. Install the new A/C compressor. For additional information, refer to [Section 412-03](#).
 6. Install the new receiver/drier, if necessary. For additional information, refer to [Section 412-03](#).
 7. Install the new TXV. For additional information, refer to [Section 412-03](#).
 8. Correctly oil match the system. For additional information, refer to [Refrigerant Oil Adding](#) in this section.
 9. Evacuate and charge the system. For additional information, refer to [Air Conditioning \(A/C\) System Recovery, Evacuation and Charging](#) in this section.
-


Refrigerant Identification Testing

Special Tool(s)




1. **NOTE:** An A/C refrigerant analyzer must be used to identify gas samples taken directly from the refrigeration system or storage containers prior to recovering or charging the refrigerant system.

Follow the instructions included with the Deluxe Refrigerant Diagnostic Tool to obtain the sample for testing.

2. The diagnostic tool will display one of the following:
 - If the purity level of R-134a or R-12 is 98% or greater by weight, the green "PASS" light emitting diode (LED) will light. The weight concentrations of R-134a, R-12, R-22, hydrocarbons, and air will be displayed on the digital display.
 - If refrigerants R-134a or R-12 do not meet the 98% purity levels, the red "FAIL" LED will light and a horn will sound alerting the user of potential hazards. The weight concentrations of R-134a, R-12, R-22, and hydrocarbons will be displayed on the digital display.
 - If hydrocarbon concentrations are 2% or greater by weight, the red "FAIL" LED will light, "Hydrocarbon High" will be displayed on the digital display, and a horn will sound alerting the user of potential hazards. The weight concentrations of R-134a, R-12, R-22, and hydrocarbons will also be displayed on the digital display.
3. The percentage of air contained in the sample will be displayed if the R-134a or R-12 content is 98% or greater. The diagnostic tool eliminates the effect of air when determining the refrigerant sample content because air is not considered a contaminant, although air can affect A/C system performance. When the diagnostic tool has determined that a refrigerant source is pure (R-134a or R-12 is 98% or greater by weight) and air concentration levels are 2% or greater by weight, the diagnostic tool will prompt the user if an air purge is desired.
4. If contaminated refrigerant is detected, repeat the refrigerant identification test to verify that the refrigerant is indeed contaminated.
5.  **CAUTION: If contaminated refrigerant is detected, DO NOT recover the refrigerant into R-134a or R-12 recovery/recycling equipment.**

Recover any contaminated refrigerant using suitable recovery-only equipment designed for capturing and storing contaminated refrigerant. For additional information, refer to [Contaminated Refrigerant Handling](#) in this section.

Contaminated Refrigerant Handling

1.  **CAUTION:** If contaminated refrigerant is detected, DO NOT recover the refrigerant into your recovery/recycling equipment.

Recover the contaminated refrigerant using suitable recovery-only equipment designed for capturing and storing contaminated refrigerant.

- This equipment must only be used to recover contaminated refrigerant to prevent the spread to other vehicles.
- If this equipment is not available, contact an A/C repair facility in your area with the correct equipment to carry out this repair.

2. Determine and correct the cause of the customer's initial concern.
3. **NOTE:** Residual refrigerant oil in the receiver/drier must be drained and measured for correct oil system matching. For additional information, refer to [Refrigerant Oil Adding](#) in this section.

The receiver/drier cannot be cleaned and a new receiver/drier must be installed. Remove the receiver/drier. For additional information, refer to [Section 412-03](#).

4. Clean the A/C evaporator core and the A/C condenser core by flushing. For additional information, refer to [Air Conditioning \(A/C\) System Flushing](#) in this section.
 5. Install the new receiver/drier. For additional information, refer to [Section 412-03](#).
 6. Correctly oil match the system. For additional information, refer to [Refrigerant Oil Adding](#) in this section.
 7. Evacuate and charge the system. For additional information, refer to [Air Conditioning \(A/C\) System Recovery, Evacuation and Charging](#) in this section.
 8. Dispose of contaminated refrigerant according to all federal, state and local regulations.
-

Torque Specifications

Description	Nm	lb-ft	lb-in
Cross-vehicle support bolts	25	18	—
Cabin air filter plenum bolts	6	—	53
Plenum chamber center screws to cross-vehicle beam	6	—	53
Plenum chamber lower screw to cross-vehicle beam	6	—	53

Air Distribution And Filtering

There are two sources of air available to the air distribution system:

- outside air
- recirculated air

Air distribution within the vehicle is controlled by the dual electronic automatic temperature control (DATC) system in the AUTOMATIC mode, but it can be overridden by the driver if desired. Airflow control doors are used to direct airflow within the evaporator and blower assembly (19B555) and within the plenum chamber (19740). Electrically powered actuators (19E616) are used to position the airflow control doors. For additional information, refer to [Section 412-00](#) for description and operation of each of the system functions.

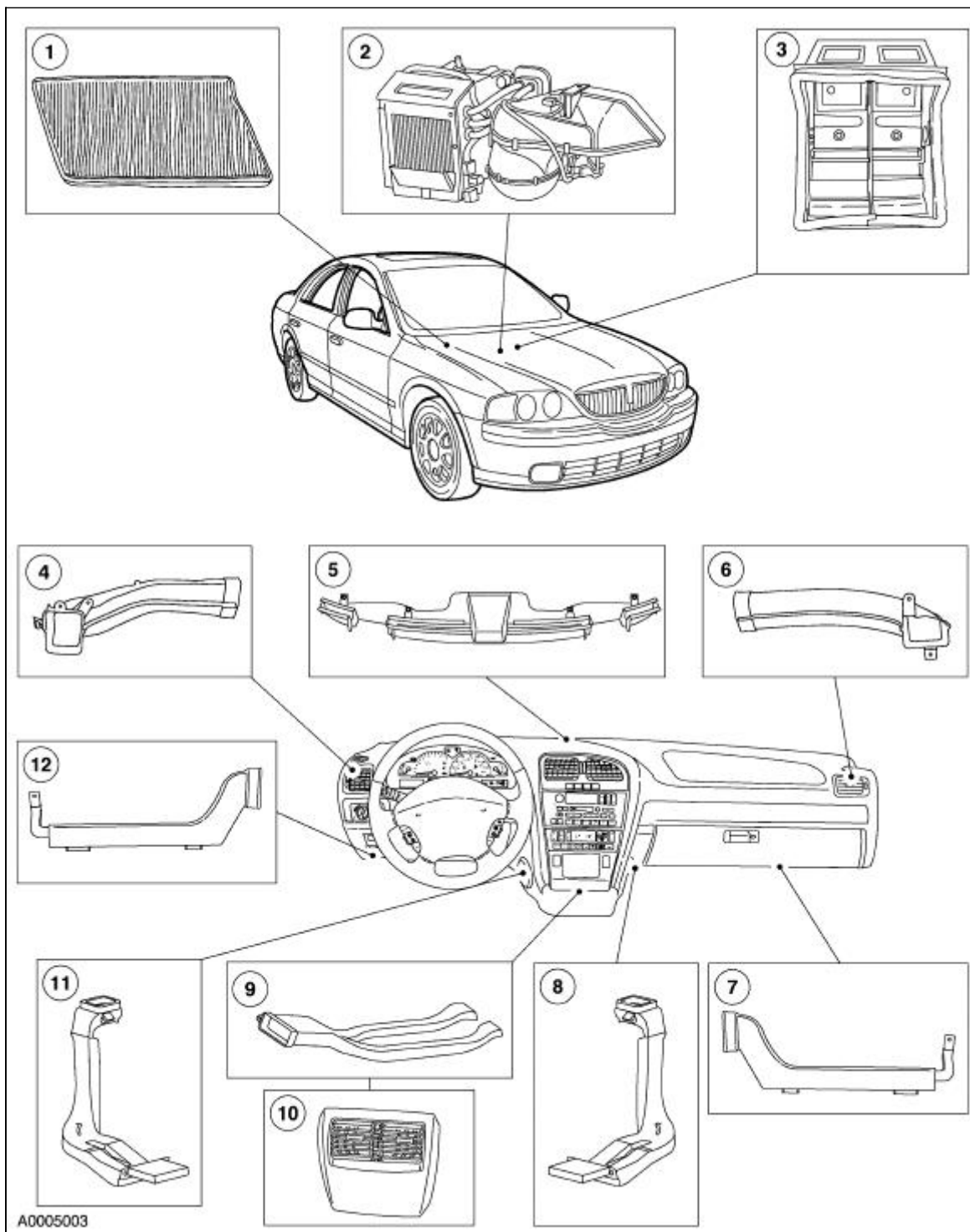
Recirculated air can be selected by pushing the recirculating air button on the dual automatic temperature control panel. It may also be commanded by the DATC during AUTOMATIC and OFF modes. If the recirculating mode is selected in floor mode, the DATC module will automatically discontinue the recirculating air mode in floor mode, to reduce fogging of the windows.

Air enters the passenger compartment from the:

- instrument panel A/C registers (19893).
- heater outlet floor duct.
- windshield defroster hose nozzle (18490).
- side window demisters.
- center console rear A/C registers.
- rear seat floor ducts (18C464).

Passenger compartment air is exhausted from the vehicle through open windows or luggage compartment air vents.

Component Locations



A0005003

Item	Part Number	Description
1	19N619	Cabin air filter
2	19850	A/C evaporator housing
3	19740	Plenum chamber
4	19B680	LH register duct
5	18C433	Defroster duct
6	19A843	RH register duct
7	—	RH floor duct
8	18C464	RH rear seat duct

9	19E766	Center console duct
10	—	Center console register
11	18C464	LH rear seat duct
12	—	LH floor duct

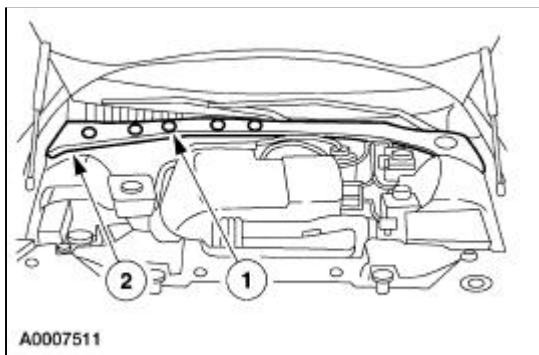
Cabin Air Filter

Removal and Installation

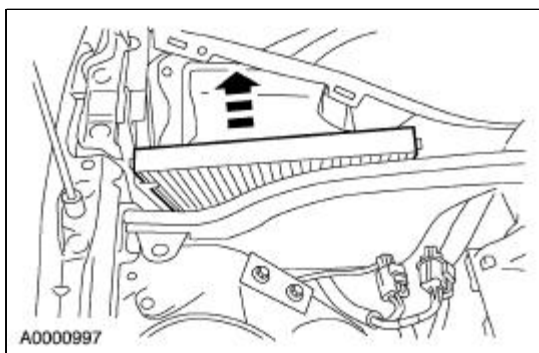
1. **NOTE:** The fasteners are reusable.

Remove the right side of the cowl vent screen.

1. Remove the two-part pin-type retainers and separate the Velcro® attachment of the rubber hinge cover to the rear outboard corner of the cowl vent screen.
2. Pull up on the cowl vent screen to release the lower clips.



2. Push on the RH corner of the filter to release the clip. Release the LH clip and remove the cabin air filter.

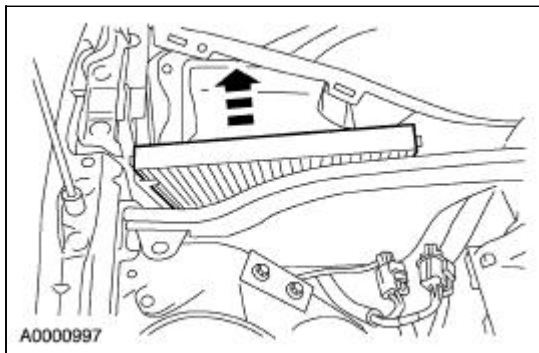


3. To install, reverse the removal procedure.

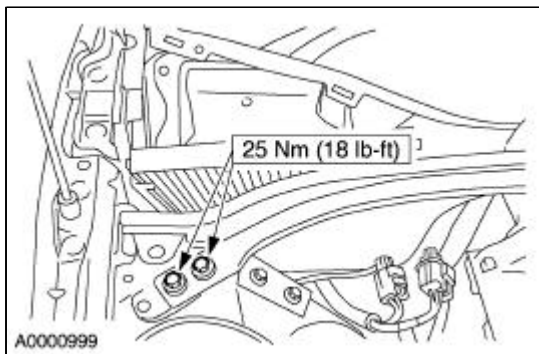
Fresh Air Inlet Duct

Removal and Installation

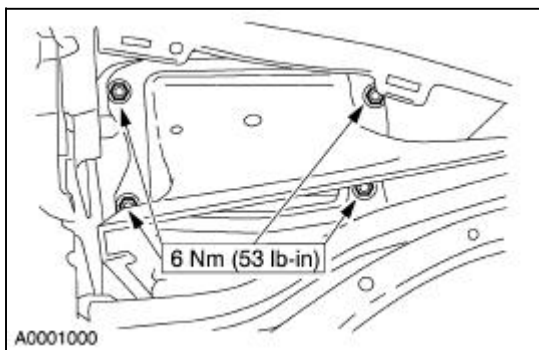
1. Remove the cowl vent screen. For additional information, refer to [Section 501-02](#).
2. Push on the RH corner of the filter to release the clip. Release the LH clip and remove the cabin air filter.



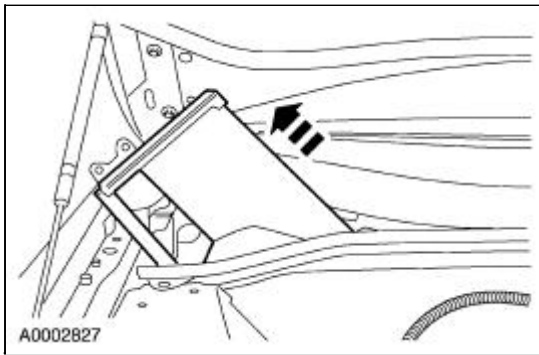
3. Remove the seven bolts and remove the cross-vehicle support.



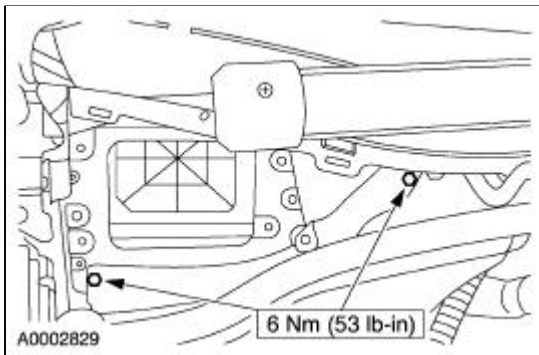
4. Remove the bolts.



5. Remove the cabin air filter housing by lifting the outboard side then removing the housing.



6. Remove the three bolts and remove the plenum panel.



7. To install, reverse the removal procedure.

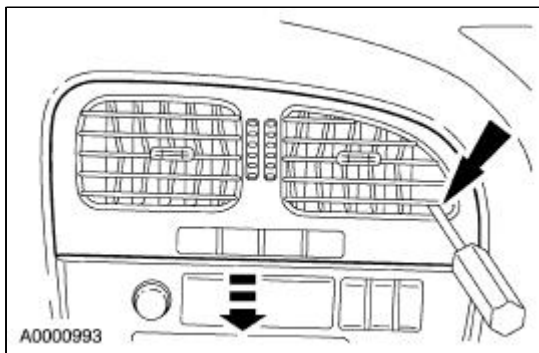
Center Registers

Removal

1. **NOTE:** The center register has pockets in the lower RH and LH corners to assist in removal.

Insert a mini-pick in the pocket and pull the register from the instrument panel.

- Disconnect the message center connector, if equipped.



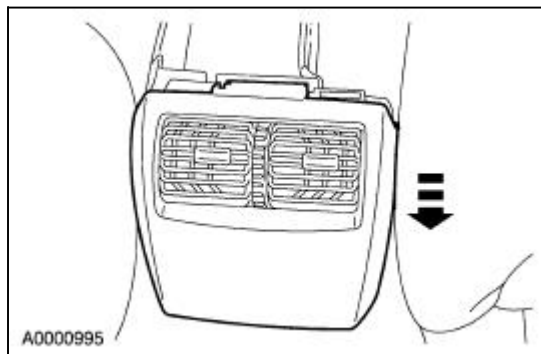
Installation

1. To install, connect the message center connector, if equipped, position the register and press into place.
-

Floor Console Register

Removal and Installation

1. Lift the center console cover and pull the register from the center console.



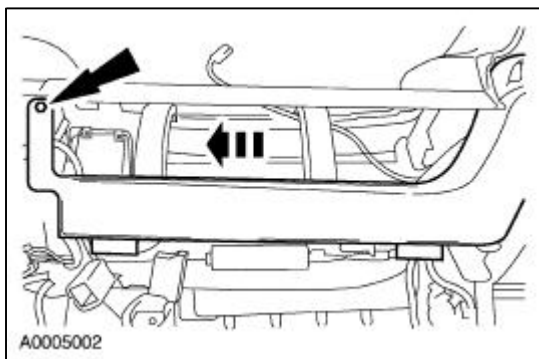
2. To install, reverse the removal procedure.
-

Footwell Duct

Removal and Installation

1. Remove the lower instrument panel insulator.
 - Disconnect the electrical connector.
2. **NOTE:** RH shown, LH similar.

Remove the screw and remove the duct.

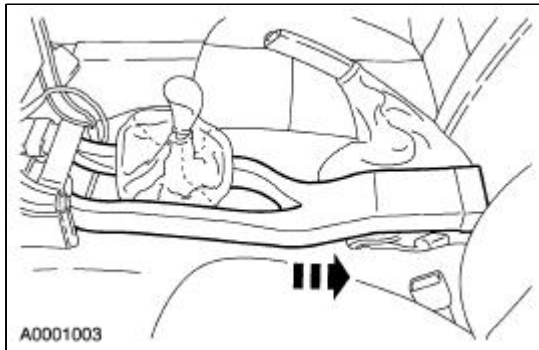


3. To install, reverse the removal procedure.
-

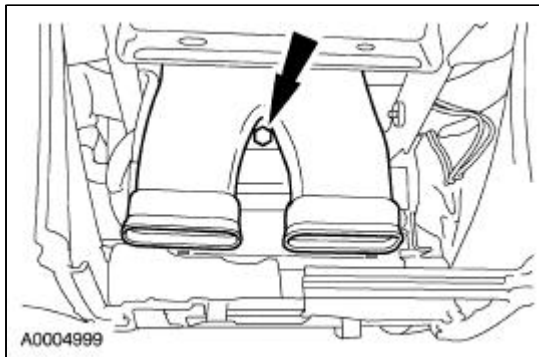
Duct —Floor Console

Removal and Installation

1. Remove the floor console. For additional information, refer to [Section 501-12](#).
2. Remove the duct.



3. Remove the screw and remove the front portion of the duct.



4. To install, reverse the removal procedure.
-

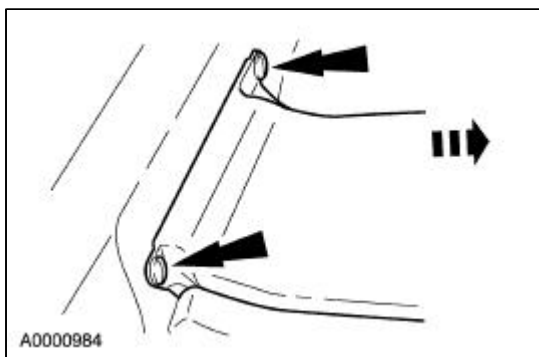
Rear Footwell Duct

Removal and Installation

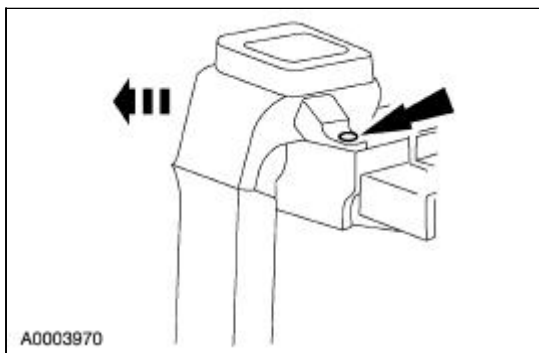
1. **NOTE:** RH shown, LH similar.

Remove the front seat. For additional information, refer to [Section 501-10](#).

2. Remove the carpet.
3. Remove the pin-type retainers.



4. Remove the pin-type retainer. Move the duct outboard and remove the duct.



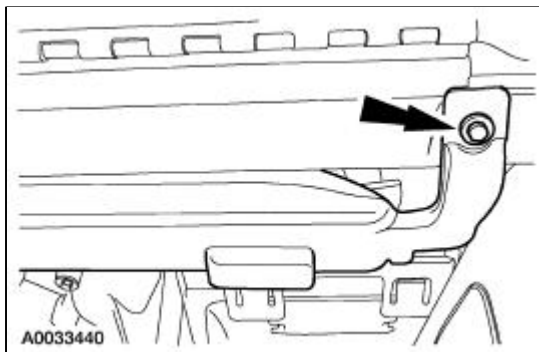
5. To install, reverse the removal procedure.
-

Plenum Chamber

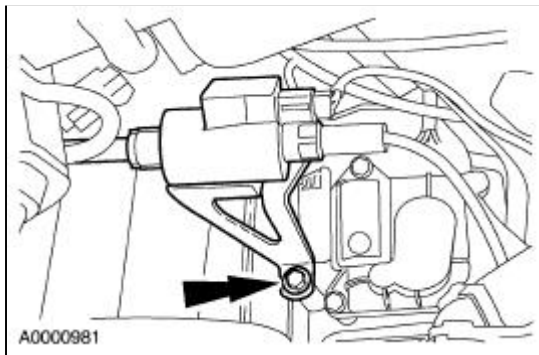
Removal and Installation

1. Remove the instrument panel. For additional information, refer to [Section 501-12](#).
2. **NOTE:** Passenger side duct shown, driver side similar.

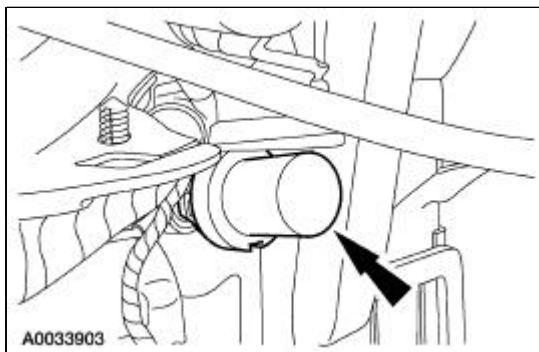
Remove the screws and remove the floor ducts.



3. Remove the screws and detach the transmission shift lockout bracket from the plenum chamber.

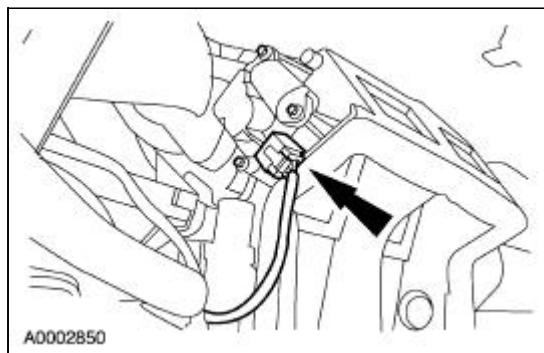


4. Detach the venturi assembly from the plenum chamber.

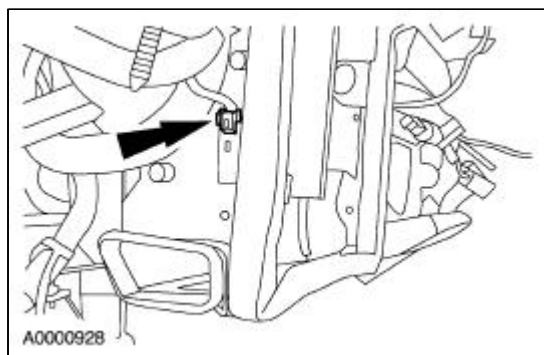


5. **NOTE:** Panel door actuator shown, defrost door and floor door actuators similar.

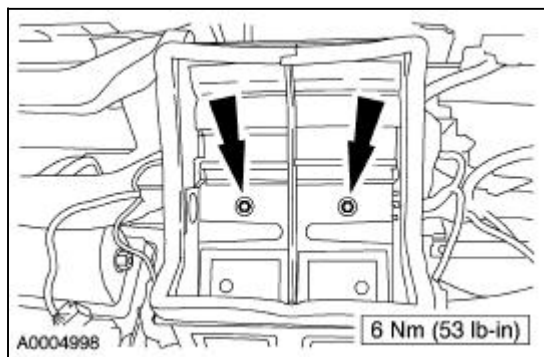
Disconnect the electrical connectors from the panel door, defrost door and floor door actuators.



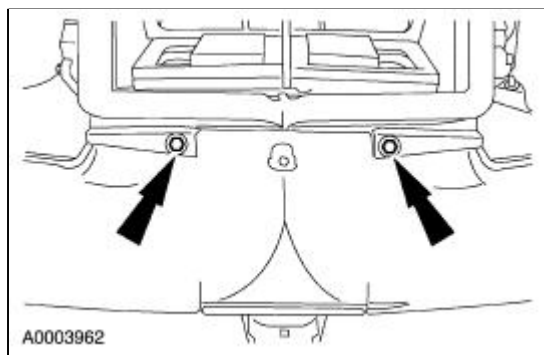
6. Disconnect the two air discharge temperature sensors from the plenum chamber.



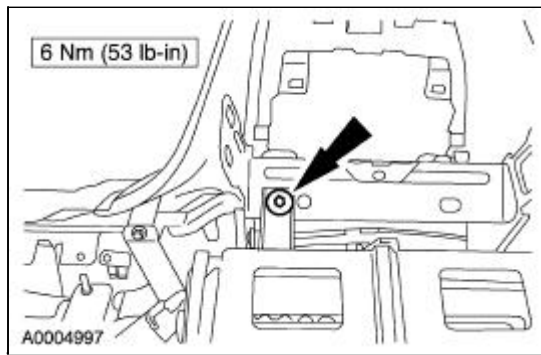
7. Remove the screws.



8. Remove the screws.



9. Remove the screw.



10. Remove the plenum chamber.
 11. If a new plenum chamber is to be installed, transfer the mode door actuators from the old unit to the new unit. For additional information, refer to [Section 412-04](#).
 12. If a new plenum chamber is to be installed, transfer the venturi cap from the old unit to the new unit.
 13. To install, reverse the removal procedure.
-

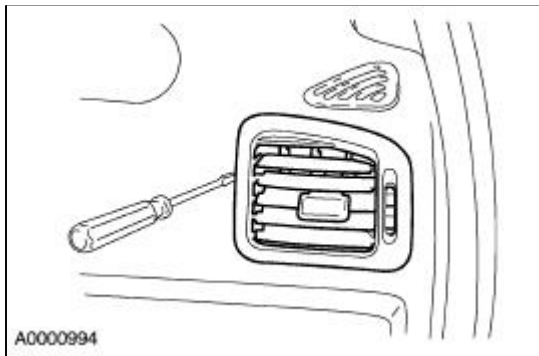
Instrument Panel Air Distribution Ducts

Disassembly and Assembly

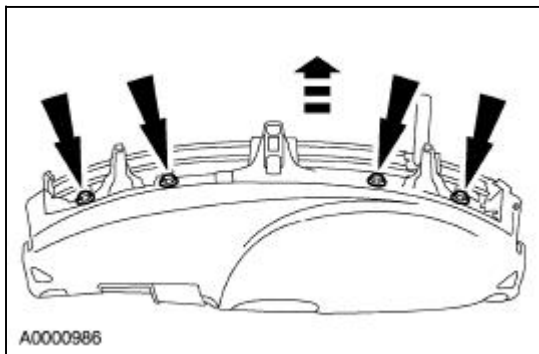
1. **NOTE:** RH register shown LH similar.

Remove the LH and RH panel registers.

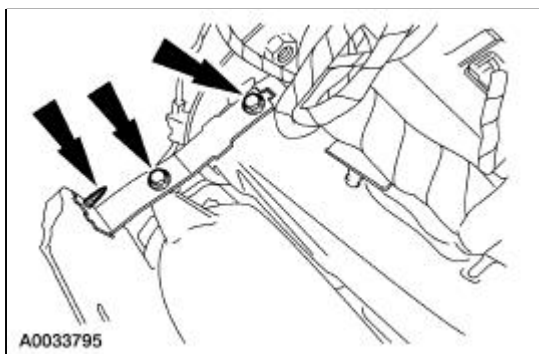
- Depress the inboard side tab with a flat blade tool. Pull the register rearward, depress the outboard tab and remove the register.



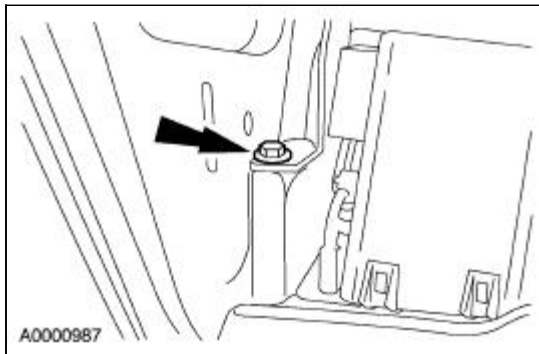
2. Remove the plenum chamber. For additional information, refer to [Plenum Chamber](#) in this section.
3. Remove the screws and remove the defroster duct.



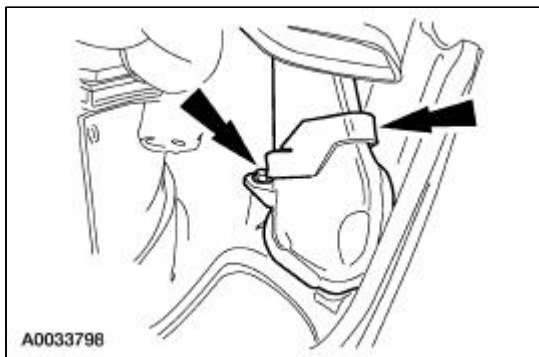
4. Remove the screws and remove the driver side support brace.



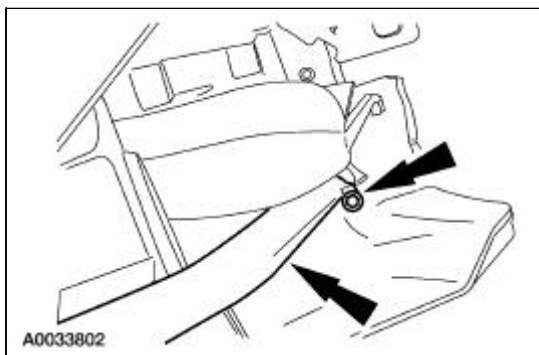
5. Remove the screw and position the driver side panel duct away from the driver side demister duct screw.



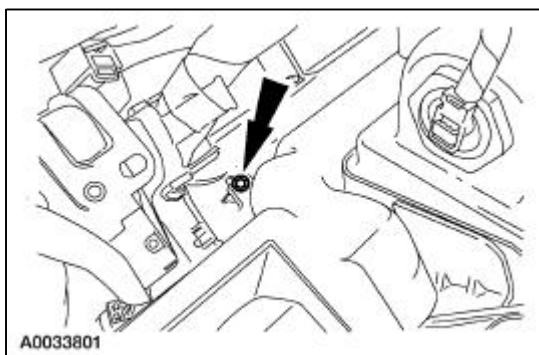
6. Remove the driver side demister duct screw and remove the driver side demister duct.



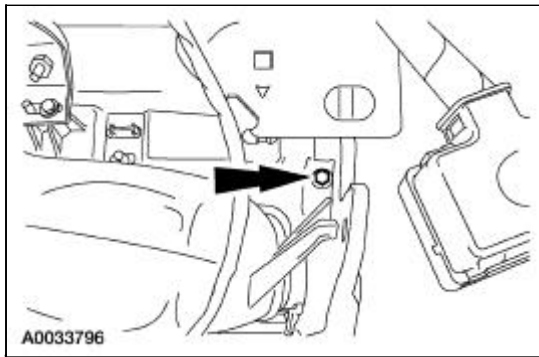
7. Remove the passenger side demister duct screw and remove the passenger side demister duct.



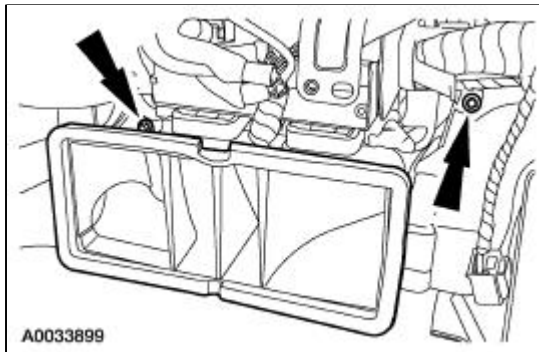
8. Remove the passenger side panel duct inner screw.



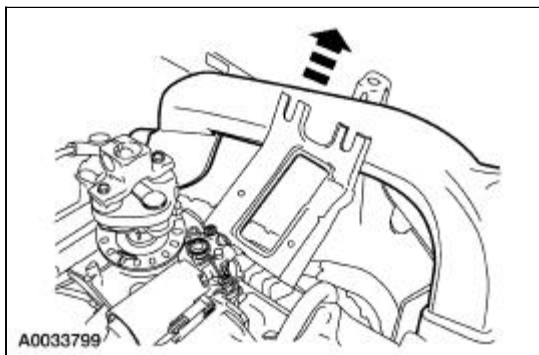
9. Remove the passenger side panel duct outer screw.



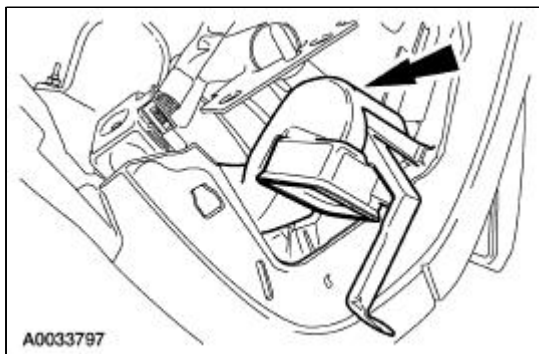
10. Remove the screws and remove the center panel duct.



11. Remove the driver side panel duct.



12. Rotate and pull the panel duct through the opening in the side of the instrument panel.



13. To assemble, reverse the disassembly procedure.
-

General Specifications

Item	Specification
Lubricants	
MERPOL®	ESE-M99B144-B
PAG Refrigerant Compressor Oil (R-134a Systems) F7AZ-19589-DA (Motorcraft YN-12-C)	WSH-M1C231-B
Refrigerant	
R-134a Refrigerant YN-19	WSH-M17B19-A
Capacity kg (oz)	0.79 (28)

Torque Specifications

Description	Nm	lb-in
Evaporator housing mounting nuts	7	62
Cowl top attachment bolt	7	62
Coolant valve mounting bracket bolts	9	80
Coolant valve assembly mounting bolts	9	80
Auxiliary coolant pump mounting bolts	6	53
Rear hose assembly mounting bolt	9	80
Forward heater hose mounting bolt	9	80
Evaporator housing attachment bolt	5	44

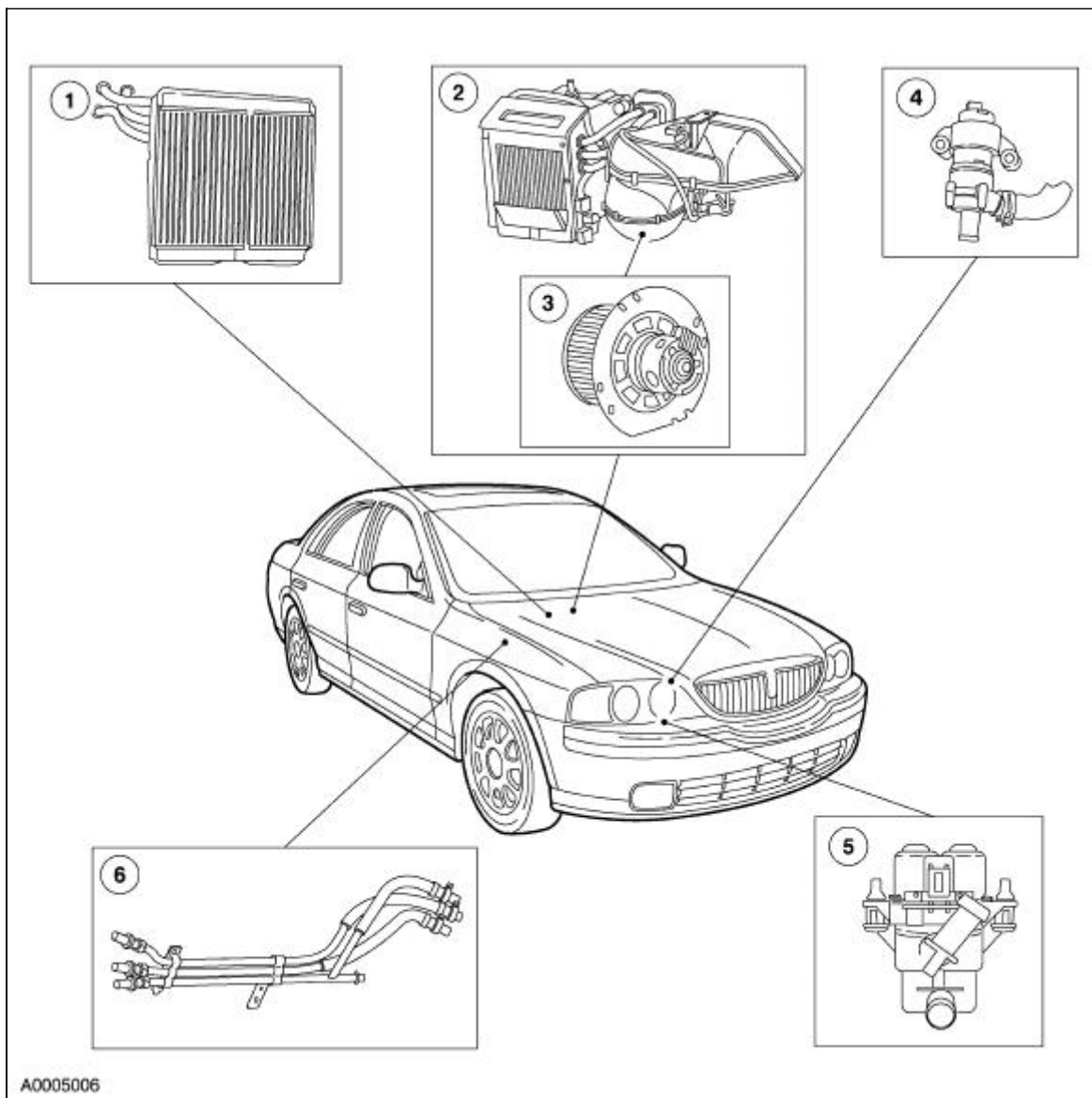
Heating and Defrosting

The heating and defrosting system:

- controls the vehicle air temperature and, during A/C operation, reduces the relative humidity of the air inside the vehicle.
- delivers heated or cooled air to maintain the vehicle interior temperature and comfort level.
- controls the A/C blower motor speed.
- allows temperature to be adjusted individually by the driver and the passenger to maintain comfort.
- uses a reheat method to provide conditioned air to the passenger compartment. All airflow from the blower motor passes through the A/C evaporator core (19860) and the heater core (18476). Temperature is regulated by reheating the air out of the evaporator core to achieve the desired temperature.
- controls the air temperature by regulating the flow of engine coolant to separate halves of the heater core. A dual solenoid actuated valve is used to control the flow of coolant.

The blower motor (19805) draws outside air through the air inlet filter and duct or draws recirculated air through the recirculated air duct.

Component Locations



A0005006

Item	Part Number	Description
1	18476	Heater core
2	19850	A/C evaporator housing
3	19805	Blower motor
4	18D473	Auxiliary coolant flow pump—3.9L only
5	18495	Dual coolant flow valve
6	18C553	Heater water hose assembly — (consists of 18663 and two 18696 hose assemblies)

Heater Core

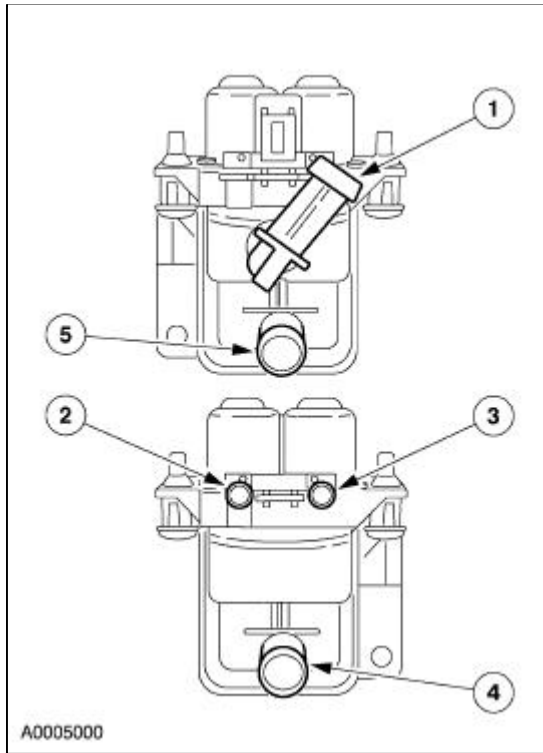
The heater core consists of fins and tubes arranged to extract heat from the engine coolant and transfer it to air passing through the heater core. The heater core is separated into two sections. Air passing through one section is directed to the driver side of the vehicle, while air passing through the other section is directed to the passenger side of the vehicle. The heater core has separate inlet ports with a common outlet port.

Blower Motor

The A/C blower motor (19805) pulls air from the air inlet and forces it into the evaporator housing and plenum assembly (which is attached to the instrument panel) where it is distributed.

Dual Coolant Control Valve

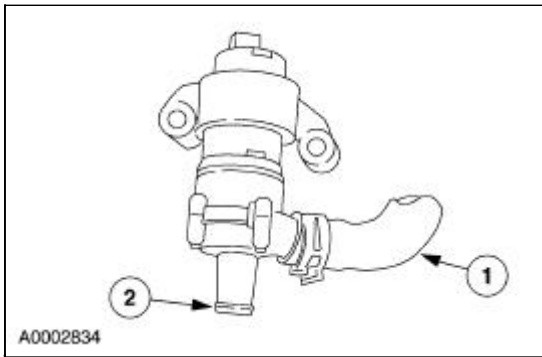
The dual coolant valves regulates the flow of engine coolant to each half of the heater core. Two electric solenoids, which are individually actuated by the DATC module, are the control elements. The valve contains five ports:



Port	Function	Location
1	Inlet—coolant from engine	front face
2	Outlet to heater core, driver side	rear face
3	Outlet to heater core, passenger side	rear face
4	Return coolant from heater core	rear face
5	Outlet—return to engine	front face

Auxiliary Water Pump—3.9L Engine

The auxiliary water pump is electrically driven and provides increased coolant flow during low engine speed operation. The pump is also used to circulate coolant after the engine is turned off under certain conditions.

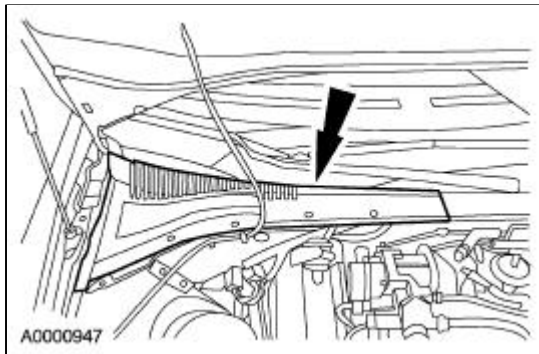


Port	Description
1	Inlet from engine
2	Outlet to coolant valve

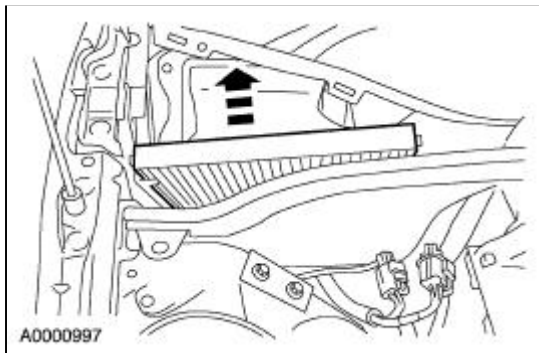
Heater Hose

Removal

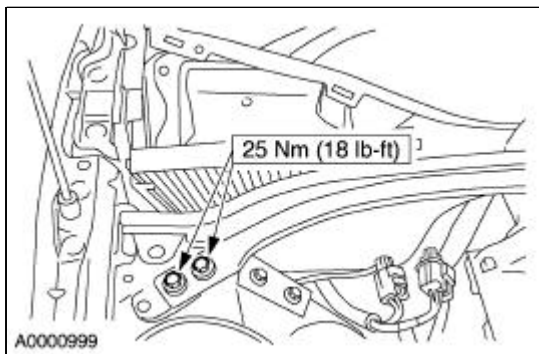
1. Drain the radiator. For additional information, refer to [Section 303-03](#).
2. Remove the throttle body air intake tube. For additional information, refer to [Section 303-12](#).
3. Remove the RH cowl cover.



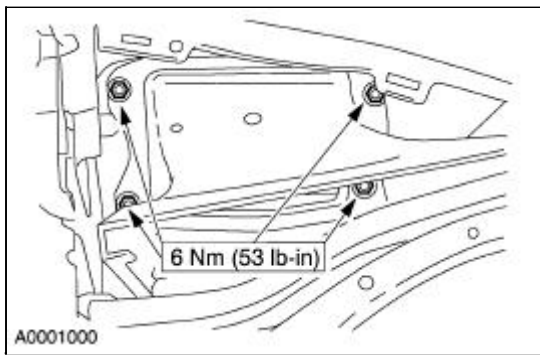
4. Push on the RH corner of the filter to release the clip. Release the LH clip and remove the cabin air filter.



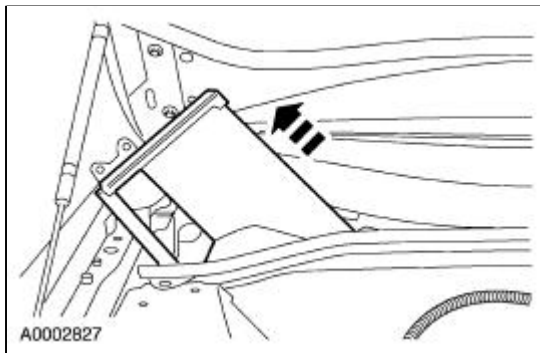
5. Remove the seven bolts and remove the cross-vehicle support.



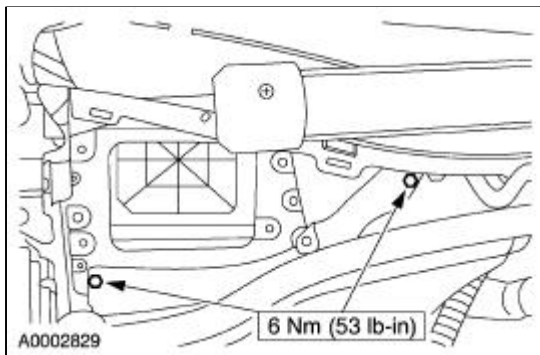
6. Remove the bolts.



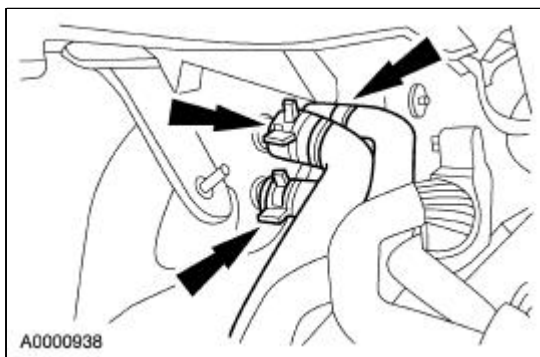
7. Remove the cabin air filter housing by lifting the outboard side then removing the housing.



8. Remove the three bolts and remove the plenum panel.



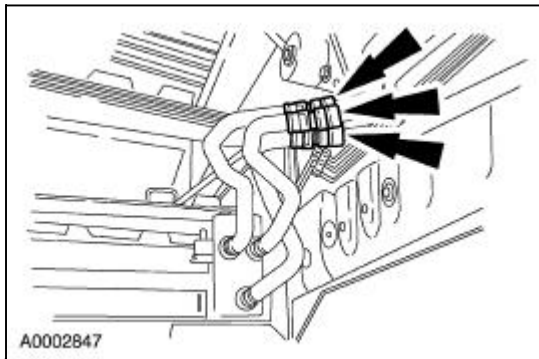
9. Disconnect the heater hoses from the heater core.



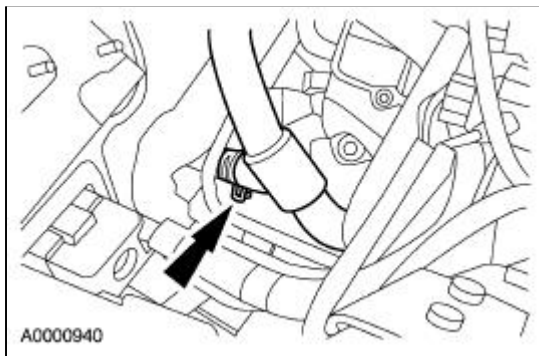
10. **NOTE:** The top heater hose has a green identifying mark to match the hose on the dual coolant flow valve. If the marking is not visible, make sure to mark the hoses for location prior to disconnecting the couplings. This will aid in the correct installation of the hose assemblies.

NOTE: Hose connections shown with components removed for clarity.

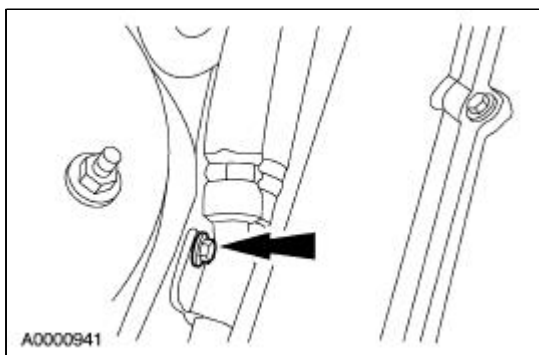
Disconnect the three quick-disconnect couplings from the coolant control valve hoses. For additional information, refer to [Section 412-00](#).



11. Disconnect the coolant recovery line.



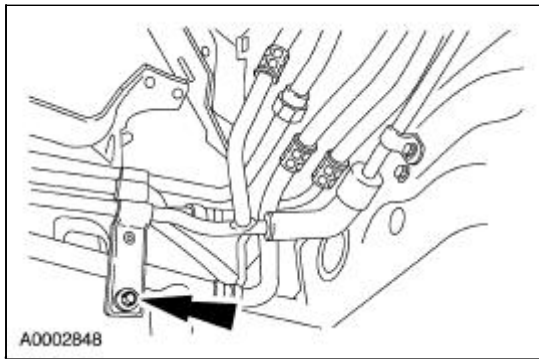
12. Remove the forward heater hose mounting bolt at the RH shock tower.



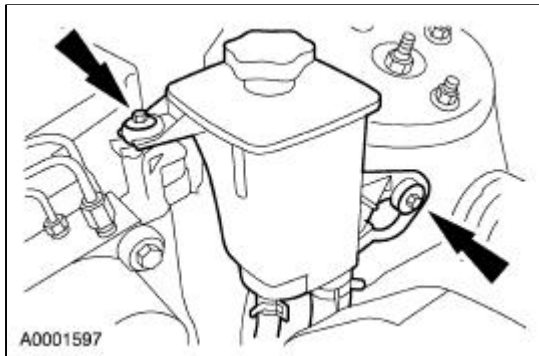
13. Raise the vehicle. For additional information, refer to [Section 100-02](#).

14. **NOTE:** View shown with components removed for clarity.

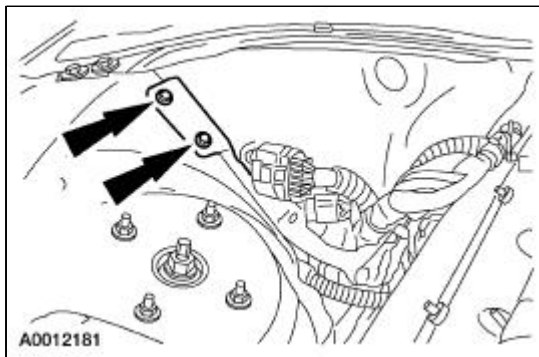
Remove the rear heater hose mounting bolt from the body side.



15. Position the hydraulic cooling fan reservoir aside.

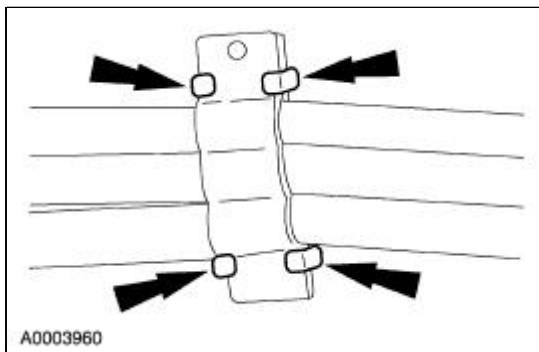


16. Position the PCM wiring harness bracket aside.

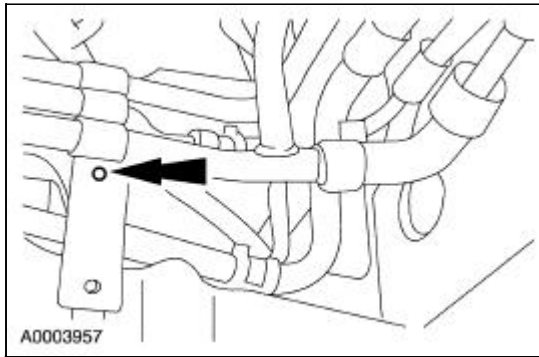


17. Lower the vehicle and remove the heater hose assembly.
18. **NOTE:** Steps 18 and 19 are required only if the heater hose assembly is being separated.

If necessary, remove the crimps and remove the bracket.

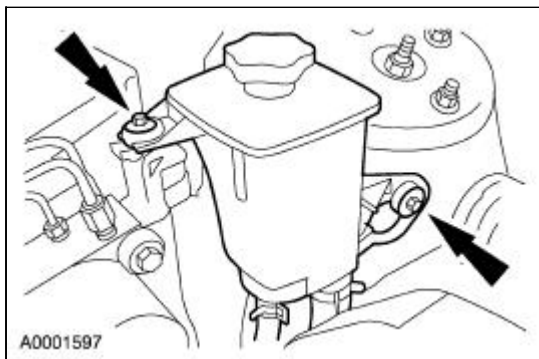


19. If necessary, remove the rivet and remove the bracket.

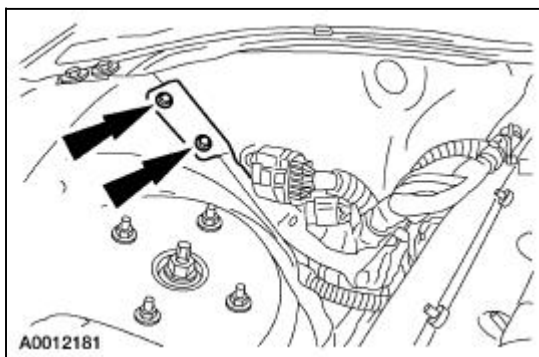


Installation

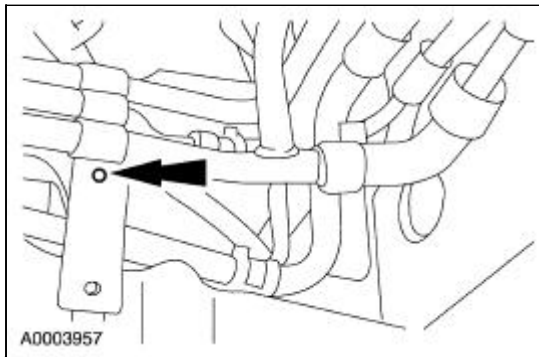
1. Install heater hose assembly.
2. Install the hydraulic cooling fan reservoir.



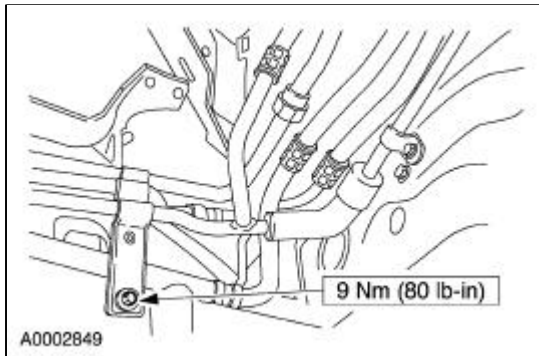
3. Install the PCM wiring harness bracket.



4. **NOTE:** If the hose assembly has been separated, install the bracket removed using a new rivet.
Install the bracket using a new rivet.

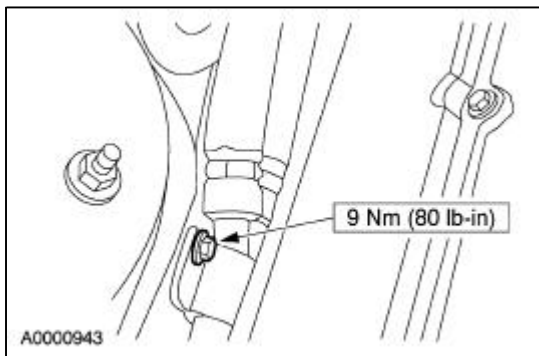


5. Install the rear heater hose mounting bolt.

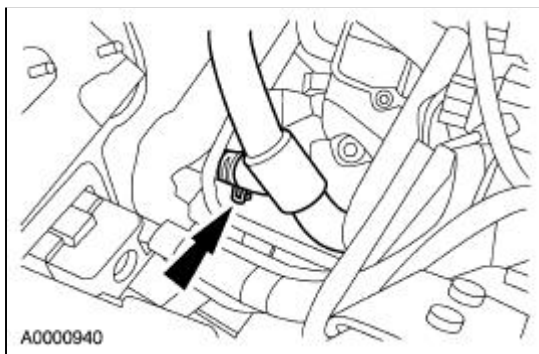


6. **NOTE:** If the hose assembly has been separated, a new bracket must be installed.

Install the forward heater hose mounting bolt.



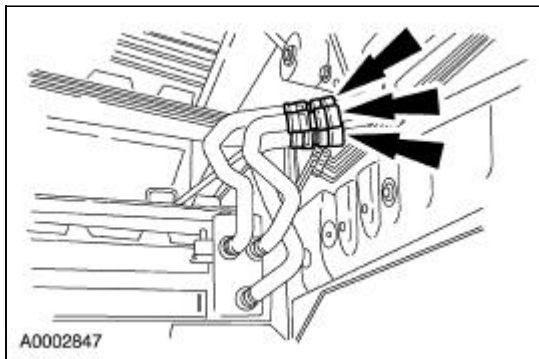
7. Connect the coolant recovery line.



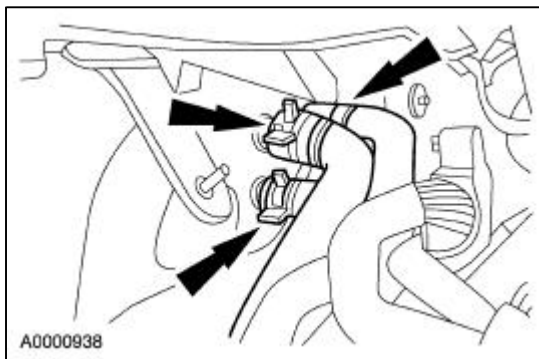
8. Install the couplings.

- Make sure that the heater hoses are installed in the correct position.

- Lubricate the coolant hoses with MERPOL® meeting Ford specification ESE-M99B144-B or plain water only, if needed.



9. Install the heater hoses at the heater core.
 - Make sure that the heater hoses are installed in the correct position.
 - Lubricate the coolant hoses with MERPOL® meeting Ford specification ESE-M99B144-B or plain water only, if needed.
 - Check for correct hose installation by verifying DATC system operation.

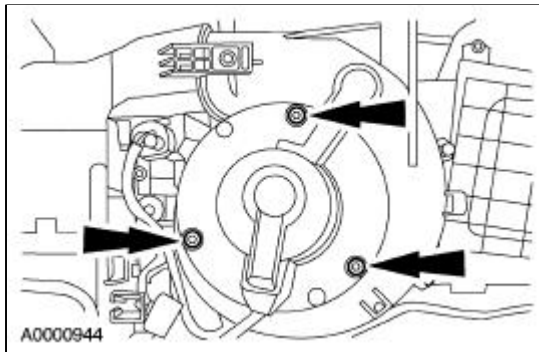


10. Install the cabin air intake plenum.
 11. Install the cabin air filter.
 12. Install the RH cowl cover.
 13. Install the throttle body intake tube.
 14. Fill the cooling system.
-

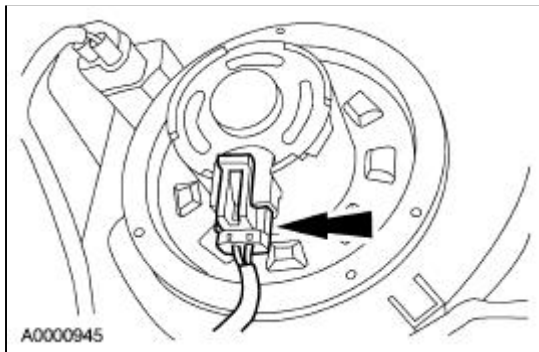
Blower Motor


Removal and Installation

1. Disconnect the battery ground cable. For additional information, refer to [Section 414-01](#).
2. Remove the passenger side floor duct. For additional information, refer to [Section 412-01](#).
3. Remove the screws and remove the cover.



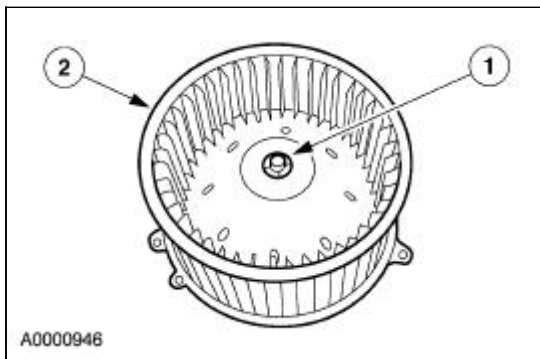
4. Disconnect the connector and remove the blower motor.



5.  **CAUTION:** Prior to removing a wheel that is to be reused, clean any corrosion from the blower motor shaft to prevent damage to the wheel mounting diameter.

Remove the wheel from the blower motor.

1. Remove the push clip.
2. Remove the wheel from the blower motor.



6. **NOTE:** Make sure to install the blower motor cover. It is necessary for correct cooling.

To install, reverse the removal procedure.

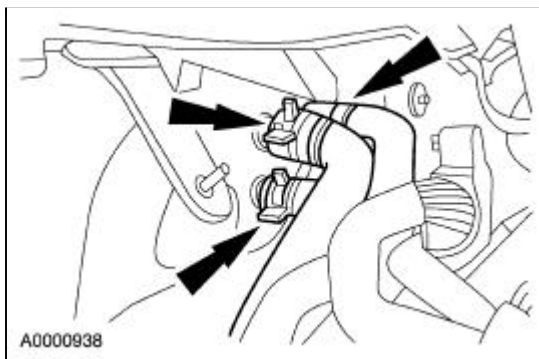
Heater Core And Evaporator Core Housing

Material

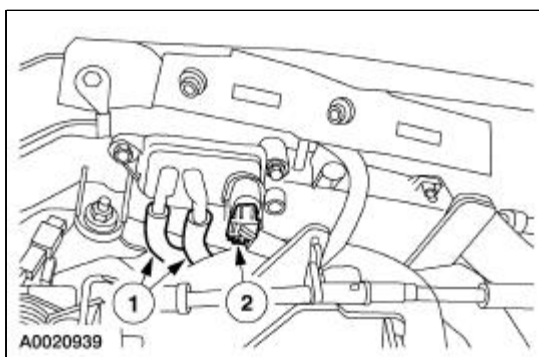
Item	Specification
PAG Refrigerant Compressor Oil (R-134a Systems) F7AZ-19589-DA (Motorcraft YN-12-C)	WSH-M1C231-B
MERPOL®	ESE-M99B144-B

Removal and Installation

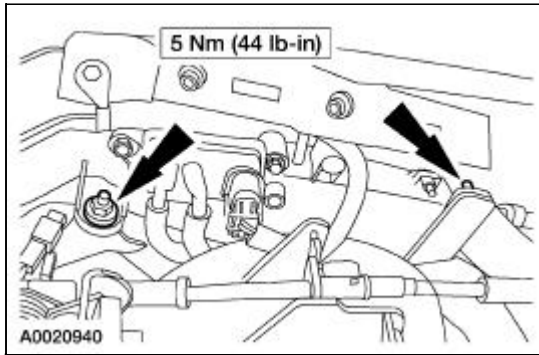
1. Disconnect the battery ground cable. For additional information, refer to [Section 414-01](#).
2. Recover the refrigerant. For additional information, refer to [Section 412-00](#).
3. Partially drain the cooling system. For additional information, refer to [Section 303-03](#).
4. Remove the fresh air inlet duct. For additional information, refer to [Section 412-01](#).
5. Disconnect the heater hose assembly from the heater core.



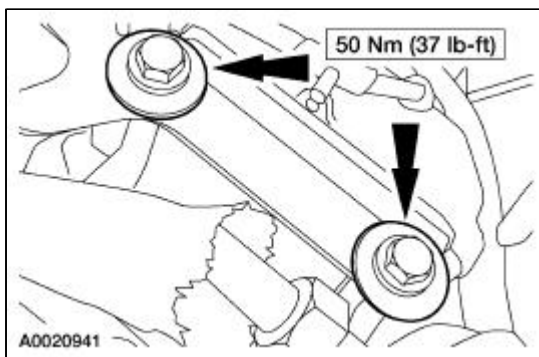
6. Disconnect the differential pressure feedback (DFPE) sensor.
 1. Disconnect the vacuum hoses.
 2. Disconnect the electrical connector.



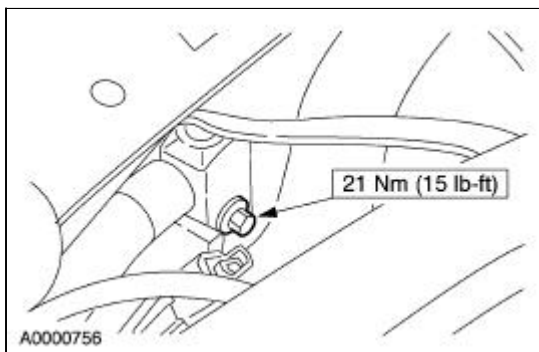
7. Remove the wire harness retaining nuts and position the wiring harness aside.



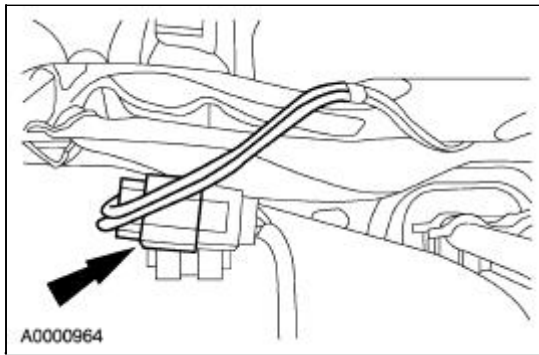
8. Remove the two harness bracket retaining bolts from the RH cylinder head and position the bracket aside.



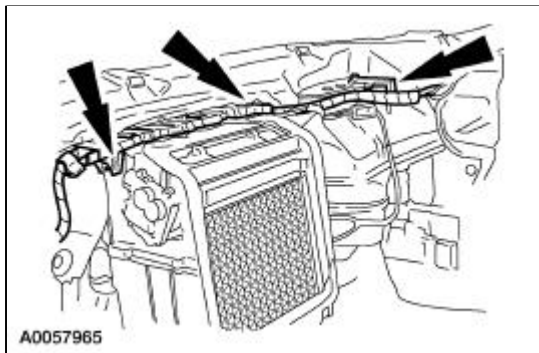
9. Remove the bolt and disconnect the manifold and tube assembly from the thermostatic expansion valve.
 - Discard the O-ring seals.



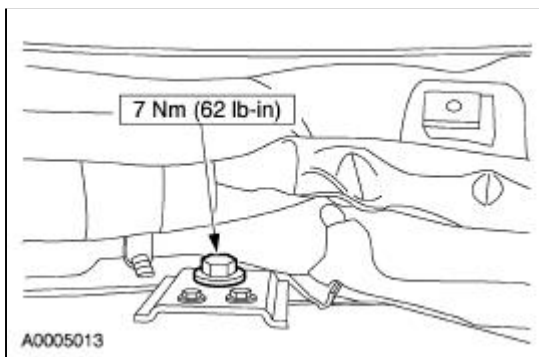
10. Remove the instrument panel. For additional information, refer to [Section 501-12](#).
11. Disconnect the connector located on the top of the evaporator core housing.



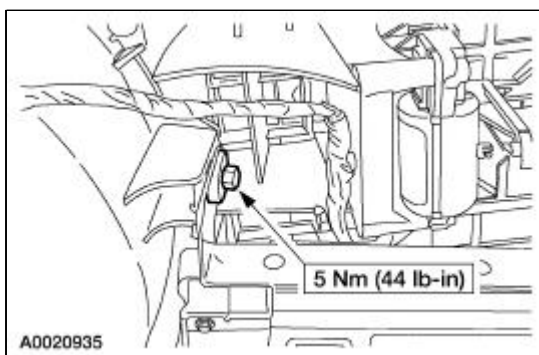
12. Detach and position the wiring harness aside.



13. Remove the cowl top attachment bolt.

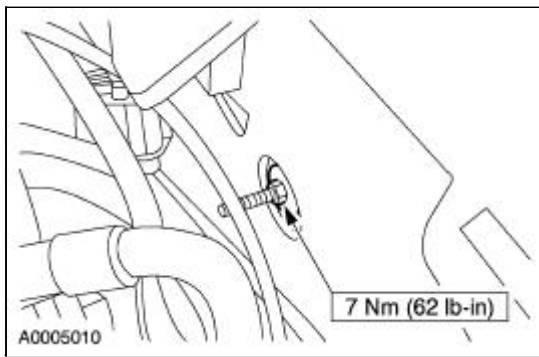


14. Remove the evaporator housing attachment bolt.

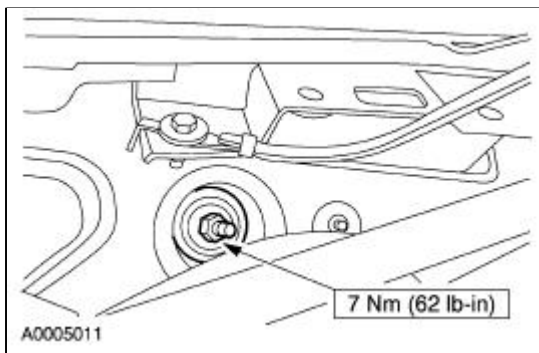


15. **NOTE:** Nut and washer assemblies removed in steps 15 and 16 are located in the engine compartment.

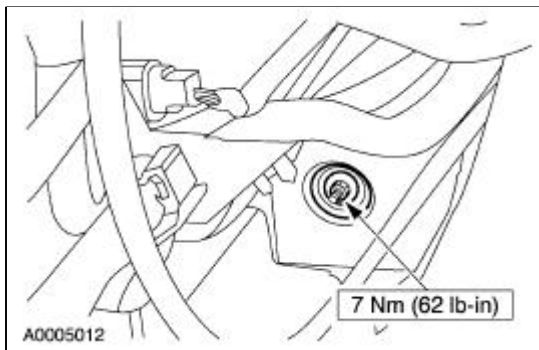
Remove the nut and washer assembly retaining the evaporator housing to the bulkhead.



16. Remove the nut and washer assembly retaining the evaporator housing to the bulkhead.



17. Remove the nut and washer assembly retaining the evaporator housing to the bulkhead.



18. Remove the evaporator core housing.
19. To install, reverse the removal procedure.
- Install new O-ring seals lubricated in clean PAG oil.
 - Clean and lubricate the coolant hoses with coolant hose lubricant or plain water only if needed.
20. Fill the engine coolant level. For additional information, refer to [Section 303-03](#).
21. Evacuate, leak test and charge the refrigerant system. For additional information, refer to [Section 412-00](#).
-

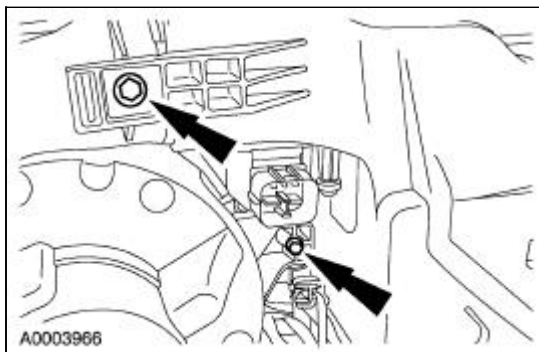
Heater Core

Removal and Installation

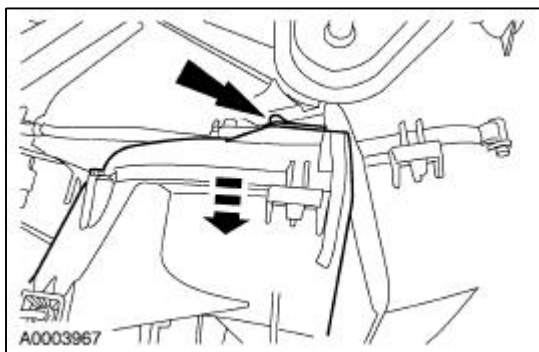
1. **NOTE:** If a leak is suspected, the heater core must be leak tested in the vehicle before removal. For additional information, refer to [Section 412-00](#).

Remove the evaporator core housing. For additional information, refer to [Heater Core And Evaporator Core Housing](#) in this section.

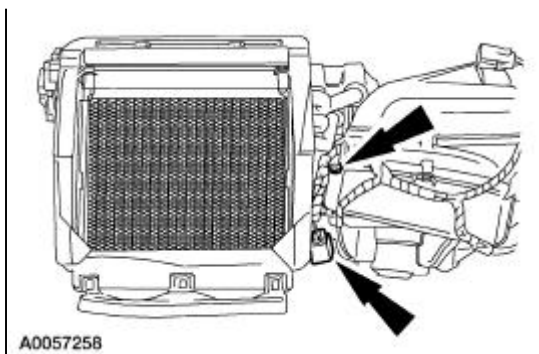
2. Remove the evaporator core housing to air inlet housing screws.



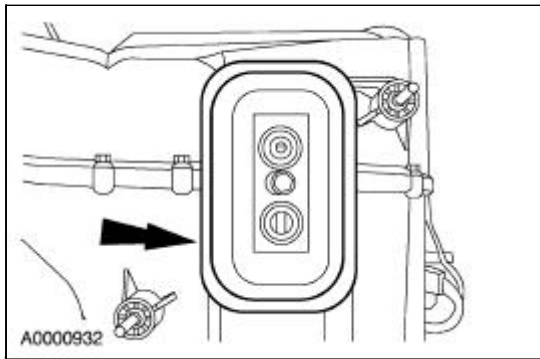
3. Disengage the clip and separate the evaporator core housing from the air inlet housing.



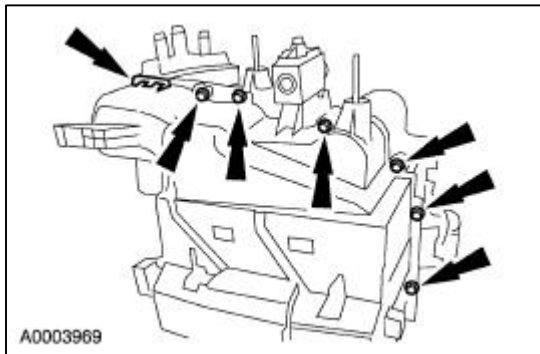
4. Disconnect the evaporator core housing electrical connectors and position the wire harness aside.



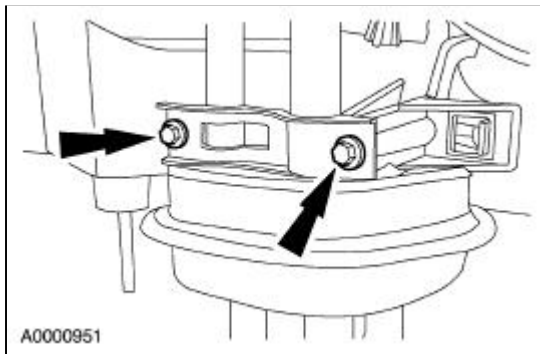
5. Remove the gasket.



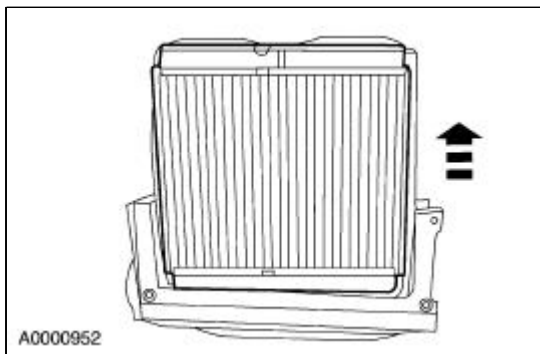
6. Remove the nine screws, disengage the clip and separate the heater core and evaporator core housing.



7. Remove the screws.



8. Remove the heater core.

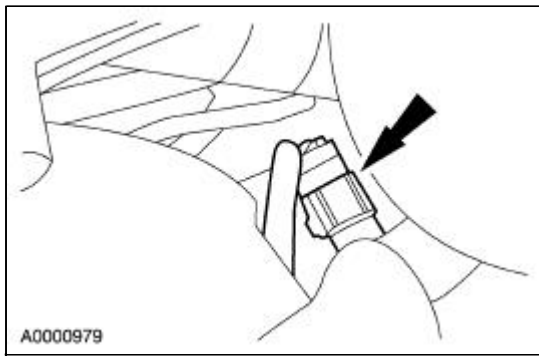


9. Remove the heater core tube gasket.
10. To install, reverse the removal procedure.

Dual Coolant Flow Valve

Removal and Installation

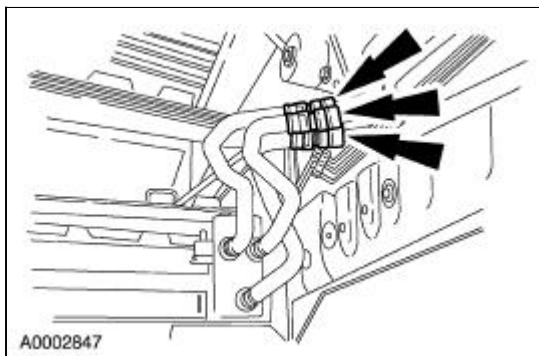
1. Disconnect the battery ground cable. For additional information, refer to [Section 414-01](#).
2. Drain the radiator. For additional information, refer to [Section 303-03](#).
3. If equipped with 3.9L engine, remove the auxiliary coolant pump. For additional information, refer to [Auxiliary Coolant Flow Pump](#) in this section.
4. Disconnect the connector located at the end of the coolant valve harness pigtail.



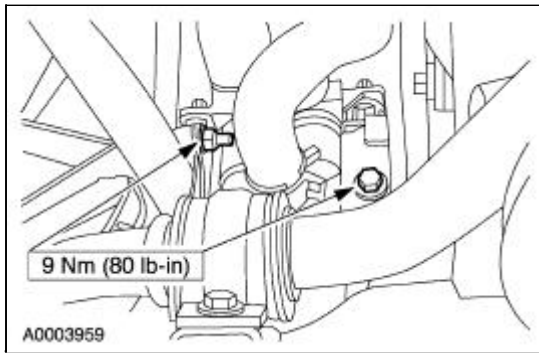
5. **NOTE:** The top heater hose has a green identifying mark to match the hose on the dual coolant flow valve. If mark is not visible, identify the hoses for location. This will aid in the correct installation of the hose assemblies.

NOTE: Hose assemblies shown with components removed for clarity.

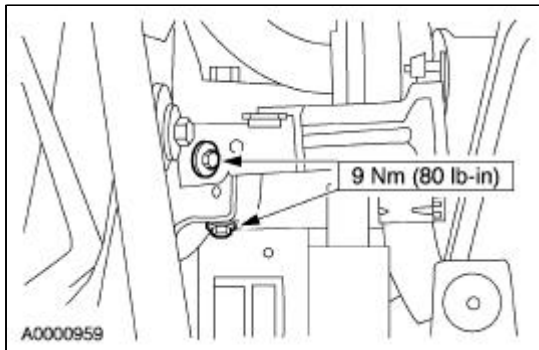
Disconnect the three quick-disconnect couplings from the coolant control valve hoses. For additional information, refer to [Section 412-00](#).



6. Raise the vehicle. For additional information, refer to [Section 100-02](#).
7. Remove the coolant valve assembly mounting bolt and the nut.



8. Raise the valve and disconnect the coolant supply and return lines.
9. Remove the bolts and remove the coolant valve mounting bracket.

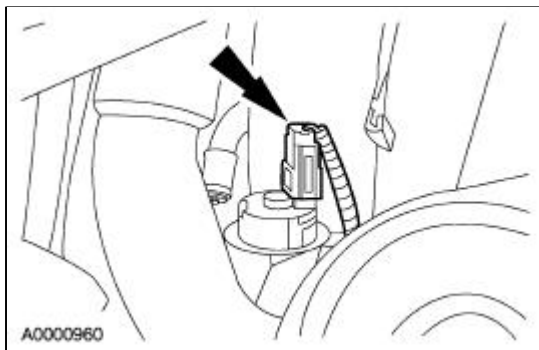


10. To install, reverse the removal procedure.
 - Make sure that the heater hoses are installed in the correct position.
 - Lubricate the coolant hoses with MERPOL® meeting Ford specification ESE-M99B144-B or plain water only, if needed.
 - Check for correct hose installation by verifying DATC system operation.
-

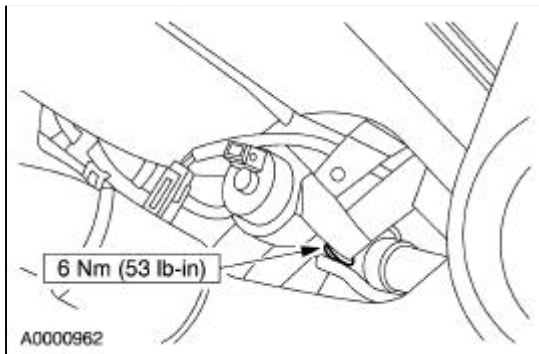
Auxiliary Coolant Flow Pump

Removal and Installation

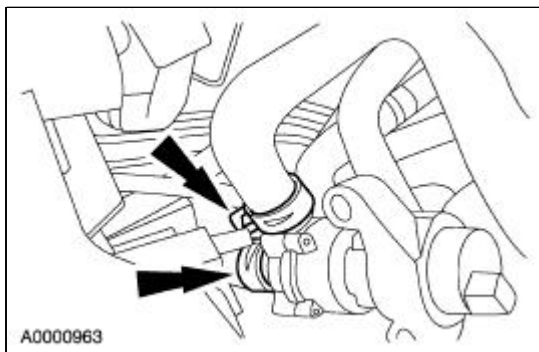
1. Disconnect the battery ground cable. For additional information, refer to [Section 414-01](#).
2. Drain the radiator. For additional information, refer to [Section 303-03](#).
3. Disconnect the connector.



4. Remove the two auxiliary coolant pump to fan shroud bolts.



5. Disconnect the hoses and remove the pump.



6. To install, reverse the removal procedure.
 - Make sure that the heater hoses are installed in the correct position.
 - Lubricate the coolant hoses with MERPOL® meeting Ford specification ESE-M99B144-B

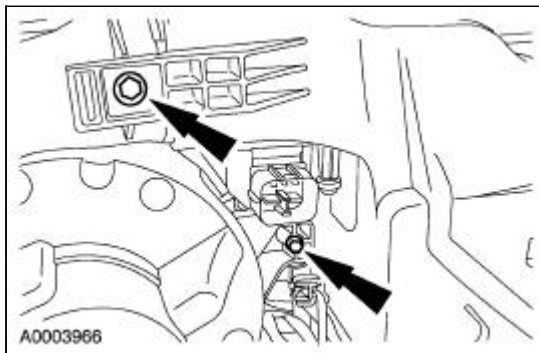
or plain water only, if needed.

- Check for correct hose installation by verifying DATC system operation.
-

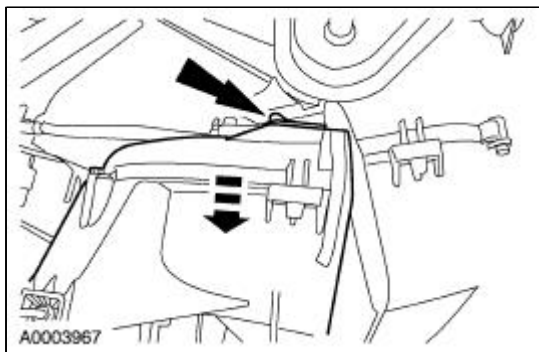
Heater Core And Evaporator Core Housing

Disassembly and Assembly

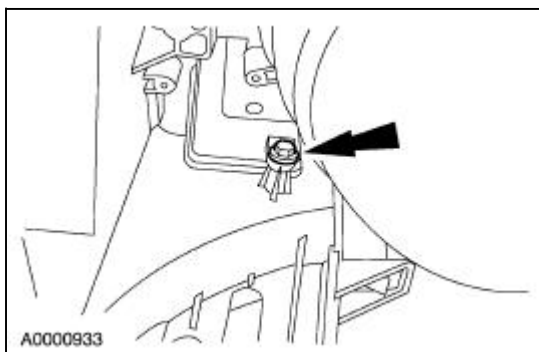
1. Remove the evaporator core housing. For additional information, refer to [Heater Core And Evaporator Core Housing](#) in this section.
2. Remove the evaporator core housing to air inlet housing screws.



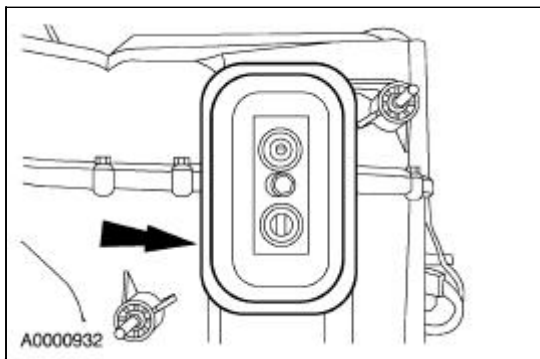
3. Disengage the clip and separate the evaporator core housing from the air inlet housing.



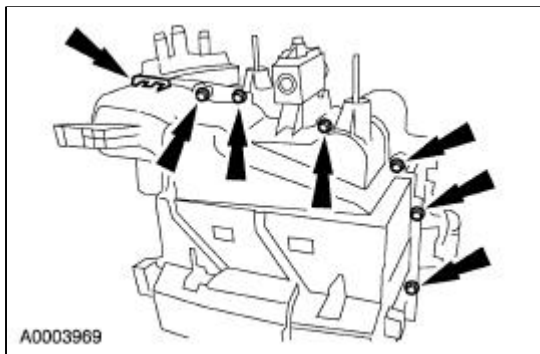
4. Remove the screw and remove the blower motor speed control.



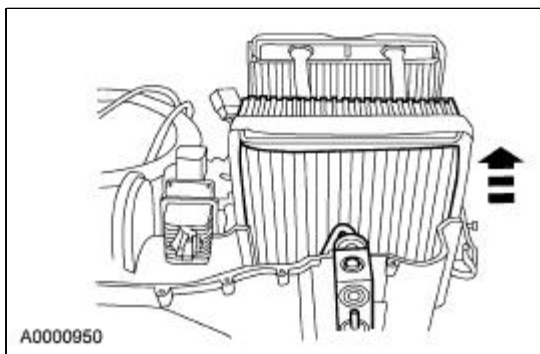
5. Remove the gasket.



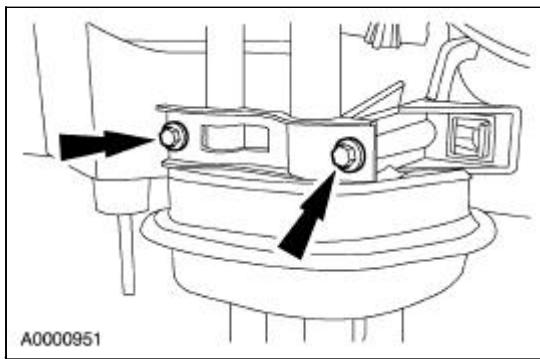
6. Remove the nine screws, disengage the clip and separate the housing.



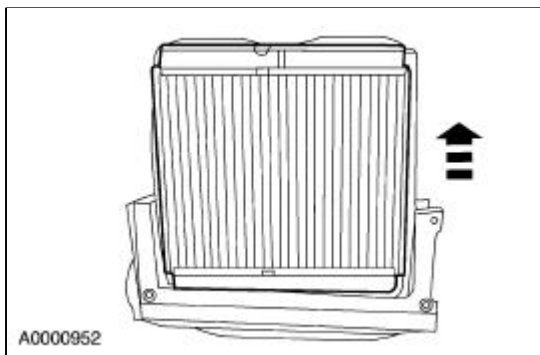
7. If necessary, remove the cold air bypass door actuator. For additional information, refer to [Section 412-04](#).
8. If necessary, remove the evaporator core air discharge temperature sensor. For additional information, refer to [Section 412-04](#).
9. Remove the evaporator core.



10. Disconnect the air bypass door actuator connector and position the harness aside.
11. Remove the screws.



12. Remove the heater core.



13. Remove the blower motor. For additional information, refer to [Blower Motor](#) in this section.
 14. If necessary, remove the air inlet door actuator. For additional information, refer to [Section 412-04](#).
 15. To assemble, reverse the disassembly procedure.
-

General Specifications

Item	Specification
Magnetic Clutch	
Air gap between pulley and clutch plate	0.35-0.75 mm (0.014-0.030 in)
Lubricants	
PAG Refrigerant Compressor Oil (R-134a Systems) F7AZ-19589-DA (Motorcraft YN-12-C)	WSH-M1C231-B
MERPOL®	ESE-M99B144-B

Torque Specifications

Description	Nm	lb-ft	lb-in
A/C compressor mounting bolts	25	18	—
A/C compressor manifold and tube retaining bolt	21	15	—
A/C compressor clutch retaining nut	17	13	—
A/C condenser core mounting bolts	10	—	89
Receiver drier mounting bracket clamp bolt	7	—	62
A/C pressure transducer	10	—	89
A/C pressure relief valve	9	—	80
Peanut fitting retaining nut	8	—	71
Thermostatic expansion valve fitting nut	9	—	80
Electrical harness bracket bolts	9	—	80
A/C compressor manifold and tube assembly bracket nut	12	9	—
A/C compressor mounting bracket bolts	50	37	—
TXV fittings	24	18	—
Refrigerant line bracket bolt	9	—	80
TXV mounting bolt	21	15	—
Receiver drier manifold nut	8	—	71

Air Conditioning

The A/C refrigerant system is a clutch cycling, thermostatic expansion valve type. The system components are:

- A/C compressor
- A/C clutch
- A/C condenser core
- A/C evaporator core
- thermostatic expansion valve
- receiver drier
- connecting refrigerant lines

The refrigeration system operation is controlled by the:

- thermostatic expansion valve.
- evaporator discharge temperature sensor.
- A/C compressor pressure relief valve.
- A/C pressure transducer.
- powertrain control module (PCM).
- DATC module.
- ambient temperature sensor.

The refrigerant system incorporates a variable capacity A/C compressor. The A/C compressor clutch engagement is controlled by the vehicle PCM.

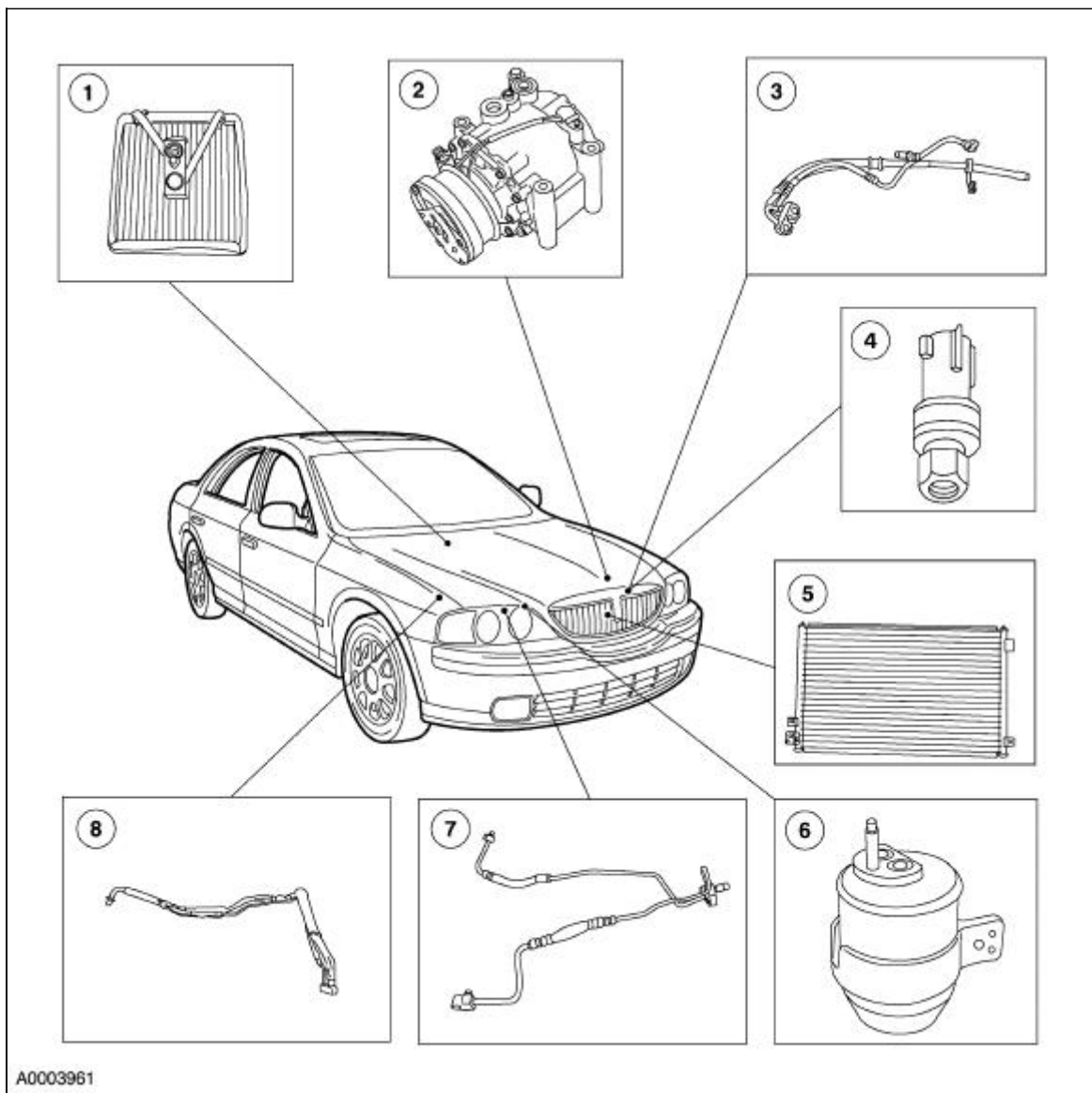
The evaporator discharge temperature sensor senses evaporator discharge temperature. The DATC module monitors the evaporator discharge temperature sensor and communicates with the PCM to control clutch cycling. The DATC also monitors the ambient air temperature sensor and disables A/C operation when the ambient air temperature is below 0°C (32°F).

The A/C pressure transducer is located in the compressor discharge line and is monitored by the PCM. If high or low refrigerant pressures are experienced, the PCM will interrupt A/C compressor operation.

The pressure relief valve is installed in the compressor manifold and tube assembly and protects the system from excessively high refrigerant pressure.

The thermostatic expansion valve, which is mounted to the evaporator core inlet and outlet tubes, contains an adjustable orifice which provides the restriction that separates the high and low pressure liquid phases in the refrigeration system.

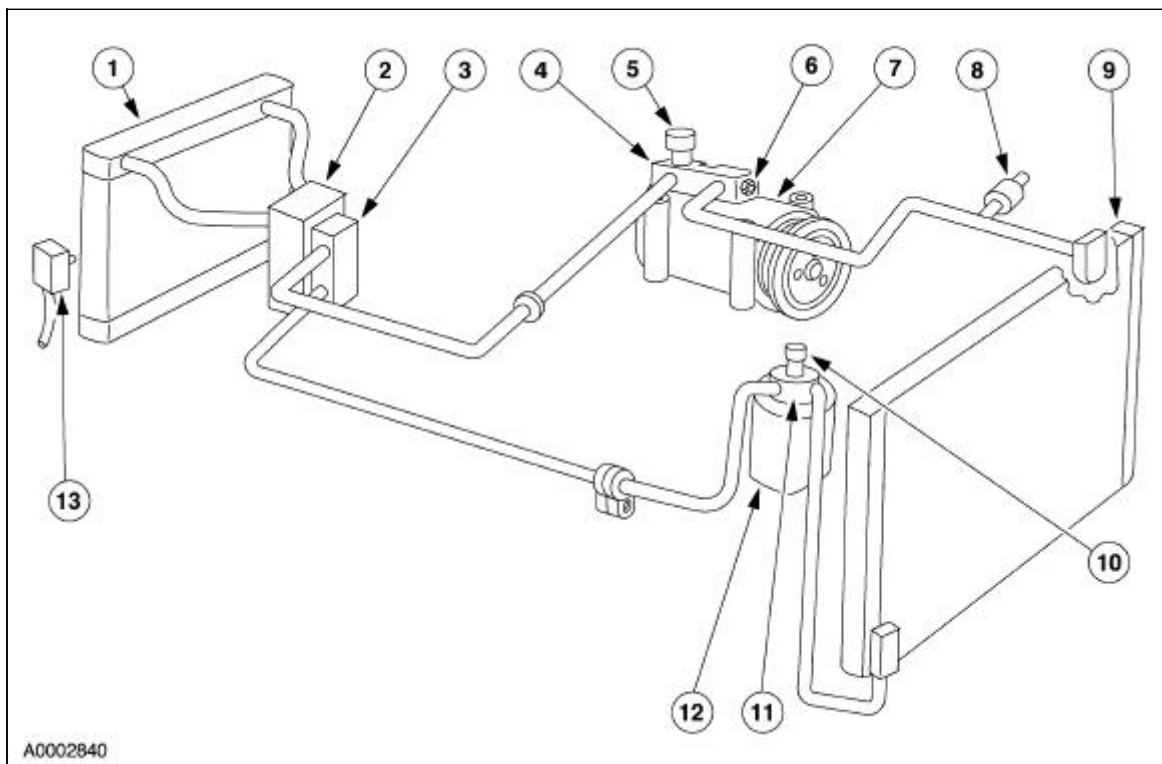
Component Locations



A0003961

Item	Part Number	Description
1	19860	A/C evaporator core
2	19D629	A/C compressor and clutch assembly
3	19D850	Manifold and tube assembly—A/C compressor
4	19D594	A/C pressure transducer
5	19712	A/C condenser core
6	19959	Receiver drier
7	19N585	Manifold and tube assembly—receiver drier
8	19A834	Manifold and tube assembly—thermal expansion valve

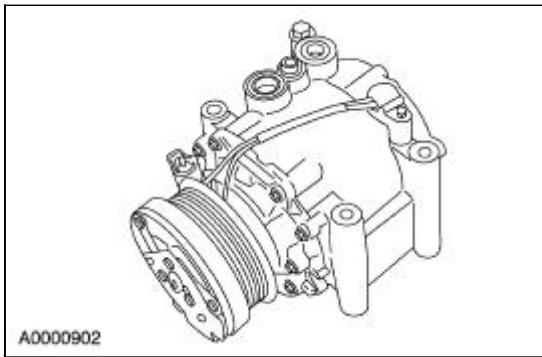
Refrigeration System Components



A0002840

Item	Part Number	Description
1	19860	A/C evaporator core
2	19849	Thermostatic expansion valve
3	19A834	Manifold and tube assembly—thermostatic expansion valve
4	19D850	Manifold and tube assembly—A/C compressor
5	19E762	A/C charge port valve (low side)
6	19E762	A/C pressure relief valve
7	19703	A/C compressor
8	19D594	A/C pressure transducer
9	19712	A/C condenser core
10	19D701	A/C charge port valve (high side)
11	19N585	Manifold and tube assembly—receiver drier
12	19959	Receiver drier
13	19C734	Sensor—evaporator air discharge temperature

A/C Compressor and Clutch Assembly



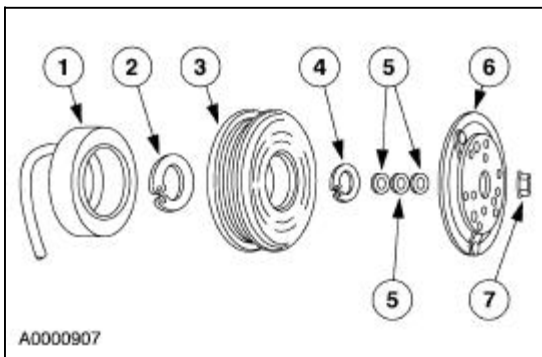
NOTE: Internal A/C compressor components are not serviced separately. The A/C scroll compressor is serviced only as an assembly. The A/C clutch, A/C clutch pulley and the A/C clutch field coil are serviceable.

The Ford Variable Scroll A/C compressor (SC90V) has the following characteristics:

- A variable capacity function controlled by a suction pressure sensing device.
- A fixed and orbiting scroll to provide refrigerant compression.
- A non-serviceable shaft seal.
- The A/C compressor uses PAG Refrigerant Compressor Oil (R-134a Systems) F7AZ-19589-DA (Motorcraft YN-12-C) or equivalent meeting Ford specification WSH-M1C231-B. This oil contains special additives necessary for the A/C compressor.

The A/C compressor contains a thermal cutout switch which senses the compressor housing temperature. The switch will disengage the A/C compressor clutch if the housing temperature exceeds 120°C (247°F).

SC90V A/C compressors used on the six and eight cylinder engines are not interchangeable.



Item	Part Number	Description
1	19D798	A/C clutch field coil
2	W704579-S301	Field coil snap ring
3	19D784	A/C clutch pulley
4	W701742-S301	Pulley snap ring
5	19D648	A/C clutch hub spacer
6	19D786	A/C clutch
7	W704577-S301	A/C clutch nut

The SC90V magnetic A/C clutch has the following characteristics:

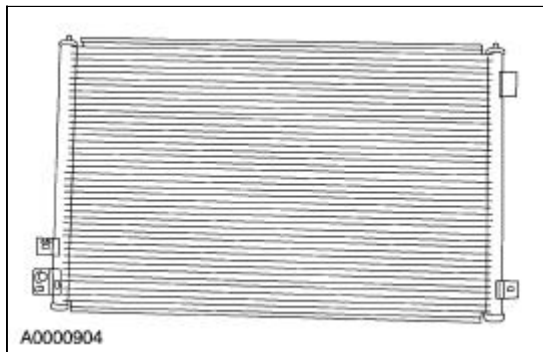
- It drives the compressor shaft.
- When battery positive voltage (B+) is applied to the A/C clutch field coil, the clutch disc and hub assembly is drawn toward the A/C clutch pulley.
- The magnetic force locks the clutch disc and hub assembly and the A/C clutch pulley together as one unit, causing the compressor shaft to rotate.
- When B+ is removed from the A/C clutch field coil, springs in the clutch disc and hub assembly move the clutch disc away from the A/C clutch pulley.

A/C Compressor Pressure Relief Valve

An A/C compressor pressure relief valve is incorporated into the compressor A/C manifold and tube to:

- relieve unusually high refrigerant system discharge pressure buildups. For specifications regarding operating pressure(s), refer to [Section 412-00](#).
- prevent damage to the A/C compressor and other system components.
- avoid total refrigerant loss by closing after the excessive pressure has been relieved.

A/C Condenser Core



The A/C condenser core has the following characteristics:

- It is an aluminum fin and tube design heat exchanger located in front of the vehicle radiator (8005).
- It cools compressed refrigerant gas by allowing air to pass over fins and tubes to extract heat and by condensing gas to liquid refrigerant as it is cooled.

Refrigerant Lines

The manifold and tube assembly-receiver drier carries the high pressure liquid from the condenser core to the receiver drier, and from the receiver drier to the manifold and tube assembly-thermostatic expansion valve. It attaches to the A/C receiver drier, uses O-ring seals, and also contains the high pressure service port.

The manifold and tube assembly-thermostatic expansion valve carries high pressure liquid to the thermostatic expansion valve and low pressure gas from the thermostatic expansion valve to the manifold and tube assembly-A/C compressor.

The manifold and tube assembly-A/C compressor carries the high pressure gas from the A/C compressor to the condenser core. It also carries the low pressure gas received from the manifold and tube assembly-thermostatic expansion valve to the A/C compressor. The A/C manifold and tube assembly is attached to the A/C compressor, uses O-ring seals, and has:

- a Schrader-type valve stem core fitting used to mount the A/C pressure transducer so that the A/C pressure transducer can be removed without discharging the A/C system.
- a serviceable high pressure relief valve.

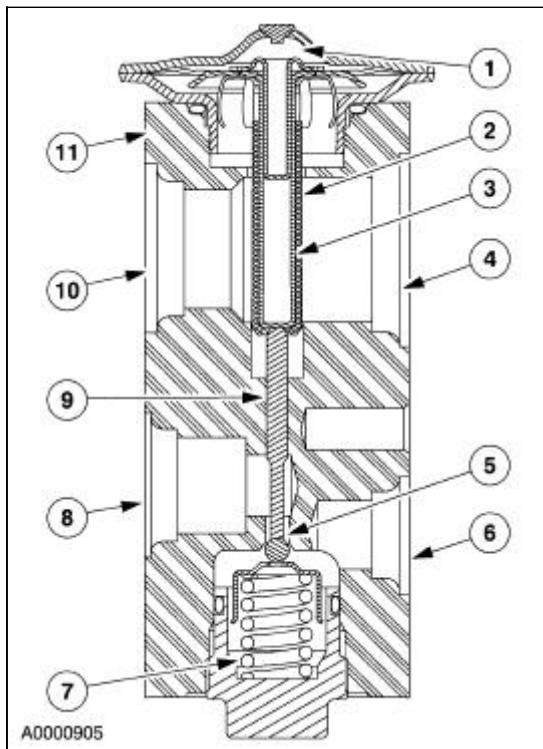
The manifold and tube assembly-A/C compressor used on the V6 and V8 engines are not interchangeable.

A/C Evaporator Core

The A/C evaporator core is the plate/fin type with a unique refrigerant flow path.

- A mixture of refrigerant and oil exits the thermostatic expansion valve (TXV) and enters the evaporator tank area through the 1/2 inch (12.7 mm) tube.
- The tank area is divided into three sections: front inlet, front outlet and rear tank.
- The refrigerant enters the evaporator core tank area at the front inlet, flows down through the core and up the back side in a "U-flow" pattern.
- The refrigerant moves into the rear tank area and across to the other half of the core. The refrigerant moves down through the core and back up the front side of the core to the front outlet tank area.
- The refrigerant at this point is in a gaseous state. It exits the evaporator through the 5/8 inch (15.9 mm) tube then passes through the TXV.

A/C Thermostatic Expansion Valve



Item	Description
1	Sensing bulb
2	Insulator
3	Hollow core pin-type retainer
4	Outlet port—low pressure liquid
5	Metering orifice
6	Inlet port—high pressure liquid
7	Spring
8	Evaporator inlet port—low pressure liquid
9	Pin
10	Evaporator outlet port—low pressure gas
11	Housing

The thermostatic expansion valve has the following characteristics:

- It is mounted on the A/C evaporator core inlet and outlet tubes.
- It is a block-type valve.
- It contains an internal sensing bulb to increase the effectiveness of temperature sensing.
- It is not serviceable. A new thermostatic expansion valve must be installed as a unit.

Receiver Drier

The receiver drier is mounted to the engine fan shroud to the right of the vehicle center. The inlet tube of the receiver drier attaches directly to the A/C condenser core and the outlet tube of the receiver drier attaches to the thermostatic expansion valve inlet line.

The receiver drier stores high pressure liquid after it leaves the condenser core. A desiccant bag mounted in the receiver drier removes any retained moisture.

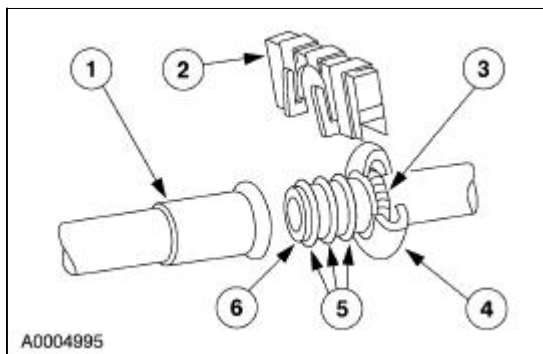
The manifold and tube assembly that mounts to the top of the receiver drier contains the high pressure service port for the refrigerant system.

A/C Pressure Transducer

The A/C pressure transducer monitors the compressor discharge pressure and communicates with the powertrain control module (PCM). The PCM will interrupt A/C compressor operation in the event that the A/C pressure transducer indicates high system discharge pressures. It is also used to sense no or low charge conditions. If the pressure is below a predetermined value for a given ambient temperature, the PCM will not allow the clutch to engage.

- The A/C pressure transducer is mounted on a Schrader valve-type fitting on the A/C compressor to condenser discharge line.
- A valve depressor, located inside the threaded end of the A/C pressure transducer, presses on the Schrader valve stem and allows the A/C pressure transducer to monitor the compressor discharge pressure.
- When the compressor discharge pressure rises, the PCM will interrupt the A/C compressor clutch coil circuit and disengage the A/C compressor. When the pressure drops, the PCM will enable the A/C compressor circuit. For specifications regarding operating pressure(s), refer to the Powertrain Control/Emissions Diagnosis (PC/ED) manual.
- It is not necessary to discharge the refrigerant system to remove the A/C pressure cut-off switch.

Spring Lock Coupling



Item	Part Number	Description
1	—	Female fitting
2	19E746	A/C tube lock coupling clip
3	19E576	A/C tube lock coupling spring
4	—	Cage
5	—	O-ring seals
6	—	Male fitting

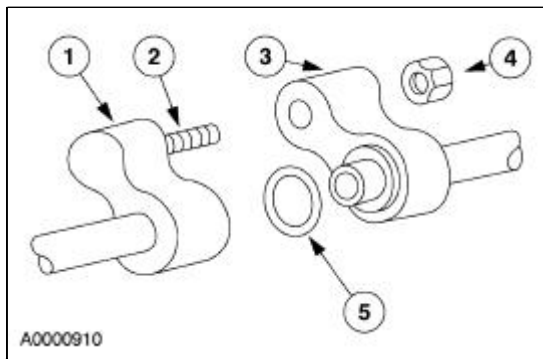
The spring lock coupling is a refrigerant line coupling held together by a garter spring inside a circular cage. The spring lock coupling is used to connect the A/C compressor manifold and tube assembly (inlet) to the TXV manifold and tube assembly (outlet).

- When the coupling is connected together, the flared end of the female fitting slips behind the garter spring inside the cage of the male fitting.
- The garter spring and cage then prevent the flared end of the female fitting from pulling out of the cage.
- Three O-ring seals are used to seal between the thermostatic expansion valve outlet tube and the compressor inlet tube. All other couplings have two O-ring seals.
- Use only the O-ring seals listed in the Ford Master Parts Catalog for the spring lock coupling.
- An A/C tube lock coupling clip is used to secure the coupling.

Peanut Fitting

The A/C condenser core and the connection between the receiver drier manifold assembly (outlet) and the TXV manifold and tube assembly (inlet) use the peanut-shaped refrigerant fittings instead of spring lock couplings.

- The male and female blocks of the peanut fitting are retained with a nut.
- An O-ring seal is installed around the tube on the male block.
- When correctly assembled, the male and female fittings should be flush.
- Use only the O-ring seals listed in the Ford Master Parts Catalog for the peanut fitting.

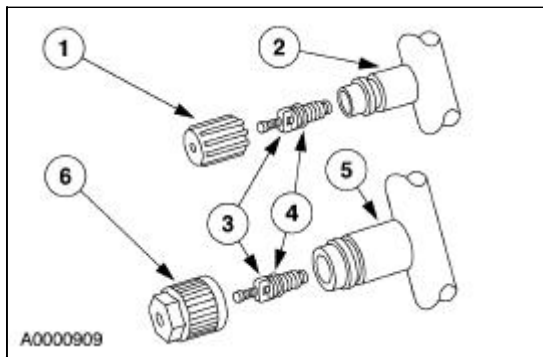


Item	Part Number	Description
1	—	Female block (part of tube assembly)
2	W701890-S426	Stud (part of female block)
3	—	Male block (part of 19712)
4	W520413-S301	Nut
5	—	O-ring seal

Service Gauge Port Valves

The high-pressure service gauge port valve is located on the A/C receiver drier manifold and tube assembly.

The low pressure service gauge port valve is located on the manifold of the A/C compressor manifold and tube assembly at the A/C compressor.



Item	Part Number	Description
1	19D702	A/C charging valve cap
2	—	Low pressure service gauge port valve
3	19D701	Schrader-type valve
4	—	O-ring seal (part of 19D701)
5	—	High pressure service gauge port valve
6	19D702	A/C charging valve cap

The fitting is an integral part of the refrigeration line or component.

- Special couplings are necessary for both the high side and low side service gauge ports.
 - A new Schrader-type valve core can be installed if the seal leaks.
 - Always install the A/C charging valve cap on the service gauge port valves after repairing the refrigerant system.
-

Air Conditioning (A/C) Compressor —3.0L

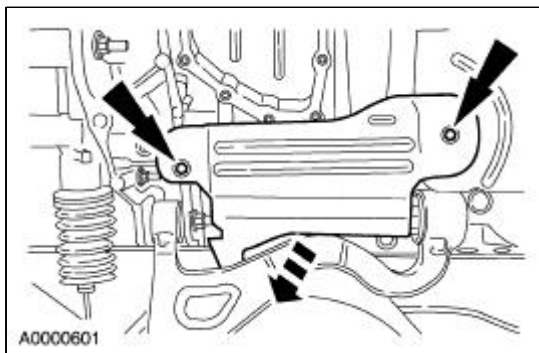
Removal and Installation

⚠ CAUTION: If installing a new air conditioning compressor due to an internal failure of the old unit, you must carry out the following procedures to remove contamination from the air conditioning system.

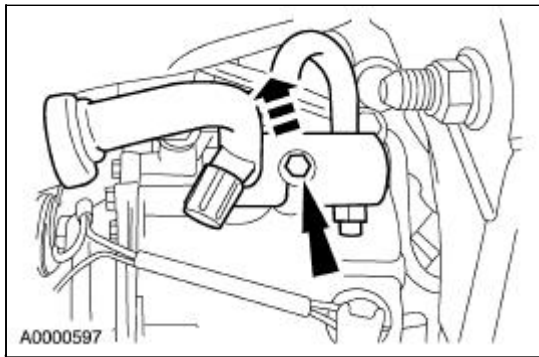
- If A/C flushing equipment is available, carry out the flushing of the air conditioning system prior to installing a new air conditioning compressor. For additional information, refer to [Section 412-00](#).
- If A/C flushing equipment is not available, carry out filtering of the air conditioning system after a new air conditioning compressor has been installed. For additional information, refer to [Section 412-00](#).
- Install a new thermostatic expansion valve, as directed by the A/C flushing or filtering procedure.
- Install a new receiver/drier, as directed by the A/C flushing or filtering procedure.

NOTE: Installation of a new receiver/drier is not required when repairing the air conditioning system except when there is physical evidence of system contamination from a failed A/C compressor or damage to the suction accumulator.

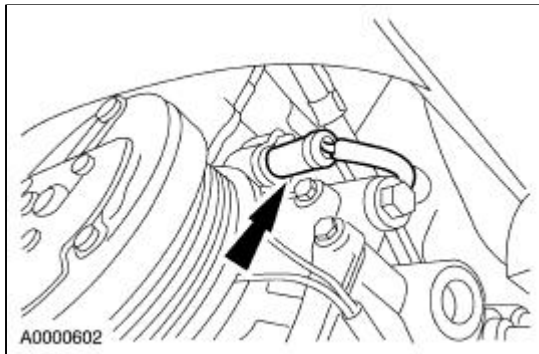
1. If flushing of the air conditioning system has not been performed, recover the refrigerant. For additional information, refer to [Section 412-00](#).
2. Remove the drive belt from the A/C clutch pulley.
3. Raise the vehicle. For additional information, refer to [Section 100-02](#).
4. Remove the screws and remove the sight shield.



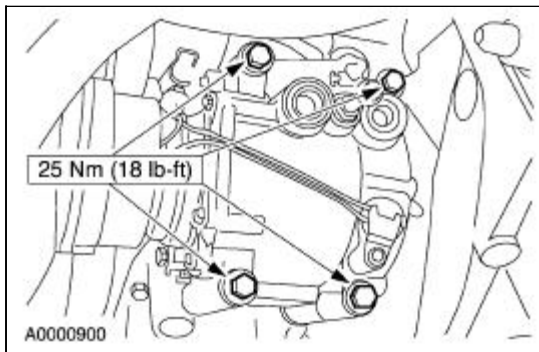
5. Remove the bolt and reposition the A/C manifold and tube assembly.



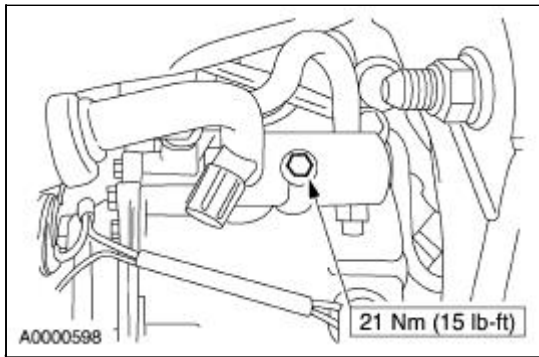
6. Disconnect the connector.



7. Remove the bolts and lower the A/C compressor.



8. To install, reverse the removal procedure.
 - If filtering of the refrigerant system is not to be performed, add the correct amount of PAG Refrigerant Compressor Oil (R-134a Systems) F7AZ-19589-DA (Motorcraft YN-12-C) or equivalent meeting Ford specification WSH-M1C231-B to the new A/C compressor. For additional information, refer to [Section 412-00](#).
 - Lubricate the O-ring seal with PAG Refrigerant Compressor Oil (R-134a Systems) F7AZ-19589-DA (Motorcraft YN-12-C) or equivalent meeting Ford specification WSH-M1C231-B.



9. If filtering of the refrigerant system is not to be performed, evacuate, charge and leak test the refrigerant system. For additional information, refer to [Section 412-00](#).
-

Air Conditioning (A/C) Compressor —3.9L

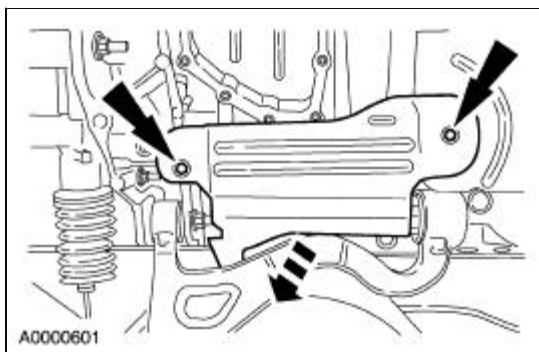
Removal and Installation

⚠ CAUTION: If installing a new air conditioning compressor due to an internal failure of the old unit, you must carry out the following procedures to remove contamination from the air conditioning system.

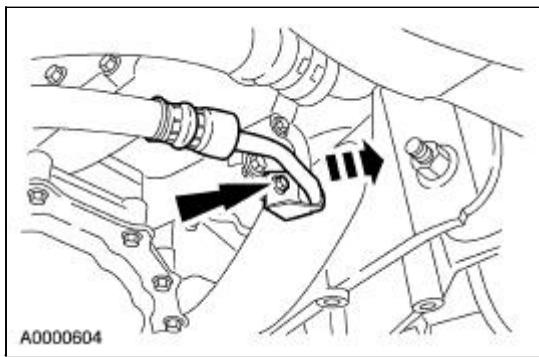
- If A/C flushing equipment is available, carry out the flushing of the air conditioning system prior to installing a new air conditioning compressor. For additional information, refer to [Section 412-00](#).
- If A/C flushing equipment is not available, carry out filtering of the air conditioning system after a new air conditioning compressor has been installed. For additional information, refer to [Section 412-00](#).
- Install a new thermostatic expansion valve, as directed by the A/C flushing or filtering procedure.
- Install a new receiver/drier, as directed by the A/C flushing or filtering procedure.

NOTE: Installation of a new receiver/drier is not required when repairing the air conditioning system except when there is physical evidence of system contamination from a failed A/C compressor or damage to the suction accumulator.

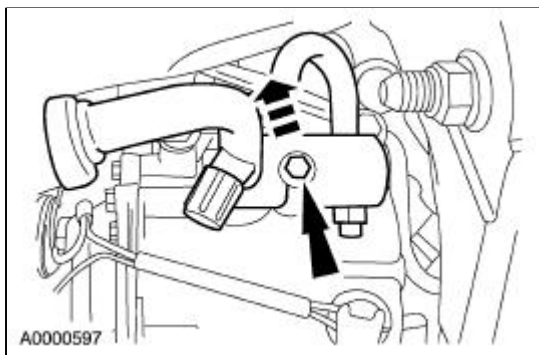
1. If flushing of the air conditioning system has not been performed, recover the refrigerant. For additional information, refer to [Section 412-00](#).
2. Remove the air cleaner outlet tube. For additional information, refer to [Section 303-12](#).
3. Remove the drive belt from the A/C clutch pulley.
4. Raise the vehicle. For additional information, refer to [Section 100-02](#).
5. Remove the screws and remove the sight shield.



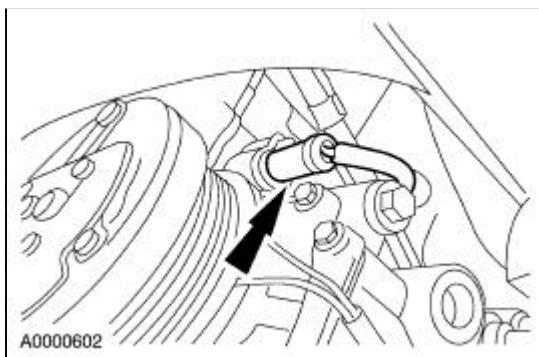
6. Remove the screw and position the power steering hose aside.



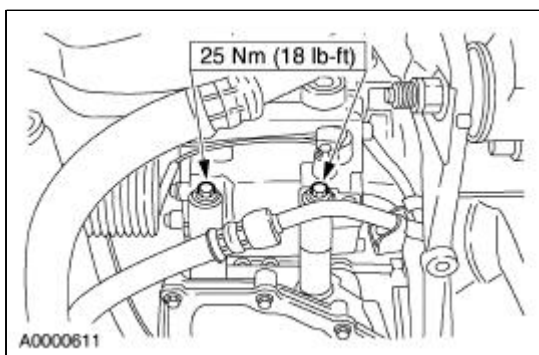
7. Remove the bolt and reposition the A/C manifold and tube assembly.



8. Disconnect the connector.



9. Remove the three bolts and lower the A/C compressor.

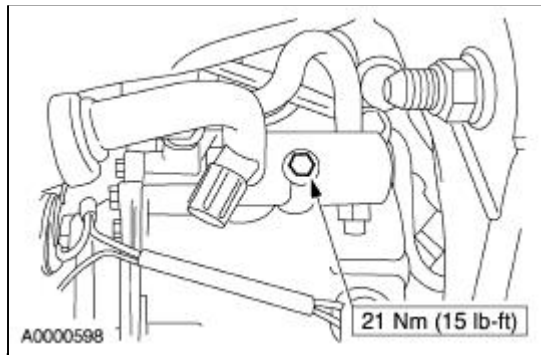


10. To install, reverse the removal procedure.

- If filtering of the refrigerant system is not to be performed, add the correct amount of PAG Refrigerant Compressor Oil (R-134a Systems) F7AZ-19589-DA (Motorcraft YN-12-C) or equivalent meeting Ford specification WSH-M1C231-B to the new A/C compressor. For

additional information, refer to [Section 412-00](#).

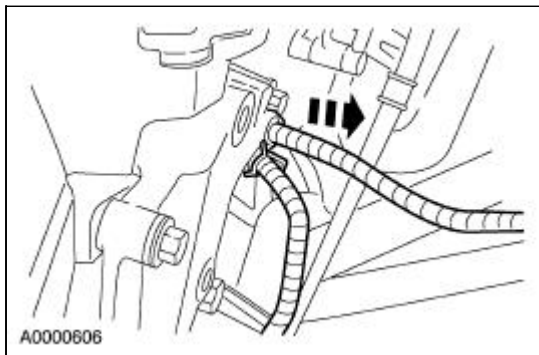
- Lubricate the O-ring seal with PAG Refrigerant Compressor Oil (R-134a Systems) F7AZ-19589-DA (Motorcraft YN-12-C) or equivalent meeting Ford specification WSH-M1C231-B.



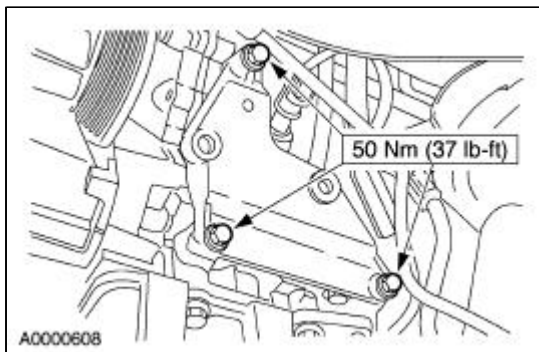
Air Conditioning (A/C) Compressor Bracket —3.0L

Removal and Installation

1. Remove the A/C compressor. For additional information, refer to [Air Conditioning \(A/C\) Compressor—3.0L](#) in this section.
2. Disengage the wire harness pin-type retainer.




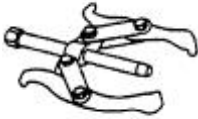
3. Remove the bolts and remove the bracket.



4. To install, reverse the removal procedure.
-

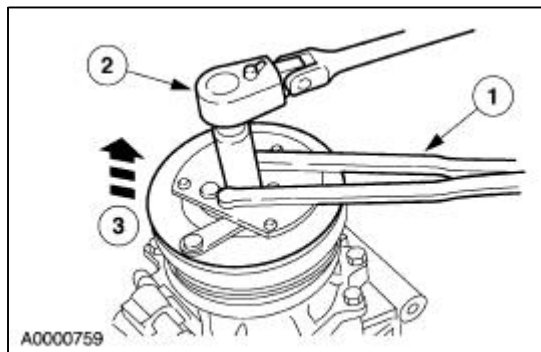
Clutch and Clutch Field Coil

Special Tool(s)

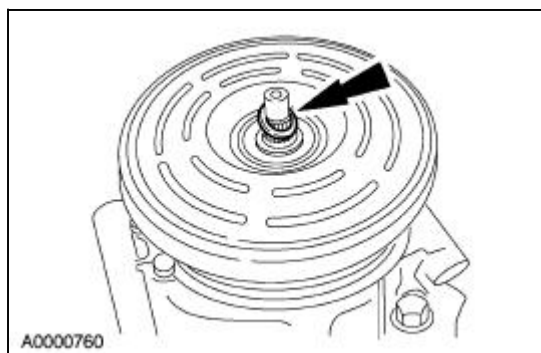
 <p>ST1233-A</p>	Installer, A/C Compressor Clutch Pulley 412-109 (T97P-19D786-A)
 <p>ST1220-A</p>	Remover, Differential Bearing 205-116 (T77F-4220-B1)

Removal

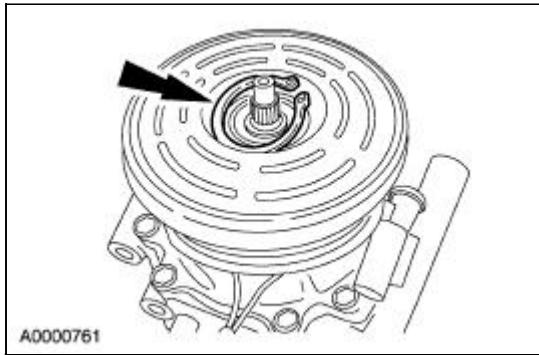
1. Remove the A/C compressor. For additional information, refer to [Air Conditioning \(A/C\) Compressor—3.0L](#) or [Air Conditioning \(A/C\) Compressor—3.9L](#) in this section.
2. Remove the A/C clutch.
 1. Hold the A/C clutch hub.
 2. Remove the nut.
 3. Remove the A/C disk and hub.



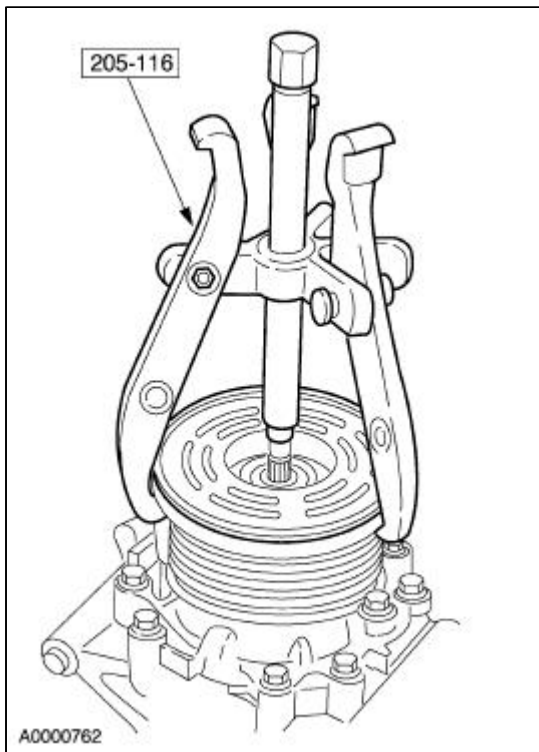
3. Remove the spacer.



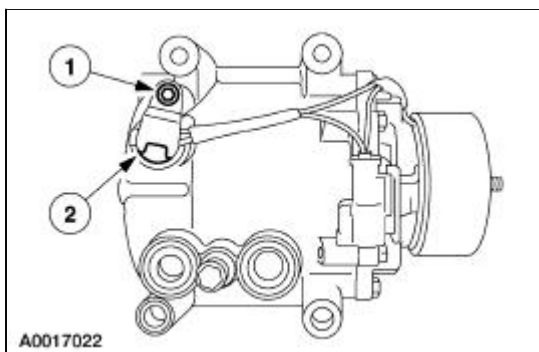
4. Remove the pulley snap ring.



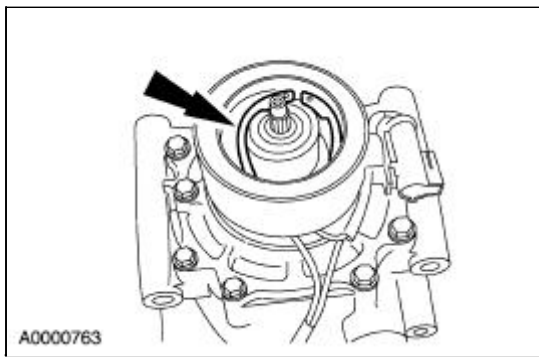
5. Using the special tool, remove the A/C clutch pulley.



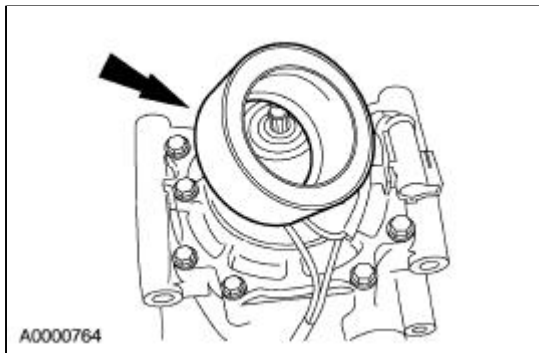
6. Remove the sensor.
 1. Remove the bolt and the hold-down bracket.
 2. Lift out the sensor while lightly twisting and pulling up on the sensor.
 - It may be necessary to pry up lightly with a small screwdriver.



7. Remove the field coil snap ring.

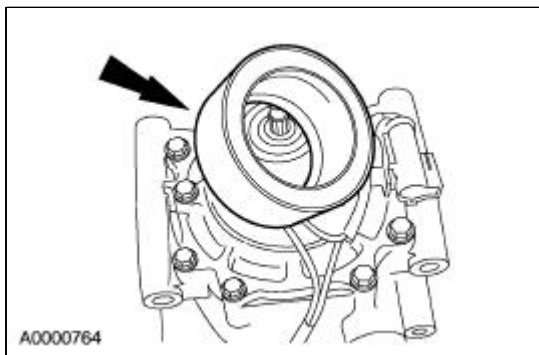


8. Remove the A/C clutch field coil.

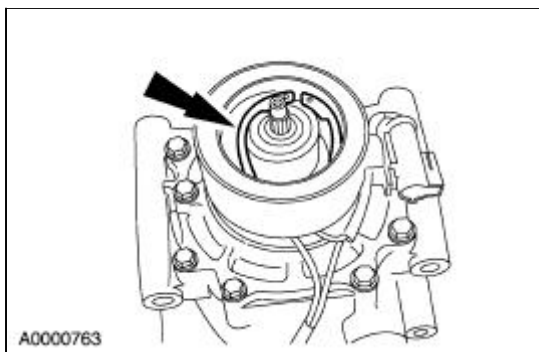


Installation

1. Clean the A/C clutch field coil and pulley mounting surfaces.
2. Install the A/C clutch field coil.



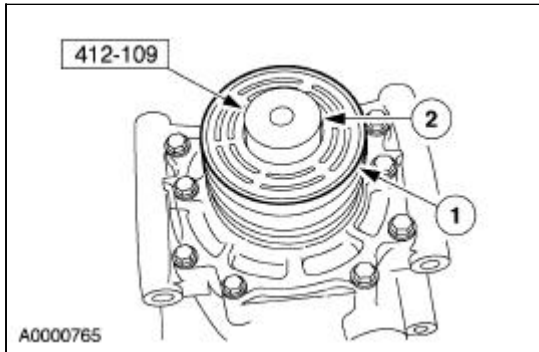
3. Install the snap ring with the bevel side out.



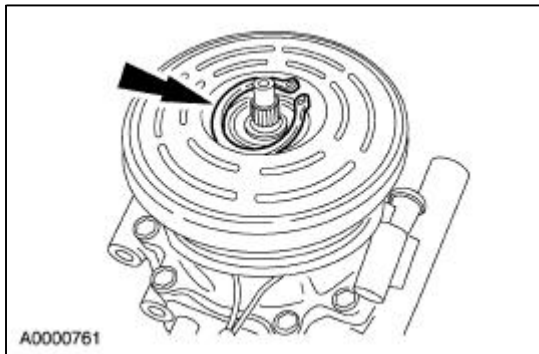
4. **NOTE:** The A/C clutch bearing and pulley is a slip fit on the compressor. If correctly aligned it should slip on easily. If difficulty is encountered, install using the special tool.

Using the special tool, install the clutch bearing and pulley.

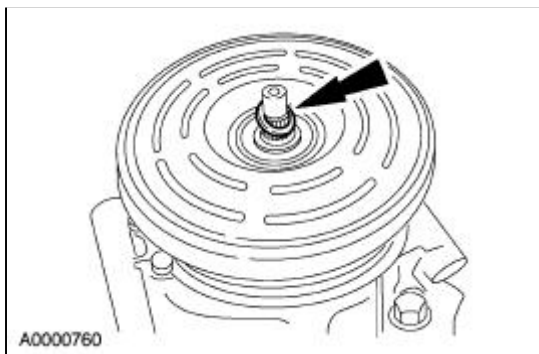
1. Position the clutch bearing and pulley.
2. Install the special tool. If required, gently tap and install the clutch bearing and pulley.



5. Install the snap ring with the bevel side out.

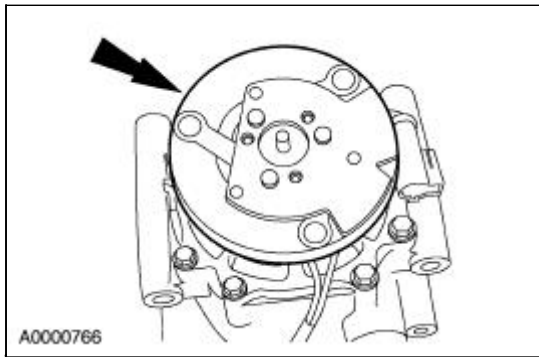


6. Install the spacer.

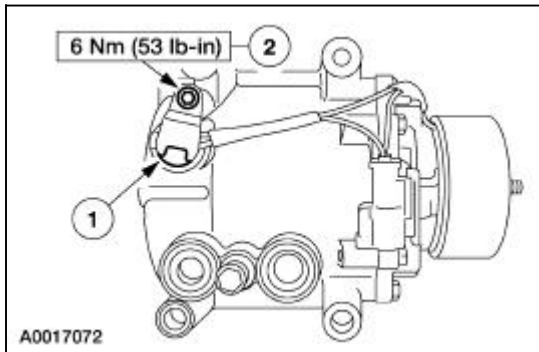


7. **NOTE:** Make sure to align the block tooth on the shaft with the missing tooth on the disc and hub.

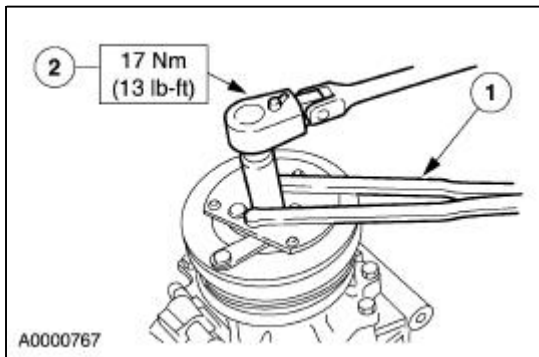
Install the A/C clutch.



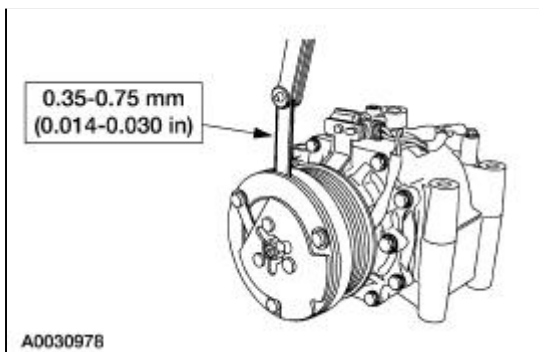
8. Install the sensor.
 1. Push the sensor into position.
 2. Install the bolt and the hold-down bracket.



9. Install the bolt.
 1. Hold the A/C clutch.
 2. Install the bolt.



10. Measure and adjust the clutch air gap by removing or adding A/C clutch hub spacers.



11. Install the A/C compressor. For additional information, refer to [Air Conditioning \(A/C\)](#)

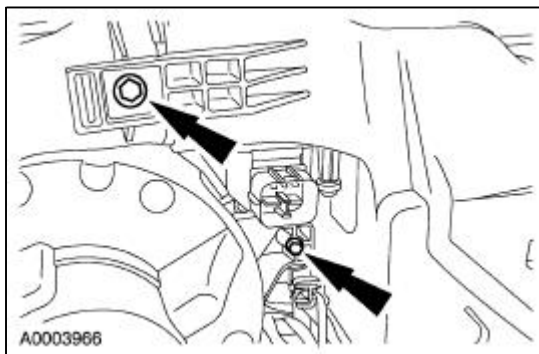
[Compressor—3.0L](#) or [Air Conditioning \(A/C\) Compressor—3.9L](#) in this section.

Evaporator Core

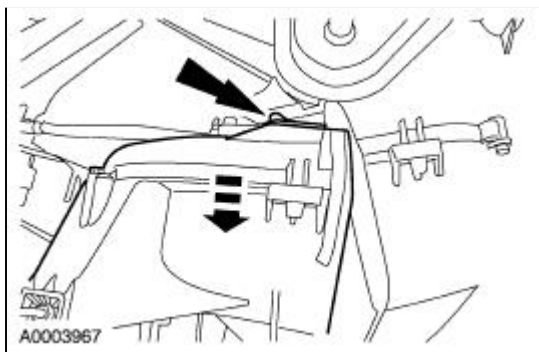
Removal and Installation

NOTE: If an A/C evaporator core leak is suspected the A/C evaporator core must be leak tested before it is removed from the vehicle. For additional information, refer to [Section 412-00](#).

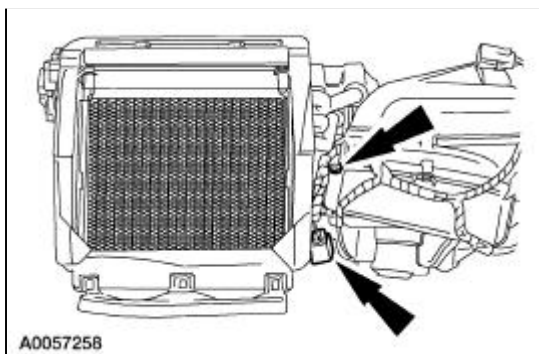
1. Remove the evaporator core housing. For additional information, refer to [Section 412-02](#).
2. Remove the screws which connect the air inlet housing to the evaporator housing.



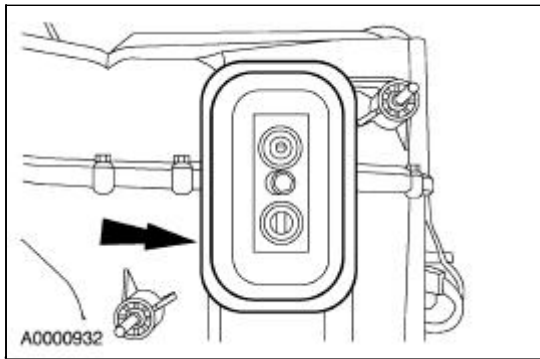
3. Disengage the clip and separate the housings.



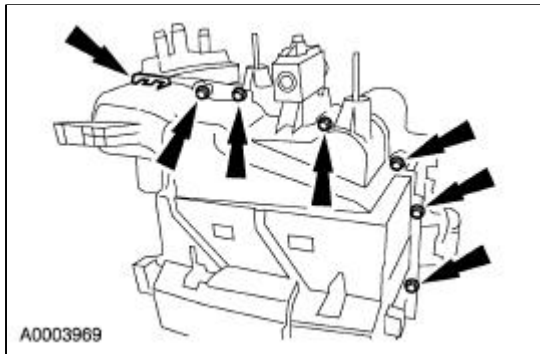
4. Disconnect the evaporator core housing wire harness connectors and position the wire harness aside.



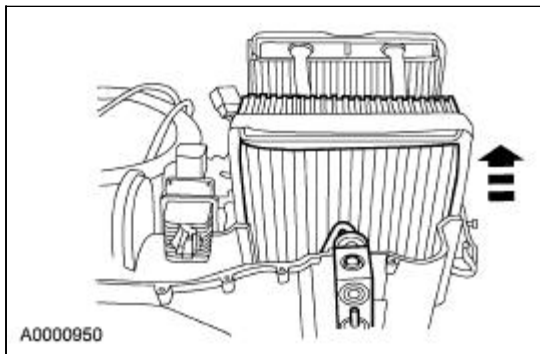
5. Remove the gasket.



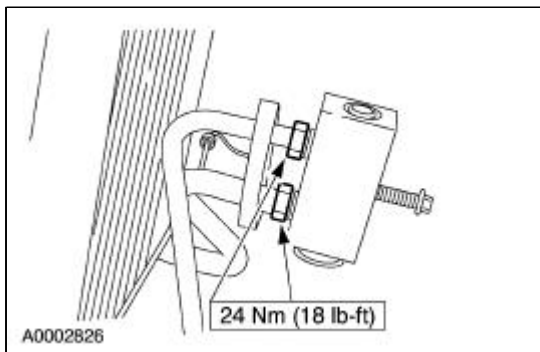
6. Remove the nine screws, disengage the clip and separate the heater/evaporator core housing.



7. Remove the evaporator core.



8. Disconnect the fittings and remove the thermostatic expansion valve.



9. To install, reverse the removal procedure.

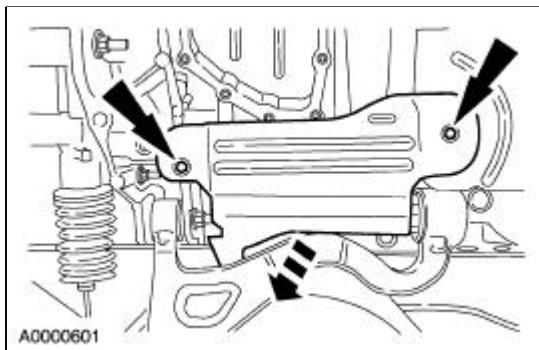
- Lubricate the O-ring seal with PAG Refrigerant Compressor Oil (R-134a Systems) F7AZ-19589-DA (Motorcraft YN-12-C) or equivalent meeting Ford specification WSH-M1C231-B.

- Add the correct amount of PAG Refrigerant Compressor Oil (R-134a Systems) F7AZ-19589-DA (Motorcraft YN-12-C) or equivalent meeting Ford specification WSH-M1C231-B to the new A/C evaporator core. For additional information, refer to [Section 412-00](#).
-

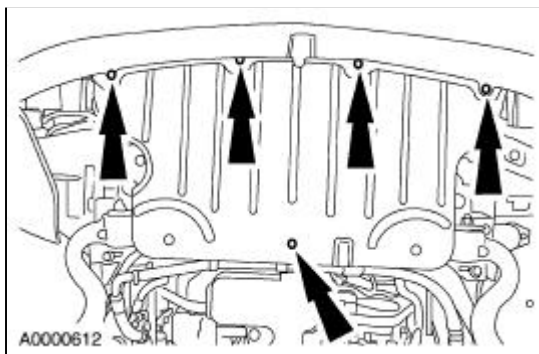
Receiver Drier

Removal and Installation

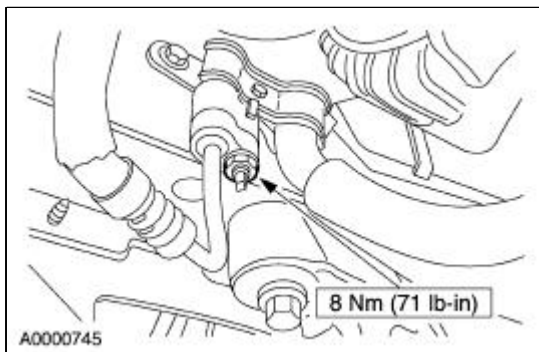
1. Recover the refrigerant. For additional information, refer to [Section 412-00](#).
2. Raise the vehicle. For additional information, refer to [Section 100-02](#).
3. Remove the screws and remove the LH sight shield.



4. Remove the screws and remove the air deflector.

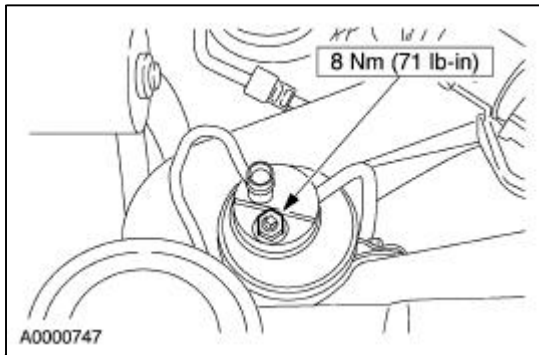


5. Remove the nut and disconnect the peanut fitting. For additional information, refer to [Section 412-00](#).

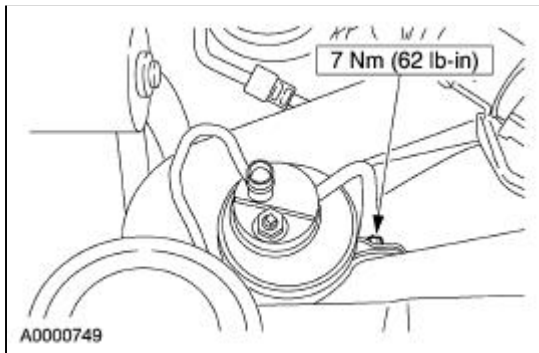


6. Lower the vehicle.

7. Disconnect the air outlet tube. For additional information, refer to [Section 303-12](#).
8. Remove the nut.



9. Remove the bolt. Position the receiver drier away from the radiator shroud and disconnect the receiver drier from the manifold.

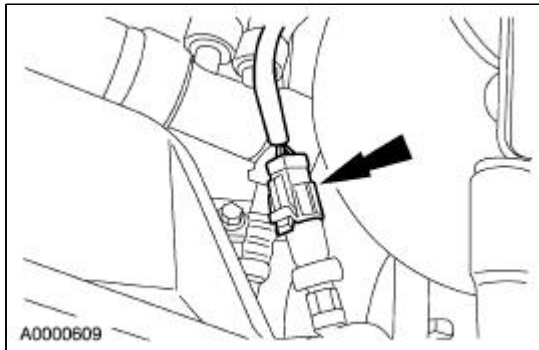


10. To install, reverse the removal procedure.
 - Lubricate the O-ring seal with PAG Refrigerant Compressor Oil (R-134a Systems) F7AZ-19589-DA (Motorcraft YN-12-C) or equivalent meeting Ford specification WSH-M1C231-B.
-

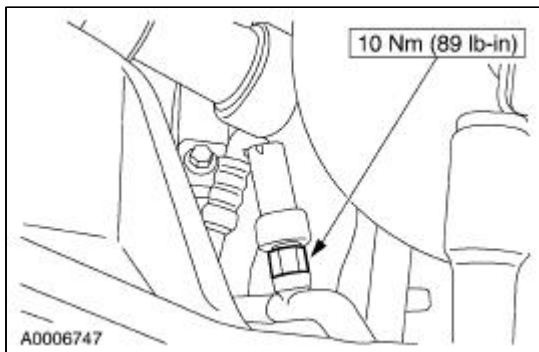
Air Conditioning (A/C) Pressure Transducer

Removal and Installation

1. Disconnect the battery. For additional information, refer to [Section 414-01](#).
2. Disconnect the connector.



3. Remove the pressure transducer.

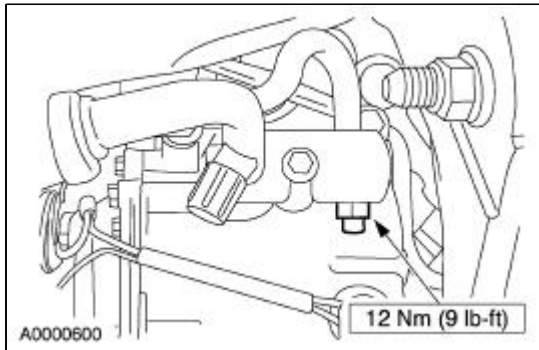


4. To install, reverse the removal procedure.
 - Lubricate the O-ring seal with PAG Refrigerant Compressor Oil (R-134a Systems) F7AZ-19589-DA (Motorcraft YN-12-C) or equivalent meeting Ford specification WSH-M1C231-B.

Air Conditioning (A/C) Pressure Relief Valve

Removal and Installation

1. Recover the refrigerant. For additional information, refer to [Section 412-00](#).
2. Remove the A/C compressor pressure relief valve (3.0L shown, 3.9L similar).



3. To install, reverse the removal procedure.
 - Lubricate the O-ring seal with PAG Refrigerant Compressor Oil (R-134a Systems) F7AZ-19589-DA (Motorcraft YN-12-C) or equivalent meeting Ford specification WSH-M1C231-B.
-

Condenser Core

Material

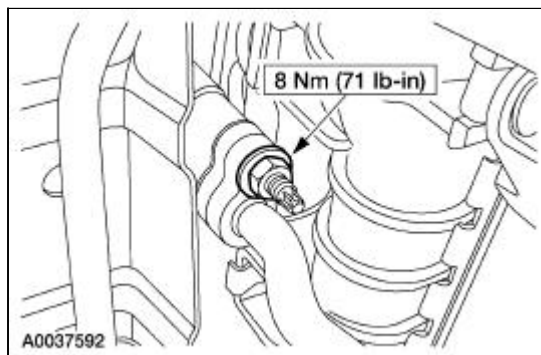
Item	Specification
PAG Refrigerant Compressor Oil (R-134a Systems) F7AZ-19589-DA (Motorcraft YN-12-C)	WSH-M1C231-B

Removal and Installation

NOTE: If an A/C condenser core leak is suspected, the A/C condenser core must be leak tested before it is removed from the vehicle. For additional information, refer to [Section 412-00](#).

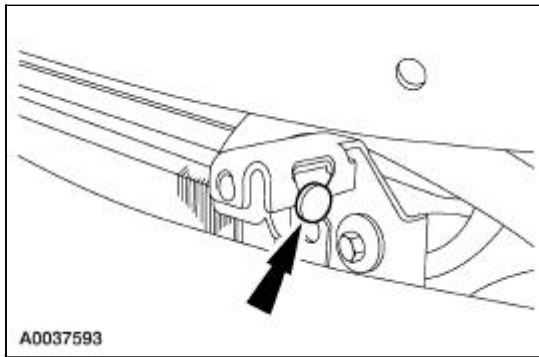
NOTE: Installation of a new receiver/drier is not required when repairing the air conditioning system except when there is physical evidence of contamination from a failed A/C compressor or damage to the receiver drier.

1. Recover the refrigerant. For additional information, refer to [Section 412-00](#).
2. Remove the air cleaner outlet tube. For additional information, refer to [Section 303-12](#).
3. Remove the upper radiator sight shield.
4. Remove the nut and disconnect the condenser inlet fitting.

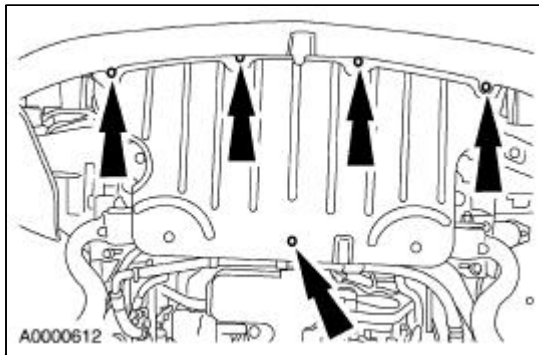


5. **NOTE:** LH condenser bracket pin-type retainer shown, RH similar.

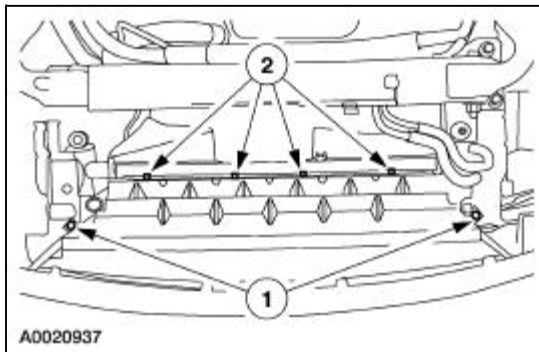
Remove the RH and LH upper condenser bracket pin-type retainers.



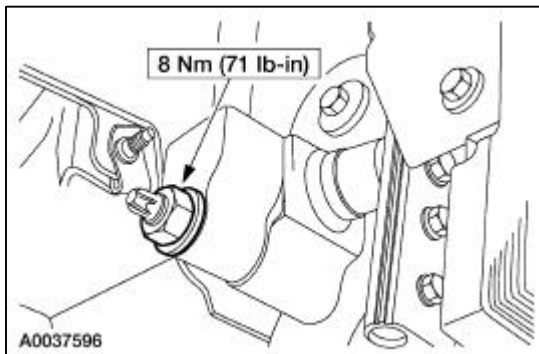
6. Raise and support the vehicle. For additional information, refer to [Section 100-02](#).
7. Remove the screws and remove the air deflector.




8. Remove the air deflector.
 1. Remove the pin-type retainers.
 2. Remove the side-clip retainers.

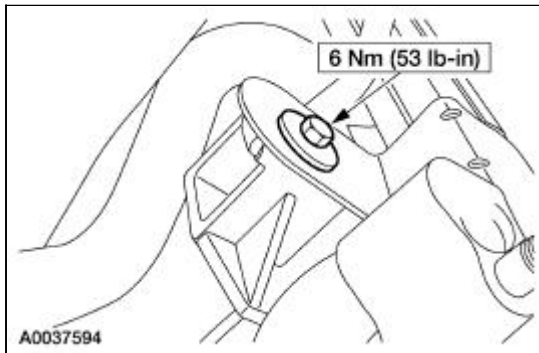


9. Remove the nut and disconnect the condenser outlet fitting.

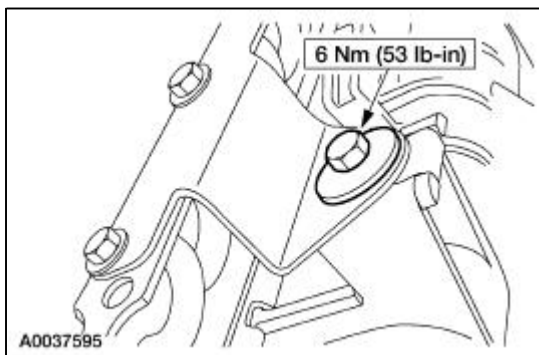


10.  **CAUTION:** To avoid damage to the condenser core, correctly support the condenser when removing the lower mounting bolts.

Remove the LH bolt.



11. Remove the RH bolt and lower the condenser core.



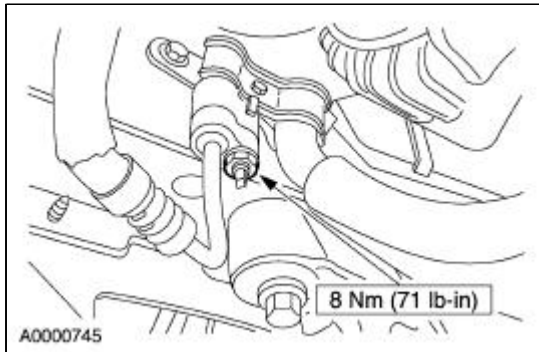
12. To install, reverse the removal procedure.

- Install new O-ring seals lubricated in clean PAG oil.
 - Lubricate the refrigerant system with the correct amount of clean PAG oil. For additional information, refer to [Section 412-00](#).
-

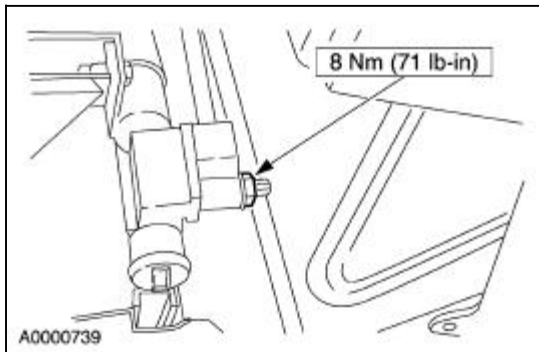
Receiver Drier Manifold and Tube Assembly —3.0L

Removal and Installation

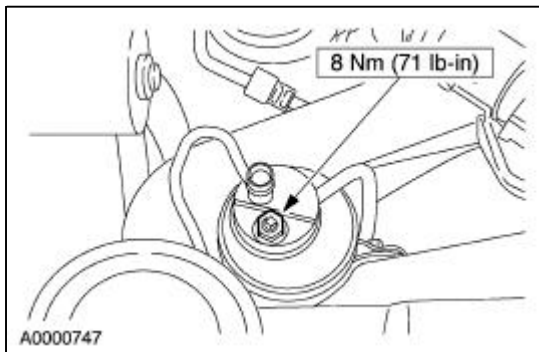
1. Recover the refrigerant. For additional information, refer to [Section 412-00](#).
2. Disconnect the peanut fitting. For additional information, refer to [Section 412-00](#).



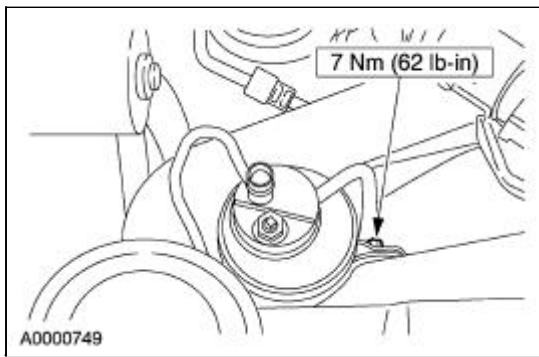
3. Disconnect the peanut fitting. For additional information, refer to [Section 412-00](#).



4. Remove the nut.



5. Remove the receiver drier mounting bracket clamp bolt. Move the receiver drier away from the fan shroud and remove the receiver drier.

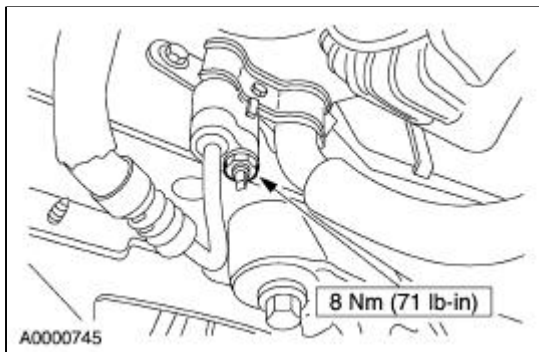


6. Remove the receiver drier manifold assembly.
 7. To install, reverse the removal procedure.
 - Lubricate the O-ring seal with PAG Refrigerant Compressor Oil (R-134a Systems) F7AZ-19589-DA (Motorcraft YN-12-C) or equivalent meeting Ford specification WSH-M1C231-B.
-

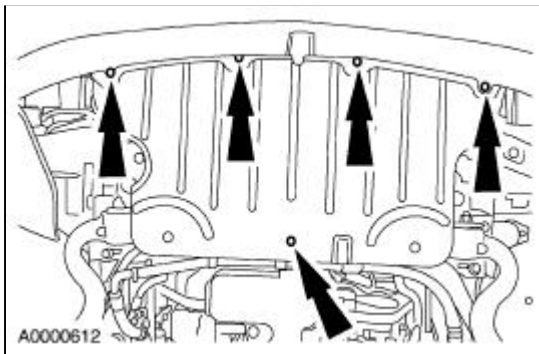
Receiver Drier Manifold and Tube Assembly —3.9L

Removal and Installation

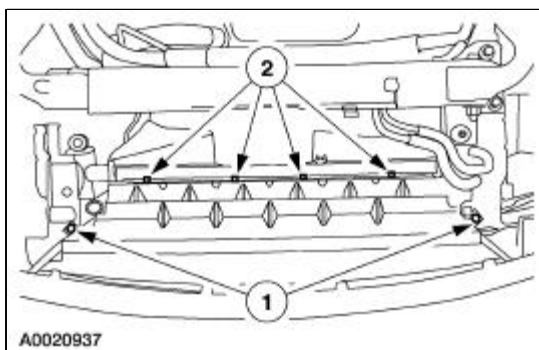
1. Recover the refrigerant. For additional information, refer to [Section 412-00](#).
2. Raise and support the vehicle. For additional information, refer to [Section 100-02](#).
3. Disconnect the peanut fitting. For additional information, refer to [Section 412-00](#).



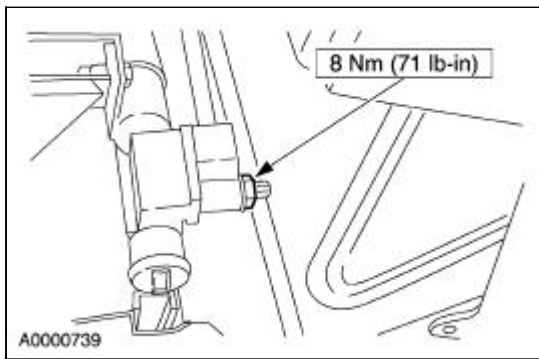
4. Remove the screws and remove the air deflector.



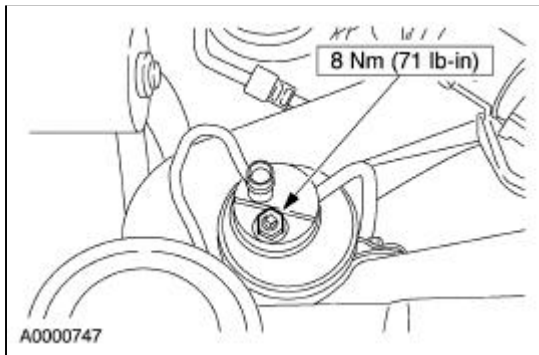
5. Remove the air deflector.
 1. Remove the push-pin retainers.
 2. Remove the side-clip retainers.



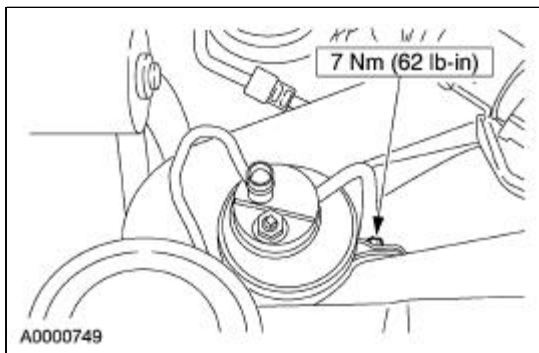
6. Disconnect the peanut fitting. For additional information, refer to [Section 412-00](#).



7. Lower the vehicle.
8. Remove the air cleaner outlet tube. For additional information, refer to [Section 303-12](#).
9. Remove the nut.



10. Remove the receiver drier mounting bracket clamp bolt. Move the receiver drier away from the fan shroud and remove the receiver drier.

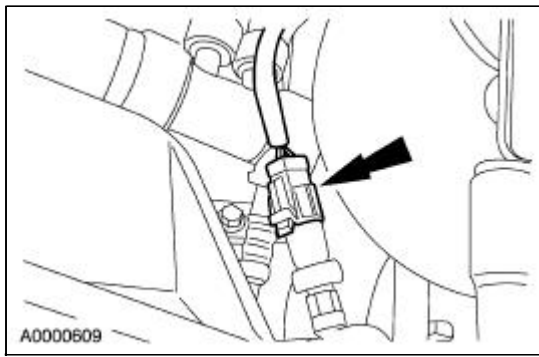


11. Remove the receiver drier manifold assembly.
 12. To install, reverse the removal procedure.
 - Lubricate the O-ring seal with PAG Refrigerant Compressor Oil (R-134a Systems) F7AZ-19589-DA (Motorcraft YN-12-C) or equivalent meeting Ford specification WSH-M1C231-B.
-

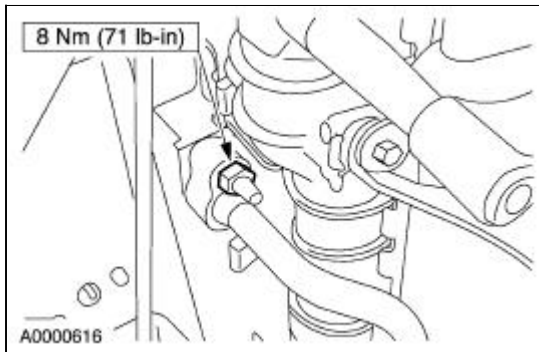
Compressor Manifold and Tube Assembly

Removal and Installation

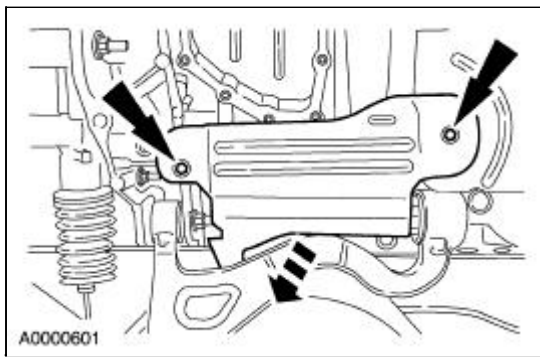
1. Disconnect the battery. For additional information, refer to [Section 414-01](#).
2. Recover the refrigerant. For additional information, refer to [Section 412-00](#).
3. Disconnect the air outlet tube and position aside. For additional information, refer to [Section 303-12](#).
4. Disconnect the connector.



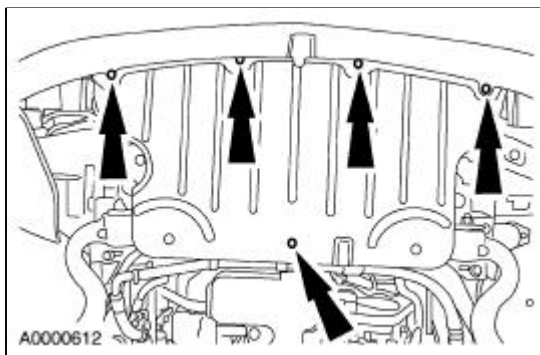
5. Remove the nut and disconnect the peanut fitting. For additional information, refer to [Section 412-00](#).



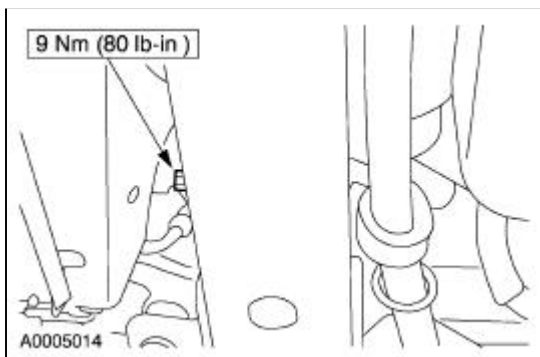
6. Raise the vehicle. For additional information, refer to [Section 100-02](#).
7. Remove the screws and remove the LH and RH sight shields (LH shown, RH similar).



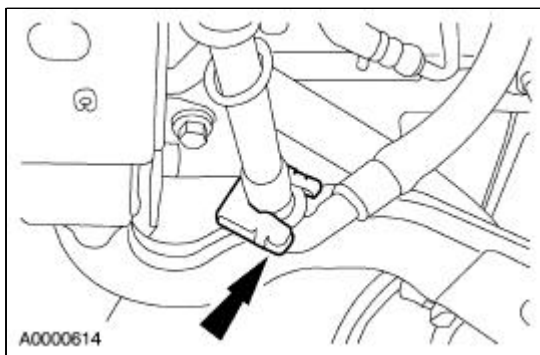
8. Remove the screws and remove the air deflector.



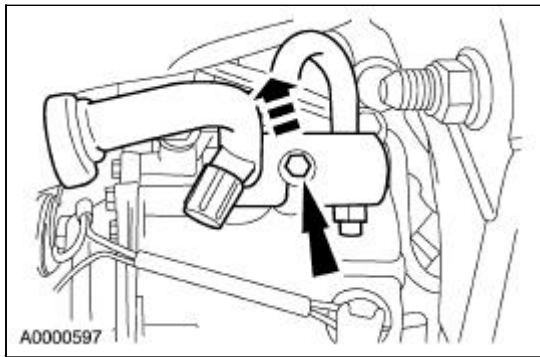
9. Remove the refrigerant line bracket bolt.



10. Disconnect the spring lock coupling. For additional information, refer to [Section 412-00](#).

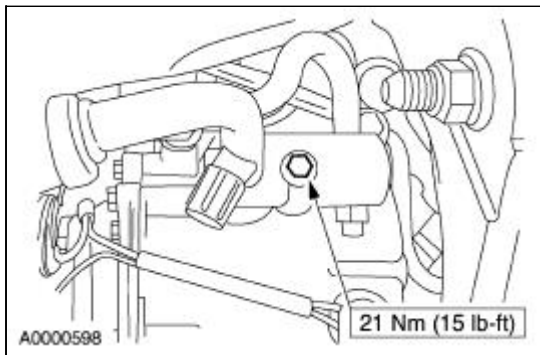


11. Loosen the bolt and remove the A/C compressor manifold and tube assembly.



12. To install, reverse the removal procedure.

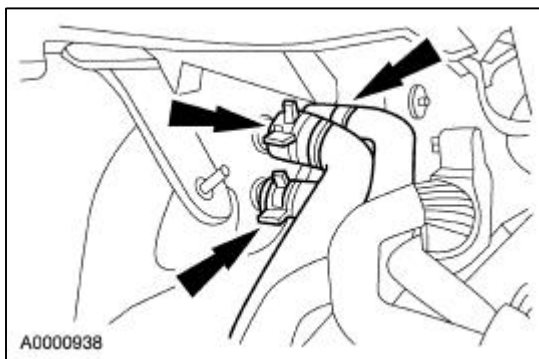
- Lubricate the O-ring seal with PAG Refrigerant Compressor Oil (R-134a Systems) F7AZ-19589-DA (Motorcraft YN-12-C) or equivalent meeting Ford specification WSH-M1C231-B.



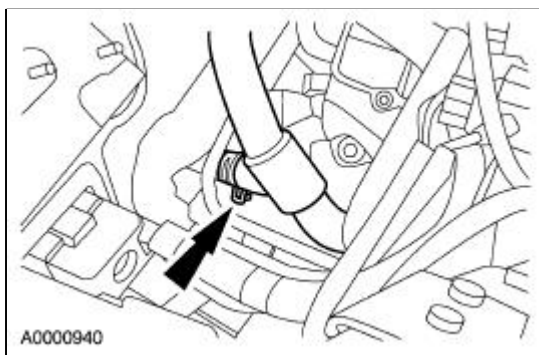
Thermostatic Expansion Valve Manifold and Tube Assembly —3.0L

Removal and Installation

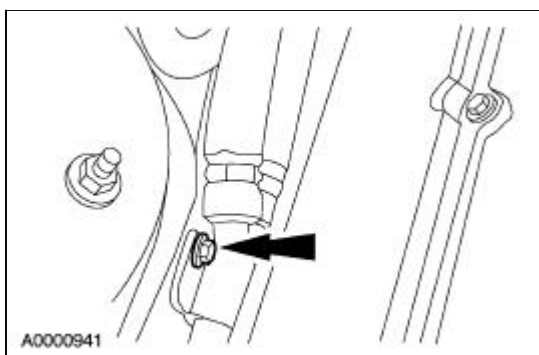
1. Recover the refrigerant. For additional information, refer to [Section 412-00](#).
2. Remove the cabin air filter plenum. For additional information refer to [Section 412-01](#).
3. Disconnect the heater hoses from the heater core.



4. Disconnect the coolant recovery line.



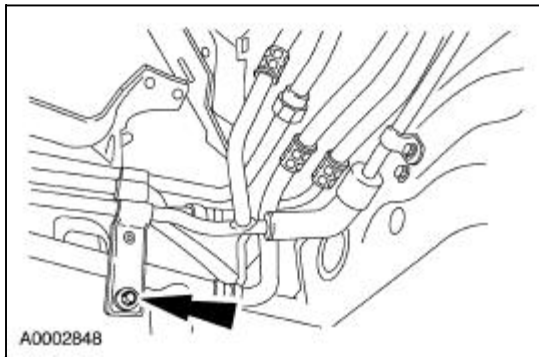
5. Remove the forward heater hose mounting bolt at the RH shock tower.



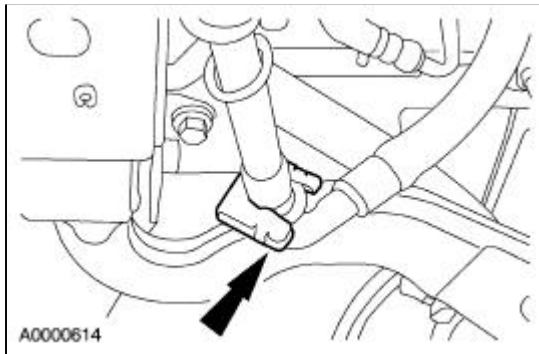
6. Raise the vehicle. For additional information refer to [Section 100-02](#).

7. **NOTE:** Shown with components removed for clarity.

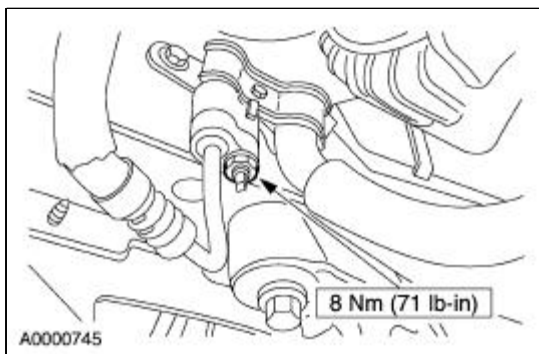
Remove the rear heater hose mounting bolt from the body side and position the heater hose assembly aside.



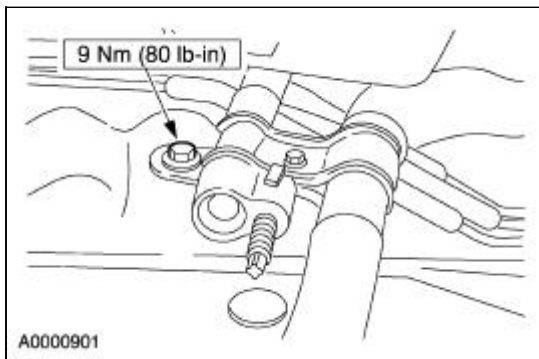
8. Disconnect the spring lock coupling. For additional information, refer to [Section 412-00](#).



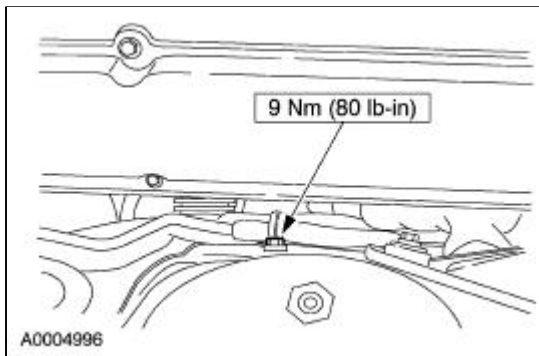
9. Remove the nut and disconnect the peanut fitting. For additional information, refer to [Section 412-00](#).



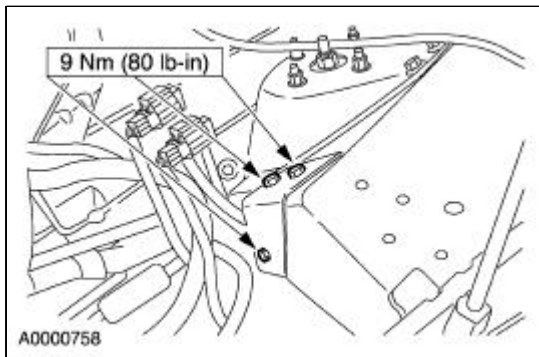
10. Remove the refrigerant line bracket bolt.



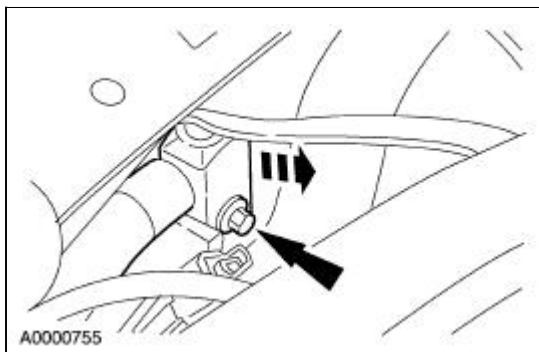
11. Remove the refrigerant line bracket bolt.



12. Remove the refrigerant line bracket bolts and position the bracket aside.



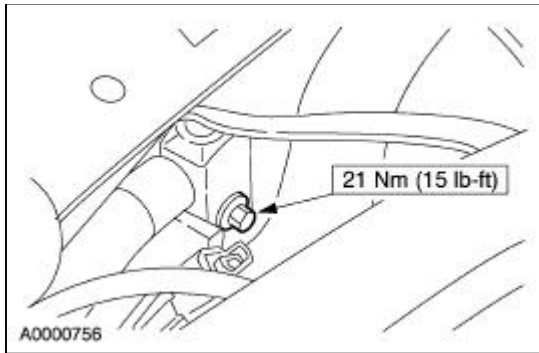
13. Loosen the bolt and remove the thermostatic expansion valve manifold and tube assembly.



14. To install, reverse the removal procedure.

- Lubricate the O-ring seal with PAG Refrigerant Compressor Oil (R-134a Systems) F7AZ-19589-DA (Motorcraft YN-12-C) or equivalent meeting Ford specification WSH-M1C231-B.

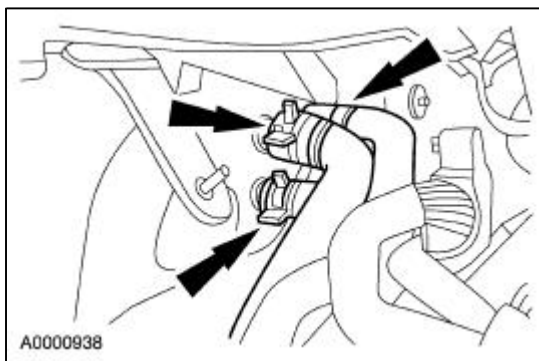
- Make sure that the heater hoses are connected correctly to the heater core. For additional information refer to [Section 412-02](#).
- Lubricate the coolant hoses with MERPOL® or plain water, if needed.



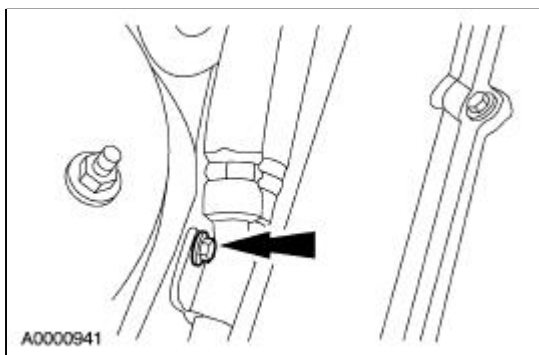
Thermostatic Expansion Valve Manifold and Tube Assembly —3.9L

Removal and Installation

1. Recover the refrigerant. For additional information, refer to [Section 412-00](#).
2. Remove the cabin air filter plenum. For additional information, refer to [Section 412-01](#).
3. Disconnect the heater hoses from the heater core.

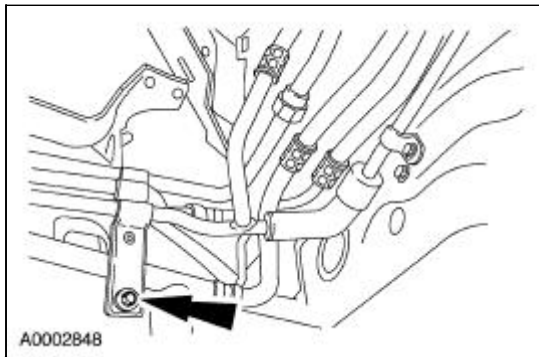


4. Remove the forward heater hose mounting bolt at the RH shock tower.

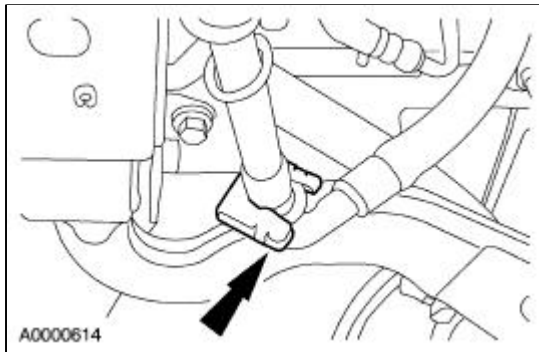


5. Raise and support the vehicle. For additional information, refer to [Section 100-02](#).
6. **NOTE:** Shown with components removed for clarity.

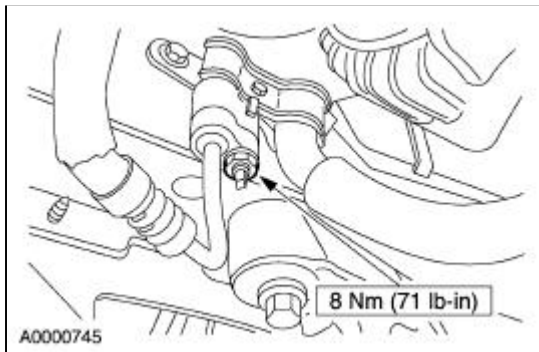
Remove the rear heater hose mounting bolt from the body side and position the heater hose assembly aside.



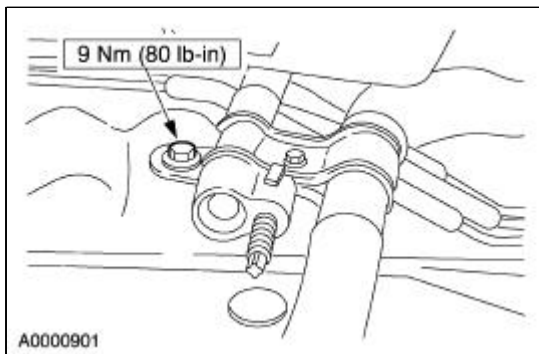
7. Disconnect the spring lock coupling. For additional information, refer to [Section 412-00](#).



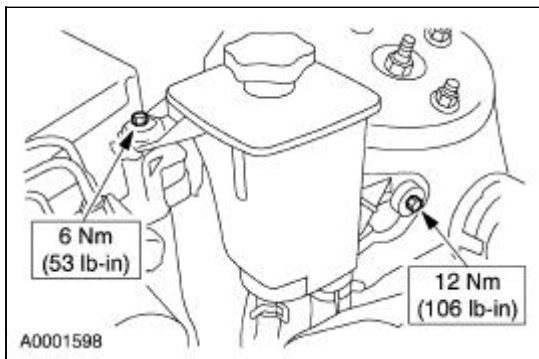
8. Remove the nut and disconnect the peanut fitting. For additional information, refer to [Section 412-00](#).



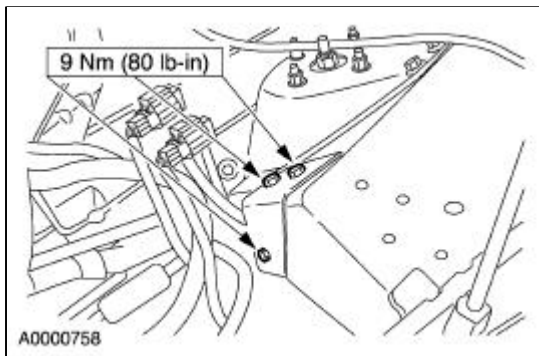
9. Remove the refrigerant line bracket bolt.



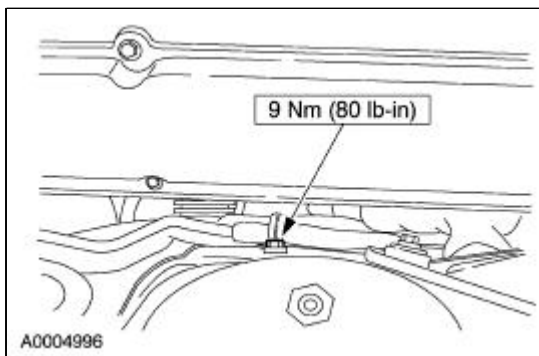
10. Lower the vehicle.
11. Loosen the two mounting bolts. Lift off and set aside the power steering reservoir.



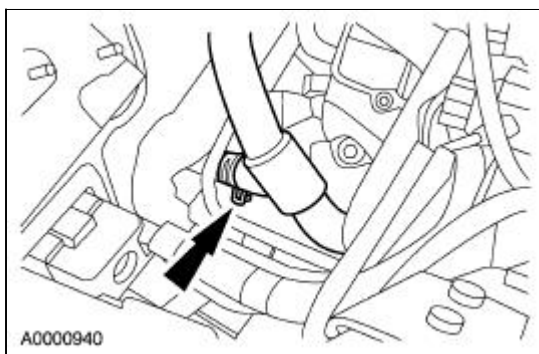
12. Remove the refrigerant line bracket bolts and position the bracket aside.



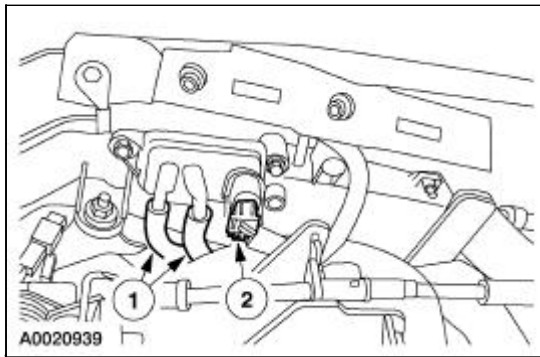
13. Remove the refrigerant line bracket bolt.



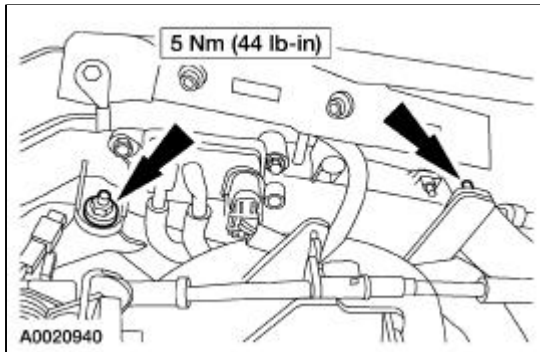
14. Disconnect the coolant recovery line.



15. Disconnect the differential pressure feedback EGR (DFPE) sensor.
1. Disconnect vacuum hoses.
 2. Disconnect electrical connector.

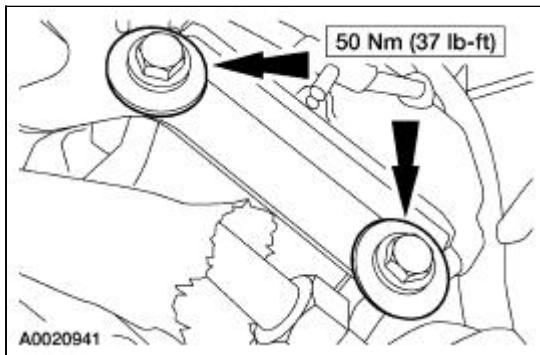


16. Remove wire harness retaining nuts and position wire harness aside.

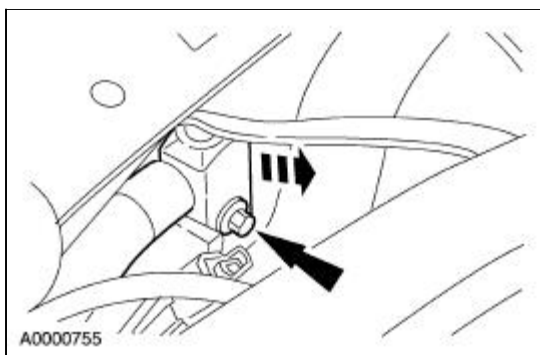


17. **NOTE:** Engine removed for clarity.

Remove the two harness bracket retaining bolts and remove the harness bracket.



18. Loosen the bolt and remove the thermostatic expansion valve manifold and tube assembly.

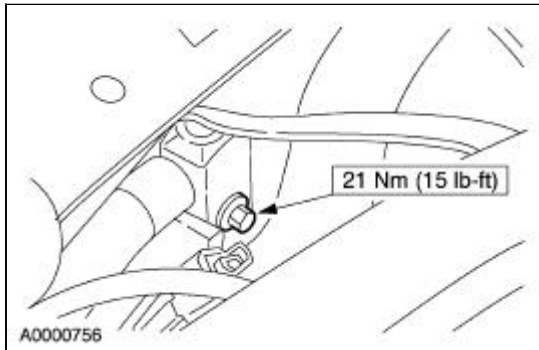


19. To install, reverse the removal procedure.

- Lubricate the O-ring seal with PAG Refrigerant Compressor Oil (R-134a Systems) F7AZ-

19589-DA (Motorcraft YN-12-C) or equivalent meeting Ford specification WSH-M1C231-B.

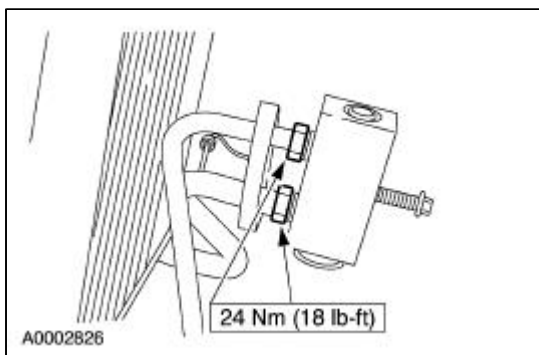
- Make sure that the heater hoses are connected correctly to the heater core. For additional information, refer to [Section 412-02](#).
- Lubricate the coolant hoses with MERPOL® or plain water, if needed.



Thermostatic Expansion Valve

Removal and Installation

1. Disconnect the battery. For additional information, refer to [Section 414-01](#).
2. Recover the refrigerant. For additional information, refer to [Section 412-00](#).
3. Remove the evaporator core. For additional information, refer to [Evaporator Core](#) in this section.
4. Disconnect the thermostatic expansion valve fittings.



5. To install, reverse the removal procedure.
 - Lubricate the O-ring seals with PAG Refrigerant Compressor Oil (R-134a Systems) F7AZ-19589-DA (Motorcraft YN-12-C) or equivalent meeting Ford specification WSH-M1C231-B.
-

Control Components

Dual Electronic Automatic Temperature Control

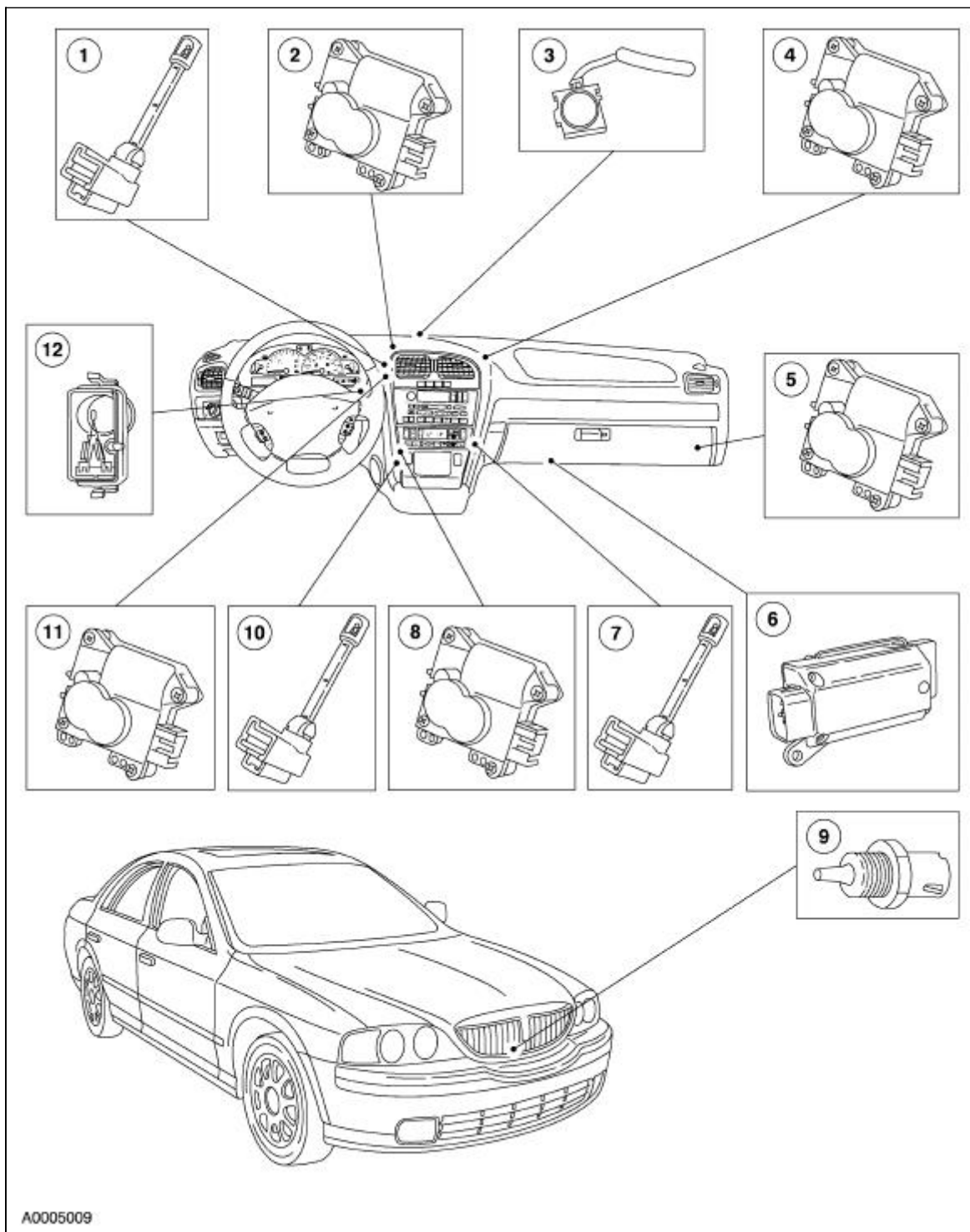
With the use of a microcontroller, the dual automatic temperature control (DATC) module analyzes input from the following major sources:

- temperature, function and blower selection (made by the vehicle occupants)
- in-vehicle temperature sensor
- ambient temperature sensor
- dual sunload sensor
- vehicle speed
- engine rpm
- engine coolant temperature
- actuator door position controls
- driver and passenger heater core air discharge temperature sensors
- evaporator discharge temperature

Using these inputs, the microcontroller determines the correct conditions for the following outputs:

- A/C clutch engagement
- blower speed
- cold air bypass door position
- panel door position
- defrost door position
- floor door position
- air inlet duct door position
- driver coolant control valve
- passenger driver coolant control valve
- electric water pump (3.9L engine)
- heater wiper rest or heated windshield
- heated rear window rear defog
- external temperature (outside temperature display)

Component Locations



A0005009

Item	Part Number	Description
1	19C734	Sensor—evaporator discharge air temperature
2	19E616	Actuator—defrost duct door
3	19E663	A/C dual sunload sensor
4	19E616	Actuator—panel, center console
5	19E616	Actuator—air inlet
6	19E624	A/C blower motor speed control
7	19C734	Sensor—passenger air discharge temperature
8	19E616	Actuator—floor duct door

9	12A648	Sensor—ambient air temperature
10	19C734	Sensor—driver air discharge temperature
11	19E616	Actuator—cold air bypass door
12	19C734	Sensor—in-vehicle temperature

Control System Inputs

Climate Control Assembly

The dual automatic temperature control (DATC) module, located in the instrument panel, has the following features:

- a blower speed override control for manual input
- individual temperature set controls for driver and passenger
- an A/C request control for manual input
- a recirculated air control for manual input
- a vacuum fluorescent display for displaying set temperatures for both the driver and passenger, external or ambient temperature, blower speed setting and diagnostic trouble codes (DTCs)
- an on-board diagnostic (OBD) feature to supply the technician with diagnostic trouble codes (DTCs). These DTCs direct the technician to the inoperative component.
- air distribution mode overrides
- rear defog control
- heated wiper rest or heated windshield
- EXT temperature control to display external or outside temperature
- F/C control to toggle between English or metric settings

A/C Ambient Air Temperature Sensor

The A/C ambient air temperature sensor:

- is located in front of the A/C condenser core near the center of the vehicle.
- contains a thermistor which measures the temperature of outside air as a resistance and sends that reading to the dual automatic temperature control assembly.

In-Vehicle Temperature Sensor

The in-vehicle temperature sensor is located in the instrument cluster finish panel. The sensor operates in the following manner:

- A thermistor in the in-vehicle temperature sensor measures air temperature inside the passenger compartment.
- An automatic temperature control sensor hose is connected between the A/C plenum housing and the in-vehicle temperature sensor.
- The automatic temperature control sensor hose and venturi takes air from the A/C plenum housing to create a suction across the in-vehicle temperature sensor.
- The suction draws in-vehicle air into the in-vehicle temperature sensor and across the thermistor.

Dual A/C Sunload Sensor

The dual A/C sunload sensor:

- is located on the top center of the instrument panel in the defroster grille.
- contains photovoltaic diodes that are sensitive to sunlight.
- generates small amounts of current across the terminals depending upon the amount of light reaching the photovoltaic diode; therefore the only test that can be carried out is for an internal short circuit, an open circuit or sensor value out-of-range.
- contains an internal diagnostic resistor to allow the DATC module to detect a difference between an open circuit and no sunlight.

Control System Outputs

A/C Blower Motor Speed Control

The A/C blower motor speed control is located on the A/C evaporator housing.

- The function of the A/C blower motor speed control is to convert low power signals from the dual electronic automatic temperature control module to a high current, variable ground feed for the blower motor.
- Blower motor speed is infinitely variable and is controlled by the dual electronic automatic temperature control module software.
- A delay function provides a gradual increase or decrease in blower motor speed under all conditions.
- Controls the integral high blower relay which is engaged when maximum fan speed is selected.

A/C Electronic Air Inlet Door Actuator

The A/C electronic air inlet door actuator is located on the evaporator housing. The air inlet door position determines whether outside or recirculated air is being used.

- The actuator positions the air inlet door on command from the control assembly.
- The air inlet door actuator contains a reversible electric motor and a potentiometer.
- A 5 volt signal and ground reference is applied to the ends of the potentiometer. The voltage available at the wiper indicates the position of the potentiometer. The target position of the actuator is calculated by the DATC module and is matched with the wiper voltage of the actuator. The control module will drive the actuator motor in the direction necessary to make the actuator wiper voltage agree with the control module target position.

Cold Air Bypass Door Actuator

The cold air bypass door actuator is located on the evaporator core housing. During automatic operation the control module can position the door fully open so that some of the airflow will not pass through the heater core. This will provide for maximum cooling. The door is closed or partially closed during modes other than maximum cooling.

- The cold air bypass door actuator positions the cold air bypass door on command from the DATC module.
- Operation of the cold air bypass door actuator is the same as the air inlet door.

Defrost Door Actuator

The defrost door actuator is located on the plenum chamber. The actuator will position the defrost door fully open during defrost operation, partially open during floor/defrost and floor mode operation and fully closed during all other operations.

- The defrost door actuator positions the defrost door on command from the DATC module.
- Operation of the defrost door actuator is the same as the air inlet door.

Panel, Floor Console Door Actuator

The panel, floor console door actuator is located on the plenum chamber. The actuator operates the panel door which is mechanically linked to the floor console door. The actuator positions the panel door and floor console door fully open during panel mode and partially open during floor/panel operation. The doors are closed during other operations.

- The panel, floor console door actuator positions the panel and floor console doors on command from the DATC module.
- Operation of the panel door actuator is the same as the air inlet door.

Floor Outlet Door Actuator

The floor outlet door actuator positions the floor outlet door fully open during floor and floor/panel and floor/defrost operations. The door is closed during other operations.

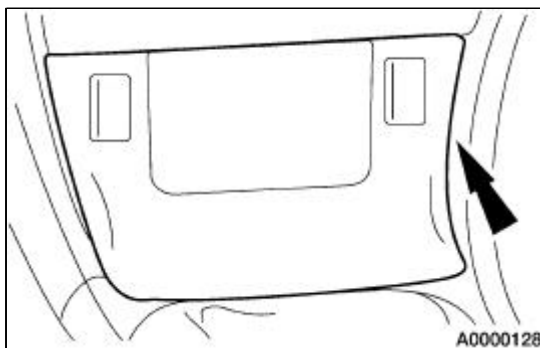
- The floor outlet door actuator positions the floor outlet door on command from the DATC module.
 - Operation of the floor door actuator is the same as the air inlet door.
 - The floor outlet door actuator is in the full open position in OFF mode.
-

Climate Control Assembly

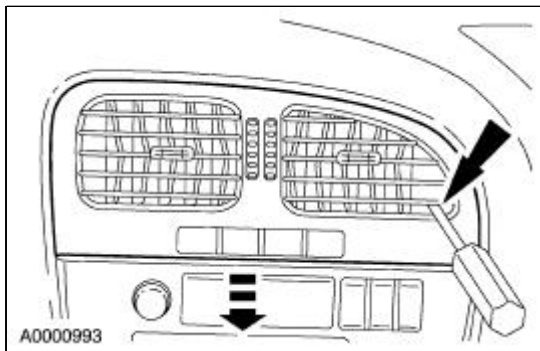
Removal and Installation

NOTE: If installing a new climate control assembly, dual automatic temperature control (DATC module), the new module must be configured. For additional information, refer to [Section 418-01](#).

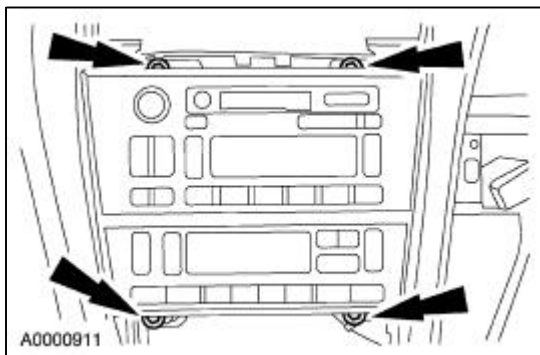
1. Disconnect the battery. For additional information, refer to [Section 414-01](#).
2. Remove the ashtray finish panel.
 - Disconnect the connector.



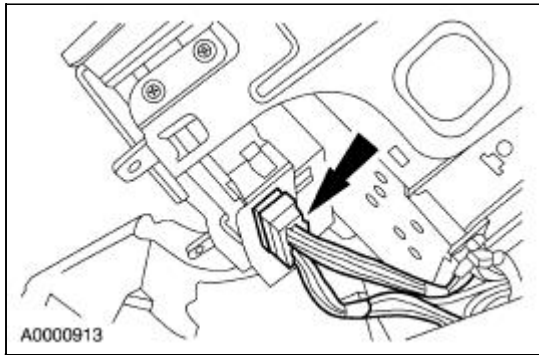
3. Insert a mini-pick in the center register and pull the center register from the instrument panel.
 - If equipped, disconnect the connector.



4. Remove the screws and pull the DATC and radio assembly away from the instrument panel.

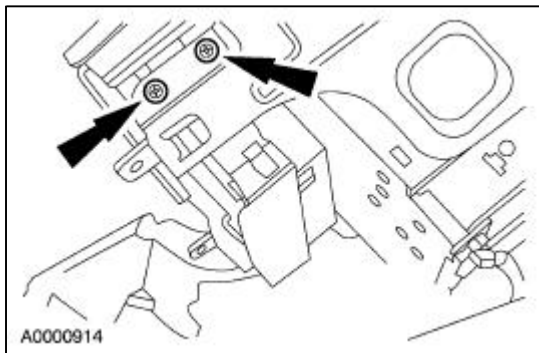


5. Disconnect the two connectors.



6. **NOTE:** The control assembly has three pins at the top of the bezel assembly which pilot in the bottom of the radio bezel. Use care when removing the control assembly.

Remove the four screws (two on each side of the control assembly) and remove the dual automatic temperature control assembly.

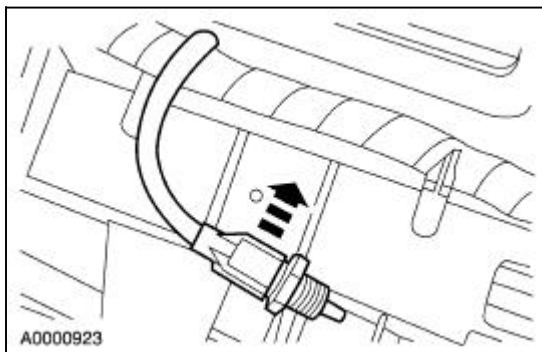


7. To install, reverse the removal procedure.
-

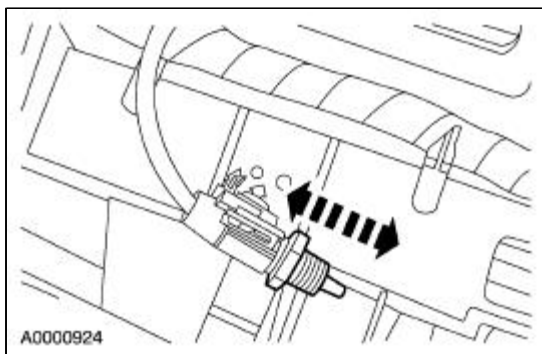
Ambient Air Temperature Sensor

Removal and Installation

1. Remove the wire harness connector and sensor.



2. Disconnect the wire harness connector.

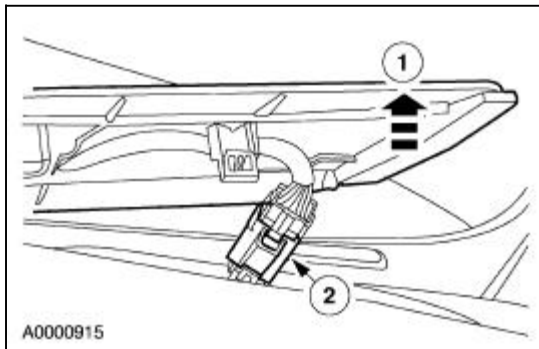


3. To install, reverse the removal procedure.
-

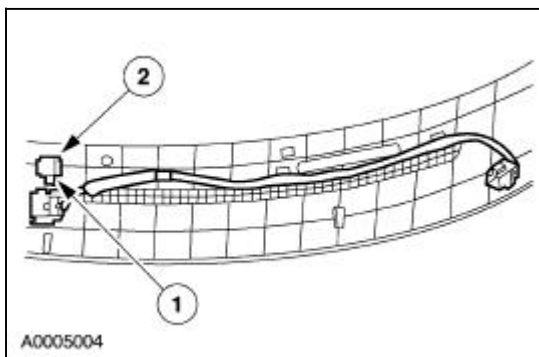
Sunload Sensor

Removal and Installation

1. Remove the instrument panel upper finish panel.
 1. Raise the upper finish panel.
 2. Disconnect the connector and remove the instrument panel finish panel.



2. Remove the dual sunload sensor.
 1. Disconnect the connector.
 2. Remove the dual sunload sensor.

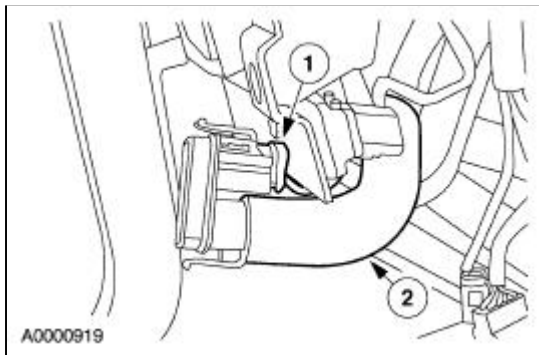


3. To install, reverse the removal procedure.

In-Vehicle Temperature Sensor

Removal and Installation

1. Remove the instrument cluster finish panel bezel. For additional information, refer to [Section 501-12](#).
2. Remove the in-car air temperature sensor.
 1. Disconnect the connector.
 2. Disconnect the aspirator hose and remove the in-car air temperature sensor.



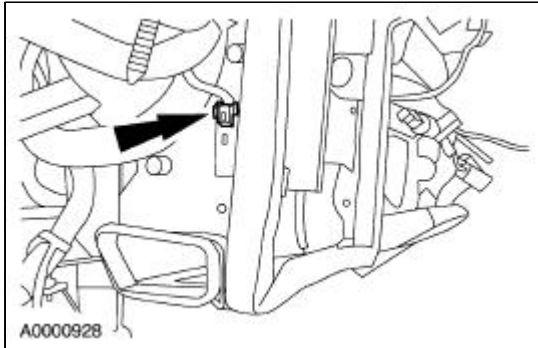
3. To install, reverse the removal procedure.
-

Air Discharge Temperature Sensor

Removal and Installation

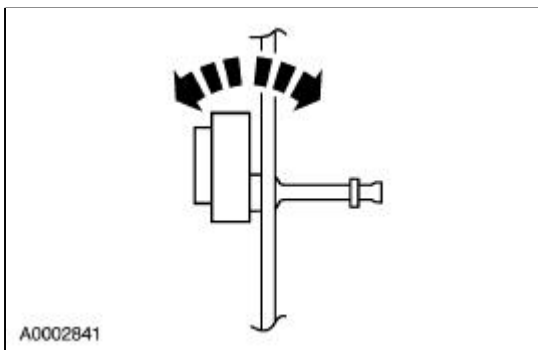
NOTE: RH shown, LH similar

1. Disconnect the connector.



2.  **CAUTION:** Do not twist the sensor during the removal process. Twisting may damage the sensor or the housing.

Remove the sensor using a rocking motion.

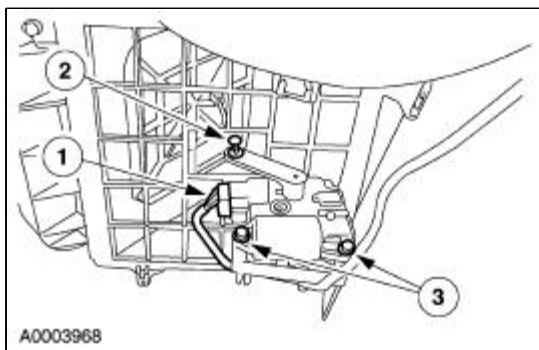


3. To install, reverse the removal procedure.

Blend Door Actuator —Air Inlet Door

Removal and Installation

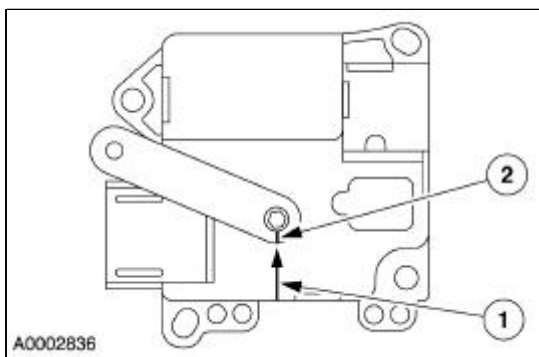
1. Disconnect the battery. Refer to [Section 414-01](#).
2. Remove the RH instrument panel insulator.
3. Remove the RH floor duct. For additional information, refer to [Section 412-01](#).
4. Remove the actuator.
 1. Disconnect the connector.
 2. Remove the coupling connector.
 3. Remove the screws and remove the actuator.



5. **NOTE:** New door actuator assemblies are shipped with the actuator in the mid-position. If reinstalling an actuator removed from the vehicle, use fused jumper wires to electrically drive the actuator to the mid-position to assist in assembly.

To install, reverse the removal procedure.

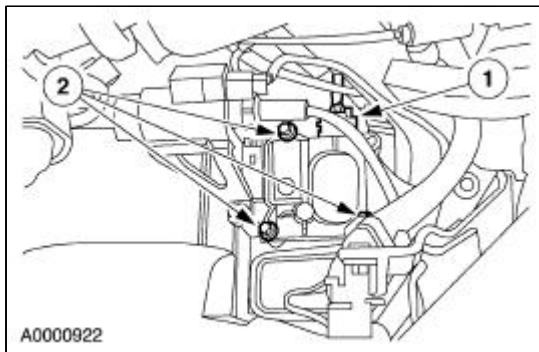
- If reinstalling an actuator removed from the vehicle, align the arrow (1) on the actuator housing with the line on the actuator coupling (2).



Blend Door Actuator —Floor Duct Door

Removal and Installation

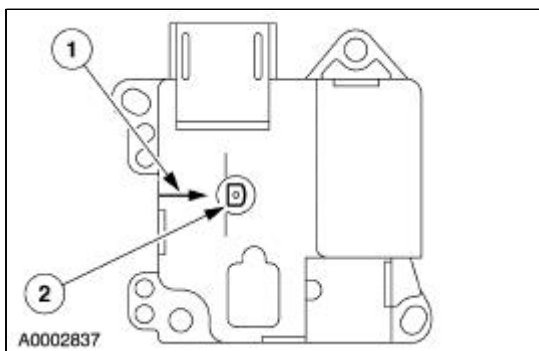
1. Disconnect the battery. For additional information, refer to [Section 414-01](#).
2. Remove the driver side instrument panel insulator.
3. Remove the LH floor duct. For additional information, refer to [Section 412-01](#).
4. Remove the actuator.
 1. Disconnect the connector.
 2. Remove the three screws and remove the actuator.



5. **NOTE:** New door actuator assemblies are shipped with the actuator in the mid-position. If reinstalling an actuator removed from the vehicle, use jumper wires to electrically drive the actuator to the mid-position to assist in assembly.

To install, reverse the removal procedure.

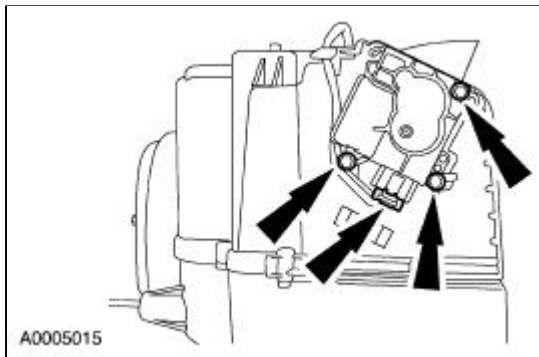
- If reinstalling an actuator removed from the vehicle, align the arrow (1) on the actuator housing with the line on the actuator coupling (2).



Blend Door Actuator —Cold Air Bypass Door

Removal and Installation

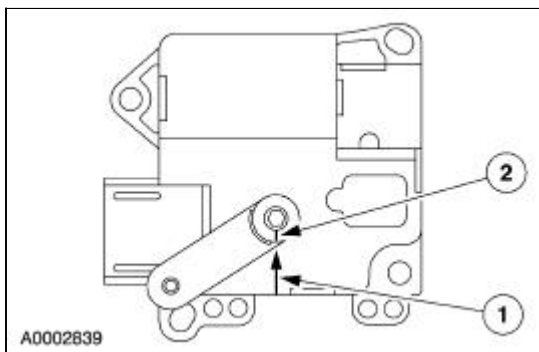
1. Disconnect the battery. For additional information, refer to [Section 414-01](#).
2. Remove the LH instrument panel insulator.
 - Disconnect the electrical connector.
3. Remove the LH floor duct. For additional information, refer to [Section 412-01](#).
4. Remove the actuator.
 - Disconnect the connector.
 - Remove the screws and remove the actuator.



5. **NOTE:** New door actuator assemblies are shipped with the actuator in the mid-position. If reinstalling an actuator removed from the vehicle, use jumper wires to electrically drive the actuator to the mid-position to assist in assembly.

To install, reverse the removal procedure.

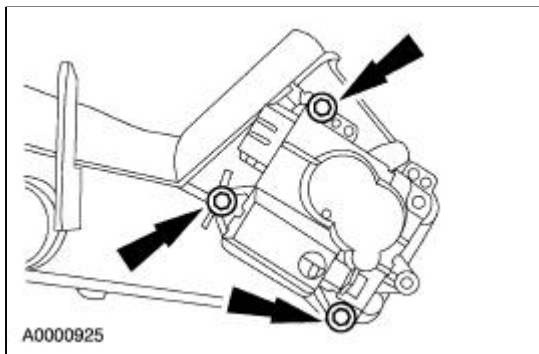
- If reinstalling an actuator removed from the vehicle, align the arrow (1) on the actuator housing with the line on the actuator coupling (2).



Blend Door Actuator —Defrost Door

Removal and Installation

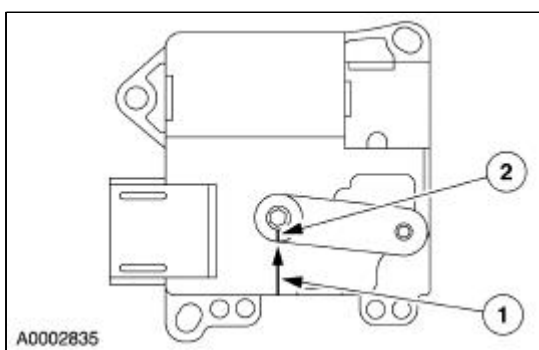
1. Remove the instrument panel. For additional information, refer to [Section 501-12](#).
2. Remove the actuator.
 - Disconnect the connector.
 - Remove the three screws and remove the actuator.



3. **NOTE:** New door actuator assemblies are shipped with the actuator in the mid-position. If reinstalling an actuator removed from the vehicle, use jumper wires to electrically drive the actuator to the mid-position to assist in assembly.

To install, reverse the removal procedure.

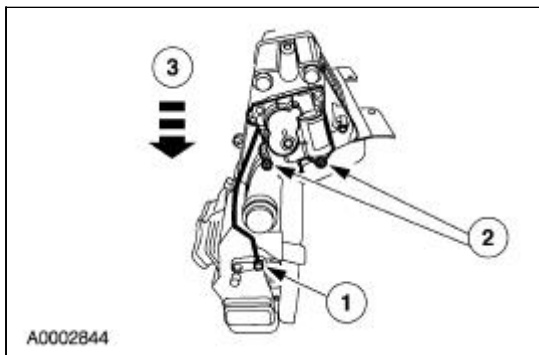
- If reinstalling an actuator removed from the vehicle, align the arrow (1) on the actuator housing with the line on the actuator coupling (2).



Blend Door Actuator —Panel, Floor Console Door

Removal and Installation

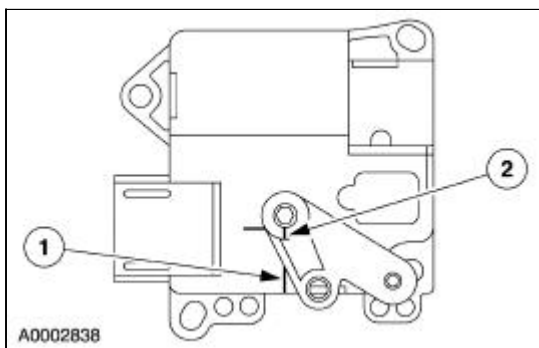
1. Disconnect the battery. For additional information, refer to [Section 414-01](#).
2. Remove the instrument panel. For additional information, refer to [Section 501-12](#).
3. Remove the panel, floor console door actuator.
 1. Disconnect the link end from the center console door.
 2. Remove the screws.
 3. Remove the panel, floor console door actuator.



4. **NOTE:** New door actuator assemblies are shipped with the actuator in mid-position. If reinstalling an actuator removed from the vehicle, use jumper wires to electrically drive the actuator to the mid-position to assist in assembly.

To install, reverse the removal procedure.

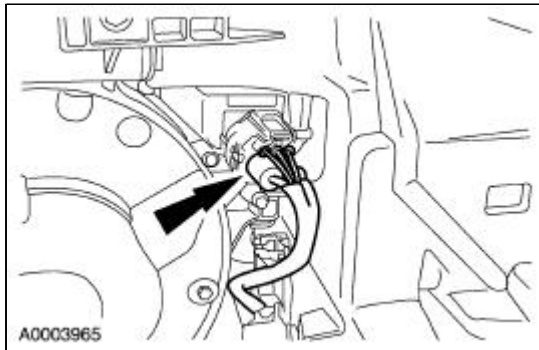
- If reinstalling an actuator removed from the vehicle, align arrow (1) on the actuator housing with the line on the actuator coupling (2).
- Position the actuator and the door fully open or fully closed.
- Manually position the floor console door fully open or fully closed and then install the link.
- Following installation, verify the door position by checking the airflow to the panel and floor console.



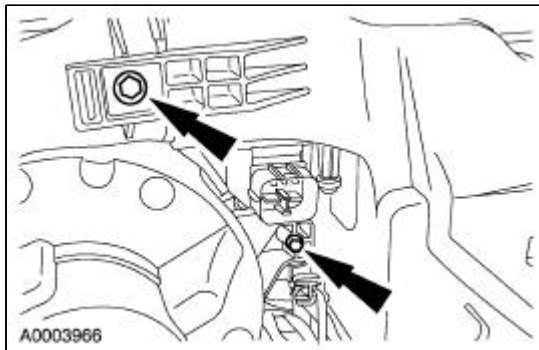
Blower Motor Speed Control

Removal and Installation

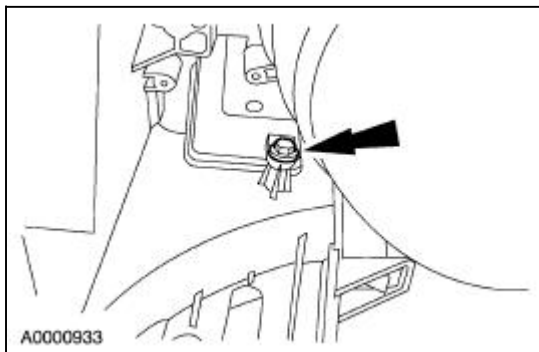
1. Remove the evaporator core housing. For additional information, refer to [Section 412-02](#).
2. Disconnect the connector.



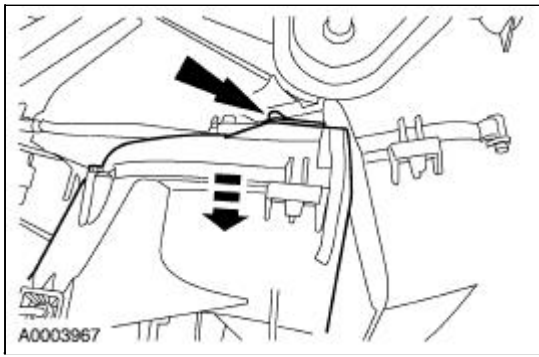
3. Remove the screws which attach the air inlet housing to the evaporator core housing.



4. Remove the blower motor speed control mounting screw.



5. Disengage the clip, separate the air inlet and evaporator housings and remove the blower motor speed control.



6. To install, reverse the removal procedure.

Instrument Cluster and Panel Lighting



The instrument cluster and panel lighting system provides dimmable backlighting to the following:

- instrument cluster (10849)
 - headlamp switch (11654)
 - panel dimmer switch
 - climate control assembly
 - audio unit
 - ash tray
 - power door lock switches
 - power window switches
 - memory set switch
 - heated seat switch
 - steering wheel switches
 - shift lever indicator bezel
 - vehicle emergency monitoring system (VEMS) switch
 - power mirror switch
 - message center
-

Instrument Cluster and Panel Lighting

Refer to Wiring Diagrams Section [413-00](#), Instrument Illumination for schematic and connector information.

Special Tool(s)

 ST1137-A	73III Automotive Meter or equivalent 105-R0051
 ST1217-A	New Generation STAR (NGS) Tester or equivalent 418-F048 (007-00500)

Principles of Operation

Instrument Cluster and Panel Lighting — Dimmable

The panel dimmer switch allows the brightness level of backlights and displays to be adjusted dependent upon the headlamp switch position and the dimmer switch position. The panel dimmer switch sends a signal to the instrument panel which then sends a backlighting intensity and dimming curve command over the standard corporate protocol (SCP) link to the front electronic module (FEM), the audio unit, and the dual automatic temperature control (DATC) module. The FEM then sends a pulse width modulated (PWM) dimming signal to the instrument cluster, the dimmable LEDs, and the dimmable incandescents.

When the headlamp switch is in the parking lamps ON, headlamps ON, or the autolamps ON position and the autolamp feature is active, synchronized dimming of the dimmable components can be controlled with the panel dimmer switch.

With the ignition switch in the RUN position and the headlamp switch in the OFF position, the audio unit, DATC module, tripometer, odometer, and selector lever indicator bezel will be at 100% brightness.

All backlighting will be disabled when the battery saver function has been activated.

Fault Management

The dimmable backlighting will default to 100% intensity if a panel dimmer switch failure occurs.

Inspection and Verification

NOTE: The instrument cluster and FEM must be reconfigured upon replacement. Refer to [Section 418-01](#).

1. Verify the customer concern by operating the system.
2. Visually inspect for obvious signs of mechanical and electrical damage.

Visual Inspection Chart

Mechanical	Electrical
<ul style="list-style-type: none"> ● Binding or damaged panel dimmer switch 	<ul style="list-style-type: none"> ● Battery junction box (BJB) fuse(s) <ul style="list-style-type: none"> ■ 425 (40A) ■ 422 (20A) ■ 432 (30A) ● Central junction box (CJB) fuse(s) <ul style="list-style-type: none"> ■ 202 (5A) ■ 207 (5A) ■ 213 (5A) ■ 217 (5A) ■ 220 (10A) ■ 233 (10A) ● Damaged bulb(s) ● Damaged/corroded wiring harness ● Damaged interior auxiliary junction box (IAJB) ● LH instrument panel junction box ● Damaged instrument cluster ● Damaged front electronic module (FEM) ● Damaged switches

3. If the concern remains after the inspection, connect the New Generation STAR (NGS) Tester to the data link connector (DLC) located beneath the instrument panel and select the vehicle to be tested from the NGS menu. If the NGS does not communicate with the vehicle:
 - check that the program card is correctly installed.
 - check the connections to the vehicle.
 - check the ignition switch position.
4. If the NGS still does not communicate with the vehicle, refer to the New Generation STAR Tester manual.
5. Carry out the DATA LINK DIAGNOSTIC TEST. If the NGS responds with:
 - CKT914, CKT915 or CKT70 = ALL ECUS NO RESP/NOT EQUIP, refer to [Section 418-00](#).
 - NO RESP/NOT EQUIP for front electronic module (FEM), go to Pinpoint Test A.
 - NO RESP/NOT EQUIP for instrument cluster (ICM), go to Pinpoint Test B.
 - SYSTEM PASSED, retrieve and record the continuous diagnostic trouble codes (DTCs), erase the continuous DTCs and carry out self-test diagnostics for the ICM or FEM.
6. If the DTCs retrieved are related to the concern, go to the Instrument Cluster or FEM Diagnostic Trouble Code (DTC) Index to continue diagnostics.
7. If no DTCs related to the concern are retrieved, proceed to Symptom Chart to continue diagnostics.

FEM Diagnostic Trouble Code (DTC) Index

DTC	Description	Source	Action
B1319	Driver Door Ajar Circuit Failure	FEM	REFER to Section 417-02 .
B1327	Passenger Door Ajar Circuit Failure	FEM	REFER to Section 417-02 .
B1342	ECU Is Defective	FEM	CLEAR the DTC. RETRIEVE the DTCs. If DTC B1342 is retrieved, INSTALL a new FEM. REFER to Section 419-10 .
B1438	Wiper Mode Select Switch Circuit Failure	FEM	REFER to Section 501-16 .
B1446	Wiper Park Sense Circuit Failure	FEM	REFER to Section 501-16 .
B1479	Wiper Washer Fluid Level Sensor Circuit Failure	FEM	REFER to Section 501-16 .
B1499	Lamp Turn Signal Left Circuit Failure	FEM	REFER to Section 417-01 .
B1501	Lamp Turn Signal Left Circuit Short to Battery	FEM	REFER to Section 417-01 .
B1503	Lamp Turn Signal Right Circuit Failure	FEM	REFER to Section 417-01 .
B1505	Lamp Turn Signal Right Circuit Short to Battery	FEM	REFER to Section 417-01 .
B1519	Hood Switch Circuit Failure	FEM	REFER to Section 419-01A .
B1567	Lamp Headlamp High Beam Circuit Failure	FEM	REFER to Section 417-01 .
B1676	Battery Pack Voltage Out of Range	FEM	REFER to Section 414-00 .
B2214	Window Passenger Front Up Switch Short to Battery	FEM	REFER to Section 501-11 .
B2215	Window Passenger Front Down Switch Short to Battery	FEM	REFER to Section 501-11 .
B2312	Mirror Passenger Horizontal Feedback Potentiometer Circuit Failure	FEM	REFER to Section 501-09 .
B2316	Mirror Passenger Vertical Feedback Potentiometer Circuit Failure	FEM	REFER to Section 501-09 .
B2442	Intrusion Sensor Fault	FEM	REFER to Section 419-01A .
B2477	Module Configuration Failure	FEM	REFER to Section 418-01 .
C1284	Oil Pressure Switch Failure	FEM	REFER to Section 413-01 .
C1446	Brake Switch Circuit Failure	FEM	REFER to Section 413-01 .
C1924	VAPS Solenoid Actuator Output Circuit Short to Ground	FEM	REFER to Section 211-00 .
C1925	VAPS Solenoid Actuator Return Circuit Failure	FEM	REFER to Section 211-00 .

FEM Parameter Identification (PID) Index

PID	Description	Expected Value
AL_EVT1	Last 8 Alarm Events	DROPEN, HOODTR, IGNTAM, PANIC, T_AJAR, RR_SD, LR_SD, P_DOOR, D_DOOR, RADIO, WINDO, ULTRS, NOEVNT, BB_SND
AL_EVT2	Last 8 Alarm Events	DROPEN, HOODTR, IGNTAM, PANIC, T_AJAR, RR_SD, LR_SD, P_DOOR, D_DOOR, RADIO, WINDO, ULTRS, NOEVNT, BB_SND
AL_EVT3	Last 8 Alarm Events	DROPEN, HOODTR, IGNTAM, PANIC, T_AJAR, RR_SD, LR_SD, P_DOOR, D_DOOR, RADIO, WINDO, ULTRS, NOEVNT, BB_SND
AL_EVT4	Last 8 Alarm Events	DROPEN, HOODTR, IGNTAM, PANIC, T_AJAR, RR_SD, LR_SD, P_DOOR, D_DOOR, RADIO, WINDO, ULTRS, NOEVNT, BB_SND
AL_EVT5	Last 8 Alarm Events	DROPEN, HOODTR, IGNTAM, PANIC, T_AJAR, RR_SD, LR_SD, P_DOOR, D_DOOR, RADIO, WINDO, ULTRS, NOEVNT, BB_SND
AL_EVT6	Last 8 Alarm Events	DROPEN, HOODTR, IGNTAM, PANIC, T_AJAR, RR_SD, LR_SD, P_DOOR, D_DOOR, RADIO, WINDO, ULTRS, NOEVNT, BB_SND
AL_EVT7	Last 8 Alarm Events	DROPEN, HOODTR, IGNTAM, PANIC, T_AJAR, RR_SD, LR_SD, P_DOOR, D_DOOR, RADIO, WINDO, ULTRS, NOEVNT, BB_SND
AL_EVT8	Last 8 Alarm Events	DROPEN, HOODTR, IGNTAM, PANIC, T_AJAR, RR_SD, LR_SD, P_DOOR, D_DOOR, RADIO, WINDO, ULTRS, NOEVNT, BB_SND
CCNT	Number Of Continuous DTCs In Module	one count per bit
D_DOOR	Left Front Door Ajar Switch	CLOSED, AJAR
FLUID_1	Brake Fluid Level Switch #1	OFF, ON
HOOD_SW	Hood Ajar Switch	CLOSED, AJAR
IGN_R	Ignition Switch -RUN Position	NO, YES
L_HIGH	Left High Beam Lamp Driver	Off---, Off-B-, On---, On-B-
L_LOW	Left Low Beam Lamp	Off---, Off-B-, On---, On-B-
LF_TURN	Left Front Turn Lamp	Off---, Off-B-, On---, On-B-
LMRKOUT	Left Front Marker Lamp	Off---, Off-B-, On---, On-B-
OILWRN	Oil Level Warning Lamp	Off---, On---
P_DN_SW	Passenger Down Activated	OFF, DOWN
P_DOOR	Passenger Door Ajar Switch	CLOSED, AJAR
P_UP_SW	Passenger Up Activated	OFF, UP
PRK_BRK	Parking Brake Switch Input	OFF, ON
PSMRPSH	Passenger Mirror Position	#####

	Sensor (Left/Right)	
PSMRPSV	Passenger Mirror Position	#####
PSPWAMP	Power Window Passenger's Peak Motor Current	#####
PWM_DC1	PWM Duty Cycle #1	%
R_HIGH	Right High Beam Lamp Driver	Off---, Off-B-, On---, On-B-
R_LOW	Right Low Beam Lamp	Off---, Off-B-, On---, On-B-
RADIOSW	Security Input Switch Status	OFF, ON
RF_TURN	Right Front Turn Lamp	Off---, Off-B-, On---, On-B-
RMRKSTB	Right Front Marker Lamp	Off---, Off-B-, On---, On-B-
STLKOUT	Steering Column Lock Ground Output	OFF, ON
VBAT	Battery Voltage	V
WFLUID	Washer Fluid Level	LOW, OK
WPMODE	Wiper Control Mode Select	WASH, OPEN, INVLD, OFF, INTVL1, INTVL2, INTVL3, INTVL4, INTVL5, INTVL6, INTVL7, LOW, HIGH
WPPRKSW	Windshield Wiper Park Sense	notPRK, PARKED

FEM Active Command Index

Active Command	Display	Action
BACKLIGHTING INTENSITY CONTROL COMMAND	ILLUM	%
BRAKE SYSTEM CONTROL COMMAND	SHFT LOCK	OFF, ON
EXTERIOR LAMP CONTROL	PARKLAMPS	OFF, ON
FRONT WINDOW CONTROL	RR UP	OFF, ON
FRONT WINDOW CONTROL	PR DOWN	OFF, ON
FRONT WINDSHIELD WIPER/WASHER	SPEED RLY	OFF, ON
FRONT WINDSHIELD WIPER/WASHER	WASH RLY	OFF, ON
FRONT WINDSHIELD WIPER/WASHER	WIPER RLY	OFF, ON
HEAD/CORNERING LAMP CONTROL	HIGH BEAM	OFF, ON
HEAD/CORNERING LAMP CONTROL	LOW BEAM	OFF, ON
INDICATOR LAMP CONTROL	NON MIL	OFF, ON
LAMP CONTROL COMMAND	HDLMPWSH	OFF, ON
POWER MIRROR CONTROL	PR DOWN	OFF, ON
POWER MIRROR CONTROL	PR LEFT	OFF, ON
POWER MIRROR CONTROL	PR RIGHT	OFF, ON
POWER MIRROR CONTROL	PR UP	OFF, ON
STEERING COLUMN CONTROL COMMAND	LOCK_GND	OFF, ON
TURN SIGNAL AND MARKER LAMPS	HAZARD	OFF, ON

Instrument Cluster Diagnostic Trouble Code (DTC) Index

DTC	Description	Source	Action
B1201	Fuel Sender Circuit Failure	ICM	REFER to Section 413-01 .
B1205	EIC Switch-1 Assembly Circuit Failure	ICM	REFER to Section 413-01 .
B1209	EIC Switch-2 Assembly Circuit Failure	ICM	REFER to Section 413-01 .
B1213	Anti-Theft Number of Programmed Keys Is Below Minimum	ICM	REFER to Section 419-01B .
B1246	Dim Panel Potentiometer Switch Circuit Failure	ICM	GO to Pinpoint Test G .
B1342	ECU Is Defective	ICM	CLEAR and DOCUMENT the DTCs. CARRY OUT the instrument cluster self-test. INSTALL a new instrument cluster if DTC B1342 is retrieved again. REFER to Section 413-01 .
B1352	Ignition Key-In Circuit Failure	ICM	REFER to Section 211-05 .
B1470	Lamp Headlamp Input Circuit Failure	ICM	REFER to Section 417-01 .
B1492	Ignition Cylinder Sensor Open Circuit	ICM	REFER to Section 419-01B .
B1567	Lamp Headlamp High eam Circuit Failure	ICM	REFER to Section 417-01 .
B1600	PATS Ignition Key Transponder Signal Is Not Received	ICM	REFER to Section 419-01B .
B1601	PATS Received Incorrect Key-Code From Ignition Key Transponder	ICM	REFER to Section 419-01B .
B1602	PATS Received Invalid Format of Key-Code From Ignition Key Transponder	ICM	REFER to Section 419-01B .
B1676	Battery Pack Voltage Out of Range	ICM	REFER to Section 413-01
B1681	PATS Transceiver Module Signal Is Not Received	ICM	REFER to Section 419-01B .
B1689	Autolamp Delay Circuit Failure	ICM	REFER to Section 417-01 .
B1875	Turn Signal / Hazard Switch Signal Circuit Failure	ICM	REFER to Section 417-01 .
B2103	Antenna Not Connected	ICM	REFER to Section 419-01B .
B2139	Data Mismatch (Receive Data Does Not Match What Was Expected)	ICM	REFER to Section 419-01A .
B2141	NVM Configuration Failure	ICM	REFER to Section 419-01B .
B2143	NVM Memory Failure	ICM	REFER to Section 419-01B .
B2162	Data Mismatch #2 (Receive Data Does Not Match What Was Expected)	ICM	REFER to Section 419-01B .
B2328	Column Reach Feedback Potentiometer Circuit Failure	ICM	REFER to Section 211-04 .
B2332	Column Tilt Feedback Potentiometer Circuit Failure	ICM	REFER to Section 211-04 .
B2351	Steering Column Switch Circuit Failure	ICM	REFER to Section 211-04 .

B2431	Transponder Programming Failed	ICM	REFER to Section 419-01A .
B2472	Fog Lamp Switch Failure	ICM	REFER to Section 417-01 .
B2477	Module Configuration Failure	ICM	REFER to Section 418-01 .
U1041	SCP (J1850) Invalid or Missing Data for Vehicle Speed	ABS, ABS/TC, IVD	CARRY OUT the ABS, ABS/TC, or IVD self-test.
U1059	SCP (J1850) Invalid or Missing Data for Transmission/Transaxle/PRNDL	PCM	CARRY OUT the PCM self-test.
U1073	SCP (J1850) Invalid or Missing Data for Engine Coolant Fluid Temperature	PCM	CARRY OUT the PCM self-test.
U1123	SCP (J1850) Invalid or Missing Data for Odometer Rolling Count	ABS, ABS/TC, IVD	CARRY OUT the ABS, ABS/TC, IVD self-test.
U1147	SCP (J1850) Invalid or Missing Data for Vehicle Security System	PCM	CARRY OUT the PCM self-test.

Instrument Cluster Parameter Identification (PID) Index

PID	Description	Expected Value
ABCHIME	Air Bag Chime	OFF, ON
ANTISCN	Anti-Scan Function	DISABL, ENABLE
ASWSTAT	Autolamp Switch Input Status	1 KEY, 2 KEY, 3 KEY, 4 KEY, 5 KEY, 6 KEY, 7 KEY, 8 KEY, 9 KEY, 0 KEY, NO KEY
CCNT	Number Of Continuous DTCs In Module	one count per bit
D_SBELT	Driver Seat Belt	OUT, IN
DSWSTAT	Dimmer Switch Input Status	ON, LVL1, LVL2, LVL3, LVL4, LVL5, LVL6, LVL7, LVL8, LVL9, LVL10, LVL11, LVL12, LVL13, LVL14, LVL15, LVL16, LVL17, LVL18, LVL19, LVL20, LVL21, ?
ENABL_S	Vehicle Enable Status	DISABL, ENABLE
HEAD_L	Headlamp Switch Input Status	OFF, PARK, HEADLP, R_FOG, INVLD, ?
HIBEAM	High Beam Switch Input Status	OFF, HIGH, PASS, INVLD, ?
HORN_SW	Horn Input Switch	OFF, ON
IGN_A	Ignition Switch -ACCY Position	NO, YES
IGN_KEY	Ignition Key In / Out	OUT, IN
IGN_O/U	Ignition Switch - OFF/Unlock Position	NO, YES
IGN_R	Ignition Switch -RUN Position	NO, YES
IGN_S	Ignition Switch - START Position	NO, YES
LIGHTSN	Night(True) / Day (False)	NO, YES

M_KEY	Master Key Present	notPRE, PRESNT
NUMKEYS	Number Of Keys Stored In Module	one count per bit
PCM_ID	PCM ID Status	notSTR, STORED
PCM_VFY	PCM Verify OK	NO, YES
RESETSW	Reset Switch	OFF, ON
SELECT	Select/Mode Switch	OFF, ON
TILT	Steering Column Tilt Switch	SHORT, UP, DOWN, OFF
TELEPOS	Telescope Position Sensor	notSEN, SENSED
TELESCP	Steering Column Telescope Switch	SHORT, IN, OUT, OFF
TILTPOS	Tilt Position Sensor	notSEN, SENSED
TR_PARK	Transmission Select Lever In Park Pos	NO, YES

Instrument Cluster Active Command Index

Active Command	Display	Action
ANTI-THEFT INDICATOR LAMP	THEFT LAMP	OFF, ON
DISPLAY DIMMING CONTROL	ILLUMINAT	OFF, ON
DISPLAY SEGMENT CONTROL II	SEGMENTS	OFF, ON
ENGINE COOLANT GAUGE CONTROL	ENGCOOLNT	0%-100%
FUEL GAUGE CONTROL	FUELLEVEL	0%-100%
MEMORY SELECT CONTROL	MEMORY 1	OFF, ON
MEMORY SELECT CONTROL	MEMORY 2	OFF, ON
PRNDL DISPLAY CONTROL COMMAND	SEGMENTS	OFF, ON
RF SIGNAL	RF	OFF, ON
SPEEDOMETER CONTROL	SPDOMETER	0%-100%
TACHOMETER CONTROL	TCHOMETER	0%-100%
WARNING LAMPS AND CHIME	ALL LAMPS	OFF, ON
WARNING LAMPS AND CHIME	CHIME	OFF, ON

Symptom Chart

Symptom Chart

Condition	Possible Sources	Action
<ul style="list-style-type: none"> No communication with the front electronic module (FEM) 	<ul style="list-style-type: none"> Battery junction box (BJB) Fuses 425 (40A), 422 (20A). Circuitry. 	<ul style="list-style-type: none"> GO to Pinpoint Test A.

	<ul style="list-style-type: none"> ● FEM. 	
<ul style="list-style-type: none"> ● No communication with the instrument cluster module (ICM) 	<ul style="list-style-type: none"> ● Central junction box (CJB) Fuses 202 (5A), 213 (5A), 217 (5A), 220 (10A). ● Circuitry. ● Instrument cluster. 	<ul style="list-style-type: none"> ● GO to Pinpoint Test B.
<ul style="list-style-type: none"> ● The instrument cluster illumination is inoperative 	<ul style="list-style-type: none"> ● Circuitry. ● Instrument cluster. 	<ul style="list-style-type: none"> ● GO to Pinpoint Test C.
<ul style="list-style-type: none"> ● The climate control illumination is inoperative 	<ul style="list-style-type: none"> ● Dual automatic temperature control (DATC) module. 	<ul style="list-style-type: none"> ● INSTALL a new DATC module. REFER to Section 412-04. CLEAR the DTCs. REPEAT the self-test.
<ul style="list-style-type: none"> ● The audio system illumination is inoperative 	<ul style="list-style-type: none"> ● Audio unit. 	<ul style="list-style-type: none"> ● REMOVE the audio unit and SEND it to an authorized Ford audio system repair facility.
<ul style="list-style-type: none"> ● The control illumination is inoperative — all LEDs and incandescents 	<ul style="list-style-type: none"> ● Circuitry. ● FEM. ● IAJB. ● LH instrument panel junction box. 	<ul style="list-style-type: none"> ● GO to Pinpoint Test D.
<ul style="list-style-type: none"> ● The control illumination is inoperative — all LEDs or incandescents 	<ul style="list-style-type: none"> ● Circuitry. ● FEM. ● IAJB. 	<ul style="list-style-type: none"> ● GO to Pinpoint Test E.
<ul style="list-style-type: none"> ● The control illumination is always on — all LEDs or incandescents 	<ul style="list-style-type: none"> ● Circuitry. ● FEM. 	<ul style="list-style-type: none"> ● GO to Pinpoint Test F.
<ul style="list-style-type: none"> ● The control illumination is always on — all LEDs and incandescents 	<ul style="list-style-type: none"> ● FEM. ● IAJB. 	<ul style="list-style-type: none"> ● GO to Pinpoint Test G.
<ul style="list-style-type: none"> ● A single illumination source is inoperative 	<ul style="list-style-type: none"> ● Circuitry. ● Component. 	<ul style="list-style-type: none"> ● GO to Pinpoint Test H.
<ul style="list-style-type: none"> ● The instrument panel illumination does not dim 	<ul style="list-style-type: none"> ● Circuitry. ● Panel dimmer module. ● Instrument cluster. 	<ul style="list-style-type: none"> ● GO to Pinpoint Test I.

Pinpoint Tests

PINPOINT TEST A: NO COMMUNICATION WITH THE FRONT ELECTRONIC MODULE

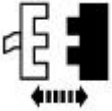
CONDITIONS	DETAILS/RESULTS/ACTIONS
A1 CHECK CIRCUITS 29-DK20 (OG/GN) AND 29SW-DK22 (OG/YE) FOR VOLTAGE	

NOTE: Cycle ignition switch from OFF to RUN to enable the switched system power feature.

1



2



FEM C201c

3

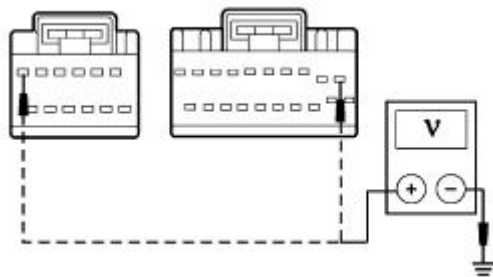


FEM C201f

4



5



A0006297

5

Measure the voltage between FEM C201c pin 6, circuit 29-DK20 (OF/GN), harness side and ground; and between FEM C201f pin 1, circuit 29S-DK22 (OG/YE), harness side and ground.

• Are the voltages greater than 10 volts?

→ **Yes**
GO to [A2](#).

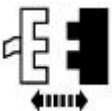
→ **No**
REPAIR the circuit(s) in question. TEST the system for normal operation.

A2 CHECK CIRCUITS 31-DK20 (BK/RD), 31-DK20A (BK/RD), 31-DK20B (BK/RD), 31-DK20C (BK/RD) AND 31-DK20D (BK/RD) FOR OPENS

1

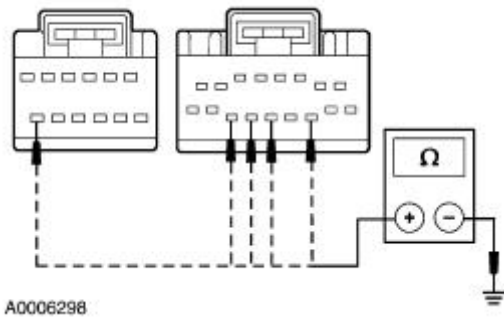


2



FEM C201a

3



3

Using the following table, measure the resistance between FEM connectors, harness side and ground:

FEM	Pin	Circuit
C201c	12	31-DK20 (BK/RD)
C201a	11	31-DK20A (BK/RD)
C201a	13	31-DK20B (BK/RD)
C201a	14	31-DK20C (BK/RD)
C201a	15	31-DK20D (BK/RD)

● Is the resistance less than 5 ohms?

→ Yes

REFER to [Section 418-00](#).

→ No

REPAIR the circuit(s) in question. TEST the system for normal operation.

PINPOINT TEST B: NO COMMUNICATION WITH THE INSTRUMENT CLUSTER MODULE

CONDITIONS	DETAILS/RESULTS/ACTIONS
B1 CHECK HOT AT ALL TIMES POWER SUPPLY CIRCUIT	
<p>1</p> <p>2</p> <p>Instrument Cluster C2208</p> <p>3</p> <p>A0002792</p>	<p>3</p> <p>Measure the voltage between instrument cluster C220b pin 3, circuit 29-GG11 (OG/BU), harness side and ground.</p> <p>● Is the voltage greater than 10 volts?</p>

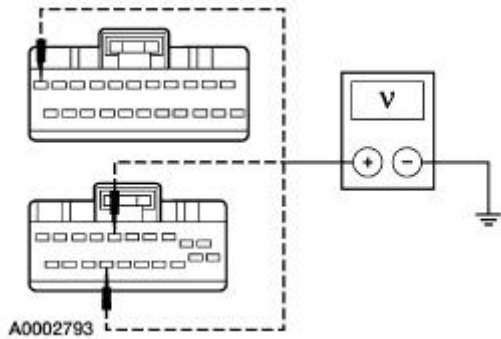
- **Yes**
GO to [B2](#).
- **No**
REPAIR the circuit. TEST the system for normal operation.

B2 CHECK HOT IN RUN POWER SUPPLY CIRCUITS

1



2



- 2 Measure the voltage between the instrument cluster and ground as follows:

Connector Pin	Circuit
C220a pin 11	15-JA14 (GN/BK)
C220b pin 6	15-GG14 (GN/RD)
C220b pin 17	75-GG15 (YE/GN)

- Are the voltages greater than 10 volts?

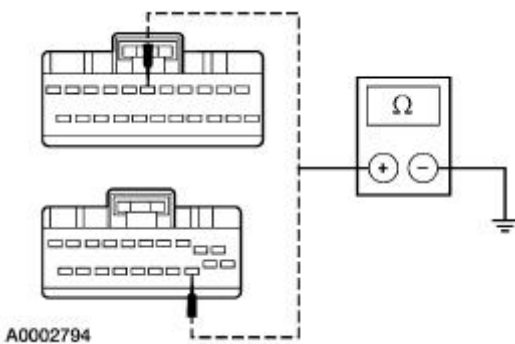
- **Yes**
GO to [B3](#).
- **No**
REPAIR the circuit(s). TEST the system for normal operation.

B3 CHECK GROUND CIRCUITS

1



2





- 2 Measure the resistance between the instrument cluster and ground as follows:

Connector Pin	Circuit
C220a pin 6	31-AL11 (BK)
C220b pin 13	91-GG11 (BN/RD)

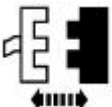
- Are the resistances less than 5 ohms?

	<p>→ Yes REFER to Section 418-00.</p> <p>→ No REPAIR the circuit(s). TEST the system for normal operation.</p>
--	--

PINPOINT TEST C: THE INSTRUMENT CLUSTER ILLUMINATION IS INOPERATIVE

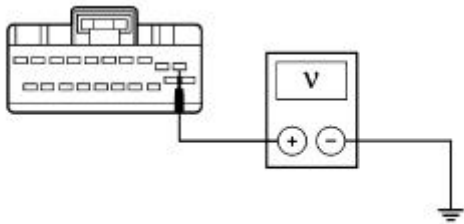
CONDITIONS	DETAILS/RESULTS/ACTIONS
C1 CHECK THE ILLUMINATION FEED CIRCUIT FOR VOLTAGE	
<p>1</p>  <p>Instrument Cluster C220a</p> <p>2</p> 	<p>3 Turn the headlamps on.</p> <p>4 Turn the panel dimmer switch to the MAX position.</p> <p>5 Measure the voltage between instrument cluster C220a pin 7, circuit 64S-LK29 (BU/RD), harness side and ground.</p> <p>● Is the voltage greater than 10 volts?</p> <p>→ Yes INSTALL a new instrument cluster; REFER to Section 413-01. CLEAR the DTCs. REPEAT the self-test.</p> <p>→ No REPAIR the circuit. TEST the system for normal operation.</p>

PINPOINT TEST D: THE CONTROL ILLUMINATION IS INOPERATIVE — ALL LEDS AND INCANDESCENTS

CONDITIONS	DETAILS/RESULTS/ACTIONS
D1 CHECK CIRCUIT 29S-DK22 FOR VOLTAGE	
<p>1</p>  <p>FEM C201f</p> <p>2</p>	



4



A0004436

3 Turn the headlamp switch to the ON position.

4 Measure the voltage between FEM C201f pin 1, circuit 29S-DK22 (OG/YE), harness side and ground.

• Is the voltage greater than 10 volts?

→ Yes
GO to [D2](#).

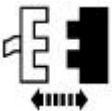
→ No
REPAIR the circuit. TEST the system for normal operation.

D2 CHECK CIRCUIT 64S-LH2 (BU/RD) FOR A SHORT TO GROUND

1

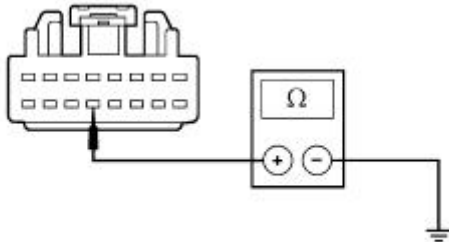


2



IAJB C283a

3



A0004437

1 Turn the headlamp switch to the OFF position.

3 Measure the resistance between IAJB C283a pin 13, circuit 64S-LH2 (BU/RD), harness side and ground.

• Is the resistance greater than 10,000 ohms?

→ Yes
GO to [D3](#).

→ **No**
REPAIR the circuit. TEST the system for normal operation.

D3 CHECK THE OPERATION OF THE FEM

1

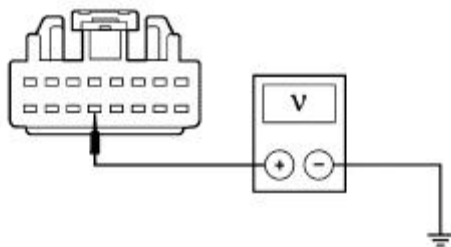


FEM C201f

2



5



A0004788

- 3 Turn the headlamps switch to the ON position.
- 4 Turn the panel dimmer switch to the MAX position.
- 5 Measure the voltage between IAJB C283a pin 13, circuit 64S-LH2 (BU/RD), harness side and ground.

● Is the voltage greater than 10 volts?

→ **Yes**
GO to [D4](#).

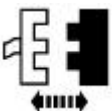
→ **No**
GO to [D8](#).

D4 CHECK THE FEED CIRCUITS FOR A SHORT TO GROUND

1



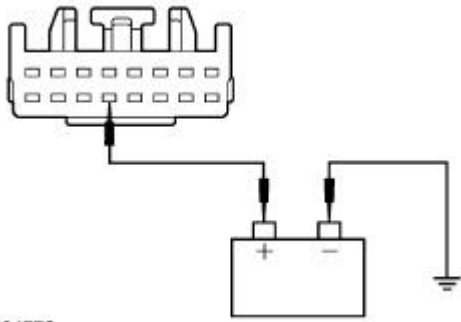
2



IAJB C283d

3

- 3 Connect a fused (5A) jumper wire between IAJB C283d pin 13, circuit 64S-LK1 (BU), harness side and the positive battery terminal.



A0004778

- Did the headlamp, panel dimmer, mirror, and steering wheel switches along with the message center and instrument cluster illuminate?

→ **Yes**
GO to [D7](#).

→ **No**
GO to [D5](#).

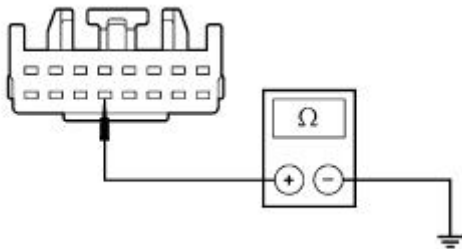
D5 CHECK CIRCUIT 64S-LK1 (BU) FOR A SHORT TO GROUND

1



LH Instrument Panel Junction Box C224

2



A0004779

- 2 Measure the resistance between IAJB C224 pin 13, circuit 64S-LK1 (BU), harness side and ground.

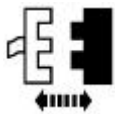
- Is the resistance greater than 10,000 ohms?

→ **Yes**
GO to [D6](#).

→ **No**
REPAIR the circuit. TEST the system for normal operation.

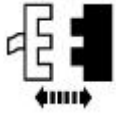
D6 CHECK THE FEED CIRCUITS FOR A SHORT TO GROUND

1



Steering Wheel Switch C217

2



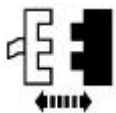
Mirror Switch C204

3



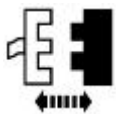
Panel Dimmer Switch C206

4



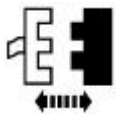
Headlamp Switch C205

5



Message Center C253

6



Instrument Cluster C220a

7 Measure the resistance between the following circuits (using the chart below) and ground:

Connector and Pin	Circuit
Steering Wheel Switch C217 pin 5	Circuit 64-LK18 (BU/RD)
Mirror Switch C204 pin 5	Circuit 64S-LH50 (BU/YE)
Panel Dimmer Switch C206 pin 1	Circuit 64S-LE10 (BU/YE)
Headlamp Switch C205 pin 5	Circuit 64S-LH26 (BU/BK)
Message Center C253 pin 1	Circuit 64S-GG25 (BU/OG)
Instrument Cluster C220a pin 7	Circuit 64S-LK29 (BU/RD)

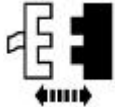
● Are the resistances greater than

10,000 ohms?

- **Yes**
REPAIR or INSTALL a new LH instrument panel junction box. CLEAR the DTCs. REPEAT the self-test.
- **No**
REPAIR the circuit in question. TEST the system for normal operation.

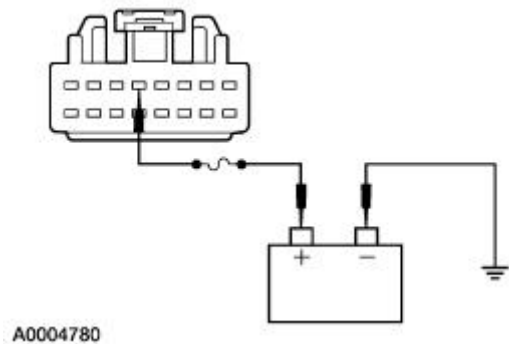
D7 CHECK THE IAJB FOR A SHORT TO GROUND

1



IAJB C283a

2



- 2 Connect a fused (5A) jumper wire between the IAJB C283a pin 5, harness side and the positive battery terminal.

- Do the selector lever indicator bezel, heated seat, TC disable, and vehicle emergency monitoring system (VEMS) switches along with the cigar lighter illuminate?

- **Yes**
REPAIR or INSTALL a new IAJB. CLEAR the DTCs. REPEAT the self-test.

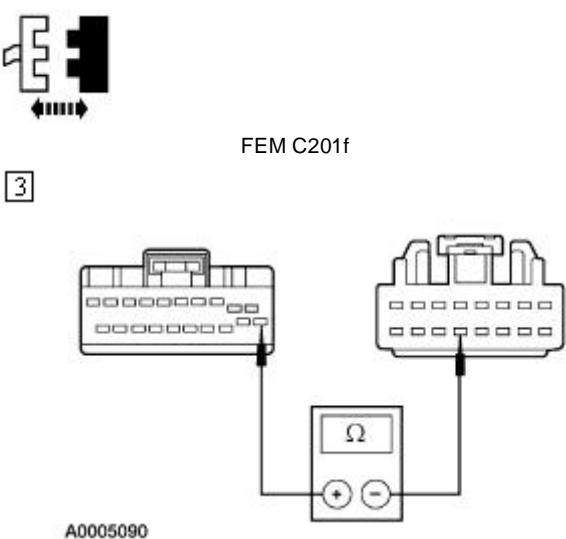
- **No**
REPAIR circuit 64S-LK21 (BU/BK), circuit 64S-HC6 (BU), circuit 64S-HC9 (BU/BK), circuit 64S-LH45 (BU/OG), circuit 64S-LK11 (BU), circuit 64S-GP6 (BU/RD), or circuit 64S-LK9 (BU) for a short to ground. TEST the system for normal operation.

D8 CHECK CIRCUIT 64S-LH2 (BU/RD) FOR AN OPEN

1



2



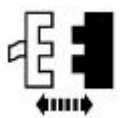
3 Measure the resistance between the FEM C201f pin 11, circuit 64S-LH2 (BU/RD), harness side and the IAJB C283a pin 13, circuit 64S-LH2 (BU/RD), harness side.

● **Is the resistance less than 5 ohms?**

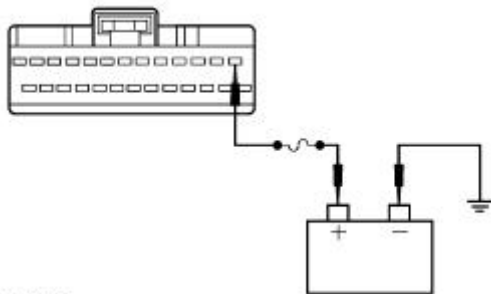
→ **Yes**
INSTALL a new FEM. REFER to [Section 419-10](#). CLEAR the DTCs. REPEAT the self-test.

→ **No**
REPAIR the circuit. TEST the system for normal operation.

PINPOINT TEST E: THE CONTROL ILLUMINATION IS INOPERATIVE — ALL LEDS OR INCANDESCENTS

CONDITIONS	DETAILS/RESULTS/ACTIONS
E1 VERIFY WHICH ILLUMINATION IS INOPERATIVE	
	<p>1 Verify which switch or component illumination is inoperative.</p> <p>● Are the power window, power door lock, and memory switches inoperative?</p> <p>→ Yes GO to E2.</p> <p>→ No GO to E4.</p>
E2 CHECK THE FEM	
<p>1</p>  <p>FEM C201e</p>	

2



A0004781

2

Connect a fused (5A) jumper wire between the FEM C201e pin 1, circuit 64S-LH1 (BU), harness side and the positive battery terminal.

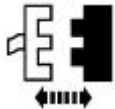
- Do the power window, power door lock, and memory switches illuminate?

→ **Yes**
INSTALL a new FEM. REFER to [Section 419-10](#). CLEAR the DTCs. REPEAT the self-test.

→ **No**
GO to [E3](#).

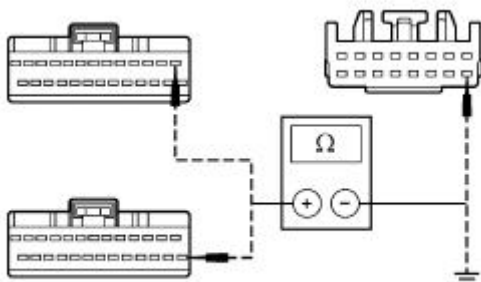
E3 CHECK THE IAJB

1



IAJB C283a

2



A0004782

2

Measure the resistance between FEM C201e pin 1, circuit 64S-LH1 (BU/RD), harness side and IAJB C283a pin 9, circuit 64S-LH1 (BU/RD), harness side; and between FEM C201e pin 1, circuit 64S-LH1 (BU/RD), harness side and ground.

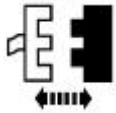
- Is the resistance between the FEM and the IAJB less than 5 ohms and the resistance between the FEM and ground greater than 10,000 ohms?

→ **Yes**
REPAIR or INSTALL a new IAJB. CLEAR the DTCs. REPEAT the self-test.

→ **No**
REPAIR the circuit. TEST the system for normal operation.

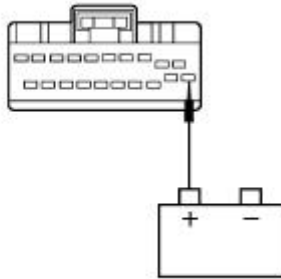
E4 CHECK THE OPERATION OF THE FEM

1



FEM C201f

2



A0005091

2

Connect a fused (5A) jumper wire between FEM C201f pin 11, circuit 64S-LH2 (BU/RD), harness side and the positive battery terminal.

- Do the selector lever indicator bezel, heated seat, TC disable, vehicle emergency monitoring system (VEMS), steering wheel, mirror, panel dimmer, and headlamp switches along with the cigar lighter, message center, and instrument cluster illuminate?

→ Yes

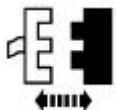
INSTALL a new FEM. REFER to [Section 419-10](#). CLEAR the DTCs. REPEAT the self-test.

→ No

GO to [E5](#).

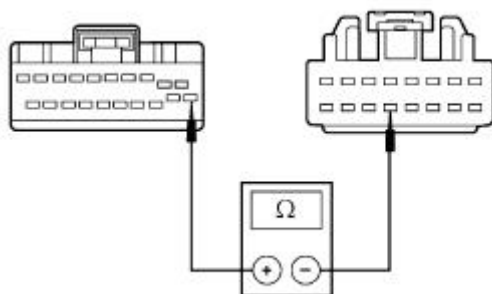
E5 CHECK CIRCUIT 64S-LH2 (BU/RD) FOR AN OPEN

1



IAJB C283a

2



A0005090



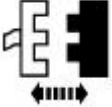

2

Measure the resistance between FEM C201f pin 11, circuit 64S-LH2 (BU/RD), harness side and the IAJB C283a pin 13, circuit 64S-LH2 (BU/RD), harness side.

- Is the resistance less than 5 ohms?

	<p>→ Yes REPAIR or INSTALL a new IAJB. CLEAR the DTCs. REPEAT the self-test.</p> <p>→ No REPAIR the circuit. TEST the system for normal operation.</p>
--	--

PINPOINT TEST F: THE CONTROL ILLUMINATION IS ALWAYS ON — ALL LEDS OR INCANDESCENTS

CONDITIONS	DETAILS/RESULTS/ACTIONS
F1 ISOLATE THE SYMPTOM	
<p>1</p> 	<p>2 Identify the symptom.</p> <ul style="list-style-type: none"> • Are only the power window, power door lock, and memory set switches always illuminated? <p>→ Yes GO to F2.</p> <p>→ No If both the LEDs and incandescents are always illuminated, GO to Pinpoint Test G. If only the selector lever indicator bezel, heated seat, TC disable, VEMS, steering wheel, mirror, panel dimmer, and headlamp switch along with the cigar lighter, message center, and instrument cluster illumination are always illuminated, GO to F7.</p>
F2 CHECK THE POWER SUPPLY CIRCUIT FOR A SHORT TO VOLTAGE	
<p>1</p>  <p>2</p>  <p>FEM C201e</p> <p>3</p> 	

- Do the power window, power door lock, and memory set switch illumination turn off?

→ **Yes**
 INSTALL a new FEM. REFER to [Section 419-10](#). CLEAR the DTCs. REPEAT the self-test.

→ **No**
 GO to [F3](#).

F3 ISOLATE THE SHORT TO VOLTAGE

1



2



IAJB C283a

3



4 Verify if any switches are still illuminated.

- Are any switches still illuminated?

→ **Yes**
 GO to [F4](#).

→ **No**
 REPAIR circuit 64S-LH1 (BU) for a short to voltage. TEST the system for normal operation.

F4 CHECK THE IAJB FOR A SHORT TO VOLTAGE

1



2



IAJB C283b

3



4 Verify if any switches are still illuminated.

● **Are any switches still illuminated?**

→ **Yes**

If the LF power door lock, power window, and memory set switch are illuminated, REPAIR circuit 29S-LH1 (OG/YE), circuit 29S-LH28 (OG/YG), circuit 29S-AH27 (OG/YE), or circuit 29S-LH14 (OG/YE) for a short to voltage; if the LR power window switch is illuminated, REPAIR circuit 29S-LH16 (OG) for a short to voltage; if any of the RF power door lock and power window, or RR power window switches are illuminated, GO to [F5](#).

→ **No**

REPAIR or INSTALL a new IAJB. CLEAR the DTCs. REPEAT the self-test.

F5 CHECK THE CJB FOR A SHORT TO VOLTAGE

1



2



CJB C270d

3



4 Verify if any switches are illuminated.

● **Are any switches illuminated?**

→ **Yes**

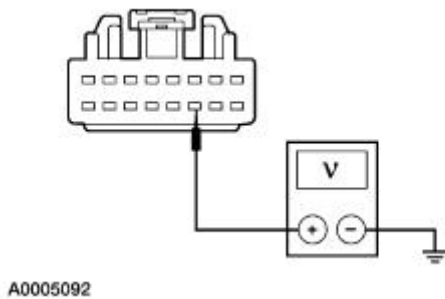
If the RF power door lock and power window switches are illuminated, REPAIR circuit 29S-LH2 (OG/BU), circuit 29S-LH42 (OG/BU), or circuit 29S-LH31 (OG/BU) for a short to power; if the RR power window switch is illuminated, REPAIR circuit 29S-LH33 (OG/BK) for a short to power. TEST the system for normal operation.

→ **No**

GO to [F6](#).

F6 CHECK CIRCUIT 29S-AD2 (OG/BU) FOR A SHORT TO VOLTAGE

1



1

Measure the voltage between IABJ C283b pin 11, circuit 29S-AD2 (OG/BU), harness side and ground.

● **Is any voltage present?**

→ **Yes**
REPAIR the circuit. TEST the system for normal operation.

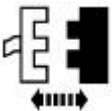
→ **No**
REPAIR or INSTALL a new CJB. CLEAR the DTCs. REPEAT the self-test.

F7 CHECK THE FEED CIRCUIT FOR A SHORT TO VOLTAGE

1



2



FEM C210f

3



● **Do the selector lever indicator bezel, heated seat, TC disable, VEMS, steering wheel, mirror, panel dimmer, and headlamp switch along with the cigar lighter, message center, and instrument cluster illumination turn off?**

→ **Yes**
INSTALL a new FEM. REFER to [Section 419-10](#). CLEAR the DTCs. REPEAT the self-test.

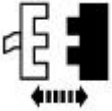
→ **No**
GO to [F8](#).

F8 ISOLATE THE SHORT TO VOLTAGE

1



2



IAJB C283d

3



IAJB C283a

4



5 Verify if any illumination sources are illuminated.

- **Are any illumination sources illuminated?**

→ **Yes**

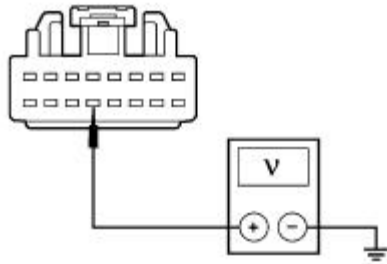
If the selector lever indicator bezel, heated seat, TC disable, and vehicle emergency monitoring system (VEMS) switches along with the cigar lighter are illuminated REPAIR circuit 64S-LK9 (BU/WH), circuit 64S-LK21 (BU/BK), circuit 64S-HC6 (BU), circuit 64S-HC9 (BU/BK), circuit 64S-LH45 (BU/OG), circuit 64S-LK11 (BU), or circuit 64S-GP6 (BU/RD) for a short to voltage. If the steering wheel, mirror, panel dimmer, headlamp switch, along with the message center, and instrument cluster illumination are illuminated GO to [F10](#). TEST the system for normal operation.

→ **No**
GO to [F9](#).

F9 CHECK CIRCUIT 64S-LH2 (BU/RD) FOR A SHORT TO VOLTAGE

1

1 Measure the voltage between IAJB C283a pin 13, circuit 64S-LH2 (BU/RD), harness side and ground.



A0005093

● **Is any voltage present?**

→ **Yes**
REPAIR the circuit. TEST the system for normal operation.

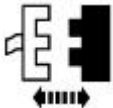
→ **No**
REPAIR or INSTALL a new IAJB. CLEAR the DTCs. REPEAT the self-test.

F10 ISOLATE THE SHORT

1



2



LH Instrument Panel Junction Box C224

3



4 Verify which illumination source is illuminated.

● **Are any illumination sources illuminated?**

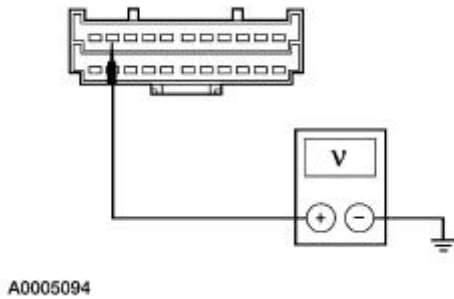
→ **Yes**
If the steering wheel switches are illuminated REPAIR circuit 64-LK18 (BU/RD) for a short to voltage; if the mirror switch is illuminated REPAIR circuit 64S-LH50 (BU/YE) for a short to voltage; if the panel dimmer switch is illuminated REPAIR circuit 64S-LE10 (BU/YE) for a short to voltage; if the headlamp switch is illuminated REPAIR circuit 64S-LH26 (BU/BK) for a short to voltage; if the message center is illuminated REPAIR circuit 64S-GG25 (BU/OG) for a short to

voltage; if the instrument cluster is illuminated REPAIR circuit 64S-LK29 (BU/RD) for a short to voltage. TEST the system for normal operation.

→ **No**
GO to [F11](#).

F11 CHECK CIRCUIT 64S-LK1 (BU) FOR A SHORT TO VOLTAGE

1



1


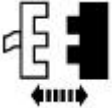

Measure the voltage between LH instrument panel junction box C224 pin 13, circuit 64S-LK1 (BU), harness side and ground.

● **Is any voltage present?**

→ **Yes**
REPAIR the circuit. TEST the system for normal operation.

→ **No**
REPAIR or INSTALL a new LH instrument panel junction box. CLEAR the DTCs. REPEAT the self-test.

PINPOINT TEST G: THE CONTROL ILLUMINATION IS ALWAYS ON — ALL LEDS AND INCANDESCENTS

CONDITIONS	DETAILS/RESULTS/ACTIONS
G1 CHECK THE IAJB FOR A SHORT TO VOLTAGE	
<p>1</p>  <p>FEM C201f</p> <p>2</p>  <p>FEM C201e</p> <p>3</p> 	

- Do all the LEDs and incandescents turn off?



→ **Yes**

INSTALL a new FEM. CLEAR the DTCs. REPEAT the self-test.

→ **No**

REPAIR or INSTALL a new IAJB. CLEAR the DTCs. REPEAT the self-test.

PINPOINT TEST H: A SINGLE ILLUMINATION SOURCE IS INOPERATIVE

CONDITIONS	DETAILS/RESULTS/ACTIONS																				
H1 CHECK THE POWER CIRCUIT TO THE LED OR INCANDESCENT IN QUESTION																					
<p>1</p>  <p>Inoperative Illumination Source</p> <p>2</p> 	<p>3 Turn the headlamps on.</p> <p>4 Turn the panel dimmer switch to the MAX position.</p> <p>5 Measure the voltage between the circuit in question and ground as follows.</p> <table border="1"> <thead> <tr> <th>Connector and Pin</th> <th>Circuit</th> </tr> </thead> <tbody> <tr> <td>LF Power Window Switch C504 pin 11</td> <td>circuit 29S-LH14 (OG/YE)</td> </tr> <tr> <td>RF Power Window Switch C604 pin 6</td> <td>circuit 29S-LH31 (OG/BU)</td> </tr> <tr> <td>RR Power Window Switch C801 pin 6</td> <td>circuit 29S-LH33 (OG/BK)</td> </tr> <tr> <td>LR Power Window Switch C701 pin 6</td> <td>circuit 29S-LH16 (OG)</td> </tr> <tr> <td>LF Power Door Switch C505 pin 6</td> <td>circuit 29S-LH28 (OG/YE)</td> </tr> <tr> <td>RF Power Door Switch C605 pin 6</td> <td>circuit 29S-LH42 (OG/BU)</td> </tr> <tr> <td>Memory Set Switch C503 pin 3</td> <td>circuit 29S-AH27 (OG/YE)</td> </tr> <tr> <td>Selector Lever Indicator Bezel C307 pin 1</td> <td>circuit 64S-LK21 (BU/RD)</td> </tr> <tr> <td>Left Heated Seat Switch C344 pin 6</td> <td>circuit 64S-HC6 (BU)</td> </tr> </tbody> </table>	Connector and Pin	Circuit	LF Power Window Switch C504 pin 11	circuit 29S-LH14 (OG/YE)	RF Power Window Switch C604 pin 6	circuit 29S-LH31 (OG/BU)	RR Power Window Switch C801 pin 6	circuit 29S-LH33 (OG/BK)	LR Power Window Switch C701 pin 6	circuit 29S-LH16 (OG)	LF Power Door Switch C505 pin 6	circuit 29S-LH28 (OG/YE)	RF Power Door Switch C605 pin 6	circuit 29S-LH42 (OG/BU)	Memory Set Switch C503 pin 3	circuit 29S-AH27 (OG/YE)	Selector Lever Indicator Bezel C307 pin 1	circuit 64S-LK21 (BU/RD)	Left Heated Seat Switch C344 pin 6	circuit 64S-HC6 (BU)
Connector and Pin	Circuit																				
LF Power Window Switch C504 pin 11	circuit 29S-LH14 (OG/YE)																				
RF Power Window Switch C604 pin 6	circuit 29S-LH31 (OG/BU)																				
RR Power Window Switch C801 pin 6	circuit 29S-LH33 (OG/BK)																				
LR Power Window Switch C701 pin 6	circuit 29S-LH16 (OG)																				
LF Power Door Switch C505 pin 6	circuit 29S-LH28 (OG/YE)																				
RF Power Door Switch C605 pin 6	circuit 29S-LH42 (OG/BU)																				
Memory Set Switch C503 pin 3	circuit 29S-AH27 (OG/YE)																				
Selector Lever Indicator Bezel C307 pin 1	circuit 64S-LK21 (BU/RD)																				
Left Heated Seat Switch C344 pin 6	circuit 64S-HC6 (BU)																				

Right Heated Seat Switch C342 pin 6	circuit 64S-HC9 (BU/BK)
TC Disable Switch C308 pin 6	circuit 64S-LH45 (BU/OG)
Cigar Lighter C319 pin 3	circuit 64S-LK11 (BU)
Vehicle Emergency Monitoring System (VEMS) Switch C915 pin 5	circuit 64S-GP6 (BU/RD)
Steering Wheel Switch Connector C217 pin 5	circuit 64-LK18
Mirror Switch C204 pin 5	circuit 64S-LH50 (BU/YE)
Panel Dimmer Switch C206 pin 1	circuit 64S-LE10 (BU/YE)
Headlamp Switch C205 pin 5	circuit 64S-LH26 (BU/BK)
Message Center C253 pin 1	circuit 64S-GG25 (BU/OG)

● **Is the voltage greater than 10 volts?**

→ **Yes**

GO to [H2](#).

→ **No**

REPAIR the circuit in question. TEST the system for normal operation.

H2 CHECK THE GROUND CIRCUIT TO THE LED OR INCANDESCENT IN QUESTION

1



2 Turn the headlamps off.

3 Measure the resistance between the circuit in question (using the chart below) and ground.

Connector and Pin	Circuit
LF Power Window Switch C504 pin 14	circuit 31-AJ80 (BK)
RF Power Window Switch C604 pin 4	circuit 31-LH31 (BK)
RR Power Window Switch C801 pin 4	circuit 31-LH33 (BK/GN)
LR Power Window Switch C701 pin 4	circuit 31-LH16 (BK/OG)
LF Power Door Switch C505 pin 4	circuit 31-LH28 (BK)
RF Power Door Switch C605 pin 4	circuit 31-LH42 (BK)
Memory Set Switch C503 pin 4	circuit 31-AH27 (BK)
Selector Lever Indicator Bezel C307 pin 2	circuit 31-LK21 (BK/GN)
Left Heated Seat Switch C344 pin 4	circuit 31-HC6 (BK/YE)

Right Heated Seat Switch C342 pin 4	circuit 31-HC9 (BK/GN)
TC Disable Switch C308 pin 5	circuit 31-LH45 (BK/WH)
Cigar Lighter C319 pin 4	circuit 31-LK11 (BK/YE)
VEMS Switch C915 pin 4	circuit 31-GP6 (BK)
Steering Wheel Switch Connector C217 pin 5	circuit 10-GJ9
Mirror Switch C204 pin 6	circuit 31-LH50 (BK)
Panel Dimmer Switch C206 pin 2	circuit 31-LE10 (BK)
Headlamp Switch C205 pin 4	circuit 31-LH26 (BK)
Message Center C253 pin 2	circuit 31-GG25 (BK)

● **Is the resistance greater than 10,000 ohms?**

→ **Yes**

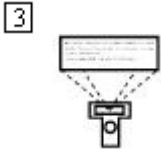
INSTALL a new switch or illuminated component. CLEAR the DTCs. REPEAT the self-test.

→ **No**

REPAIR the circuit. TEST the system for normal operation.

PINPOINT TEST I: THE INSTRUMENT PANEL ILLUMINATION DOES NOT DIM

CONDITIONS	DETAILS/RESULTS/ACTIONS
I1 RETRIEVE DTCs FROM THE INSTRUMENT CLUSTER	
	<p>1 Use the recorded results from the instrument cluster self-test.</p> <p>● Are any DTCs retrieved?</p> <p>→ Yes If DTC B1246, GO to I3.</p> <p>If DTC B1342, CLEAR and DOCUMENT the DTCs. CARRY OUT the instrument cluster self-test. INSTALL a new instrument cluster if DTC B1342 is retrieved again. REFER to Section 413-01. CLEAR the DTCs. REPEAT the self-test.</p> <p>→ No GO to I2.</p>
I2 CHECK THE PANEL DIMMER SWITCH — MONITOR THE INSTRUMENT CLUSTER PID	
1	



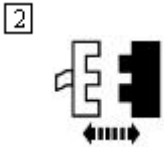
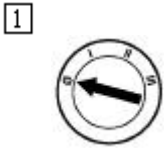
- 2 Turn the headlamps on.
- 3 Select and monitor the instrument cluster PID DSWSTAT while rotating the panel dimmer switch from the lowest position to the highest position.

● **Does the PID value agree with the panel dimmer switch position?**

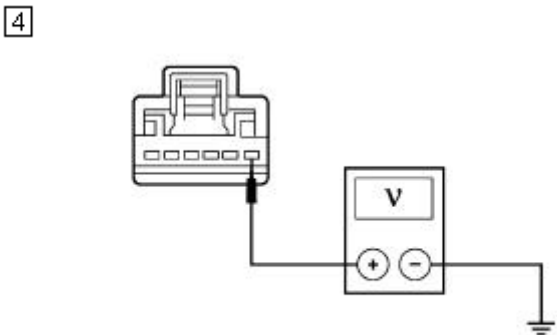
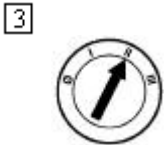
→ **Yes**
INSTALL a new instrument cluster.
REFER to [Section 413-01](#). CLEAR the DTCs. REPEAT the self-test.

→ **No**
GO to [I3](#).

I3 CHECK THE POWER CIRCUIT TO THE PANEL DIMMER SWITCH



Panel Dimmer Switch C206



A0004783

- 4 Measure the voltage between panel dimmer switch C206 pin 1, circuit 64S-LE10 (BU/YE), harness side and ground.

● **Is the voltage greater than 10 volts?**

→ **Yes**
GO to [I4](#).

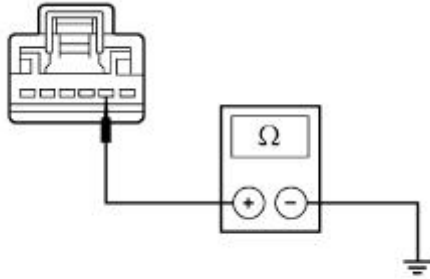
→ **No**
REPAIR the circuit. TEST the system for normal operation.

I4 CHECK THE GROUND CIRCUIT TO THE PANEL DIMMER SWITCH

1



2



A0004784

2 Measure the resistance between panel dimmer switch C206 pin 2, circuit 31-LE10 (BK), harness side and ground.

● Is the resistance less than 5 ohms?

→ **Yes**
GO to [15](#).

→ **No**
REPAIR the circuit. TEST the system for normal operation.

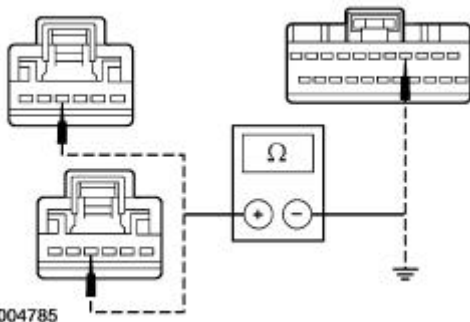
I5 CHECK CIRCUIT 9-LE10 (BN/YE) FOR AN OPEN OR SHORT TO GROUND

1



Instrument Cluster C220c

2



A0004785

2 Measure the resistance between panel dimmer switch C206 pin 4, circuit 9-LE10 (BN/YE), harness side and instrument cluster C220c pin 4, circuit 9-LE10 (BN/YE), harness side; and between panel dimmer switch C206 pin 4, circuit 9-LE10 (BN/YE), harness side and ground.

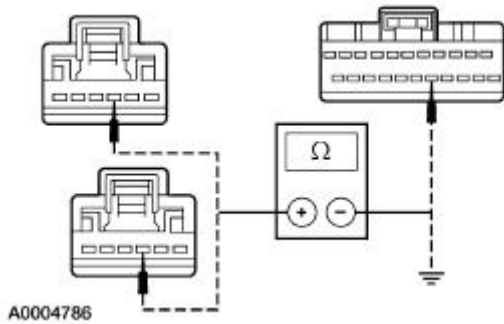
● Is the resistance less than 5 ohms between the panel dimmer switch and instrument cluster; and greater than 10,000 ohms between the panel dimmer switch and ground?

→ **Yes**
GO to [16](#).

→ **No**
REPAIR the circuit. TEST the system for normal operation.

I6 CHECK CIRCUIT 8-LE10 (WH/BK) FOR AN OPEN OR A SHORT TO GROUND

1



1 Measure the resistance between panel dimmer switch C206 pin 3, circuit 8-LE10 (WH/BK), harness side and instrument cluster C220c pin 16, circuit 8-LE10 (WH/BK), harness side; and between panel dimmer switch C206 pin 3, circuit 8-LE10 (WH/BK), harness side and ground.

- Is the resistance less than 5 ohms between the panel dimmer switch and instrument cluster; and greater than 10,000 ohms between the panel dimmer switch and ground?

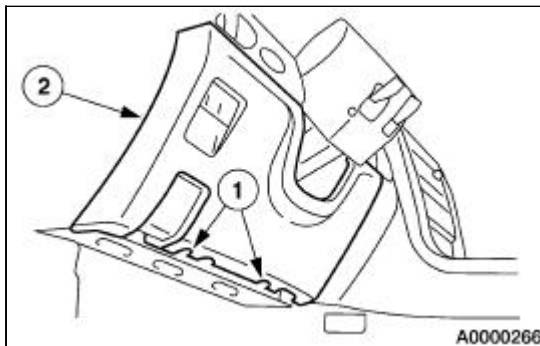
→ **Yes**
INSTALL a new panel dimmer switch.
REFER to [Switch—Panel Dimmer](#).
CLEAR the DTCs. REPEAT the self-test.

→ **No**
REPAIR the circuit. TEST the system for normal operation.

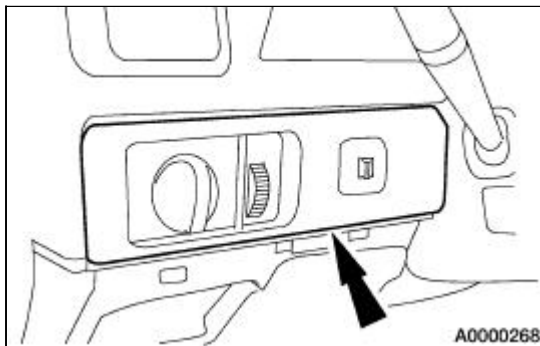
Switch —Panel Dimmer

Removal and Installation

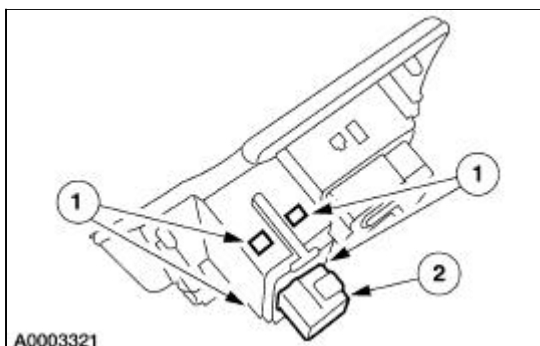
1. Disconnect the battery ground cable. Refer to [Section 414-01](#).
2. Remove the lower instrument panel finish panel.
 1. Remove the bolts.
 2. Remove the lower instrument panel finish panel.



3. Remove the instrument panel finish panel.
 - Disconnect the electrical connectors.



4. Remove the panel dimmer switch.
 1. Release the four retaining clips.
 2. Remove the panel dimmer switch.



5. **NOTE:** When the battery is disconnected and reconnected, some abnormal drive symptoms

may occur while the vehicle relearns its adaptive strategy. The vehicle may need to be driven 16 km (10 miles) or more to relearn the strategy.

To install, reverse the removal procedure.

Torque Specifications

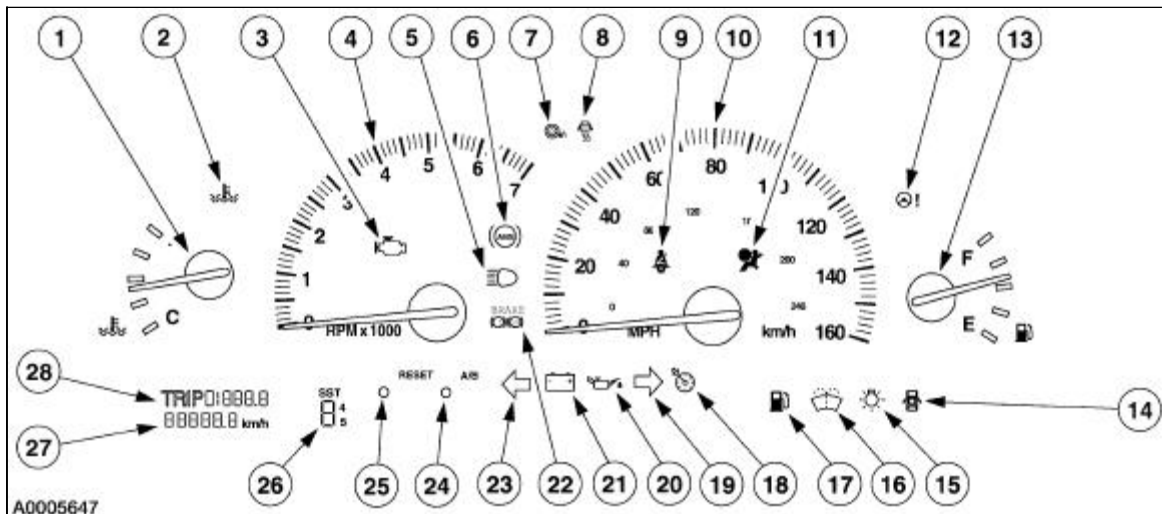
Description	Nm	lb-ft	lb-in
Battery ground cable bolt	10	—	89
Steering column reinforcement bolts	9	—	80
Instrument panel tunnel reinforcement bolts	20	15	—

Instrument Cluster

NOTE: Miles per hour (mph) instrument cluster shown, kilometers per hour (km/h) instrument cluster similar.

The standard instrument cluster consists of the following:

Instrument Cluster (Standard)



A0005647

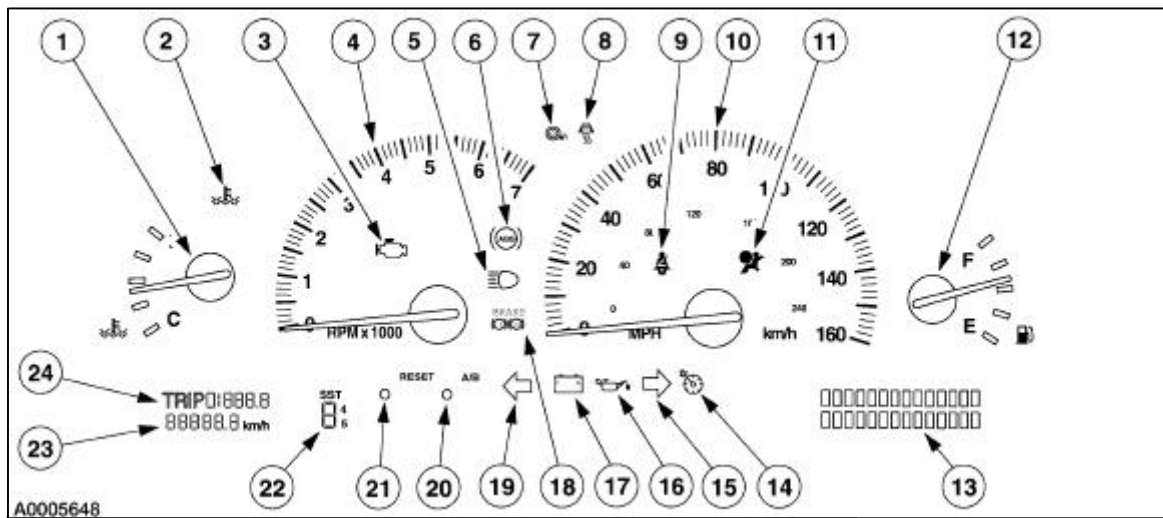
Item	Part Number	Description
1	—	Engine coolant temperature gauge
2	—	Engine over-temperature indicator
3	—	Malfunction indicator lamp (MIL) indicator
4	—	Tachometer
5	—	High beam indicator
6	—	Anti-lock brake system (ABS)
7	—	Traction control indicator
8	—	Advance traction control indicator (if equipped)
9	—	Safety belt indicator
10	—	Speedometer
11	—	Air bag indicator
12	—	Steering column lock indicator (if equipped)
13	—	Fuel gauge
14	—	Door ajar indicator
15	—	Lamp outage indicator
16	—	Low washer fluid indicator
17	—	Low fuel indicator
18	—	Speed control indicator
19	—	Right turn signal indicator

20	—	Low oil pressure indicator
21	—	Charging system indicator
22	—	Brake system warning indicator (BRAKE)
23	—	Left turn signal indicator
24	—	A/B trip odometer button
25	—	Trip odometer button (reset)
26	—	Shift indicator
27	—	Odometer
28	—	Trip odometer

NOTE: Miles per hour (mph) instrument cluster shown, kilometers per hour (km/h) instrument cluster similar.

The optional instrument cluster consists of the following:

Instrument Cluster (Optional)





Item	Part Number	Description
1	—	Engine coolant temperature gauge
2	—	Engine over-temperature indicator
3	—	Malfunction indicator lamp (MIL)
4	—	Tachometer
5	—	High beam indicator
6	—	Anti-lock brake system (ABS)
7	—	Traction control indicator
8	—	Advance traction control indicator
9	—	Safety belt indicator
10	—	Speedometer
11	—	Air bag indicator
12	—	Fuel gauge
13	—	Message center display
14	—	Speed control indicator

15	—	Right turn signal indicator
16	—	Low oil pressure indicator
17	—	Charging system indicator
18	—	Brake system warning indicator (BRAKE)
19	—	Left turn signal indicator
20	—	A/B trip odometer button
21	—	Trip odometer button (reset)
22	—	Shift indicator
23	—	Odometer
24	—	Trip odometer

Instrument Cluster

Refer to Wiring Diagrams Section [413-01](#), Instrument Cluster for schematic and connector information.

Special Tool(s)

 ST2332-A	Worldwide Diagnostic System (WDS) 418-F224, New Generation STAR (NGS) Tester 418-F052, or equivalent diagnostic tool
 ST1137-A	73III Automotive Meter 105-R0057 or equivalent

Principles of Operation

NOTE: The instrument cluster, front electronic module (FEM), and the rear electronic module (REM) must be reconfigured upon replacement. Refer to [Section 418-01](#).

NOTE: The diagnostic tool may display ICM for the instrument cluster.

NOTE: For any concerns with the restraint control module (RCM), refer to [Section 501-20B](#).

The instrument cluster is a hybrid electronic instrument cluster (HEC). The vehicle electronic functions are divided into zones. The instrument cluster, FEM, and REM use the standard corporate protocol (SCP) communication network to transmit and receive information. As a technician, it is very important to understand:

- where the input (command) originates from
- all information (messages) necessary in order for a feature to operate
- which module(s) receive(s) the input or command message
- does the module which received the input (message), control the output of the feature, or does it output a message over the SCP communication network to another module
- which module controls the output of the feature

The instrument cluster communicates with the FEM, REM, anti-lock brake system/traction control/interactive vehicle dynamics (ABS/TC/IVD), powertrain control module (PCM), steering column lock (SCL), message center (MC) module, and the restraint control module (RCM) over the SCP to control the gauges, indicators, and chimes.

Warning Indicator Functionality

Low Oil Pressure Indication

The low oil pressure switch is hardwired to the FEM. The status of the oil pressure is sent from the FEM to the instrument cluster via the standard corporate protocol (SCP) communication network.

Safety Belt Warning Indication

The safety belt switch is hardwired directly to the instrument cluster. The instrument cluster uses the input from the switch to determine whether or not the safety belt is fastened.

Door Ajar Warning Indication (If equipped)

The door switches for the rear of the vehicle are directly hardwired to the REM. The REM uses the multiple inputs from the door switches to determine whether the doors are in the opened or closed position. This information is then relayed from the REM to the instrument cluster via the SCP communication network. The door switches for the front of the vehicle are directly hardwired to the FEM. The FEM uses the multiple inputs from the door switches to determine whether the doors are in the opened or closed position. This information is then relayed to the instrument cluster via the SCP communication network.

Charging System Warning Indication

The charging system is hardwired to the PCM. The status of the charging system is then relayed from the PCM to the instrument cluster via the SCP communication network.

Brake Warning Indication

The brake warning indicator supports three separate functions. Those functions are brake system failure, low brake fluid level, and engagement of the parking brake control. These functions are controlled by the parking brake control switch, the brake fluid level switch and the brake system itself. The brake fluid level switch and the parking brake control switch are hardwired directly to the FEM. The status of both the fluid and parking brake control switches is sent from the FEM to the instrument cluster via the SCP communication network. The brake system status is sent from the ABS/TC/IVD to the instrument cluster via the SCP communication network.

High Beam Indication

The multifunction switch is hardwired directly to the FEM. The headlamp status is then sent from the FEM to the instrument cluster via the SCP communication network.

Low Washer Fluid Warning Indication (If equipped)

The low washer fluid level switch is hardwired directly to the FEM. The FEM monitors the washer fluid level status and sends it to the instrument cluster via the SCP communication network.

Air Bag Warning Indication

The AIR BAG warning indicator will be illuminated when the electronic crash sensor (ECS) sends a ground signal to the instrument cluster. The prove out of the AIR BAG warning indicator is controlled by the ECS.

ABS Warning Indication

The status of the ABS/TC/IVD system is sent to the instrument cluster via the SCP communication network. The instrument cluster uses this input to determine whether or not there is a fault with the ABS/TC/IVD system.

Traction Control Warning Indication

The status of the traction control is communicated to the instrument cluster from the TC/IVD module via the SCP communication network.

Advance Traction Warning Indication

The status of the system is communicated to the instrument cluster from the IVD module via the SCP communication network.

Lamp Outage Warning Indication (If equipped)

The FEM and REM both control the exterior illumination. If the exterior lamps are the cause of the fault, these two modules will notify the instrument cluster via the SCP communication network and cause the lamp outage warning indicator to illuminate.

Malfunction Indicator Lamp (MIL)

After the engine is started, the MIL will prove out for a duration of three seconds. If the instrument cluster does not receive a message from the PCM within five seconds, it will send two messages to the PCM and attempt to reestablish communication. If the instrument cluster is unable to reestablish communication, the instrument cluster will illuminate the MIL and log a diagnostic trouble code (DTC).

Turn/Hazard Indication

The multifunction switch is hardwired directly to the instrument cluster. The instrument cluster sends the signal from the multifunction switch to both the FEM and REM via the SCP communication network while simultaneously illuminating the turn/hazard indicators. The FEM and the REM use these inputs from the instrument cluster to illuminate the exterior lighting as necessary.

Speed Control Indication

The speed control status is monitored by the PCM and then relayed to the instrument cluster via the SCP communication network. The speed control indicator illuminates when the speed control is set.

Low Fuel Warning Indication (If equipped)

There are two fuel tank senders, and they are hardwired directly to the REM. The status of the fuel level from both senders is sent from the REM over the SCP communication network to the instrument cluster. The instrument cluster uses these inputs to determine the overall fuel level in the tank and illuminates the low fuel warning indicator if the fuel level is low.

Engine Over-Temperature Indicator

The cylinder head temperature sending unit is hardwired directly to the PCM. The status of the cylinder head temperature is sent from the PCM over the SCP communication network to the instrument cluster. The instrument cluster then determines whether or not the cylinder head temperature is above the over-temperature threshold.

Steering Column Lock Indication

The steering column lock status is monitored by the instrument cluster from the input of the steering column lock (SCL) module via the standard corporate protocol (SCP) communication network.

Gauge Functionality

Temperature Gauge

The cylinder head temperature sending unit is hardwired directly to the PCM. The status of the cylinder head temperature is sent from the PCM over the SCP communication network to the instrument cluster. Normal operating temperature is 140° F (60° C) to 248° F (120° C). Redline starts at 249.8° F (121° C).

Tachometer Gauge

The crankshaft position sensor is hardwired directly to the PCM. The status of the crankshaft position sensor is sent from the PCM to the instrument cluster via the SCP communication network.

Speedometer Gauge

The vehicle speed signal (VSS) from all four wheels are hardwired directly to the ABS/TC/IVD. The speed status is then sent to the instrument cluster by the ABS/TC/IVD via the SCP communication network.

Fuel Gauge

The fuel gauge system has a saddle-type fuel tank with two integrated fuel senders: the fuel delivery module (FDM) and the jet pump module (JPM). The FDM is located in the right side of the fuel tank and the JPM is located in the left side of the fuel tank. Fuel level status is sent directly to the rear electronic module (REM), which is hardwired to the fuel senders. The REM sends the fuel data to the instrument cluster via the standard corporate protocol (SCP) line. Normal operating range of the FDM is from 16 ± 2 ohms at empty (E) to 155 ± 4 ohms at full (F). Normal operating range of the JPM sender is from 19 ± 2 ohms at empty (E) to 160 ± 2 ohms at full (F). If either the REM or JPM fuel sender has an open or shorted signal, the instrument cluster will log diagnostic trouble code (DTC) B1201. If the JPM sender is open, the fuel gauge will default to the FDM sender value only and the fuel gauge will indicate E to 1/2 tank (depending on the fuel level on the FDM side of the tank). If the FDM is open, the fuel gauge will default to the empty position.

Digital Segment Displays

Trip A/B And Odometer Displays

The vehicle speed signal (VSS) from all four wheels are hardwired directly to the ABS/TC/IVD. The speed status is then sent to the instrument cluster by the ABS/TC/IVD via the SCP communication network to establish a rolling count.

PRNDL Display

The digital transmission range (DTR) sensor is hardwired directly to the PCM. The status of the gear selection is sent to the instrument cluster from the PCM via the SCP communication network.

Parameter Reset and Key Programming

NOTE: The instrument cluster parameters must be reset upon installation of a new instrument cluster.

NOTE: Both passive anti-theft system (PATS) keys are needed to carry out this procedure.

To reset the instrument cluster parameters and program the keys, complete the following procedure:

1. Connect the diagnostic tool.
2. Select the instrument cluster.

3. Select ENTER SECURITY ACCESS. Wait 10 minutes for security access to be granted.
4. Select PARAMETER RESET.
5. Disconnect the diagnostic tool.
6. Place the first PATS key in the OFF position.
7. Place the key in the ON position.
8. Remove the key.
9. Place the second PATS key in the ON position.
10. Place the key in the OFF position (the programming sequence is complete).

NOTE: If the vehicle fails to start following completion of the parameter reset and key programming sequence, clear the keep alive memory (KAM) by disconnecting the battery for five minutes. For additional information about the battery disconnect procedure, refer to [Section 414-00](#).

Inspection and Verification

NOTE: The instrument cluster, REM and FEM must be reconfigured upon replacement. Refer to [Section 418-01](#).

NOTE: For any concerns with the restraint control module (RCM), refer to [Section 501-20B](#).

1. Verify the customer concern by operating the instrument cluster to duplicate the condition by observing the indicators, warning displays, and gauges to determine if they are operating correctly with the ignition switch:
 - in RUN with the engine off
 - in START before the ignition switch is released
 - in RUN with the engine running
2. Visually inspect for obvious signs of mechanical and electrical damage.

Visual Inspection Chart

Mechanical	Electrical
<ul style="list-style-type: none"> ● Low washer fluid level ● Damaged fuel tank ● Low engine coolant level ● Damaged accessory drive belt ● Low engine oil level ● Low brake fluid level 	<ul style="list-style-type: none"> ● Central junction box (CJB) fuse(s): <ul style="list-style-type: none"> ■ 204 (5A) ■ 205 (5A) ■ 207 (5A) ■ 213 (5A) ■ 217 (5A) ■ 219 (15A) ■ 220 (10A) ■ 224 (5A) ■ 229 (5A) ■ 230 (5A) ■ 235 (5A)

- Battery junction box (BJB) fuse(s):
 - 422 (20A)
 - 425 (40A)
 - 427 (30A)
 - 430 (30A)
- Damaged circuitry
- Damaged connectors
- Damaged switches or sensors

3. If the inspection reveals obvious concern(s) that can be readily identified, repair as necessary.
4. If the concern remains after the inspection, connect the diagnostic tool to the data link connector (DLC) located beneath the instrument panel and select the vehicle to be tested from the diagnostic tool menu. If the diagnostic tool does not communicate with the vehicle:
 - check that the program card is correctly installed.
 - check the connections to the vehicle.
 - check the ignition switch position.
5. If the diagnostic tool still does not communicate with the vehicle, refer to the diagnostic tool manual.
6. Carry out the DATA LINK DIAGNOSTIC TEST. If the diagnostic tool responds with:
 - CKT914, CKT915 or CKT70 = ALL ECUS NO RESP/NOT EQUIP, refer to [Section 418-00](#).
 - NO RESP/NOT EQUIP for instrument cluster, GO to Pinpoint Test A.
 - NO RESP/NOT EQUIP for FEM, GO to Pinpoint Test B.
 - NO RESP/NOT EQUIP for REM, GO to Pinpoint Test C.
 - NO RESP/NOT EQUIP for RCM, REFER to [Section 501-20B](#).
 - SYSTEM PASSED, retrieve and record the continuous diagnostic trouble codes (DTCs), erase the continuous DTCs and carry out self-test diagnostics for the instrument cluster.
7. If the DTCs retrieved are related to the concern, go to the Instrument Cluster Diagnostic Trouble Code (DTC) Index to continue diagnostics.
8. If no DTCs related to the concern are retrieved, proceed to the Symptom Chart to continue diagnostics.

Instrument Cluster Diagnostic Trouble Code (DTC) Index

DTC	Description	Source	Action
B1201	Fuel Sender Circuit Failure	Instrument Cluster	GO to Pinpoint Test D .
B1205	EIC Switch-1 Assembly Circuit Failure	Instrument Cluster	INSTALL a new instrument cluster; REFER to Instrument Cluster . TEST the system for normal operation.
B1209	EIC Switch-2 Assembly Circuit Failure	Instrument Cluster	INSTALL a new instrument cluster; REFER to Instrument Cluster . TEST the system for normal operation.
B1213	Anti-Theft Number of Programmed Keys Is Below	Instrument Cluster	REFER to Section 419-01B .

	Minimum		
B1246	Dim Panel Potentiometer Switch Circuit Failure	Instrument Cluster	REFER to Section 413-00 .
B1342	ECU Is Defective	Instrument Cluster	CLEAR and DOCUMENT the DTCs. CARRY OUT the instrument cluster self-test. INSTALL a new instrument cluster if DTC B1342 is retrieved again. REFER to Instrument Cluster .
B1352	Ignition Key-In Circuit Failure	Instrument Cluster	REFER to Section 413-09 .
B1470	Lamp Headlamp Input Circuit Failure	Instrument Cluster	REFER to Section 417-01 .
B1567	Lamp Headlamp High Beam Circuit Failure	Instrument Cluster	REFER to Section 417-01 .
B1600	PATS Ignition Key Transponder Signal Is Not Received	Instrument Cluster	REFER to Section 419-01B .
B1601	PATS Received Incorrect Key-Code From Ignition Key Transponder	Instrument Cluster	REFER to Section 419-01B .
B1602	PATS Received Invalid Format of Key-Code From Ignition Key Transponder	Instrument Cluster	REFER to Section 419-01B .
B1676	Battery Pack Voltage Out of Range	Instrument Cluster	GO to Pinpoint Test J .
B1681	PATS Transceiver Module Signal Is Not Received	Instrument Cluster	REFER to Section 419-01B .
B1689	Autolamp Delay Circuit Failure	Instrument Cluster	REFER to Section 417-01 .
B1875	Turn Signal / Hazard Switch Signal Circuit Failure	Instrument Cluster	REFER to Section 417-01 .
B2103	Antenna Not Connected	Instrument Cluster	REFER to Section 419-01B .
B2139	Security Data Mismatch (Receive Data Does Not Match What Was Expected)	Instrument Cluster	REFER to Section 419-01B .
B2141	NVM Configuration Failure	Instrument Cluster	REFER to Section 419-01B .
B2143	NVM Memory Failure	Instrument Cluster	GO to Pinpoint Test Z .
B2162	Security Data Mismatch #2 (Receive Data Does Not Match What Was Expected)	Instrument Cluster	REFER to Section 419-01B .
B2328	Column Reach Feedback Potentiometer Circuit Failure	Instrument Cluster	REFER to Section 211-04 .
B2332	Column Tilt Feedback Potentiometer Circuit Failure	Instrument Cluster	REFER to Section 211-04 .
B2351	Steering Column Switch Circuit Failure	Instrument Cluster	REFER to Section 211-04 .
B2431	Transponder Programming Failed	Instrument Cluster	REFER to Section 419-01B .
B2472	Fog Lamp Switch Failure	Instrument	REFER to Section 417-01 .

		Cluster	
B2477	Module Configuration Failure	Instrument Cluster	REFER to Section 418-01 .
U1041	SCP (J1850) Invalid or Missing Data for Vehicle Speed	ABS/TC/IVD	CARRY OUT the ABS/TC/IVD self-test.
U1059	SCP (J1850) Invalid or Missing Data for Transmission/Transaxle/PRNDL	PCM	CARRY OUT the PCM self-test.
U1073	SCP (J1850) Invalid or Missing Data for Engine Coolant Fluid Temperature	PCM	CARRY OUT the PCM self-test.
U1123	SCP (J1850) Invalid or Missing Data for Odometer Rolling Count	ABS/TC/IVD	CARRY OUT the ABS/TC/IVD self-test.
U1131	SCP (J1850) Invalid or Missing Data for Fuel System	Instrument Cluster	GO to Pinpoint Test D .
U1147	SCP (J1850) Invalid or Missing Data for Vehicle Security System	PCM	REFER to Section 419-01B .
U1262	SCP (J1850) Communication Bus Fault	Instrument Cluster	REFER to Section 418-00 .

Instrument Cluster Parameter Identification (PID) Index

PID	Description	Expected Value
ABCHIME	Air Bag Chime	OFF, ON
ANTISCN	Anti-Scan Function	DISABL, ENABLE
ASWSTAT	Autolamp Switch Input Status	OFF, DELAY7, DELAY6, DELAY5, DELAY4, DELAY3, DELAY2, DELAY1, INVLD
CCNT	Number Of Continuous DTCs In Module	one count per bit
D_SBELT	Driver Seat Belt	OUT, IN
DSWSTAT	Dimmer Switch Input Status	ON, LVL1, LVL2, LVL3, LVL4, LVL5, LVL6, LVL7, LVL8, LVL9, LVL10, LVL11, LVL12, LVL13, LVL14, LVL15, LVL16, LVL17, LVL18, LVL19, LVL20, LVL21, Invalid
ENABL_S	Vehicle Enable Status	DISABL, ENABLE
FOG_SW, HZ_SW	Fog Lamp Switch, Hazard Switch	OFF, ON, OFF, ON
HEAD_L	Headlamp Switch Input Status	OFF, PARK, HEADLP, R_FOG, INVLD, (OPEN/SHORT)
HIBEAM	High Beam Switch Input Status	OFF, HIGH, PASS, INVLD, (SHORT)
HORN_SW	Horn Input Switch	OFF, ON
IGN_A	Ignition Switch - ACCY Position	NO, YES
IGN_KEY	Ignition Key In / Out	OUT, IN
IGN_O/U	Ignition Switch - OFF/Unlock Position	NO, YES
IGN_R	Ignition Switch - RUN	NO, YES

	Position	
IGN_S	Ignition Switch - START Position	NO, YES
LIGHTSN	Night (True) / Day (False)	NO, YES
LTURN	Left Turn Switch	OFF, ON
MIN#KEY	Minimum Number Of Keys Required	0-67
M_KEY	Master Key Present	notPRE, PRESNT
NUMKEYS	Number Of Keys Stored In Module	one count per bit
PCM_ID	PCM ID Status	notSTR, STORED
PCM_VFY	PCM Verify OK	NO, YES
RESETSW	Reset Switch	OFF, ON
RTURN	Right Turn Switch	OFF, ON
SELECT	Select/Mode Switch	OFF, ON
SERVMOD	Service Module	NO, YES
SPAREKY	Spare key programming: 0 = Enabled, 1 = Disabled	0-14
TILT	Steering Column Tilt Switch	SHORT, UP, DOWN, OFF
TELEPOS	Telescope Position Sensor	notSEN, SENSED
TELESCP	Steering Column Telescope Switch	SHORT, IN, OUT, OFF
TILTPOS	Tilt Position Sensor	notSEN, SENSED
TR_PARK	Transmission Select Lever In Park Pos	NO, YES

Instrument Cluster Active Command Index

Active Command	Display	Action
ANTI-THEFT INDICATOR LAMP	THEFT LAMP	OFF, ON
DISPLAY DIMMING CONTROL	ILLUMINAT	OFF, ON
DISPLAY SEGMENT CONTROL II	SEGMENTS	OFF, ON
DISPLAY SEGMENT CONTROL	SEGMENTS	OFF, ON
ENGINE COOLANT GAUGE CONTROL	ENGCOOLNT	0%-100%
FUEL GAUGE CONTROL	FUELLEVEL	0%-100%
MEMORY SELECT CONTROL	MEMORY 1	OFF, ON
MEMORY SELECT CONTROL	MEMORY 2	OFF, ON
PRNDL DISPLAY CONTROL COMMAND	SEGMENTS	OFF, ON
RF SIGNAL	RF	OFF, ON
SPEEDOMETER CONTROL	SPDOMETER	0%-100%

TACHOMETER CONTROL	TCHOMETER	0%-100%
WARNING LAMPS AND CHIME	ALL LAMPS	OFF, ON
WARNING LAMPS AND CHIME	CHIME	OFF, ON

FEM Diagnostic Trouble Code (DTC) Index

DTC	Description	Source	Action
B1319	Driver Door Ajar Circuit Failure	FEM	REFER to Section 417-02 .
B1327	Passenger Door Ajar Circuit Failure	FEM	REFER to Section 417-02 .
B1342	ECU Is Defective	FEM	CLEAR the DTC. RETRIEVE the DTCs. If DTC B1342 is retrieved, INSTALL a new FEM. REFER to Section 419-10 . CLEAR the DTCs. REPEAT the self-test.
B1438	Wiper Mode Select Switch Circuit Failure	FEM	REFER to Section 501-16 .
B1446	Wiper Park Sense Circuit Failure	FEM	REFER to Section 501-16 .
B1479	Wiper Washer Fluid Level Sensor Circuit Failure	FEM	REFER to Section 413-01 .
B1499	Lamp Turn Signal Left Circuit Failure	FEM	REFER to Section 417-01 .
B1501	Lamp Turn Signal Left Circuit Short to Battery	FEM	REFER to Section 417-01 .
B1503	Lamp Turn Signal Right Circuit Failure	FEM	REFER to Section 417-01 .
B1505	Lamp Turn Signal Right Circuit Short to Battery	FEM	REFER to Section 417-01 .
B1519	Hood Switch Circuit Failure	FEM	REFER to Section 419-01A .
B1567	Lamp Headlamp High Beam Circuit Failure	FEM	REFER to Section 417-01 .
B1676	Battery Pack Voltage Out of Range	FEM	REFER to Section 414-00 .
B1794	Lamp Headlamp Low Beam Circuit Failure	FEM	REFER to Section 417-01 .
B2214	Window Passenger Front Up Switch Short to Battery	FEM	REFER to Section 501-11 .
B2215	Window Passenger Front Down Switch Short to Battery	FEM	REFER to Section 501-11 .
B2312	Mirror Passenger Horizontal Feedback Potentiometer Circuit Failure	FEM	REFER to Section 501-09 .
B2316	Mirror Passenger Vertical Feedback Potentiometer Circuit Failure	FEM	REFER to Section 501-09 .
B2443	Powertrain Performance Mode Switch Circuit Failure	FEM	Not Applicable

B2477	Module Configuration Failure	FEM	REFER to Section 418-01 .
C1284	Oil Pressure Switch Failure	FEM	REFER to Section 413-01 .
C1446	Brake Switch Circuit Failure	FEM	REFER to Section 413-01 .
C1924	VAPS Solenoid Actuator Output Circuit Short to Ground	FEM	REFER to Section 211-00 .
C1925	VAPS Solenoid Actuator Return Circuit Failure	FEM	REFER to Section 211-00 .
U1027	SCP (J1850) Invalid or Missing Data for Engine RPM	PCM	CARRY OUT the PCM self-test.
U1041	SCP (J1850) Invalid or Missing Data for Vehicle Speed	ABS	CARRY OUT the ABS self-test.
U1059	SCP (J1850) Invalid or Missing Data for Transmission / Transaxle / PRNDL	PCM	CARRY OUT the PCM self-test.
U1218	SCP (J1850) Invalid or Missing Data for External Lamps	Instrument Cluster	CARRY OUT the instrument cluster self-test.
U1222	SCP (J1850) Invalid or Missing Data for Interior Lamps	Instrument Cluster	CARRY OUT the instrument cluster self-test.
U1227	SCP (J1850) Invalid or Missing Data for Body Status Request	Instrument Cluster	CARRY OUT the instrument cluster self-test.

FEM Parameter Identification (PID) Index

PID	Description	Expected Value
AL_EVT1	Last 8 Alarm Events	DROPEN, HOODTR, IGNTAM, PANIC, T_AJAR, RR_SD, LR_SD, P_DOOR, D_DOOR, RADIO, WINDO, ULTRS, NOEVNT, BB_SND
AL_EVT2	Last 8 Alarm Events	DROPEN, HOODTR, IGNTAM, PANIC, T_AJAR, RR_SD, LR_SD, P_DOOR, D_DOOR, RADIO, WINDO, ULTRS, NOEVNT, BB_SND
AL_EVT3	Last 8 Alarm Events	DROPEN, HOODTR, IGNTAM, PANIC, T_AJAR, RR_SD, LR_SD, P_DOOR, D_DOOR, RADIO, WINDO, ULTRS, NOEVNT, BB_SND
AL_EVT4	Last 8 Alarm Events	DROPEN, HOODTR, IGNTAM, PANIC, T_AJAR, RR_SD, LR_SD, P_DOOR, D_DOOR, RADIO, WINDO, ULTRS, NOEVNT, BB_SND
AL_EVT5	Last 8 Alarm Events	DROPEN, HOODTR, IGNTAM, PANIC, T_AJAR, RR_SD, LR_SD, P_DOOR, D_DOOR, RADIO, WINDO, ULTRS, NOEVNT, BB_SND
AL_EVT6	Last 8 Alarm Events	DROPEN, HOODTR, IGNTAM, PANIC, T_AJAR, RR_SD, LR_SD, P_DOOR, D_DOOR, RADIO, WINDO, ULTRS, NOEVNT, BB_SND
AL_EVT7	Last 8 Alarm Events	DROPEN, HOODTR, IGNTAM, PANIC, T_AJAR, RR_SD, LR_SD, P_DOOR, D_DOOR, RADIO, WINDO, ULTRS,

		NOEVNT, BB_SND
AL_EVT8	Last 8 Alarm Events	DROPEN, HOODTR, IGNTAM, PANIC, T_AJAR, RR_SD, LR_SD, P_DOOR, D_DOOR, RADIO, WINDO, ULTRS, NOEVNT, BB_SND
CCNT	Number Of Continuous DTCs In Module	one count per bit
D_DOOR	Left Front Door Ajar Switch	CLOSED, AJAR
FLUID_1	Brake Fluid Level Switch #1	OFF, ON
HOOD_SW	Hood Ajar Switch	CLOSED, AJAR
IGN_R	Ignition Switch -RUN Position	NO, YES
L_HIGH	Left High Beam Lamp Driver	Off---, Off-B-, On---, On-B-
L_LOW	Left Low Beam Lamp	Off---, Off-B-, On---, On-B-
LF_TURN	Left Front Turn Lamp	Off---, Off-B-, On---, On-B-
LMRKOUT	Left Front Marker Lamp	Off---, Off-B-, On---, On-B-
OILWRN	Oil Level Warning Lamp	Off---, On---
P_DN_SW	Passenger Down Activated	OFF, DOWN
P_DOOR	Passenger Door Ajar Switch	CLOSED, AJAR
P_UP_SW	Passenger Up Activated	OFF, UP
PRK_BRK	Parking Brake Switch Input	OFF, ON
PSMRPSH	Passenger Mirror Position Sensor (Left/Right)	#####
PSMRPSV	Passenger Mirror Position	#####
PSPWAMP	Power Window Passenger's Peak Motor Current	#####
PWM_DC1	PWM Duty Cycle #1	%
R_HIGH	Right High Beam Lamp Driver	Off---, Off-B-, On---, On-B-
R_LOW	Right Low Beam Lamp	Off---, Off-B-, On---, On-B-
RF_TURN	Right Front Turn Lamp	Off---, Off-B-, On---, On-B-
RMRKSTB	Right Front Marker Lamp	Off---, Off-B-, On---, On-B-
STLKOUT	Steering Column Lock Ground Output	OFF, ON
VBAT	Battery Voltage	Volts
WFLUID	Washer Fluid Level	LOW, OK
WPMODE	Wiper Control Mode Select	WASH, OPEN, INVLD, OFF, INTVL1, INTVL2, INTVL3, INTVL4, INTVL5, INTVL6, INTVL7, LOW, HIGH
WPPRKSW	Windshield Wiper Park Sense	notPRK, PARKED

FEM Active Command Index

Active Command	Display	Action
BACKLIGHTING INTENSITY CONTROL COMMAND	ILLUM	%
BRAKE SYSTEM CONTROL COMMAND	SHFT LOCK	OFF, ON
EXTERIOR LAMP CONTROL	PARKLAMPS	OFF, ON
FRONT WINDOW CONTROL	RR UP	OFF, ON
FRONT WINDOW CONTROL	PR DOWN	OFF, ON
FRONT WINDSHIELD WIPER/WASHER	SPEED RLY	OFF, ON
FRONT WINDSHIELD WIPER/WASHER	WASH RLY	OFF, ON
FRONT WINDSHIELD WIPER/WASHER	WIPER RLY	OFF, ON
HEAD/CORNERING LAMP CONTROL	HIGH BEAM	OFF, ON
HEAD/CORNERING LAMP CONTROL	LOW BEAM	OFF, ON
INDICATOR LAMP CONTROL	NON MIL	OFF, ON
LAMP CONTROL COMMAND	HDLMPWSH	OFF, ON
POWER MIRROR CONTROL	PR DOWN	OFF, ON
POWER MIRROR CONTROL	PR LEFT	OFF, ON
POWER MIRROR CONTROL	PR RIGHT	OFF, ON
POWER MIRROR CONTROL	PR UP	OFF, ON
STEERING COLUMN CONTROL COMMAND	LOCK_GND	OFF, ON
TURN SIGNAL AND MARKER LAMPS	HAZARD	OFF, ON
VAPS II OUTPUT PULSE CONTROL	VAPSIIOUT	%

REM Diagnostic Trouble Code (DTC) Index

DTC	Description	Source	Action
B1201	Fuel Sender Circuit Failure	REM	REFER to Section 413-01 .
B1300	Power Door Lock Circuit Failure	REM	REFER to Section 501-14B .
B1310	Power Door Unlock Circuit Failure	REM	REFER to Section 501-14B .
B1331	Deck Lid Ajar Rear Door Circuit Failure	REM	REFER to Section 417-02 .
B1335	Door Ajar RR Circuit Failure	REM	REFER to Section 417-02 .
B1342	ECU Is Defective	REM	CLEAR the DTC. RETRIEVE the DTCs. If DTC B1342 is retrieved, INSTALL a new REM. REFER to Section 419-10 . CLEAR the DTCs. REPEAT the self-test.
B1483	Brake Pedal Input Circuit Failure	REM	REFER to Section 417-01 .
B1499	Lamp Turn Signal Left Circuit Failure	REM	REFER to Section 417-01 .
B1501	Lamp Turn Signal Left Circuit Short to Battery	REM	REFER to Section 417-01 .

B1503	Lamp Turn Signal Right Circuit Failure	REM	REFER to Section 417-01 .
B1505	Lamp Turn Signal Right Circuit Short to Battery	REM	REFER to Section 417-01 .
B1551	Deck Lid Release Circuit Failure	REM	REFER to Section 501-14B .
B1571	Door Ajar LR Circuit Failure	REM	REFER to Section 417-02 .
B1676	Battery Pack Voltage Out of Range	REM	REFER to Section 414-00 .
B2172	Inertia Switch Input Circuit Open	REM	REFER to Powertrain Control/Emissions Diagnosis (PC/ED) manual.
B2174	Window Driver Rear Remote Up Switch Short to Battery	REM	REFER to Section 501-11 .
B2178	Window Driver Rear Remote Down Switch Short to Battery	REM	REFER to Section 501-11 .
B2190	Window Passenger Rear Remote Up Switch Short to Battery	REM	REFER to Section 501-11 .
B2194	Window Passenger Rear Remote Down Switch Short to Battery	REM	REFER to Section 501-11 .
B2477	Module Configuration Failure	REM	REFER to Section 418-01 .
U1041	SCP (J1850) Invalid or Missing Data for Vehicle Speed	ABS	CARRY OUT the ABS self-test.
U1059	SCP (J1850) Invalid or Missing Data for Transmission/Transaxle/PRNDL	PCM	CARRY OUT the PCM self-test.
U1218	SCP (J1850) Invalid or Missing Data for External Lamps	Instrument Cluster	CARRY OUT the instrument cluster self-test

REM Parameter Identification (PID) Index

PID	Description	Expected Value
BOO	Brake Switch Input	OFF, ON
DECKLID	Deck Lid Ajar Switch	CLOSED, AJAR
DL_DSRM	Deck Lid Disarm	NO, YES
DLIDOUT	Deck Lid Driver	Off---, Off--G, Off-B-, Off-BG, OffO--, OffO-G, OffOB-, OffOBG, On---, On--G, On-B-, On-BG, OnO--, OnO-G, OnOB-, OnOBG
DLIDRLS	Deck Lid Release	OFF, ON
L_TAIL	Left and Right Tail Lamp	Off---, Off--G, Off-B-, Off-BG, OffO--, OffO-G, OffOB-, OffOBG, On---, On--G, On-B-, On-BG, OnO--, OnO-G, OnOB-, OnOBG
LMRKOUT	Left Marker Lamp Driver Output State	OFF, ON
LMRKSTB	Left Marker Lamp Driver Short To Battery	NO, YES
LR_TURN	Left and Right Rear Turn Lamp	Off---, Off--G, Off-B-, Off-BG, OffO--, OffO-G, OffOB-, OffOBG, On---, On--G, On-B-, On-BG, OnO--, OnO-G, OnOB-, OnOBG

LRDN_SW	Left Rear Window Down Switch	OFF, UP
LRDR_SW	Left Rear Door Ajar Switch	CLOSED, AJAR
LRUP_SW	Left Rear Window Up Switch	OFF, DOWN
PD_LOCK	Passenger Door Lock	NO, YES
PD_UNLK	Passenger Door Unlock	NOTLOC, LOCK
R_TAIL	Left and Right Tail Lamp	Off---, Off--G, Off-B-, Off-BG, OffO--, OffO-G, OffOB-, OffOBG, On---, On--G, On-B-, On-BG, OnO--, OnO-G, OnOB-, OnOBG
RR_TURN	Left and Right Rear Turn Lamp	Off---, Off--G, Off-B-, Off-BG, OffO--, OffO-G, OffOB-, OffOBG, On---, On--G, On-B-, On-BG, OnO--, OnO-G, OnOB-, OnOBG
RRDN_SW	Right Rear Window Down Switch	OFF, UP
RRDR_SW	Right Rear Door Ajar Switch	CLOSED, AJAR
RRUP_SW	Right Rear Window Up Switch	OFF, DOWN

REM Active Command Index

Active Command	Display	Action
EXTERIOR LAMP CONTROL	BACKUPLMP	OFF, ON
EXTERIOR LAMP CONTROL	H MNT STP	OFF, ON
EXTERIOR LAMP CONTROL	L STOP	OFF, ON
EXTERIOR LAMP CONTROL	PARKLAMPS	OFF, ON
EXTERIOR LAMP CONTROL	R DEF RLY	OFF, ON
EXTERIOR LAMP CONTROL	R FOG LMP	OFF, ON
EXTERIOR LAMP CONTROL	R STOP	OFF, ON
POWER WINDOW ENABLE COMMAND	PSGR RLY	OFF, ON
REAR DOOR LOCK CONTROL	LR LOCK	OFF, ON
REAR DOOR LOCK CONTROL	LR UNLOCK	OFF, ON
REAR DOOR LOCK CONTROL	RELEASE	OFF, ON
REAR WINDOW CONTROL	LR DOWN	OFF, ON
REAR WINDOW CONTROL	LR UP	OFF, ON
REAR WINDOW CONTROL	RR DOWN	OFF, ON
REAR WINDOW CONTROL	RR UP	OFF, ON
TURN SIGNAL AND MARKER LAMPS	HAZARD	OFF, ON

Symptom Chart

Symptom Chart



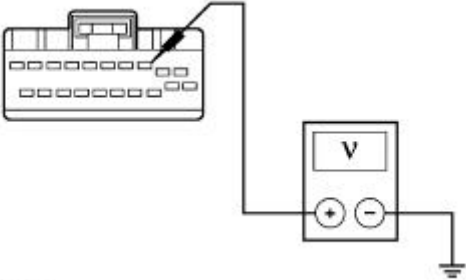
Condition	Possible Sources	Action
<ul style="list-style-type: none"> No communication with the instrument cluster 	<ul style="list-style-type: none"> CJB Fuse 220 (10A). BJB Fuse 425 (40A). Circuitry. J1850 Communication Network (SCP). Instrument Cluster. 	<ul style="list-style-type: none"> GO to Pinpoint Test A.
<ul style="list-style-type: none"> No communication with the front electronic module 	<ul style="list-style-type: none"> BJB Fuses 422 (20A), 425 (40A). Circuitry. FEM. 	<ul style="list-style-type: none"> GO to Pinpoint Test B.
<ul style="list-style-type: none"> No communication with the rear electronic module 	<ul style="list-style-type: none"> BJB Fuse 425 (40A). CJB Mini Fuse 207 (5A). Circuitry. REM. 	<ul style="list-style-type: none"> GO to Pinpoint Test C.
<ul style="list-style-type: none"> Incorrect fuel gauge indication 	<ul style="list-style-type: none"> Fuel tank. Circuitry. REM. Fuel level sender(s). Fuel pump module. Instrument Cluster. 	<ul style="list-style-type: none"> GO to Pinpoint Test D.
<ul style="list-style-type: none"> Incorrect temperature gauge indication 	<ul style="list-style-type: none"> Circuitry. Instrument cluster. Powertrain control module (PCM). Engine coolant temperature sender. 	<ul style="list-style-type: none"> GO to Pinpoint Test E.
<ul style="list-style-type: none"> An indicator is inoperative/always on — low oil pressure 	<ul style="list-style-type: none"> Circuitry. Engine oil pressure. Engine oil pressure switch. FEM. Instrument Cluster. 	<ul style="list-style-type: none"> GO to Pinpoint Test F.
<ul style="list-style-type: none"> The speedometer is inoperative 	<ul style="list-style-type: none"> Circuitry. ABS/TC/IVD. Instrument Cluster. 	<ul style="list-style-type: none"> GO to Pinpoint Test G.
<ul style="list-style-type: none"> The safety belt warning indicator is inoperative/does not operate correctly 	<ul style="list-style-type: none"> Circuitry. Safety belt switch (part of buckle end). Instrument Cluster. 	<ul style="list-style-type: none"> GO to Pinpoint Test H.
<ul style="list-style-type: none"> The door ajar indicator is inoperative/does not operate correctly 	<ul style="list-style-type: none"> Circuitry. FEM. REM. Instrument Cluster. 	<ul style="list-style-type: none"> GO to Pinpoint Test I.
<ul style="list-style-type: none"> The charge system warning indicator is never/always on 	<ul style="list-style-type: none"> Circuitry. Generator (GEN) (10300). PCM. Instrument Cluster. 	<ul style="list-style-type: none"> GO to Pinpoint Test J.
<ul style="list-style-type: none"> The brake warning indicator is always on 	<ul style="list-style-type: none"> Circuitry. Low brake fluid level. Low brake pressure. Parking brake switch. 	<ul style="list-style-type: none"> GO to Pinpoint Test K.

	<ul style="list-style-type: none"> ● Brake fluid level switch. ● ABS/TC/IVD. ● FEM. ● Instrument Cluster. 	
<ul style="list-style-type: none"> ● An indicator is inoperative/always on — high beam 	<ul style="list-style-type: none"> ● Circuitry. ● Multifunction switch. ● Instrument Cluster. ● FEM. 	<ul style="list-style-type: none"> ● GO to Pinpoint Test L.
<ul style="list-style-type: none"> ● An indicator is inoperative/always on — low washer fluid warning 	<ul style="list-style-type: none"> ● Circuitry. ● Low washer fluid switch. ● FEM. ● Instrument Cluster. 	<ul style="list-style-type: none"> ● GO to Pinpoint Test M.
<ul style="list-style-type: none"> ● An indicator is inoperative/always on — ABS warning 	<ul style="list-style-type: none"> ● Circuitry. ● ABS/TC/IVD. ● Instrument Cluster. 	<ul style="list-style-type: none"> ● GO to Pinpoint Test N.
<ul style="list-style-type: none"> ● An indicator is inoperative/always on — traction control and advance traction 	<ul style="list-style-type: none"> ● Circuitry. ● ABS/TC/IVD. ● Instrument Cluster. 	<ul style="list-style-type: none"> ● GO to Pinpoint Test O.
<ul style="list-style-type: none"> ● An indicator is inoperative/always on — lamp outage 	<ul style="list-style-type: none"> ● Bulb. ● Instrument cluster. ● FEM. ● REM. 	<ul style="list-style-type: none"> ● GO to Pinpoint Test P.
<ul style="list-style-type: none"> ● An indicator is inoperative/always on — malfunction indicator lamp (MIL) 	<ul style="list-style-type: none"> ● Circuitry. ● Instrument cluster. ● PCM. 	<ul style="list-style-type: none"> ● GO to Pinpoint Test Q.
<ul style="list-style-type: none"> ● An indicator is inoperative/always on — turn/hazard 	<ul style="list-style-type: none"> ● Circuitry. ● Multifunction switch. ● Instrument cluster. 	<ul style="list-style-type: none"> ● GO to Pinpoint Test R.
<ul style="list-style-type: none"> ● An indicator is inoperative/always on — steering column lock warning 	<ul style="list-style-type: none"> ● Circuitry. ● SCL. ● Instrument Cluster. ● FEM. ● REM. 	<ul style="list-style-type: none"> ● GO to Pinpoint Test S.
<ul style="list-style-type: none"> ● The tachometer is inoperative 	<ul style="list-style-type: none"> ● Circuitry. ● Instrument Cluster. ● PCM. 	<ul style="list-style-type: none"> ● GO to Pinpoint Test T.
<ul style="list-style-type: none"> ● The indicator is inoperative/always on — speed control 	<ul style="list-style-type: none"> ● Circuitry. ● ABS/TC/IVD. ● Instrument Cluster. ● PCM. 	<ul style="list-style-type: none"> ● GO to Pinpoint Test U.
<ul style="list-style-type: none"> ● An indicator is inoperative/always on — PRNDL display 	<ul style="list-style-type: none"> ● Circuitry. ● Digital transmission range sensor. ● PCM. ● Instrument Cluster. 	<ul style="list-style-type: none"> ● GO to Pinpoint Test V.
<ul style="list-style-type: none"> ● An indicator is inoperative/always on — low fuel warning 	<ul style="list-style-type: none"> ● Circuitry. ● PCM. ● Instrument Cluster. ● REM. ● Fuel sender(s). 	<ul style="list-style-type: none"> ● GO to Pinpoint Test W.
<ul style="list-style-type: none"> ● An indicator is inoperative/always on — engine over-temperature 	<ul style="list-style-type: none"> ● Circuitry. ● PCM. ● Instrument Cluster. 	<ul style="list-style-type: none"> ● GO to Pinpoint Test X.
<ul style="list-style-type: none"> ● An indicator is inoperative — air 	<ul style="list-style-type: none"> ● Circuitry. 	<ul style="list-style-type: none"> ● GO to

bag warning	<ul style="list-style-type: none"> ● Instrument cluster. ● Electronic crash sensor (ECS). 	Pinpoint Test Y.
<ul style="list-style-type: none"> ● The air bag warning indicator is always on 	<ul style="list-style-type: none"> ● Circuitry. ● Restraint Control Module (RCM). ● ECS. 	<ul style="list-style-type: none"> ● REFER to Section 501-20B.
<ul style="list-style-type: none"> ● The odometer is inoperative 	<ul style="list-style-type: none"> ● Circuitry. ● Instrument cluster. 	<ul style="list-style-type: none"> ● GO to Pinpoint Test Z.

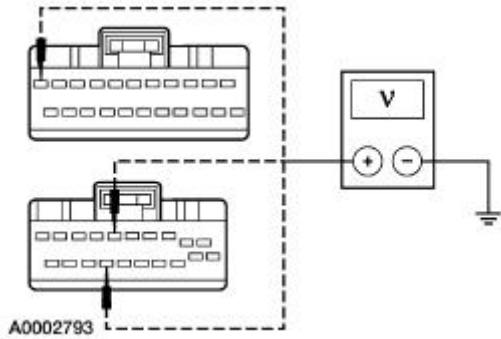
Pinpoint Tests

PINPOINT TEST A: NO COMMUNICATION WITH THE INSTRUMENT CLUSTER

CONDITIONS	DETAILS/RESULTS/ACTIONS
A1 CHECK HOT AT ALL TIMES POWER SUPPLY CIRCUIT	
<p>1</p>  <p>2</p>  <p>Instrument Cluster C220b</p> <p>3</p>  <p>A0002792</p>	<p>3</p> <p>Measure the voltage between instrument cluster C220b pin 3, circuit 29-GG11 (OG/BU), harness side and ground.</p> <ul style="list-style-type: none"> ● Is the voltage greater than 10 volts? <p>→ Yes GO to A2.</p> <p>→ No REPAIR the circuit. TEST the system for normal operation.</p>
A2 CHECK HOT IN RUN POWER SUPPLY CIRCUITS	
1	



2



2 Measure the voltage between the instrument cluster and ground as follows:

Connector Pin	Circuit
C220a pin 11	15-JA14 (GN/BK)
C220b pin 6	15-GG14 (GN/RD)
C220b pin 17	75-GG15 (YE/GN)

• Are the voltages greater than 10 volts?

→ **Yes**
GO to [A3](#).

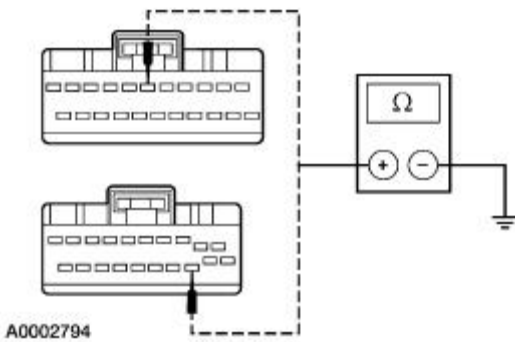
→ **No**
REPAIR the circuit(s). TEST the system for normal operation.

A3 CHECK GROUND CIRCUITS

1



2



2 Measure the resistance between the instrument cluster and ground as follows:


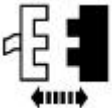
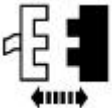

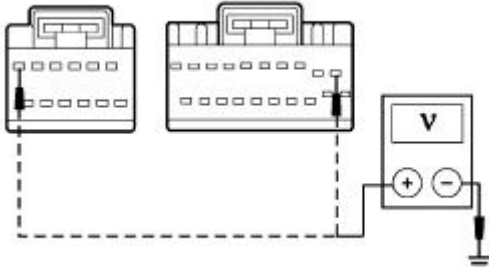
Connector Pin	Circuit
C220a pin 6	31-AL11 (BK)
C220b pin 13	91-GG11 (BN/RD)

• Are the resistances less than 5 ohms?

→ **Yes**
REFER to [Section 418-00](#).

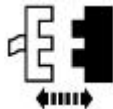
→ **No**
REPAIR the circuit(s). TEST the system for normal operation.

PINPOINT TEST B: NO COMMUNICATION WITH THE FRONT ELECTRONIC MODULE

CONDITIONS	DETAILS/RESULTS/ACTIONS
B1 CHECK CIRCUITS 29-DK20 (OG/GN) AND 29S-DK22 (OG/YE) FOR VOLTAGE	
NOTE: Cycle ignition switch from OFF to RUN to enable the switched system power feature.	
<p>1 </p> <p>2  FEM C201c</p> <p>3  FEM C201f</p> <p>4 </p> <p>5 </p> <p>A0006297</p>	<p>5 Measure the voltage between FEM C201c pin 6, circuit 29-DK20 (OG/GN), harness side and ground; and between FEM C201f pin 1, circuit 29S-DK22 (OG/YE) harness side and ground.</p> <p>● Are the voltages greater than 10 volts?</p> <p>→ Yes GO to B2.</p> <p>→ No REPAIR the circuit(s) in question. TEST the system for normal operation.</p>
B2 CHECK CIRCUITS 31-DK20 (BK/RD), 31-DK20A (BK/RD), 31-DK20B (BK/RD), 31-DK20C (BK/RD) AND 31-DK20D (BK/RD) FOR OPENS	
<p>1</p>	

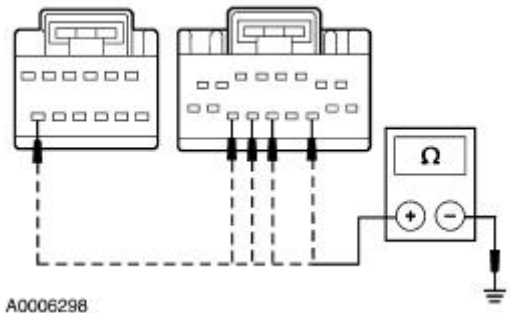


2



FEM C201a

3



A0006298

3 Measure the resistance between FEM connectors, harness side and ground as follows:

FEM	Pin	Circuit
C201c	12	31-DK20 (BK/RD)
C201a	11	31-DK20A (BK/RD)
C201a	13	31-DK20B (BK/RD)
C201a	14	31-DK20C (BK/RD)
C201a	15	31-DK20D (BK/RD)

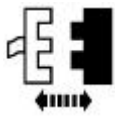
• Are the resistances less than 5 ohms?

→ Yes
REFER to [Section 418-00](#).

→ No
REPAIR the circuit(s) in question. TEST the system for normal operation.

PINPOINT TEST C: NO COMMUNICATION WITH THE REAR ELECTRONIC MODULE

CONDITIONS	DETAILS/RESULTS/ACTIONS
C1 CHECK CIRCUIT 29-DK31 (OG/BK) FOR VOLTAGE	
NOTE: Cycle ignition switch from OFF to RUN to enable the switched system power feature.	
<p>1</p> <p>2</p> <p>REM C420d</p> <p>3</p>	

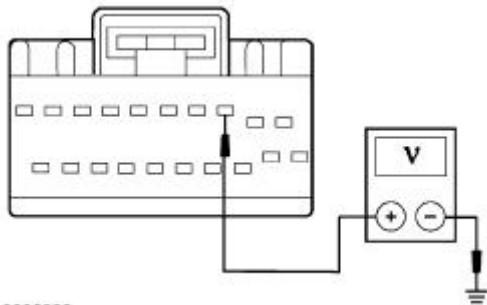


REM C420c

4



5



A0006299

5

Measure the voltage between REM C420d pin 3, circuit 29-DK31 (OG/BK), harness side and ground.

• Is the voltage greater than 10 volts?

→ **Yes**
GO to [C2](#).

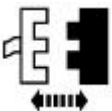
→ **No**
REPAIR the circuit. TEST the system for normal operation.

C2 CHECK CIRCUITS 29S-DK31 (OG/BK), 31-DK30D (BK), 31-DK30E (BK), 31-DK30F (BK), 31-DK30G (BK) AND 31-DK30H (BK/OG), FOR OPENS

1

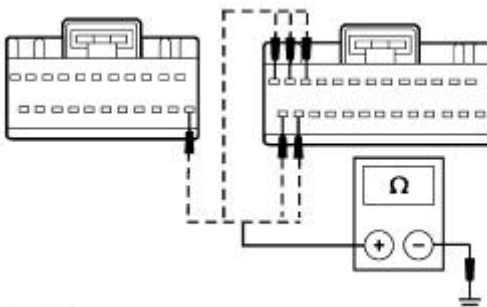


2



REM C420b

3



A0006300

3

Measure the resistance between REM connectors, harness side and ground as follows:


REM	Pin	Circuit
C420c	13	29S-DK31 (OG/BK)
C420c	12	31-DK30E (BK)
C420c	11	31-DK30D (BK)
C420c	26	31-DK30G (BK)
C420c	25	31-DK30F (BK)

C420b | 12 | 31-DK30H (BK/OG)

- Are the resistances less than 5 ohms?

- **Yes**
REFER to [Section 418-00](#).
- **No**
REPAIR the circuit(s) in question. TEST the system for normal operation.

PINPOINT TEST D: INCORRECT FUEL GAUGE INDICATION

CONDITIONS	DETAILS/RESULTS/ACTIONS
D1 RETRIEVE THE RECORDED DTCS FROM BOTH CONTINUOUS AND ON-DEMAND SELF-TESTS — REM AND INSTRUMENT CLUSTER	
NOTE: The fuel gauge does not change indication unless there has been at least eleven liters (three gallons) of fuel added or removed between ignition switch cycle.	
	<p>1 Use recorded REM and instrument cluster DTCs from the continuous and on-demand self-test.</p> <ul style="list-style-type: none"> ● Are any DTCs recorded? <p>→ Yes If REM DTC B1201, or instrument cluster DTC U1131 is retrieved, GO to D7.</p> <p>→ No GO to D2.</p>
D2 CARRY OUT THE INSTRUMENT CLUSTER FUEL GAUGE ACTIVE COMMAND	
<p>1</p>  <p>Instrument Cluster Active Command</p>	<p>1 Select the instrument cluster FUEL GAUGE CONTROL active command.</p> <p>2 Trigger FUELLEVEL active command. Toggle and monitor the fuel gauge while adjusting the FUELLEVEL active command to read 50% and 100%.</p> <ul style="list-style-type: none"> ● Did the fuel gauge needle start at empty (E), move to half at 50%, and full (F) at 100%? <p>→ Yes GO to D3.</p> <p>→ No INSTALL a new instrument cluster;</p>

REFER to [Instrument Cluster](#). CLEAR the DTC. REPEAT the instrument cluster self-test.

D3 CHECK THE FUEL DELIVERY MODULE (FDM) RESISTANCE READING

NOTE: The fuel delivery module (FDM) sender resistance varies from 16 ± 2 ohms when empty (E) to 155 ± 4 ohms when full (F).

1

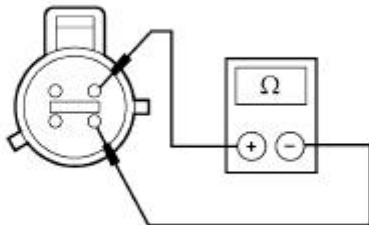


2



(RH) Fuel Delivery Module (FDM)

3



A0006000

3 Measure the resistance between the RH fuel delivery module (FDM) C433 pin 2, circuit 8-GA7 (WH/RD), component side and the FDM C433 pin 3, circuit 9-GA7 (BN/RD), component side.

● Is the resistance within specifications?

→ Yes
GO to [D4](#).

→ No
INSTALL a new FDM. REFER to [Section 310-01](#). TEST the system for normal operation. GO to [D5](#).

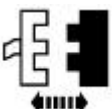
D4 CHECK THE JET PUMP MODULE (JPM) RESISTANCE READING

NOTE: The jet pump module (JPM) sender resistance varies from 19 ± 2 ohms when empty (E) to 160 ± 4 ohms when full (F).

1



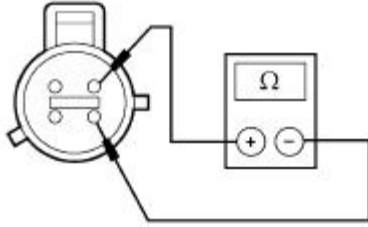
2



(LH) Jet Pump Module (JPM)

3

3 Measure the resistance between the LH jet pump module (JPM) C434 pin 2,



A0006000

circuit 8-GA25 (WH/BU), component side and JPM C434 pin 3, circuit 9-GA25 (BN/WH), component side.

● **Is the resistance within specifications?**

→ **Yes**
GO to [D6](#).

→ **No**
INSTALL a new JPM. REFER to [Section 310-01](#). TEST the system for normal operation. GO to [D5](#).

D5 INSPECT THE FUEL TANK

1 Visually inspect the fuel tank for any damage or deformation.

● **Is the fuel tank OK?**

→ **Yes**
GO to [D6](#).

→ **No**
INSTALL a new fuel tank. REFER to [Section 310-01](#). TEST the system for normal operation.

D6 INSPECT THE FUEL LEVEL SENSOR AND PUMP ASSEMBLY

1 Visually inspect the float and float rod for damage or obstruction.

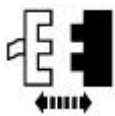
● **Are the fuel pump and wiring OK?**

→ **Yes**
INSTALL a new fuel level sender. REFER to [Section 310-01](#). TEST the system for normal operation.

→ **No**
REPAIR as necessary. REFER to [Section 310-01](#). TEST the system for normal operation.

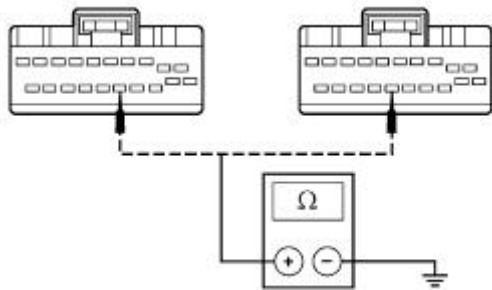
D7 CHECK CIRCUIT 8-GA7 (WH/RD), CIRCUIT 9-GA1 (BN) AND CIRCUIT 8-GA25 (WH/BU) FOR SHORT TO GROUND WITH REM DISCONNECTED

1



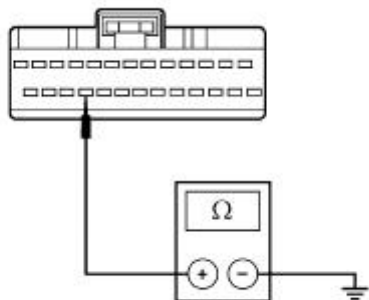
REM

2



A0004796

3



A0004797

2

Measure the resistance between REM C420d pin 15, circuit 8-GA7 (WH/RD), harness side and ground; and between REM C420d pin 16, circuit 8-GA25 (WH/BU), harness side and ground.

3

Measure the resistance between REM C420c pin 23, circuit 9-GA1 (BN), harness side and ground.

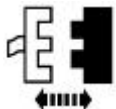
- Are the resistances greater than 10,000 ohms?

→ Yes
GO to [D9](#).

→ No
GO to [D8](#).

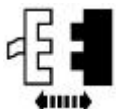
D8 CHECK CIRCUIT 8-GA7 (WH/RD), CIRCUIT 9-GA1 (BN) AND CIRCUIT 8-GA25 (WH/BU) FOR SHORT TO GROUND WITH FUEL PUMP MOTOR AND FUEL SENDER DISCONNECTED

1



Fuel Pump Motor C433

2

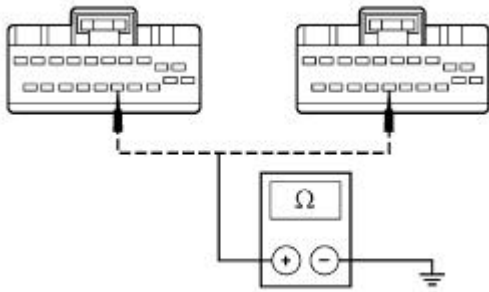


Fuel Sender C434

3

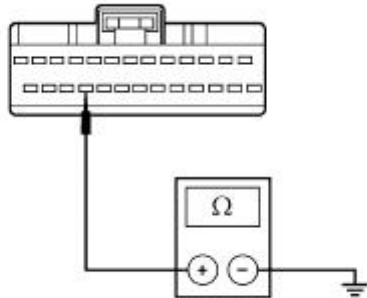
3

Measure the resistance between REM C420d pin 15, circuit 8-GA7 (WH/RD), harness side and ground; and between



A0004796

4



A0004797

REM C420d pin 16, circuit 8-GA25 (WH/BU), harness side and ground.

4 Measure the resistance between REM C420c pin 23, circuit 9-GA1 (BN), harness side and ground.

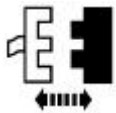
- Are the resistances greater than 10,000 ohms?

→ **Yes**
REPAIR the fuel sender circuit in question. TEST the system for normal operation.

→ **No**
REPAIR the circuit in question. TEST the system for normal operation.

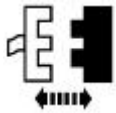
D9 CHECK CIRCUIT 8-GA7 (WH/RD), CIRCUIT 9-GA1 (BN) AND CIRCUIT 8-GA25 (WH/BU) FOR OPEN

1



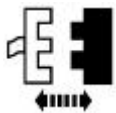
Fuel Pump Motor C433

2



Fuel Sender C434

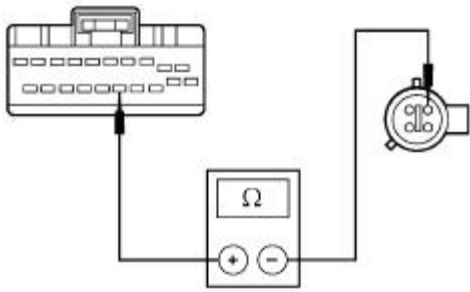
3



REM

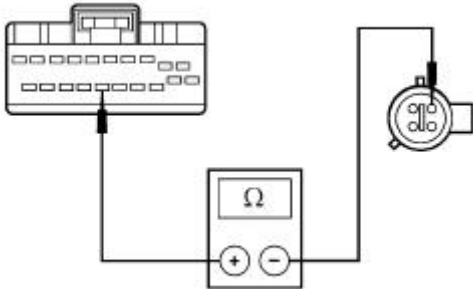
4

4 Measure the resistance between REM



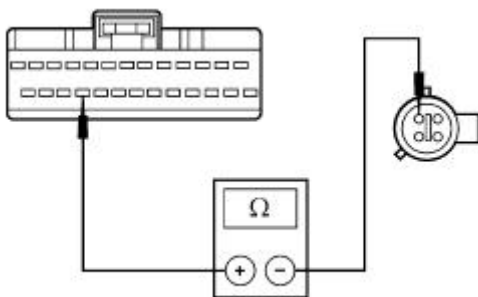
A0004800

5



A0004801

6



A0004802

C420d pin 15, circuit 8-GA7 (WH/RD), harness side and fuel pump motor C433 pin 1, circuit 8-GA7 (WH/RD), harness side.

5 Measure the resistance between REM C420d pin 16, circuit 8-GA25 (WH/BU), harness side and fuel sender C434 pin 1, circuit 8-GA25 (WH/BU), harness side.

6 Measure the resistance between REM C420c pin 23, circuit 9-GA1 (BN), harness side and fuel pump motor C433 pin 3, circuit 9-GA7 (BN/RD), harness side.

• Are the resistances less than 5 ohms?

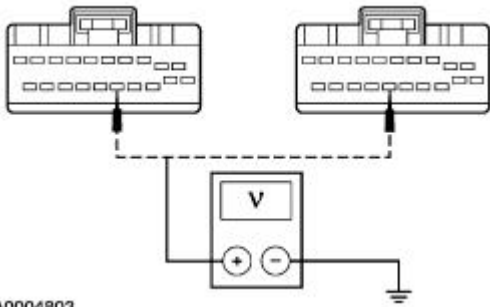
→ **Yes**
GO to [D10](#).

→ **No**
REPAIR the circuit in question. TEST the system for normal operation.

D10 CHECK CIRCUIT 8-GA7 (WH/RD), CIRCUIT 9-GA1 (BN) AND CIRCUIT 8-GA25 (WH/BU) FOR SHORT TO BATTERY

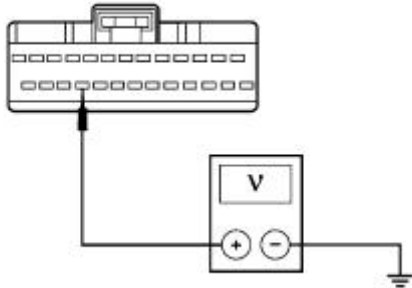
1

1 Measure the voltage between REM C420d pin 15, circuit 8-GA7 (WH/RD), harness side and REM C420d pin 16, circuit 8-GA25 (WH/BU), harness side and ground.



A0004803

2



A0004804

2 Measure the voltage between REM C420c pin 23, circuit 9-GA1 (BN), harness side and ground

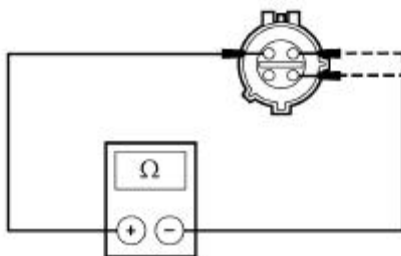
• Is any voltage indicated?

→ **Yes**
REPAIR the circuit in question. TEST the system for normal operation.

→ **No**
GO to [D11](#).

D11 CHECK FUEL PUMP MOTOR CIRCUITS FOR SHORT

1



A0060345

1 Measure the resistance between fuel pump motor C433 pin 1, circuit 15S-RG2A (GN/BU), component side and fuel pump motor C433 pin 2, circuit 8-GA7 (WH/RD), component side, and between fuel pump motor C433 pin 1, circuit 15S-RG2A (GN/BU), component side and fuel pump motor C433 pin 3, circuit 9-GA7 (BN/RD), component side.


• Is the resistance greater than 10,000 ohms?

→ **Yes**
REPAIR in-tank fuel pump module, and fuel sender circuit(s) as necessary. REFER to [Section 310-01](#). TEST the system for normal operation.

→ **No**




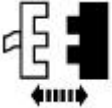


INSTALL a new REM. REFER to [Section 419-10](#). CLEAR the DTCs. REPEAT the self-test. INSTALL a new instrument cluster. If incorrect fuel gauge indication is still present REFER to [Instrument Cluster](#). CLEAR the DTCs. REPEAT the self-test.

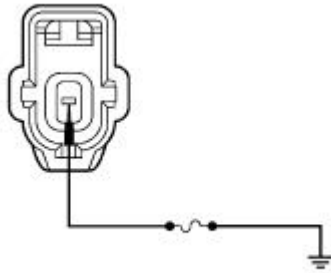
PINPOINT TEST E: INCORRECT TEMPERATURE GAUGE INDICATION

CONDITIONS	DETAILS/RESULTS/ACTIONS
E1 RETRIEVE THE RECORDED DTCS FROM BOTH CONTINUOUS AND ON-DEMAND SELF-TESTS — INSTRUMENT CLUSTER	
	<p>1 Use recorded instrument cluster DTCs from the continuous and on-demand self-test.</p> <ul style="list-style-type: none"> ● Are any instrument cluster DTCs recorded? <p>→ Yes If instrument cluster DTC U1073 is retrieved, REFER to Powertrain Control/Emissions Diagnosis (PC/ED) manual.</p> <p>All other DTCs, refer to the Instrument Cluster Diagnostic Trouble Code (DTC) Index.</p> <p>→ No GO to E2.</p>
E2 CARRY OUT THE INSTRUMENT CLUSTER ENGINE COOLANT TEMPERATURE GAUGE ACTIVE COMMAND	
<p>1</p>  <p>Instrument Cluster Active Command</p>	<p>1 Select the instrument cluster ENGINE COOLANT CONTROL active command.</p> <p>2 Trigger the ENGCOOLNT active command. Toggle and monitor the engine coolant temperature gauge while adjusting the ENGCOOLNT active command to read 50% and 100%.</p> <ul style="list-style-type: none"> ● Did the temperature gauge needle start at cold, move to half at 50%, and full hot at 100%? <p>→ Yes REFER to Powertrain Control/Emissions Diagnosis (PC/ED) manual.</p> <p>→ No INSTALL a new instrument cluster; REFER to Instrument Cluster. CLEAR the DTCs. REPEAT the self-test.</p>

PINPOINT TEST F: AN INDICATOR IS INOPERATIVE/ALWAYS ON —

LOW OIL PRESSURE

CONDITIONS	DETAILS/RESULTS/ACTIONS
F1 CHECK THE INSTRUMENT CLUSTER LOW OIL PRESSURE WARNING INDICATOR ILLUMINATION	
NOTE: Verify that the oil level is at or near the FULL level.	
<p>1  Instrument Cluster Active Command</p> <p>2  Instrument Cluster Active Command</p>	<p>1 Select the instrument cluster WARNING LAMPS AND CHIME active command. Trigger the ALL LAMPS active command ON.</p> <p>2 Trigger OFF the active command ALL LAMPS.</p> <ul style="list-style-type: none"> • Does the low oil pressure warning indicator illuminate when triggered ON, and go off when triggered OFF? <p>→ Yes GO to F2.</p> <p>→ No INSTALL a new instrument cluster. REFER to Instrument Cluster. CLEAR the DTCs. REPEAT the self-test.</p>
F2 MONITOR FEM LOW OIL LEVEL PRESSURE PID OILWRN	
<p>1 </p> <p>2  Oil Pressure Switch C103</p> <p>3 </p> <p>4 </p> <p>5</p>	<p>4 Monitor the FEM PID OILWRN.</p> <p>5 Connect a 10A fused jumper wire between oil pressure switch C103 pin 1, circuit 8-GC21 (WH/GN), harness side</p>



A0004821

and ground.

- Does the FEM PID read ON and OFF alternately?

→ **Yes**

INSTALL a new oil pressure switch. REFER to [Section 303-01A](#) or [Section 303-01B](#). TEST the system for normal operation.

→ **No**

REMOVE the jumper wire, EXIT the FEM PID, GO to [F3](#).

If the fused jumper wire fails, REMOVE the jumper and GO to [F5](#).

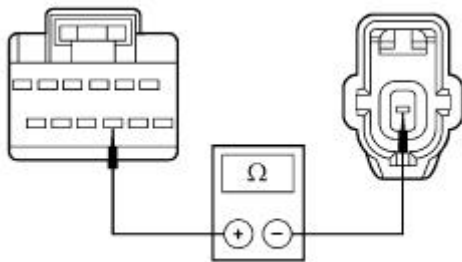
F3 CHECK CIRCUIT 8-GC21 (WH/GN) FOR OPEN

1



FEM 201c

2



A0004822

2

Measure the resistance between FEM C201c pin 9, circuit 8-GC21 (WH/GN), harness side and oil pressure switch C103, circuit 8-GC21 (WH/GN), harness side.

- Is the resistance less than 5 ohms?

→ **Yes**

GO to [F4](#).

→ **No**

REPAIR the circuit. TEST the system for normal operation.

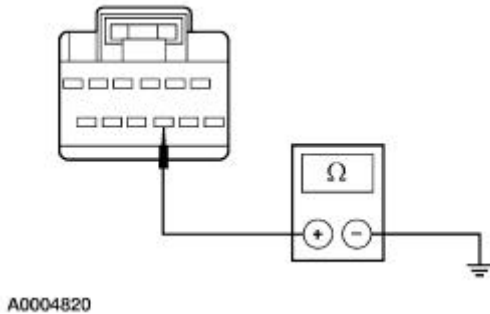
F4 CHECK CIRCUIT 8-GC21 (GN/WH) FOR SHORT TO GROUND

1



FEM C201c

2



3 Measure the resistance between FEM C201c pin 9, circuit 8-GC21 (WH/GN), harness side and ground.

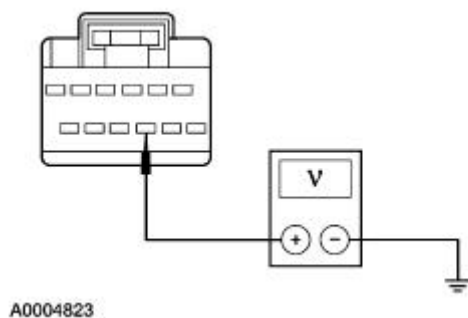
• Is the resistance greater than 10,000 ohms?

→ **Yes**
INSTALL a new FEM. REFER to [Section 419-10](#). CLEAR the DTCs. REPEAT the self-test.

→ **No**
REPAIR the circuit. TEST the system for normal operation.

F5 CHECK CIRCUIT 8-GC21 (WH/GN) FOR SHORT TO BATTERY

1





1 Measure the voltage between FEM C201c pin 9, circuit 8-GC21 (WH/GN), harness side and ground.

• Is any voltage present?





→ **Yes**
REPAIR the circuit. TEST the system for normal operation.

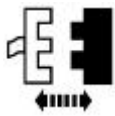
→ **No**
INSTALL a new FEM. REFER to [Section 419-10](#). CLEAR the DTCs. REPEAT the self-test.

PINPOINT TEST G: THE SPEEDOMETER IS INOPERATIVE

CONDITIONS	DETAILS/RESULTS/ACTIONS
G1 RETRIEVE THE RECORDED DTCS FROM BOTH CONTINUOUS AND ON-DEMAND SELF-TESTS — INSTRUMENT CLUSTER	<p>1 Use recorded instrument cluster DTCs from the continuous and on-demand self-test.</p> <ul style="list-style-type: none"> ● Are any DTCs recorded? <p>→ Yes If instrument cluster DTC U1041 is recorded, REFER to Section 206-09A with ABS, REFER to Section 206-09B with ABS/TC, or REFER to Section 206-09C with ABS/TC/IVD.</p> <p>All other instrument cluster DTCs, REFER to the Instrument Cluster Diagnostic Trouble Code (DTC) Index.</p> <p>→ No GO to G2.</p>
G2 CARRY OUT THE INSTRUMENT CLUSTER SPEEDOMETER AND DIGITAL SEGMENT DISPLAY ACTIVE COMMANDS	<p>1  Instrument Cluster Active Command</p> <p>1 Select the instrument cluster SPEEDOMETER COMMAND active command.</p> <p>2 Trigger SPDOMETER and scroll in increments of 10%. Monitor the speedometer gauge. The speedometer should be increasing in increments of 16 mph for every 10%.</p> <p>3  Instrument Cluster Active Command</p> <p>3 Select the instrument cluster DISPLAY SEGMENT CONTROL II active command.</p> <p>4 Trigger the SEGMENTS active command.</p> <ul style="list-style-type: none"> ● Does the speedometer increase within specification and do all segments illuminate? <p>→ Yes REFER to Section 206-09A with ABS, REFER to Section 206-09B with ABS/TC, or REFER to Section 206-09C with stability assist.</p> <p>→ No INSTALL a new instrument cluster. REFER to Instrument Cluster. CLEAR the DTCs. REPEAT the instrument cluster self-test. TEST the system for normal operation.</p>

PINPOINT TEST H: THE SAFETY BELT WARNING INDICATOR IS INOPERATIVE/DOES NOT OPERATE CORRECTLY

CONDITIONS	DETAILS/RESULTS/ACTIONS
H1 MONITOR THE INSTRUMENT CLUSTER SAFETY BELT PID D_SBELT	
<p>1 </p> <p>2  Instrument Cluster PID</p>	<p>2 Select and monitor the instrument cluster PID D_SBELT while fastening and unfastening the safety belt.</p> <ul style="list-style-type: none"> • Does the PID agree with the safety belt position? <p>→ Yes GO to H2.</p> <p>→ No GO to H3.</p>
H2 CARRY OUT THE INSTRUMENT CLUSTER WARNING LAMPS AND CHIME ACTIVE COMMAND	
<p>1  Instrument Cluster Active Command</p>	<p>1 Select the instrument cluster WARNING LAMPS AND CHIME active command ALL LAMPS. Trigger the ALL LAMPS active command.</p> <ul style="list-style-type: none"> • Does the safety belt warning indicator illuminate? <p>→ Yes The system is OK. REFER to the Principles of Operation for the safety belt warning indicator.</p> <p>→ No INSTALL a new instrument cluster. REFER to Instrument Cluster. CLEAR the DTCs. REPEAT the self-test.</p>
H3 CHECK THE SAFETY BELT SWITCH	
<p>1 </p> <p>2</p>	

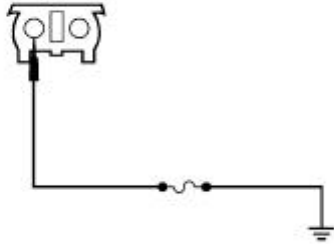


Safety Belt Switch C381

3



4



A0004824

5



Instrument Cluster PID

4 Connect a 10A fused jumper wire between safety belt switch C381, circuit 8-GE52 (WH/BK), harness side and ground.

5 Select and monitor the instrument cluster PID D_SBELT.

6 DISCONNECT the jumper wire. Monitor the instrument cluster PID D_SBELT.

- Does the PID value alternate between IN and OUT?

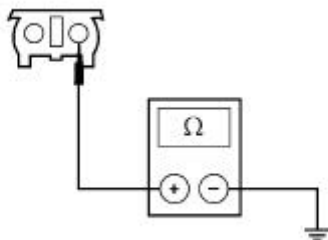
→ Yes
GO to [H4](#).

→ No
REMOVE the jumper wire and GO to [H5](#).

If the fused jumper wire fails, REMOVE the jumper wire and GO to [H6](#).

H4 CHECK THE SAFETY BELT SWITCH CIRCUIT 31-GE52 (BK) FOR OPEN

1



A0004835

1 Measure the resistance between safety belt switch C381, circuit 31-GE52 (BK), component side and ground.

● Is the resistance less than 5 ohms?

→ **Yes**
INSTALL a new buckle end. TEST the system for normal operation.

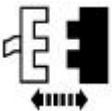
→ **No**
REPAIR the circuit. TEST the system for normal operation.

H5 CHECK SAFETY BELT WARNING INDICATOR CIRCUIT 8-GE52 (WH/BK)

1

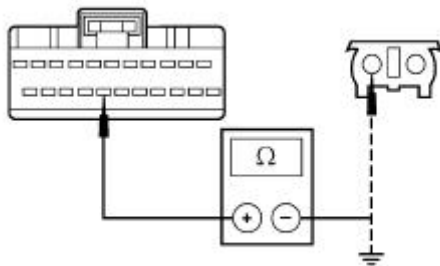


2



Instrument Cluster C220a

3



A0004836

3 Measure the resistance between instrument cluster C220a pin 18, circuit 8-GE52 (WH/BK), harness side and safety belt switch C381, circuit 8-GE52 (WH/BK), harness side; and between instrument cluster C220a pin 18, circuit 8-GE52 (WH/BK), harness side and ground.

● Is the resistance between the instrument cluster and the safety belt switch less than 5 ohms, and greater than 10,000 ohms between the instrument cluster and ground?

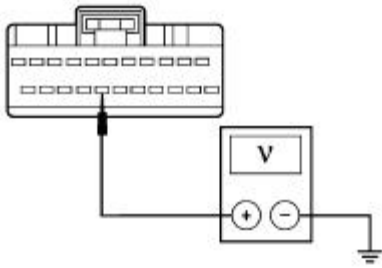
→ **Yes**
GO to [H6](#).

→ **No**
REPAIR the circuit. TEST the system for normal operation.

H6 CHECK CIRCUIT 8-GE52 (WH/BK) FOR SHORT TO BATTERY

1

1 Measure the voltage between instrument cluster C220a pin 18, circuit 8-GE52 (WH/BK), harness side and ground.



A0004837

● Is any voltage present?

→ **Yes**
REPAIR the circuit. TEST the system for normal operation.

→ **No**
GO to [H2](#).

PINPOINT TEST I: THE DOOR AJAR INDICATOR IS INOPERATIVE/DOES NOT OPERATE CORRECTLY

CONDITIONS	DETAILS/RESULTS/ACTIONS
I1 RETRIEVE THE RECORDED DTCS FROM BOTH CONTINUOUS AND ON-DEMAND SELF-TESTS — FEM AND REM	<p>1 Use recorded FEM and REM DTCs from the continuous and on-demand self-test.</p> <p>● Are any FEM or REM DTCs recorded?</p> <p>→ Yes REFER to FEM Diagnostic Trouble Code (DTC) Index or REM Diagnostic Trouble Code (DTC) Index.</p> <p>→ No GO to I2.</p>
I2 CARRY OUT THE INSTRUMENT CLUSTER WARNING LAMPS AND CHIME ACTIVE COMMAND	<p>1 Select the instrument cluster WARNING LAMPS AND CHIME active command. Trigger the ALL LAMPS active command. Observe the door ajar warning indicator.</p> <p>● Does the door ajar warning indicator illuminate?</p> <p>→ Yes REFER to Section 417-02.</p>



1



Instrument Cluster
Active Command

→ **No**
 INSTALL a new instrument cluster. REFER to [Instrument Cluster](#) .
 CLEAR the DTCs. REPEAT the self-test.

PINPOINT TEST J: THE CHARGE SYSTEM WARNING INDICATOR IS NEVER/ALWAYS ON

CONDITIONS	DETAILS/RESULTS/ACTIONS
J1 CHECK CHARGING SYSTEM	
	<p>1 Check the charging system operation. Refer to Section 414-00 .</p> <ul style="list-style-type: none"> ● Is the charging system operating correctly? <p>→ Yes GO to J2 .</p> <p>→ No REFER to Section 414-00 .</p>
J2 CHECK THE CHARGE SYSTEM WARNING INDICATOR	
<p>1</p>  <p>Instrument Cluster Active Command</p> <p>2</p>  <p>Instrument Cluster Active Command</p>	<p>1 Select the instrument cluster WARNING LAMPS AND CHIME active command. Trigger the ALL LAMPS active command ON.</p> <p>2 Trigger OFF the active command ALL LAMPS.</p> <ul style="list-style-type: none"> ● Does the charge system warning indicator illuminate when triggered ON, and go off when triggered OFF? <p>→ Yes REFER to Powertrain Control/Emissions Diagnosis (PC/ED) manual.</p> <p>→ No INSTALL a new instrument cluster. REFER to Instrument Cluster . CLEAR the DTCs. REPEAT the self-test.</p>

PINPOINT TEST K: THE BRAKE WARNING INDICATOR IS ALWAYS ON

CONDITIONS	DETAILS/RESULTS/ACTIONS
K1 CHECK THE INSTRUMENT CLUSTER BRAKE WARNING INDICATOR ILLUMINATION	
1	1 Select the instrument cluster WARNING



Instrument Cluster Active Command

2



Instrument Cluster Active Command

LAMPS AND CHIME active command.
Trigger the ALL LAMPS active command ON.

2

Select the instrument cluster WARNING LAMPS AND CHIME active command.
Trigger the ALL LAMPS active command OFF.

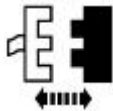
- Does the BRAKE warning indicator illuminate when triggered ON, and go off when triggered OFF?

→ Yes
GO to [K2](#).

→ No
INSTALL a new instrument cluster.
REFER to [Instrument Cluster](#) . CLEAR the DTCs. REPEAT the self-test.

K2 CHECK BRAKE FLUID LEVEL SWITCH

1



Brake Fluid Level Switch C124

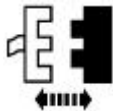
- Does the BRAKE warning indicator continue to illuminate?

→ Yes
GO to [K3](#).

→ No
INSTALL a new brake fluid level switch.
REFER to [Section 206-06](#) . TEST the system for normal operation.

K3 CHECK PARKING BRAKE CONTROL SWITCH

1



Parking Brake Control Switch C306

- Does the BRAKE warning indicator continue to illuminate?

→ Yes
GO to [K4](#).

→ No

INSTALL a new parking brake control switch. REFER to [Section 206-05](#). TEST the system for normal operation.

K4 CHECK BRAKE FLUID LEVEL FEM PID FLUID_1

1

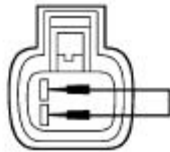


2



FEM PID

3



A0004838

2

Select and monitor FEM PID FLUID_1.

3

Connect a 10A fused jumper wire between brake fluid warning switch C124, circuit 8-GC7 (WH/RD), harness side and ground.

- Does the PID read OFF when the jumper wire is not connected and ON when the jumper wire is connected?

→ Yes

GO to [K5](#).

→ No

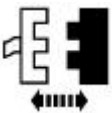
GO to [K6](#).

K5 CHECK PARKING BRAKE CONTROL SWITCH CIRCUIT 31S-RP9 (BK/GN) FOR SHORT TO GROUND

1



2

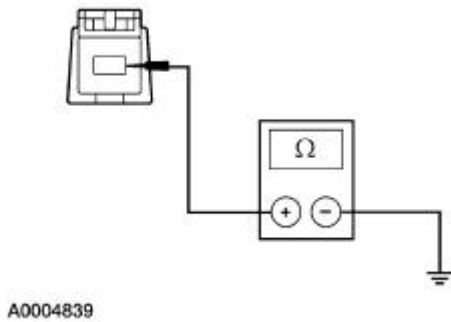


FEM C281

3



4



4

Measure the resistance between parking brake switch C306 pin 1, circuit 31S-RP9 (BK/GN), harness side and ground.

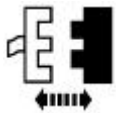
● Is the resistance greater than 10,000 ohms?

→ **Yes**
INSTALL a new FEM. REFER to [Section 419-10](#). CLEAR the DTCs. REPEAT the self-test.

→ **No**
REPAIR the circuit. TEST the system for normal operation.

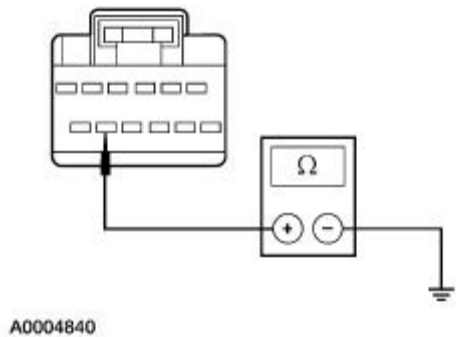
K6 CHECK BRAKE WARNING INDICATOR INPUT CIRCUIT 8-GC7 (WH/RD) FOR SHORT TO GROUND

1



FEM C201c

2



2




Measure the resistance between FEM C201c pin 11, circuit 8-GC7 (WH/RD), harness side and ground.

● Is the resistance greater than 10,000 ohms?

→ **Yes**
INSTALL a new FEM. REFER to [Section 419-10](#). CLEAR the DTCs. REPEAT the self-test.

→ **No**
REPAIR the circuit. TEST the system for normal operation.




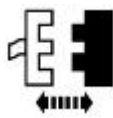

PINPOINT TEST L: AN INDICATOR IS INOPERATIVE/ALWAYS ON — HIGH BEAM

CONDITIONS	DETAILS/RESULTS/ACTIONS
L1 RETRIEVE THE RECORDED DTCS FROM BOTH CONTINUOUS AND ON-DEMAND SELF-TESTS — INSTRUMENT CLUSTER	
	<p>1 Use recorded instrument cluster DTCs from the continuous and on-demand self-test.</p> <ul style="list-style-type: none"> ● Are any instrument cluster DTCs recorded? <p>→ Yes If DTC B1567, REFER to Section 417-01. All other DTCs, REFER to the Instrument Cluster Diagnostic Trouble Code (DTC) Index.</p> <p>→ No GO to L2.</p>
L2 MONITOR THE INSTRUMENT CLUSTER PID LSWMODE	
<p>1</p>  <p>4</p>  <p>Instrument Cluster PID</p>	<p>2 Place headlamp switch in the ON position.</p> <p>3 Verify that the multifunction switch is in the high beam position.</p> <p>4 Select and monitor the instrument cluster PID HIBEAM with the multifunction switch in the high beam position.</p> <ul style="list-style-type: none"> ● Does the PID read HIGH? <p>→ Yes GO to L3.</p> <p>→ No REFER to Section 417-01.</p>
L3 CARRY OUT THE INSTRUMENT CLUSTER WARNING LAMPS AND CHIME ACTIVE COMMAND	
<p>1</p>  <p>Instrument Cluster Active Command</p>	<p>1 Select the instrument cluster WARNING LAMPS AND CHIME active command. Trigger the ALL LAMPS active command.</p> <ul style="list-style-type: none"> ● Does the high beam indicator turn on?

→ **Yes**
REFER to [Section 417-01](#).

→ **No**
INSTALL a new instrument cluster. REFER to [Instrument Cluster](#).
CLEAR the DTCs. REPEAT the self-test.

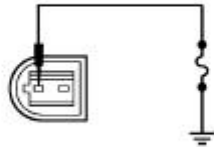
PINPOINT TEST M: AN INDICATOR IS INOPERATIVE/ALWAYS ON — LOW WASHER FLUID WARNING

CONDITIONS	DETAILS/RESULTS/ACTIONS
M1 CHECK THE LOW WASHER FLUID WARNING INDICATOR	
<p>1  Instrument Cluster Active Command</p> <p>2  Instrument Cluster Active Command</p>	<p>1 Select the instrument cluster WARNING LAMPS AND CHIME active command. Trigger the ALL LAMPS active command ON.</p> <p>2 Trigger OFF the active command ALL LAMPS.</p> <ul style="list-style-type: none"> • Does the low washer fluid warning indicator illuminate when triggered ON, and go off when triggered OFF? <p>→ Yes GO to M2.</p> <p>→ No INSTALL a new instrument cluster. REFER to Instrument Cluster. CLEAR the DTCs. REPEAT the self-test.</p>
M2 MONITOR FEM PID WFLUID	
<p>1 </p> <p>2  Washer Fluid Level Switch C138</p> <p>3 </p>	

4



5



A0004841

4

Monitor the FEM PID WFLUID.

5

Connect a 10A fused jumper wire between washer fluid level switch C138, circuit 8-GC8 (WH/GN), harness side and ground.

● Does the FEM PID read ON and OFF alternately?

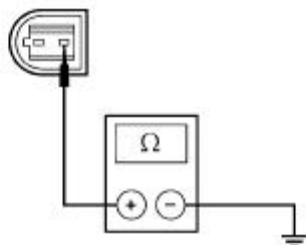
→ **Yes**
GO to [M3](#).

→ **No**
REMOVE the jumper wire, EXIT the FEM PID, GO to [M4](#).

If the fused jumper wire blows, REMOVE the jumper and GO to [M5](#).

M3 CHECK WASHER FLUID LEVEL SWITCH GROUND CIRCUIT 31-GC8 (BK) FOR OPEN

1



A0004810

1

Measure the resistance between washer fluid level switch C138, circuit 31-GC8 (BK), harness side and ground.

● Is the resistance less than 5 ohms?

→ **Yes**
INSTALL a new washer fluid level switch. REFER to [Section 501-16](#). TEST the system for normal operation.

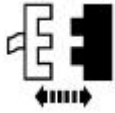
→ **No**
REPAIR the circuit. TEST the system for normal operation.

M4 CHECK CIRCUIT 8-GC8 (WH/BU) FOR SHORT TO GROUND

1

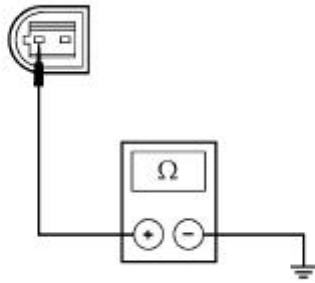


2



FEM C201b

3



A0004806

3 Measure the resistance between washer fluid level switch C138, circuit 8-GC8 (WH/BU), harness side and ground.

• Is the resistance greater than 10,000 ohms?

→ Yes
INSTALL a new FEM. REFER to [Section 419-10](#). CLEAR the DTCs. REPEAT the self-test.

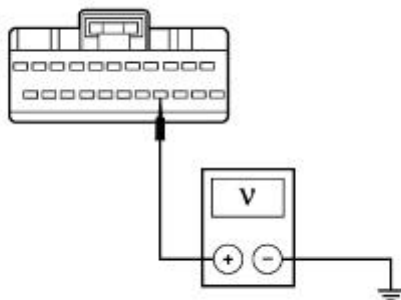
→ No
REPAIR the circuit. TEST the system for normal operation.

M5 CHECK THE LOW WASHER FLUID SWITCH CIRCUIT 8-GC8 (WH/BU) FOR SHORT TO BATTERY

1



2



A0004807


2 Measure the voltage between FEM C201b pin 15, circuit 8-GC8 (WH/BU), harness side and ground.

• Is any voltage present?

→ Yes

	REPAIR the circuit. CLEAR the DTCs. REPEAT the self-test. → No INSTALL a new FEM. REFER to Section 419-10 . CLEAR the DTCs. REPEAT the self-test.
--	--


PINPOINT TEST N: AN INDICATOR IS INOPERATIVE/ALWAYS ON — ABS WARNING

CONDITIONS	DETAILS/RESULTS/ACTIONS
N1 CARRY OUT THE INSTRUMENT CLUSTER ABS WARNING INDICATOR ACTIVE COMMAND USING THE DIAGNOSTIC TOOL	
<div style="border: 1px solid black; padding: 5px; width: fit-content;"> <div style="border: 1px solid black; width: 40px; height: 20px; margin: 0 auto;"></div> <div style="text-align: center; margin: 5px 0;">  </div> <p style="text-align: center; margin: 0;">Instrument Cluster Active Command</p> </div>	<div style="border: 1px solid black; padding: 5px;"> <p>1 Select the instrument cluster WARNING LAMPS AND CHIME active command. Trigger the ALL LAMPS active command. Observe the ABS warning indicator.</p> <p style="text-align: center;">● Does the ABS warning indicator illuminate?</p> <p>→ Yes REFER to Section 206-09A with ABS, REFER to Section 206-09B with ABS/TC, or REFER to Section 206-09C with ABS/TC/IVD.</p> <p>→ No INSTALL a new instrument cluster. REFER to Instrument Cluster. CLEAR the DTCs. REPEAT the self-test.</p> </div>



PINPOINT TEST O: AN INDICATOR IS INOPERATIVE / ALWAYS ON — TRACTION CONTROL AND ADVANCE TRACTION

CONDITIONS	DETAILS/RESULTS/ACTIONS
O1 RETRIEVE THE RECORDED DTCS FROM BOTH CONTINUOUS AND ON-DEMAND SELF-TESTS — INSTRUMENT CLUSTER	
	<div style="border: 1px solid black; padding: 5px;"> <p>1 Use recorded instrument cluster DTCs from the continuous and on-demand self-test.</p> <p style="text-align: center;">● Are any DTCs recorded?</p> <p>→ Yes If DTC U1041, REFER to Section 206-09A with ABS, REFER to Section 206-09B with ABS/TC, or REFER to Section 206-09C with ABS/TC/IVD.</p> <p>All other instrument cluster DTCs, REFER to the Instrument Cluster Diagnostic Trouble Code (DTC) Index.</p> <p>→ No GO to O2.</p> </div>

02 CARRY OUT THE INSTRUMENT CLUSTER WARNING LAMPS AND CHIME ACTIVE COMMAND USING THE DIAGNOSTIC TOOL


<p>1</p>  <p>Instrument Cluster Active Command</p>	<p>1</p> <p>Select the instrument cluster WARNING LAMPS AND CHIME active command. Trigger the ALL LAMPS active command ON and OFF. Observe the traction control and advance traction indicators.</p> <ul style="list-style-type: none"> ● Do both indicators illuminate and turn off? <p>→ Yes REFER to Section 206-09A with ABS, REFER to Section 206-09B with ABS/TC, or REFER to Section 206-09C with ABS/TC/IVD.</p> <p>→ No INSTALL a new instrument cluster. REFER to Instrument Cluster. CLEAR the DTCs. REPEAT the self-test.</p>
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PINPOINT TEST P: AN INDICATOR IS INOPERATIVE / ALWAYS ON — LAMP OUTAGE


CONDITIONS	DETAILS/RESULTS/ACTIONS
P1 CHECK EXTERIOR LIGHTING OPERATION	
<p>1</p>  <p>Instrument Cluster Active Command</p>	<p>1</p> <p>Verify that the exterior lighting operates correctly.</p> <ul style="list-style-type: none"> ● Do all of the exterior lights operate correctly? <p>→ Yes GO to P2.</p> <p>→ No REFER to Section 417-01.</p>
P2 CARRY OUT THE INSTRUMENT CLUSTER WARNING LAMPS AND CHIME ACTIVE COMMAND USING THE DIAGNOSTIC TOOL	
<p>1</p>  <p>Instrument Cluster Active Command</p>	<p>1</p> <p>Select the instrument cluster WARNING LAMPS AND CHIME active command. Trigger the ALL LAMPS active command ON. Observe the lamp outage indicator.</p> <p>2</p> <p>Trigger the ALL LAMPS active command OFF. Observe the lamp outage indicator.</p> <ul style="list-style-type: none"> ● Does the lamp outage indicator illuminate, then turn off? <p>→ Yes GO to P3.</p> <p>→ No</p>


	INSTALL a new instrument cluster. REFER to Instrument Cluster . CLEAR the DTCs. REPEAT the self-test.
P3 RETRIEVE THE RECORDED DTCS FROM BOTH CONTINUOUS AND ON-DEMAND SELF-TESTS — FEM AND REM	
	<p>1 Use recorded REM and FEM DTCs from the continuous and on-demand self-test.</p> <ul style="list-style-type: none"> ● Are any FEM or REM DTCs recorded? <p>→ Yes REFER to the FEM or REM DTC indices.</p> <p>→ No REFER to Section 417-01.</p>

PINPOINT TEST Q: AN INDICATOR IS INOPERATIVE/ALWAYS ON — MALFUNCTION INDICATOR LAMP (MIL)



CONDITIONS	DETAILS/RESULTS/ACTIONS
Q1 CHECK THE INSTRUMENT CLUSTER ILLUMINATION	
<p>1</p>  <p>Instrument Cluster Active Command</p>	<p>1 Select the instrument cluster WARNING LAMPS AND CHIME active command. Trigger the ALL LAMPS active command ON and OFF. Observe the MIL warning indicator.</p> <ul style="list-style-type: none"> ● Does the MIL warning indicator illuminate and turn off? <p>→ Yes REFER to Powertrain Control/Emissions Diagnosis (PC/ED) manual.</p> <p>→ No INSTALL a new instrument cluster. REFER to Instrument Cluster. CLEAR the DTCs. REPEAT the self-test.</p>

PINPOINT TEST R: AN INDICATOR IS INOPERATIVE/ALWAYS ON — TURN / HAZARD

CONDITIONS	DETAILS/RESULTS/ACTIONS
R1 CHECK THE TURN SIGNAL AND HAZARD LAMPS OPERATION	
<p>1</p> 	<p>2 Operate the turn signal on the left and right sides.</p> <p>3 Operate the hazard lamps.</p>



	<ul style="list-style-type: none"> ● Do the turn signals and hazard lamps operate correctly? <p>→ Yes GO to R2.</p> <p>→ No REFER to Section 417-01.</p>
<p>R2 CARRY OUT THE INSTRUMENT CLUSTER WARNING LAMPS AND CHIME ACTIVE COMMAND USING THE DIAGNOSTIC TOOL</p>	
<p>1</p>  <p>Instrument Cluster Active Command</p>	<p>1 Select the instrument cluster WARNING LAMPS AND CHIME active command. Trigger the ALL LAMPS active command ON and OFF. Observe the LH turn and RH turn indicators.</p> <ul style="list-style-type: none"> ● Do the indicators illuminate and turn off? <p>→ Yes REFER to Section 417-01.</p> <p>→ No INSTALL a new instrument cluster. REFER to Instrument Cluster. CLEAR the DTCs. REPEAT the self-test.</p>

PINPOINT TEST S: AN INDICATOR IS INOPERATIVE / ALWAYS ON — STEERING COLUMN LOCK WARNING

CONDITIONS	DETAILS/RESULTS/ACTIONS
<p>S1 CARRY OUT THE INSTRUMENT CLUSTER WARNING LAMPS AND CHIME ACTIVE COMMAND</p>	
<p>1</p>  <p>Instrument Cluster Active Command</p> <p>2</p>  <p>Instrument Cluster Active Command</p>	<p>1 Select the instrument cluster WARNING LAMPS AND CHIME active command. Trigger the ALL LAMPS active command ON.</p> <p>2 Trigger the ALL LAMPS active command OFF.</p> <ul style="list-style-type: none"> ● Did the steering column lock indicator turn on and off with the active command? <p>→ Yes REFER to Section 211-05.</p>

→ **No**
 INSTALL a new instrument cluster. REFER to [Instrument Cluster](#).
 CLEAR the DTCs. REPEAT the self-test.


PINPOINT TEST T: THE TACHOMETER IS INOPERATIVE

CONDITIONS	DETAILS/RESULTS/ACTIONS
T1 CARRY OUT THE INSTRUMENT CLUSTER WARNING LAMPS AND CHIME ACTIVE COMMAND USING THE DIAGNOSTIC TOOL	
<p>1</p>  <p>Instrument Cluster Active Command</p> <p>2</p>  <p>Instrument Cluster Active Command</p>	<p>1</p> <p>Select the instrument cluster TACHOMETER CONTROL active command. Trigger the TCHOMETER active command. Adjust the scroll knob until TCHOMETER reads 50%. Note the tachometer gauge reading.</p> <p>2</p> <p>Adjust the scroll knob until TCHOMETER reads 100%. Note the tachometer gauge reading.</p> <ul style="list-style-type: none"> • Does the tachometer gauge needle start at 0 rpm, move to approximately 3500 rpm at 50% and 7000 rpm at 100%? <p>→ Yes REFER to Powertrain Control/Emissions Diagnosis (PC/ED) manual.</p> <p>→ No INSTALL a new instrument cluster. REFER to Instrument Cluster. CLEAR the DTCs. REPEAT the self-test.</p>


PINPOINT TEST U: AN INDICATOR IS INOPERATIVE/ALWAYS ON — SPEED CONTROL

CONDITIONS	DETAILS/RESULTS/ACTIONS
U1 VERIFY THAT THE SPEED CONTROL AND SPEEDOMETER OPERATE CORRECTLY	
	<p>1</p> <p>Verify that the speed control and the speedometer operate correctly.</p> <ul style="list-style-type: none"> • Do the speed control and speedometer operate correctly? <p>→ Yes GO to U2.</p> <p>→ No If the speed control does not operate correctly, REFER to Section 310-03. If the speedometer does not operate correctly, GO to Pinpoint Test G.</p>

U2 CARRY OUT THE INSTRUMENT CLUSTER WARNING LAMPS AND CHIME ACTIVE COMMAND


<p>1</p>  <p>Instrument Cluster Active Command</p>	<p>1 Select the instrument cluster WARNING LAMPS AND CHIME active command. Trigger the ALL LAMPS active command. Observe the speed control indicator.</p> <p>• Does the speed control indicator illuminate?</p> <p>→ Yes REFER to Section 310-03.</p> <p>→ No INSTALL a new instrument cluster. REFER to Instrument Cluster. CLEAR the DTCs. REPEAT the self-test.</p>
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PINPOINT TEST V: AN INDICATOR IS INOPERATIVE/ALWAYS ON — PRNDL DISPLAY

CONDITIONS	DETAILS/RESULTS/ACTIONS
V1 VERIFY THAT THE PRNDL DISPLAY OPERATES CORRECTLY	
<p>1</p>  <p>Instrument Cluster Active Command</p>	<p>1 Select the instrument cluster DISPLAY SEGMENT CONTROL II active command.</p> <p>2 Trigger the SEGMENTS active command.</p> <p>• Do ALL of the segments illuminate?</p> <p>→ Yes REFER to Section 310-03.</p> <p>→ No INSTALL a new instrument cluster. REFER to Instrument Cluster. CLEAR the DTCs. REPEAT the instrument cluster self-test. TEST the system for normal operation.</p>

PINPOINT TEST W: AN INDICATOR IS INOPERATIVE / ALWAYS ON — LOW FUEL WARNING

CONDITIONS	DETAILS/RESULTS/ACTIONS
W1 RETRIEVE THE RECORDED DTCs FROM BOTH CONTINUOUS AND ON-DEMAND SELF-TESTS — REM AND INSTRUMENT CLUSTER	
	<p>1 Use recorded REM and instrument cluster DTCs from the continuous and on-demand self-test.</p>

	<ul style="list-style-type: none"> ● Are any DTCs recorded? <p>→ Yes If REM DTC B1201, or instrument cluster DTC U1131 is retrieved, GO to Pinpoint Test D.</p> <p>→ No GO to W2.</p>
<p>W2 CARRY OUT THE INSTRUMENT CLUSTER WARNING LAMPS AND CHIME ACTIVE COMMAND USING THE DIAGNOSTIC TOOL</p>	
<p>1</p>  <p>Instrument Cluster Active Command</p>	<p>1</p> <p>Select the instrument cluster WARNING LAMPS AND CHIME active command. Trigger ALL LAMPS active command ON and OFF. Observe the low fuel warning indicator.</p> <ul style="list-style-type: none"> ● Does the low fuel indicator illuminate and turn off? <p>→ Yes GO to Pinpoint Test D.</p> <p>→ No INSTALL a new instrument cluster. REFER to Instrument Cluster. CLEAR the DTCs. REPEAT the self-test.</p>

PINPOINT TEST X: AN INDICATOR IS INOPERATIVE / ALWAYS ON — ENGINE OVER-TEMPERATURE

CONDITIONS	DETAILS/RESULTS/ACTIONS
<p>X1 RETRIEVE THE RECORDED DTCs FROM BOTH CONTINUOUS AND ON-DEMAND SELF-TESTS — INSTRUMENT CLUSTER</p>	
	<p>1</p> <p>Use recorded instrument cluster DTCs from the continuous and on-demand self-test.</p> <ul style="list-style-type: none"> ● Are any DTCs recorded? <p>→ Yes If instrument cluster DTC U1073 is retrieved, REFER to Powertrain Control/Emissions Diagnosis (PC/ED) manual.</p> <p>All other instrument cluster DTCs, REFER to the Instrument Cluster Diagnostic Trouble Code (DTC) Index.</p> <p>→ No GO to X2.</p>
<p>X2 CARRY OUT THE INSTRUMENT CLUSTER WARNING LAMPS AND CHIME ACTIVE COMMAND USING THE DIAGNOSTIC TOOL</p>	
<p>1</p>	<p>1</p> <p>Select the instrument cluster WARNING LAMPS AND CHIME active command. Trigger the ALL LAMPS active command ON and OFF. Observe the engine over-temperature indicator.</p>



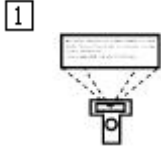
Instrument Cluster
Active Command

- Does the engine over-temperature indicator illuminate and turn off?

→ **Yes**
GO to [Pinpoint Test E](#).

→ **No**
INSTALL a new instrument cluster. REFER to [Instrument Cluster](#).
CLEAR the DTCs. REPEAT the self-test.

PINPOINT TEST Y: AN INDICATOR IS INOPERATIVE/ALWAYS ON — AIR BAG WARNING


CONDITIONS	DETAILS/RESULTS/ACTIONS
Y1 RETRIEVE THE RECORDED DTCS FROM BOTH CONTINUOUS AND ON-DEMAND SELF-TESTS — RCM	<p>1 Use the recorded RCM DTCs from the continuous and on-demand self-tests.</p> <ul style="list-style-type: none"> ● Are any RCM DTCs recorded? <p>→ Yes REFER to Section 501-20B.</p> <p>→ No GO to Y2.</p>
Y2 CARRY OUT THE INSTRUMENT CLUSTER WARNING LAMPS AND CHIME ACTIVE COMMAND USING THE DIAGNOSTIC TOOL	<p>1  Select the instrument cluster WARNING LAMPS AND CHIME active command. Trigger the ALL LAMPS active command ON and OFF. Observe the air bag warning indicator.</p> <ul style="list-style-type: none"> ● Does the air bag warning indicator illuminate and turn off? <p>→ Yes The system is operating correctly at this time.</p> <p>→ No INSTALL a new instrument cluster. REFER to Instrument Cluster. CLEAR the DTCs. REPEAT the self-test.</p>

PINPOINT TEST Z: THE ODOMETER IS INOPERATIVE

CONDITIONS	DETAILS/RESULTS/ACTIONS
<p>Z1 RETRIEVE THE RECORDED DTCS FROM BOTH CONTINUOUS AND ON-DEMAND SELF-TESTS — INSTRUMENT CLUSTER</p>	<p>1 Use recorded instrument cluster DTCs from the continuous and on-demand self-test.</p> <ul style="list-style-type: none"> ● Are there any DTCs recorded? <p>→ Yes If the instrument cluster DTC U1123 is recorded, REFER to Section 206-09A with ABS, Section 206-09B with ABS/TC, or Section 206-09C with ABS/TC/IVD.</p> <p>If DTC B2143, GO to Z2.</p> <p>All other instrument cluster DTCs, REFER to the Instrument Cluster Diagnostic Trouble Code (DTC) Index.</p> <p>→ No GO to Z3.</p>
<p>Z2 VERIFY THE ODOMETER ILLUMINATES</p>	<p>1 Verify that the odometer does illuminate with the ignition in the RUN position.</p> <ul style="list-style-type: none"> ● Does the odometer illuminate? <p>→ Yes GO to Z3.</p> <p>→ No INSTALL a new instrument cluster. REFER to Instrument Cluster. TEST the system for normal operation.</p>
<p>Z3 CHECK THE SPEEDOMETER OPERATION</p>	<p>1 Operate the vehicle to verify that the speedometer operates correctly.</p> <ul style="list-style-type: none"> ● Does the speedometer operate correctly? <p>→ Yes The system is OK.</p> <p>→ No INSTALL a new instrument cluster. REFER to Instrument Cluster. TEST the system for normal operation.</p>

Instrument Cluster

Removal and Installation

1.  **CAUTION:** Prior to removal of the module, it is necessary to upload module configuration information to the diagnostic tool. This information needs to be downloaded into the new module once installed. For additional information, refer to [Section 418-01](#).

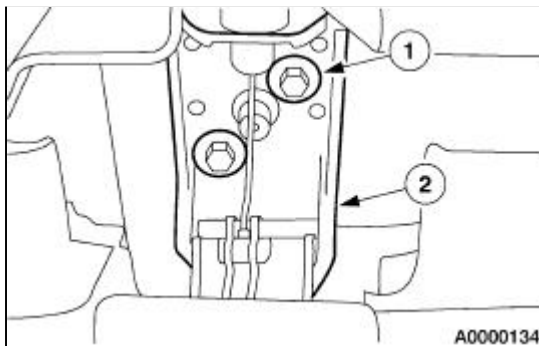
 **CAUTION:** Electronic modules are sensitive to electrical charges. If exposed to these charges, damage may result.

 **CAUTION:** To avoid damaging the instrument cluster lens, place a protective cloth over the upper steering column cover before removing the instrument cluster.

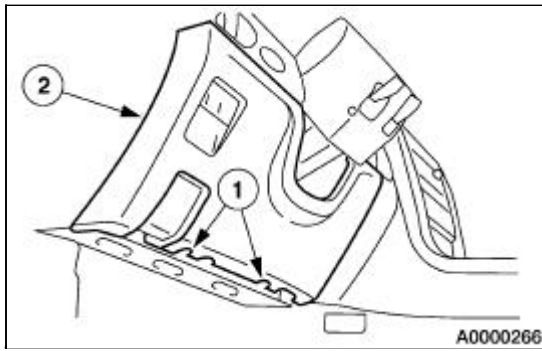
NOTE: The instrument cluster is not repairable at the dealership. Do not disassemble the instrument cluster.

Remove the instrument panel cluster finish panel. For additional information, refer to [Section 501-12](#).

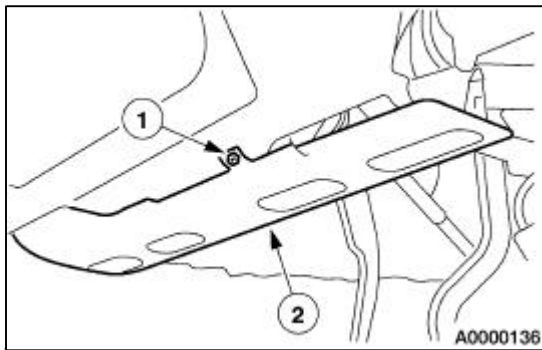
2. Disconnect the battery ground cable. For additional information, refer to [Section 414-01](#).
3. Remove the hood latch release handle.
 1. Remove the bolts.
 2. Remove the handle.



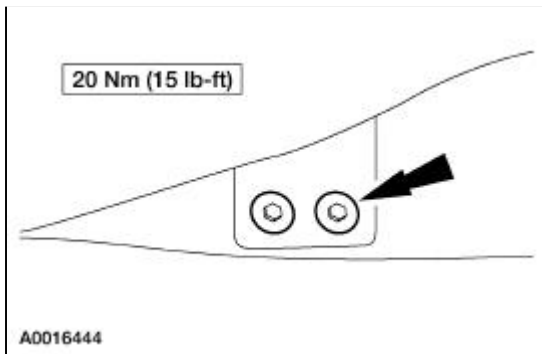
4. Remove the instrument panel steering column cover.
 1. Remove the bolts.
 2. Remove the cover.



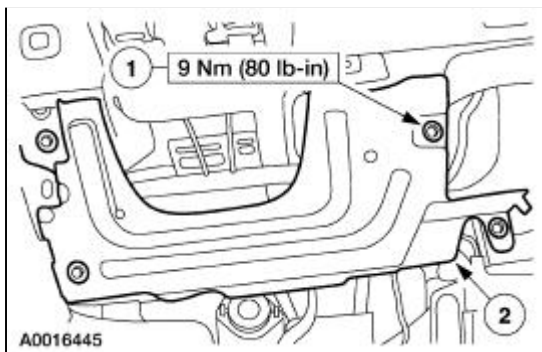
5. Remove the floor heat duct.
 1. Remove the bolt.
 2. Remove the duct.



6. Loosen the two LH instrument panel tunnel brace bolts.

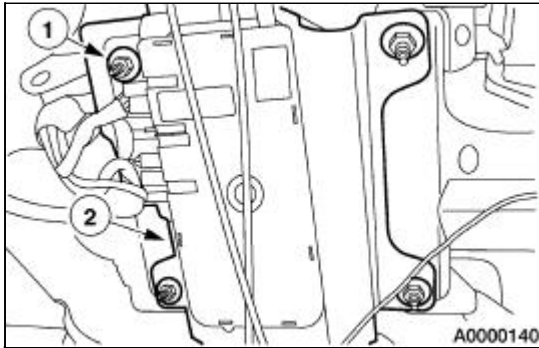


7. Remove the steering column reinforcement.
 1. Remove the bolts.
 2. Remove the reinforcement.

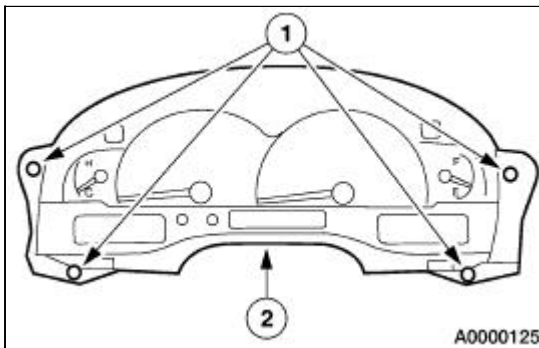


8. Lower the steering column.

1. Loosen, but do not remove, the four nuts.
2. Lower the column.



9. Disconnect the passive anti-theft system (PATS) transceiver electrical connector. For additional information, refer to [Section 419-01B](#).
10. Remove the instrument cluster.
 1. Remove the bolts.
 2. Remove the instrument cluster.
 - Disconnect the electrical connectors.



11. **⚠ CAUTION:** Once the new module is installed, it is necessary to download the module configuration information from the diagnostic tool into the new module. For additional information, refer to [Section 418-01](#).

⚠ CAUTION: To avoid damaging the instrument cluster lens, place a protective cloth over the upper steering column cover before installing the instrument cluster.

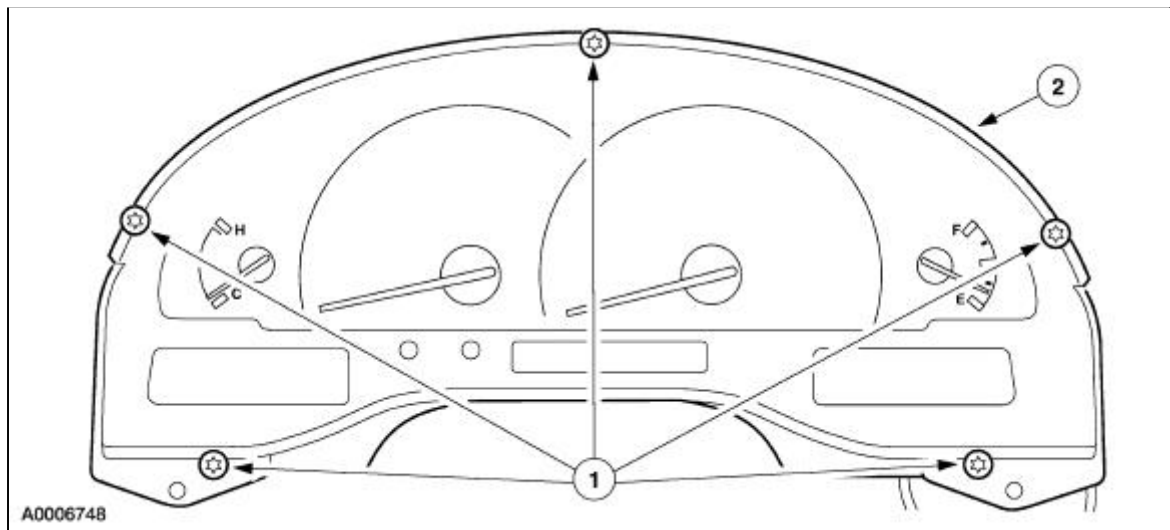
NOTE: Following the installation of a new instrument cluster, carry out the Parameter Reset and Key Programming procedure in this section.

To install, reverse the removal procedure.

Cluster Lens

Removal and Installation

1. Remove the instrument cluster. For additional information, refer to [Instrument Cluster](#) in this section.
2. Remove the cluster lens.
 1. Remove the screws.
 2. Remove the cluster lens.



3. To install, reverse the removal procedure.

Torque Specifications

Description	Nm	lb-ft	lb-in
Horn bolt	20	15	—
Horn switch pad bolt	6	—	53

Horn



The horn system includes the following:

- Horn relay.
 - Horn (13832).
 - Air bag sliding contact (14A664).
 - Steering wheel switch harness.
 - Horn switch.
-

Horn

Refer to Wiring Diagrams Section [413-06](#), Horn for schematic and connector information.

Special Tool(s)

 ST1137-A	73III Automotive Meter 105-R0057 or equivalent
 ST2332-A	Worldwide Diagnostic System (WDS) 418-F224, New Generation STAR (NGS) Tester 418-F052, or equivalent diagnostic tool

Principles of Operation

When the horn switch is depressed, a message is sent from the instrument cluster via the network communication link to the front electronic module (FEM). The FEM acknowledges the message and energizes the horn relay by grounding the horn relay coil which allows the dual note horn to sound.

Inspection and Verification

NOTE: The FEM and instrument cluster must be reconfigured upon replacement. Refer to [Section 418-01](#).

1. Verify the customer concern by operating the horn.
2. Visually inspect for obvious signs of mechanical and electrical damage.

Visual Inspection Chart

Mechanical	Electrical
<ul style="list-style-type: none"> ● Damaged horn ● Damaged horn switch ● Damaged horn relay ● Damaged air bag sliding contact (14A664) C2 	<ul style="list-style-type: none"> ● Battery junction box (BJB) Fuses: <ul style="list-style-type: none"> ■ 425 (40A) ■ 422 (20A) ● Central junction box (CJB) Fuses: <ul style="list-style-type: none"> ■ 202 (5A) ■ 213 (5A) ■ 217 (5A) ■ 220 (10A)

- Auxiliary junction box (AJB) Fuse(s):
 - 104 (15A)
- Damaged circuitry
- Damaged horn relay
- Loose or corroded connections
- Damaged air bag sliding contact (14A664)

3. If the concern remains after the inspection, connect the diagnostic tool to the data link connector (DLC) located beneath the instrument panel and select the vehicle to be tested from the diagnostic tool menu. If the diagnostic tool does not communicate with the vehicle:
 - check that the program card is correctly installed.
 - check the connections to the vehicle.
 - check the ignition switch position.
4. If the diagnostic tool still does not communicate with the vehicle, refer to the diagnostic tool manual.
5. Carry out the DATA LINK DIAGNOSTIC TEST. If the diagnostic tool responds with:
 - CKT914, CKT915 or CKT70 = ALL ECUS NO RESP/NOT EQUIP, refer to [Section 418-00](#).
 - NO RESP/NOT EQUIP for instrument cluster, GO to Pinpoint Test B.
 - NO RESP/NOT EQUIP for FEM, GO to Pinpoint Test A.
 - SYSTEM PASSED, retrieve and record the continuous diagnostic trouble codes (DTCs), erase the continuous DTCs and carry out self-test diagnostics for the instrument cluster and FEM.
6. If the DTCs retrieved are related to the concern, go to the Instrument Cluster Diagnostic Trouble Code (DTC) Index or go to the FEM Diagnostic Trouble Code (DTC) Index to continue diagnostics.
7. If no DTCs related to the concern are retrieved, proceed to Symptom Chart to continue diagnostics.

FEM Diagnostic Trouble Code (DTC) Index

FEM Diagnostic Trouble Code (DTC) Index

DTC	Description	Source	Action
B1319	Driver Door Ajar Circuit Failure	FEM	REFER to Section 417-02 .
B1327	Passenger Door Ajar Circuit Failure	FEM	REFER to Section 417-02 .
B1342	ECU Is Defective	FEM	CLEAR the DTC. RETRIEVE the DTCs. If DTC B1342 is retrieved, INSTALL a new FEM. REFER to Section 419-10 .
B1438	Wiper Mode Select Switch Circuit Failure	FEM	REFER to Section 501-16 .
B1446	Wiper Park Sense Circuit Failure	FEM	REFER to Section 501-16 .
B1479	Wiper Washer Fluid Level Sensor Circuit Failure	FEM	REFER to Section 501-16 .
B1499	Lamp Turn Signal Left Circuit	FEM	REFER to Section 417-01 .

	Failure		
B1501	Lamp Turn Signal Left Circuit Short to Battery	FEM	REFER to Section 417-01 .
B1503	Lamp Turn Signal Right Circuit Failure	FEM	REFER to Section 417-01 .
B1505	Lamp Turn Signal Right Circuit Short to Battery	FEM	REFER to Section 417-01 .
B1519	Hood Switch Circuit Failure	FEM	REFER to Section 419-01A .
B1567	Lamp Headlamp High Beam Circuit Failure	FEM	REFER to Section 417-01 .
B1676	Battery Pack Voltage Out of Range	FEM	REFER to Section 414-00 .
B1794	Lamp Headlamp Low — Beam Circuit Failure	FEM	REFER to Section 417-01 .
B2214	Window Passenger Front Up Switch Short to Battery	FEM	REFER to Section 501-11 .
B2215	Window Passenger Front Down Switch Short to Battery	FEM	REFER to Section 501-11 .
B2312	Mirror Passenger Horizontal Feedback Potentiometer Circuit Failure	FEM	REFER to Section 501-09 .
B2316	Mirror Passenger Vertical Feedback Potentiometer Circuit Failure	FEM	REFER to Section 501-09 .
B2442	Intrusion Sensor Fault	FEM	REFER to Section 419-01A .
B2477	Module Configuration Failure	FEM	REFER to Section 418-01 .
C1284	Oil Pressure Switch Failure	FEM	REFER to Section 413-01 .
C1446	Brake Switch Circuit Failure	FEM	REFER to Section 417-01 .
C1924	VAPS Solenoid Actuator Output Circuit Short to Ground	FEM	REFER to Section 211-00 .
C1925	VAPS Solenoid Actuator Return Circuit Failure	FEM	REFER to Section 211-00 .
U1027	SCP (J1850) Invalid or Missing Data for Engine RPM	PCM	CARRY OUT the PCM self-test.
U1041	SCP (J1850) Invalid or Missing Data Vehicle Speed	ABS	CARRY OUT the ABS self-test.
U1059	SCP (J1850) Invalid or Missing Data for Transmission/ Transaxle/PRNDL	PCM	CARRY OUT the PCM self-test.
U1218	SCP (J1850) Invalid or Missing Data for External Lamps	ICM	CARRY OUT the ICM self-test.
U1222	SCP (J1850) Invalid or Missing Data for Interior Lamps	ICM	CARRY OUT the ICM self-test.
U1227	SCP (J1850) Invalid or Missing Data for Body Status Request	ICM	CARRY OUT the ICM self-test.

FEM Parameter Identification (PID) Index

FEM Parameter Identification (PID) Index

PID	Description	Expected Value
AL_EVT1	Last 8 Alarm Events	DROPEN, HOODTR, IGNTAM, PANIC, T_AJAR, RR_SD, LR_SD, P_DOOR, D_DOOR, RADIO, WINDO, ULTRS, NOEVNT, BB_SND
AL_EVT2	Last 8 Alarm Events	DROPEN, HOODTR, IGNTAM, PANIC, T_AJAR, RR_SD, LR_SD, P_DOOR, D_DOOR, RADIO, WINDO, ULTRS, NOEVNT, BB_SND
AL_EVT3	Last 8 Alarm Events	DROPEN, HOODTR, IGNTAM, PANIC, T_AJAR, RR_SD, LR_SD, P_DOOR, D_DOOR, RADIO, WINDO, ULTRS, NOEVNT, BB_SND
AL_EVT4	Last 8 Alarm Events	DROPEN, HOODTR, IGNTAM, PANIC, T_AJAR, RR_SD, LR_SD, P_DOOR, D_DOOR, RADIO, WINDO, ULTRS, NOEVNT, BB_SND
AL_EVT5	Last 8 Alarm Events	DROPEN, HOODTR, IGNTAM, PANIC, T_AJAR, RR_SD, LR_SD, P_DOOR, D_DOOR, RADIO, WINDO, ULTRS, NOEVNT, BB_SND
AL_EVT6	Last 8 Alarm Events	DROPEN, HOODTR, IGNTAM, PANIC, T_AJAR, RR_SD, LR_SD, P_DOOR, D_DOOR, RADIO, WINDO, ULTRS, NOEVNT, BB_SND
AL_EVT7	Last 8 Alarm Events	DROPEN, HOODTR, IGNTAM, PANIC, T_AJAR, RR_SD, LR_SD, P_DOOR, D_DOOR, RADIO, WINDO, ULTRS, NOEVNT, BB_SND
AL_EVT8	Last 8 Alarm Events	DROPEN, HOODTR, IGNTAM, PANIC, T_AJAR, RR_SD, LR_SD, P_DOOR, D_DOOR, RADIO, WINDO, ULTRS, NOEVNT, BB_SND
CCNT	Number Of Continuous DTCs In Module	one count per bit
D_DOOR	Left Front Door Ajar Switch	CLOSED, AJAR
FLUID_1	Brake Fluid Level Switch #1	OFF, ON
HOOD_SW	Hood Ajar Switch	CLOSED, AJAR
IGN_R	Ignition Switch -RUN Position	NO, YES
L_HIGH	Left High Beam Lamp Driver	Off---, Off-B-, On---, On-B-
L_LOW	Left Low Beam Lamp	Off---, Off-B-, On---, On-B-
LF_TURN	Left Front Turn Lamp	Off---, Off-B-, On---, On-B-
LMRKOUT	Left Front Marker Lamp	Off---, Off-B-, On---, On-B-
OILWRN	Oil Level Warning Lamp	Off---, On---
P_DN_SW	Passenger Down Activated	OFF, DOWN
P_DOOR	Passenger Door Ajar Switch	CLOSED, AJAR
P_UP_SW	Passenger Up Activated	OFF, UP
PRK_BRK	Parking Brake Switch Input	OFF, ON
PSMRPSH	Passenger Mirror Position Sensor (Left/Right)	#####

PSMRPSV	Passenger Mirror Position	#####
PSPWAMP	Power Window Passenger's Peak Motor Current	#####
PWM_DC1	PWM Duty Cycle #1	%
R_HIGH	Right High Beam Lamp Driver	Off---, Off-B-, On---, On-B-
R_LOW	Right Low Beam Lamp	Off---, Off-B-, On---, On-B-
RADIOSW	Security Input Switch Status	OFF, ON
RF_TURN	Right Front Turn Lamp	Off---, Off-B-, On---, On-B-
RMRKSTB	Right Front Marker Lamp	Off---, Off-B-, On---, On-B-
STLKOUT	Steering Column Lock Ground Output	OFF, ON
VBAT	Battery Voltage	V
WFLUID	Washer Fluid Level	LOW, OK
WPMODE	Wiper Control Mode Select	WASH, OPEN, INVLD, OFF, INTVL1, INTVL2, INTVL3, INTVL4, INTVL5, INTVL6, INTVL7, LOW, HIGH
WPPRKS	Windshield Wiper Park Sense	notPRK, PARKED

FEM Active Command Index

FEM Active Command Index

Active Command	Display	Action
BACKLIGHTING INTENSITY CONTROL COMMAND	ILLUM	%
BRAKE SYSTEM CONTROL COMMAND	SHFT LOCK	OFF, ON
EXTERIOR LAMP CONTROL	PARKLAMPS	OFF, ON
FRONT WINDOW CONTROL	RR UP	OFF, ON
FRONT WINDOW CONTROL	PR DOWN	OFF, ON
FRONT WINDSHIELD WIPER/WASHER	SPEED RLY	OFF, ON
FRONT WINDSHIELD WIPER/WASHER	WASH RLY	OFF, ON
FRONT WINDSHIELD WIPER/WASHER	WIPER RLY	OFF, ON
HEAD/CORNERING LAMP CONTROL	HIGH BEAM	OFF, ON
HEAD/CORNERING LAMP CONTROL	LOW BEAM	OFF, ON
INDICATOR LAMP CONTROL	NON MIL	OFF, ON
LAMP CONTROL COMMAND	HDLMPWSH	OFF, ON
POWER MIRROR CONTROL	PR DOWN	OFF, ON
POWER MIRROR CONTROL	PR LEFT	OFF, ON
POWER MIRROR CONTROL	PR RIGHT	OFF, ON
POWER MIRROR CONTROL	PR UP	OFF, ON
STEERING COLUMN CONTROL COMMAND	LOCK_GND	OFF, ON
TURN SIGNAL AND MARKER LAMPS	HAZARD	OFF, ON

Instrument Cluster Diagnostic Trouble Code (DTC) Index

Instrument Cluster Diagnostic Trouble Code (DTC) Index

DTC	Description	Source	Action
B1201	Fuel Sender Circuit Failure	ICM	REFER to Section 413-01 .
B1205	EIC Switch-1 Assembly Circuit Failure	ICM	REFER to Section 413-01 .
B1209	EIC Switch-2 Assembly Circuit Failure	ICM	REFER to Section 413-01 .
B1213	Anti-Theft Number of Programmed Keys Is Below Minimum	ICM	REFER to Section 419-01B .
B1246	Dim Panel Potentiometer Switch Circuit Failure	ICM	REFER to Section 413-00 .
B1342	ECU Is Defective	ICM	CLEAR and DOCUMENT the DTCs. CARRY OUT the instrument cluster Self-Test. INSTALL a new instrument cluster if DTC B1342 is retrieved again. REFER to Section 413-01 .
B1352	Ignition Key-In Circuit Failure	ICM	REFER to Section 211-05 .
B1470	Lamp Headlamp Input Circuit Failure	ICM	REFER to Section 417-01 .
B1492	Ignition Cylinder Sensor Open Circuit	ICM	REFER to Section 419-01B .
B1567	Lamp Headlamp High Beam Circuit Failure	ICM	REFER to Section 417-01 .
B1600	PATS Ignition Key Transponder Signal Is Not Received	ICM	REFER to Section 419-01B .
B1601	PATS Received Incorrect Key-Code From Ignition Key Transponder	ICM	REFER to Section 419-01B .
B1602	PATS Received Invalid Format of Key-Code From Ignition Key Transponder	ICM	REFER to Section 419-01B .
B1676	Battery Pack Voltage Out of Range	ICM	REFER to Section 413-01 .
B1681	PATS Transceiver Module Signal Is Not Received	ICM	REFER to Section 419-01B .
B1689	Autolamp Delay Circuit Failure	ICM	REFER to Section 417-01 .
B1875	Turn Signal / Hazard Switch Signal Circuit Failure	ICM	REFER to Section 417-01 .
B2103	Antenna Not Connected	ICM	REFER to Section 419-01B .
B2139	Data Mismatch (Receive Data Does Not Match What Was Expected)	ICM	REFER to Section 419-01A .
B2141	NVM Configuration Failure	ICM	REFER to Section 418-01 .

B2143	NVM Memory Failure	ICM	REFER to Section 413-01 .
B2162	Data Mismatch #2 (receive data does not match what was expected)	ICM	REFER to Section 419-01B .
B2328	Column Reach Feedback Potentiometer Circuit Failure	ICM	REFER to Section 211-04 .
B2332	Column Tilt Feedback Potentiometer Circuit Failure	ICM	REFER to Section 211-04 .
B2351	Steering Column Switch Circuit Failure	ICM	REFER to Section 211-04 .
B2431	Transponder Programming Failed	ICM	REFER to Section 419-01A .
B2472	Fog Lamp Switch Failure	ICM	REFER to Section 417-01 .
B2477	Module Configuration Failure	ICM	REFER to Section 418-01 .
U1041	SCP (J1850) Invalid or Missing Data for Vehicle Speed	ABS	CARRY OUT the ABS self-test.
U1059	SCP (J1850) Invalid or Missing Data for Transmission/ Transaxle/PRNDL	PCM	CARRY out the PCM self-test.
U1073	SCP (J1850) Invalid or Missing Data for Engine Coolant Fluid Temperature	PCM	CARRY OUT the PCM self-test.
U1123	SCP (J1850) Invalid or Missing Data for Odometer Rolling Count	ABS	CARRY OUT the ABS self-test.
U1131	SCP (J1850) Invalid or Missing Data for Fuel System	ICM	REFER to Section 413-01 .
U1147	SCP (J1850) Invalid or Missing Data for Vehicle Security System	PCM	CARRY OUT the PCM self-test.

Instrument Cluster Parameter Identification (PID) Index

Instrument Cluster Parameter Identification (PID) Index

PID	Description	Expected Value
ABCHIME	Air Bag Chime	OFF, ON
ANTISCN	Anti-Scan Function	DISABL, ENABLE
ASWSTAT	Autolamp Switch Input Status	1 KEY, 2 KEY, 3 KEY, 4 KEY, 5 KEY, 6 KEY, 7 KEY, 8 KEY, 9 KEY, 0 KEY, NO KEY
CCNT	Number Of Continuous DTCs In Module	one count per bit
D_SBELT	Driver Seat Belt	OUT, IN
DSWSTAT	Dimmer Switch Input Status	ON, LVL1, LVL2, LVL3, LVL4, LVL5, LVL6, LVL7, LVL8, LVL9, LVL10, LVL11, LVL12, LVL13, LVL14, LVL15, LVL16, LVL17, LVL18, LVL19, LVL20, LVL21, ?
ENABL_S	Vehicle Enable Status	DISABL, ENABLE
HEAD_L	Headlamp Switch	OFF, PARK, HEADLP, R_FOG, INVLD, ?

	Input Status	
HIBEAM	High Beam Switch Input Status	OFF, HIGH, PASS, INVLD, ?
HORN_SW	Horn Input Switch	OFF, ON
IGN_A	Ignition Switch -ACCY Position	NO, YES
IGN_KEY	Ignition Key In / Out	OUT, IN
IGN_O/U	Ignition Switch - OFF/Unlock Position	NO, YES
IGN_R	Ignition Switch -RUN Position	NO, YES
IGN_S	Ignition Switch - START Position	NO, YES
LIGHTSN	Night(True) / Day (False)	NO, YES
M_KEY	Master Key Present	notPRE, PRESNT
NUMKEYS	Number Of Keys Stored In Module	one count per bit
PCM_ID	PCM ID Status	notSTR, STORED
PCM_VFY	PCM Verify OK	NO, YES
RESETSW	Reset Switch	OFF, ON
SELECT	Select/Mode Switch	OFF, ON
TILT	Steering Column Tilt Switch	SHORT, UP, DOWN, OFF
TELEPOS	Telescope Position Sensor	notSEN, SENSED
TELESCP	Steering Column Telescope Switch	SHORT, IN, OUT, OFF
TILTPOS	Tilt Position Sensor	notSEN, SENSED
TR_PARK	Transmission Select Lever In Park Pos	NO, YES

Instrument Cluster Active Command Index

Instrument Cluster Active Command Index

Active Command	Display	Action
ANTI-THEFT INDICATOR LAMP	THEFT_LAMP	OFF, ON
DISPLAY DIMMING CONTROL	ILLUMINAT	OFF, ON
DISPLAY SEGMENT CONTROL II	SEGMENTS	OFF, ON
ENGINE COOLANT GAUGE CONTROL	ENGCOOLNT	0%-100%
FUEL GAUGE CONTROL	FUELLEVEL	0%-100%
MEMORY SELECT CONTROL	MEMORY 1	OFF, ON
MEMORY SELECT CONTROL	MEMORY 2	OFF, ON
PRNDL DISPLAY CONTROL COMMAND	SEGMENTS	OFF, ON

RF_SIGNAL	RF	OFF, ON
SPEEDOMETER CONTROL	SPDOMETER	0%-100%
TACHOMETER CONTROL	TCHOMETER	0%-100%
WARNING LAMPS AND CHIME	ALL_LAMPS	OFF, ON
WARNING LAMPS AND CHIME	CHIME	OFF, ON


Symptom Chart

Symptom Chart

Condition	Possible Sources	Action
<ul style="list-style-type: none"> No communication with front electronic module (FEM) 	<ul style="list-style-type: none"> BJB Fuses 425 (40A) and 422 (20A). Circuitry. J1850 communication network (SCP). FEM. 	<ul style="list-style-type: none"> GO to Pinpoint Test A.
<ul style="list-style-type: none"> No communication with the instrument cluster module 	<ul style="list-style-type: none"> Circuitry. CJB Fuses 202 (5A), 213 (5A), 217 (5A), 220 (10A). J1850 communication network (SCP). Instrument cluster. 	<ul style="list-style-type: none"> GO to Pinpoint Test B.
<ul style="list-style-type: none"> The horn does not sound 	<ul style="list-style-type: none"> BJB Fuse 104 (15A). Circuitry. Horn relay. Horn switch. Horn. FEM. Instrument cluster. 	<ul style="list-style-type: none"> GO to Pinpoint Test C.
<ul style="list-style-type: none"> The horn sounds continuously 	<ul style="list-style-type: none"> Instrument cluster. Horn relay. Circuitry. Horn switch. FEM. 	<ul style="list-style-type: none"> GO to Pinpoint Test D.

Pinpoint Tests

PINPOINT TEST A: NO COMMUNICATION WITH THE FRONT ELECTRONIC MODULE (FEM)

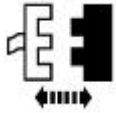
CONDITIONS	DETAILS/RESULTS/ACTIONS
A1 CHECK CIRCUITS 29-DK20 (OG/GN) AND 29S-DK22 (OG/YE) FOR VOLTAGE	
NOTE: Cycle ignition switch from OFF to RUN to enable the switched system power feature.	
<p>1</p> 	

2



FEM C201c

3

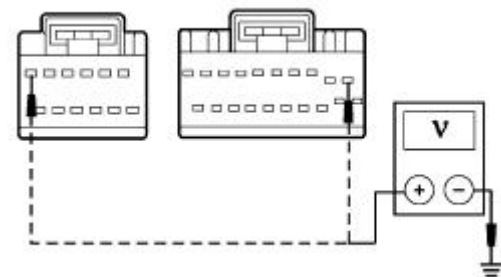


FEM C201f

4



5



A0006297

5

Measure the voltage between FEM C201c pin 6, circuit 29-DK20 (OG/GN), harness side and ground; and between FEM C201f pin 1, circuit 29S-DK22 (OG/YE) harness side and ground.

• Are the voltages greater than 10 volts?

→ **Yes**
GO to [A2](#).

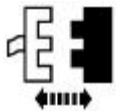
→ **No**
REPAIR the circuit(s) in question. TEST the system for normal operation.

A2 CHECK CIRCUITS 31-DK20 (BK/RD), 31-DK20A (BK/RD), 31-DK20B (BK/RD), 31-DK20C (BK/RD) AND 31-DK20D (BK/RD) FOR OPENS

1



2



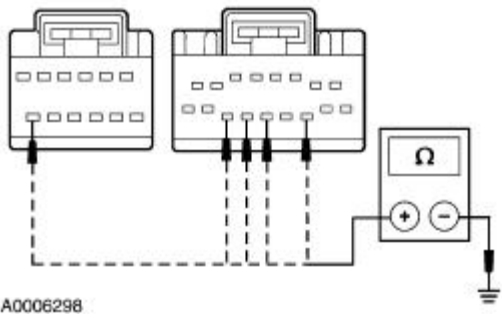
FEM C201a

3

3

Using the following table, measure the resistance between FEM connectors, harness side and ground:

FEM	Pin	Circuit
-----	-----	---------



A0006298


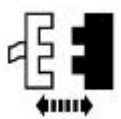
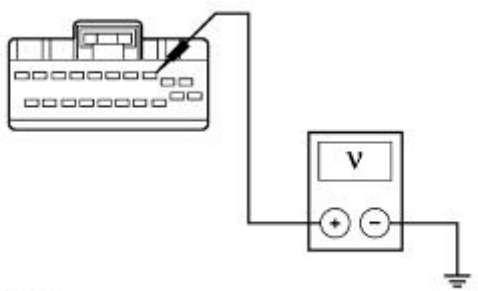
C201c	12	31-DK20 (BK/RD)
C201a	11	31-DK20A (BK/RD)
C201a	13	31-DK20B (BK/RD)
C201a	14	31-DK20C (BK/RD)
C201a	15	31-DK20D (BK/RD)

● Is the resistance less than 5 ohms?

→ **Yes**
REFER to [Section 418-00](#).

→ **No**
REPAIR the circuit(s) in question. TEST the system for normal operation.

PINPOINT TEST B: NO COMMUNICATION WITH THE INSTRUMENT CLUSTER

CONDITIONS	DETAILS/RESULTS/ACTIONS
B1 CHECK HOT AT ALL TIMES POWER SUPPLY CIRCUIT	
<p>1 </p> <p>2  Instrument Cluster</p> <p>3 </p> <p>A0002792</p>	<p>3 Measure the voltage between instrument cluster C220b pin 3, circuit 29-GG11 (OG/BU), harness side and ground.</p> <p>● Is the voltage greater than 10 volts?</p> <p>→ Yes GO to B2.</p>

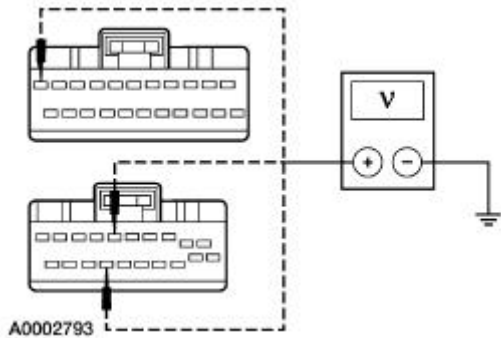
→ **No**
REPAIR the circuit. TEST the system for normal operation.

B2 CHECK HOT IN RUN POWER SUPPLY CIRCUITS

1



2



2 Measure the voltage between the instrument cluster and ground as follows:

Connector Pin	Circuit
C220a pin 11	15-JA14 (GN/BK)
C220b pin 6	15-GG14 (GN/RD)
C220b pin 17	75-GG15 (YE/GN)

- Are the voltages greater than 10 volts?

→ **Yes**
GO to [B3](#).

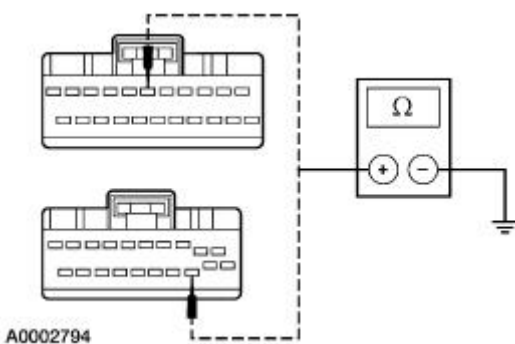
→ **No**
REPAIR the circuit(s). TEST the system for normal operation.

B3 CHECK GROUND CIRCUITS

1



2



2 Measure the resistance between the instrument cluster and ground as follows:




Connector Pin	Circuit
C220a pin 6	31-AL11 (BK)
C220b pin 13	91-GG11 (BN/RD)

- Are the resistances less than 5 ohms?

→ **Yes**
REFER to [Section 418-00](#).

→ **No**
REPAIR the circuit(s). TEST the system for normal operation.

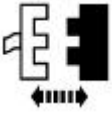
PINPOINT TEST C: THE HORN DOES NOT SOUND

CONDITIONS	DETAILS/RESULTS/ACTIONS
C1 CHECK HORN INPUT PID FROM THE INSTRUMENT CLUSTER	
<p>1 </p> <p>Diagnostic Tool</p> <p>2 </p> <p>3 </p>	<p>4 Monitor the ICM PID HORN_SW while depressing and releasing the horn switch.</p> <ul style="list-style-type: none"> • Does the PID indicate ON with the horn switch depressed and OFF with the horn switch released? <p>→ Yes GO to C6.</p> <p>→ No GO to C2.</p>
C2 INITIATE THE HORN CONTROL ACTIVE COMMAND	
	<p>1 Trigger the ICM active command HORN CONTROL.</p> <ul style="list-style-type: none"> • Does the horn sound? <p>→ Yes GO to C3.</p> <p>→ No INSTALL a new instrument cluster. REFER to Section 413-01 . CLEAR the DTCs. REPEAT the self-test.</p>
C3 CHECK THE OPERATION OF THE HORN SWITCH	

1

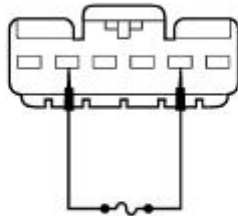


3



Horn Switch Connector

4



A0003816

2

Deactivate the air bag system; refer to [Section 501-20B](#).

4

Connect a fused (5A) jumper wire between the horn switch connector pin 2, harness side and the horn switch connector pin 5, harness side.

● Does the horn sound?

→ Yes

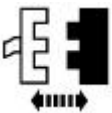
INSTALL a new horn switch. REFER to [Horn—Switch](#). CLEAR the DTCs. REPEAT the self-test.

→ No

GO to [C4](#).

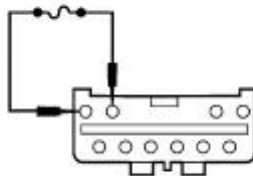
C4 CHECK THE OPERATION OF THE AIR BAG SLIDING CONTACT

1



Air Bag Sliding Contact C218

2



A0003817

2

Connect a fused (5A) jumper wire between air bag sliding contact C218 pin 9, circuit 10-GJ9 (GY/OG), harness side and air bag sliding contact C218 pin 10, circuit 64-LK18 (BU/RD), harness side.

● Does the horn sound?

- **Yes**
INSTALL a new air bag sliding contact.
REFER to [Section 501-20B](#) . CLEAR the DTCs. REPEAT the self-test.
- **No**
GO to [C5](#) .

C5 CHECK CIRCUIT 10-GJ9 (GY/OG) FOR AN OPEN

1



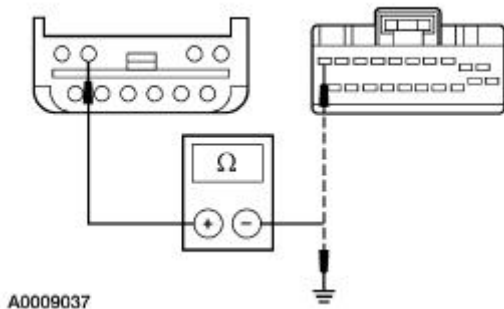
Instrument Cluster C220b

2



Air Bag Sliding Contact C218

3



- 3 Measure the resistance between instrument cluster C220b pin 10, circuit 10-GJ9 (GY/OG), harness side and air bag sliding contact C218 pin 9, circuit 10-GJ9 (GY/OG), harness side; and between air bag sliding contact C218 pin 9, circuit 10-GJ9 (GY/OG), harness side and ground.

- **Is the resistance less than 5 ohms between the instrument cluster and the air bag sliding contact; and greater than 10,000 ohms between the air bag sliding contact and ground?**

- **Yes**
REPAIR circuit 64-LK18 for a short to ground or an open. CLEAR the DTCs. REPEAT the self-test.

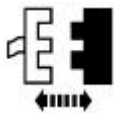
- **No**
REPAIR the circuit. CLEAR the DTCs. REPEAT the self-test.

C6 CHECK THE OPERATION OF THE HORN RELAY

1



2



Horn Relay C1006

3 Carry out the relay component test. Refer to Wiring Diagrams Section 700-09, Component Testing.

• Is the relay OK?

→ Yes
GO to C7.

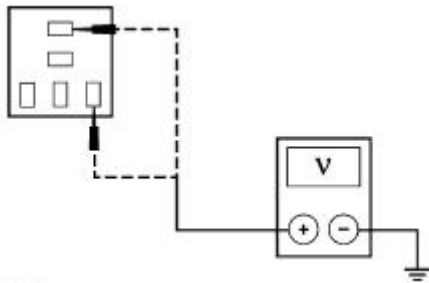
→ No
INSTALL a new horn relay. CLEAR the DTCs. REPEAT the self-test.

C7 CHECK CIRCUITS 30-GJ7A (RD/BU) AND 30-GJ7B (RD/BU) FOR AN OPEN

1



2



A0003390

2 Measure the voltage between horn relay C1006 pin 3, circuit 30-GJ7A, harness side and ground; and between horn relay C1006 pin 2, circuit 30-GJ7B (RD/BU), harness side and ground.

• Are the voltages greater than 10 volts?

→ Yes
GO to C8.

→ No
REPAIR the circuit in question. CLEAR the DTCs. REPEAT the self-test.

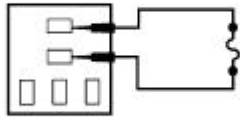
C8 CHECK THE HORN OPERATION

1



2

2 Connect a fused (5A) jumper wire between horn relay C1006 pin 5, circuit 30S-GJ6 (RD/YE), harness side and the horn relay C1006 pin 3, circuit 30-GJ7A (RD/BU), harness side.



A0003391

3



● Does the horn sound?

→ **Yes**
GO to [C9](#).

→ **No**
GO to [C10](#).

C9 CHECK CIRCUIT 91S-GJ7 (BN/RD) FOR AN OPEN

1

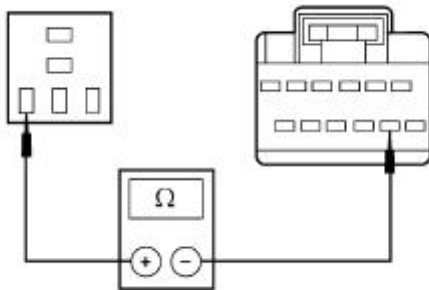


2



FEM C201c

3



A0003392

3 Measure the resistance between horn relay C1006 pin 1, circuit 91S-GJ7 (BN/RD), harness side and FEM C201c pin 8, circuit 91S-GJ7 (BN/RD), harness side.

● Is the resistance less than 5 ohms?

→ **Yes**
INSTALL a new FEM. REFER to [Section 419-10](#). CLEAR the DTCs. REPEAT the self-test.

→ **No**

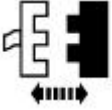
REPAIR the circuit. CLEAR the DTCs.
REPEAT the self-test.

C10 CHECK CIRCUIT 30S-GJ6 (RD/YE) FOR AN OPEN

1

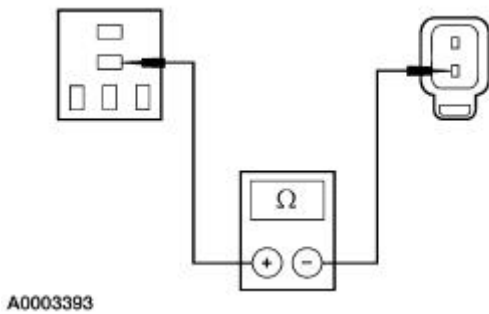


2



Horn C131

3



3 Measure the resistance between horn relay C1006 pin 5, circuit 30S-GJ6 (RD/YE), harness side and horn C131 pin 1, circuit 30S-GJ6 (RD/YE), harness side.

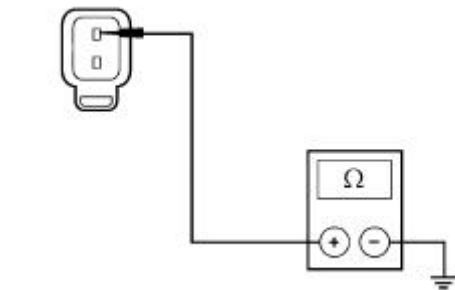
● Is the resistance less than 5 ohms?

→ **Yes**
GO to [C11](#).

→ **No**
REPAIR the circuit. CLEAR the DTCs.
REPEAT the self-test.

C11 CHECK CIRCUIT 31-GJ6 (BK/YE) FOR AN OPEN

1



1 Measure the resistance between horn C131 pin 2, circuit 31-GJ6 (BK/YE), harness side and ground.





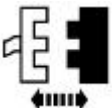
● Is the resistance less than 5 ohms?

→ **Yes**
INSTALL a new horn. REFER to [Horn](#).
CLEAR the DTCs. REPEAT the self-test.

→ **No**

REPAIR the circuit. CLEAR the DTCs.
REPEAT the self-test.

PINPOINT TEST D: THE HORN SOUNDS CONTINUOUSLY

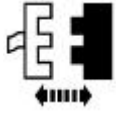
CONDITIONS	DETAILS/RESULTS/ACTIONS
D1 CHECK HORN INPUT PID FROM THE INSTRUMENT CLUSTER	
<p>1 </p> <p>Diagnostic Tool</p> <p>2 </p> <p>3 </p> <p>PID HORN_SW</p>	<p>4 Monitor the ICM PID HORN_SW.</p> <ul style="list-style-type: none"> ● Does the PID always indicate ON? <p>→ Yes GO to D2.</p> <p>→ No GO to D5.</p>
D2 CHECK THE HORN SWITCH OPERATION	
<p>1 </p> <p>3 </p> <p>Horn Switch</p>	<p>2 Deactivate the air bag system; refer to Section 501-20B.</p> <ul style="list-style-type: none"> ● Does the horn stop? <p>→ Yes INSTALL a new horn switch. REFER to Horn—Switch. CLEAR the DTCs.</p>

REPEAT the self-test.

→ **No**
GO to [D3](#).

D3 CHECK THE AIR BAG SLIDING CONTACT OPERATION

1



Air Bag Sliding Contact C218

● **Does the horn stop?**

→ **Yes**
INSTALL a new air bag sliding contact.
REFER to [Section 501-20B](#). CLEAR the DTCs. REPEAT the self-test.

→ **No**
GO to [D4](#).

D4 CHECK THE INSTRUMENT CLUSTER OPERATION

1



Instrument Cluster C220b

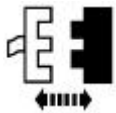
● **Does the horn stop?**

→ **Yes**
INSTALL a new instrument cluster.
REFER to [Section 413-01](#). CLEAR the DTCs. REPEAT the self-test.

→ **No**
REPAIR circuit 10-GJ9 (GY/OG) for a short to power. CLEAR the DTCs. REPEAT the self-test.

D5 CHECK CIRCUIT 30S-GJ6 (RD/YE) FOR A SHORT TO POWER

1



Horn Relay C1006

● **Does the horn stop?**

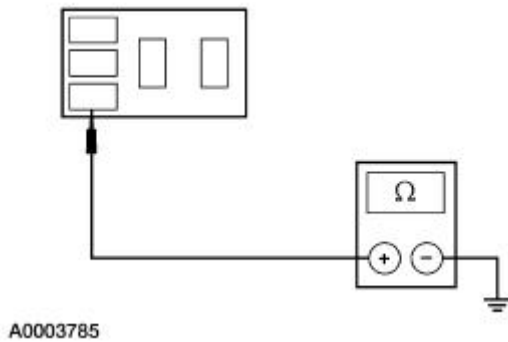
→ **Yes**
GO to [D6](#).

→ **No**
REPAIR the circuit. CLEAR the DTCs.

REPEAT the self-test.

D6 CHECK CIRCUIT 91S-GJ7 (BK/BU) FOR A SHORT TO GROUND

1



1

Measure the resistance between horn relay C1006 pin 2, circuit 91S-GJ7 (BK/BU), harness side and ground.

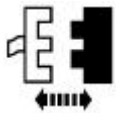
- Is the resistance greater than 10,000 ohms?

→ **Yes**
INSTALL a new horn relay. CLEAR the DTCs. REPEAT the self-test.

→ **No**
GO to [D7](#).

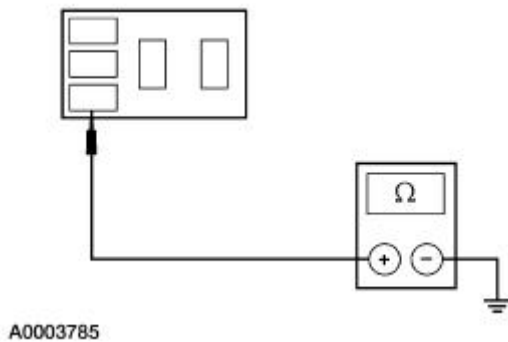
D7 CHECK CIRCUIT 91S-GJ7 (BK/BU) AND THE FEM FOR A SHORT TO GROUND

1



FEM C201c

2



2

Measure the resistance between horn relay C1006 pin 2, circuit 91S-GJ7 (BK/BU), harness side and ground.

- Is the resistance greater than 10,000 ohms?

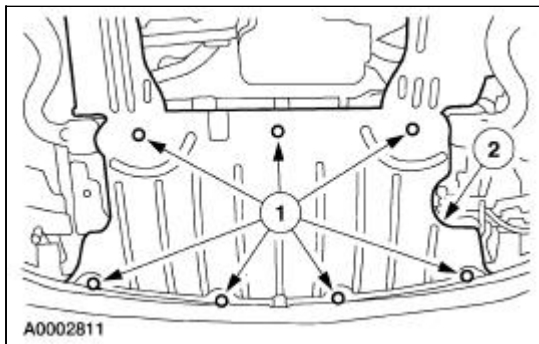
→ **Yes**
INSTALL a new FEM. REFER to [Section 419-10](#). CLEAR the DTCs. REPEAT the self-test.

→ **No**
REPAIR the circuit. CLEAR the DTCs. REPEAT the self-test.

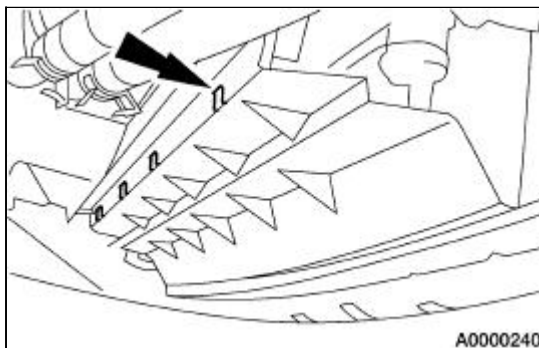
Horn

Removal and Installation

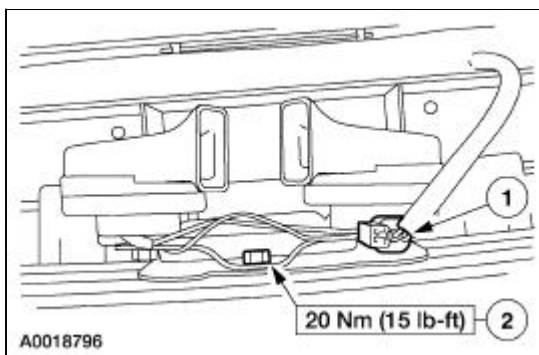
1. Raise and support the vehicle. For additional information, refer to [Section 100-02](#).
2. Remove the front splash shield.
 1. Remove the bolts.
 2. Remove the front splash shield.



3. Remove the air deflector shield.



4. Remove the horn.
 1. Disconnect the electrical connector.
 2. Remove the bolt.



5. To install, reverse the removal procedure.

Horn —Switch

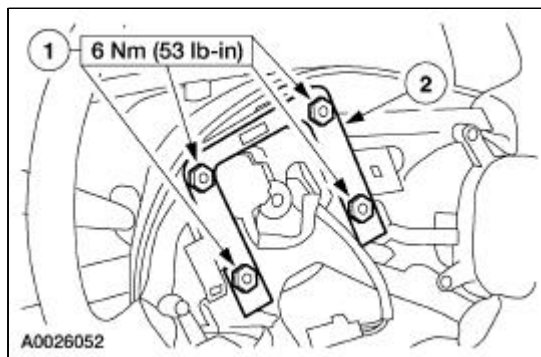
Removal and Installation

1. Remove the driver air bag module. Refer to [Section 501-20B](#).
2. **NOTE:** The diagnostic tool has been removed from the art for clarity.

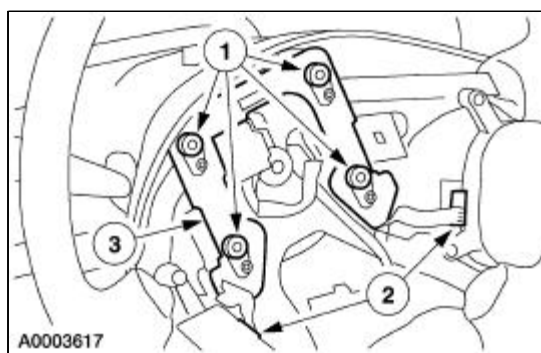
NOTE: The four horn switch springs are not attached. To avoid losing the springs use caution when removing the horn switch.

Remove the horn switch pad.

1. Remove the bolts.
2. Remove the horn switch pad.



3. Remove the horn switch.
 1. Remove the springs.
 2. Disconnect the steering wheel controls.
 3. Remove the horn switch.



4. **NOTE:** To provide correct tension between the horn pad and horn switch, install the yellow horn switch springs at the bottom and the silver horn switch springs at the top.

To install, reverse the removal procedure.



Information And Message Center

The message center display is a green vacuum fluorescent, fixed format display. The message center display is integrated within the instrument cluster (10849) and cannot be replaced separately, refer to [Section 413-01](#). The message center is controlled by the four message center switches (FUEL, RESET, STATUS, and SETUP). Refer to the owner literature for more information.

Information And Message Center

Refer to Wiring Diagrams Section [413-08](#), Message Center for schematic and connector information.

Special Tool(s)

 ST1137-A	73 III Automotive Meter or equivalent 105-R0057
 ST2332-A	Worldwide Diagnostic System (WDS) 418-F224, New Generation STAR (NGS) Tester 418-F052, or equivalent diagnostic tool

Principles of Operation

NOTE: The instrument cluster (IC), message center (MC), front electronic module (FEM), rear electronic module (REM), remote emergency satellite cellular unit (RESCU), anti-lock braking system/traction control/stability assist module (ABS/TC), and the driver door module (DDM) must be reconfigured upon replacement. Refer to [Section 418-01](#).

The message center is part of the instrument cluster (10849). It uses a vacuum fluorescent display. The message center communicates with the PCM, FEM, REM, IC, ABS/TC/stability assist module, DDM, and the RESCU module over the SCP network. As a technician it is important to understand:

- where the input (command) originates from.
- all information (messages) necessary in order for a feature to operate.
- which module(s) receive(s) the input or command message.
- does the module which received the input (message) control the output of the feature, or does it output a message over the SCP communication network to another module?
- which module controls the output of the feature.

Display Information

The display modes are:

- fuel (average fuel economy, distance to empty)
- setup
- system status
- warning

- temporary alert

The message center information can be selected by depressing any of the following four buttons:

- FUEL
- RESET
- SETUP
- STATUS

The setup display and the status display will time-out and default to the fuel blank display function. The temporary alert display will interrupt the current display to show the status of an event that has just happened. The warning display interrupts the current display until cleared or reset by the driver.

Status Displays

The status displays are timed modes and default back to the fuel blank display function. The status display modes are:

- oil life %
- AC air filter life %
- charging system
- engine temperature
- brake fluid level
- washer fluid level
- driver door
- passenger door
- driver rear door
- passenger rear door
- luggage compartment lid
- front turn lamps
- rear turn lamps
- stoplamps
- tail lamps
- traction control
- advance trac

Setup Displays

The setup displays are timed modes and default back to the fuel blank display function. The setup display modes are:

- language
- English/metric units
- autolocks on, autolocks off
- lock chirp on, lock chirp off

- easy entry on, easy entry off

Warning Messages

The warning messages can interrupt the display until cleared or reset by the driver. The warning messages are:

- engine temperature
- oil life
- check charging system
- transmission errors
- low washer fluid level
- low brake fluid
- low fuel
- driver door
- passenger door
- driver rear door
- passenger rear door
- luggage compartment lid
- stoplamps
- front turn lamps
- rear turn lamps
- rear tail lamps

The warning messages will display when the ignition switch is turned to ON and a fault occurs in a system. The message can be cleared by pressing the RESET button.

Temporary Alert Messages

The temporary alert display will interrupt the current display to show the status of an event that has just happened. The temporary alert messages are:

- autolamp delay
- memory recall/save
- traction control
- advance trac
- RESCU message

Inspection and Verification

NOTE: The IC, MC, REM, and FEM must be reconfigured upon replacement. Refer to [Section 418-01](#).

1. Verify the customer concern by operating the instrument cluster and message center to duplicate the condition by observing the indicators, warning displays, and gauges to determine if they are operating correctly with the ignition switch:

- in RUN with the engine off
- in START before the ignition switch is released
- in RUN with the engine running

2. Visually inspect for obvious signs of mechanical and electrical damage.

Visual Inspection Chart

Mechanical	Electrical
<ul style="list-style-type: none"> ● Low washer fluid level ● Damaged fuel tank ● Low engine coolant level ● Damaged accessory drive belt ● Low engine oil level ● Low brake fluid level 	<ul style="list-style-type: none"> ● Central junction box (CJB) Fuse(s): <ul style="list-style-type: none"> ■ 204 (5A) ■ 205 (5A) ■ 207 (5A) ■ 213 (5A) ■ 217 (5A) ■ 219 (15A) ■ 220 (10A) ■ 224 (5A) ■ 229 (5A) ■ 230 (5A) ● Battery junction box (BJB) Fuse(s): <ul style="list-style-type: none"> ■ 422 (20A) ■ 425 (40A) ■ 430 (30A) ● Damaged circuitry ● Damaged connectors ● Damaged switches or sensors

3. If the inspection reveals obvious concern(s) that can be readily identified, repair as necessary.
4. If the concern remains after the inspection, connect the diagnostic tool to the data link connector (DLC) located beneath the instrument panel and select the vehicle to be tested from the diagnostic tool menu. If the diagnostic tool does not communicate with the vehicle:
 - check that the program card is correctly installed.
 - check the connections to the vehicle.
 - check the ignition switch position.
5. If the diagnostic tool still does not communicate with the vehicle, refer to the New Generation STAR Tester manual.
6. Carry out the DATA LINK DIAGNOSTIC TEST. If the diagnostic tool responds with:
 - CKT914, CKT915 or CKT70 = ALL ECUS NO RESP/NOT EQUIP, refer to [Section 418-00](#).
 - NO RESP/NOT EQUIP for instrument cluster (IC) or message center (MCM), go to Pinpoint Test A.
 - NO RESP/NOT EQUIP for FEM, go to Pinpoint Test B.
 - NO RESP/NOT EQUIP for REM, go to Pinpoint Test C.
 - SYSTEM PASSED, retrieve and record the continuous diagnostic trouble codes (DTCs), erase the continuous DTCs and carry out self-test diagnostics for the instrument cluster.
7. If the DTCs retrieved are related to the concern, go to the Message Center Module Diagnostic

Trouble Code (DTC) Index, Instrument Cluster Diagnostic Trouble Code (DTC) Index, FEM Diagnostic Trouble Code (DTC) Index, REM Diagnostic Trouble Code (DTC) Index or RESCU Diagnostic Trouble Code (DTC) Index to continue diagnostics.

8. If no DTCs related to the concern are retrieved, proceed to Symptom Chart to continue diagnostics.

Message Center Module Diagnostic Trouble Code (DTC) Index

DTC	Description	Source	Action
B1205	Message Center Switch Assembly Circuit Failure	MCM	Go To Pinpoint Test F.
B1342	ECU Defective	MCM	<p>NOTE: The message center is part of the instrument cluster.</p> <p>CLEAR and DOCUMENT the DTCs. CARRY OUT the message center self-test. INSTALL a new instrument cluster if the DTC B1342 is retrieved again. REFER to Section 413-01.</p>
B1676	Battery Voltage Out of Range	MCM	GO to Pinpoint Test A.
B2477	Module Configuration Failure	MCM	REFER to Section 418-01.
U1020	SCP (J1850) Invalid or Missing Data for Engine Air Conditioning Clutch	FEM	CARRY OUT the FEM self-test.
U1027	SCP (J1850) Invalid or Missing Data for Engine RPM	PCM	CARRY OUT the PCM self-test.
U1041	SCP (J1850) Invalid or Missing Data for Vehicle Speed	ICM	CARRY OUT the instrument cluster self-test.
U1053	SCP (J1850) Invalid or Missing Data for Steering / Steering Wheel	PCM	CARRY OUT the PCM self-test.
U1059	SCP (J1850) Invalid or Missing Data for Transmission / Transaxle / PRNDL	PCM	CARRY OUT the PCM self-test.
U1065	SCP (J1850) Invalid or Missing Data for Primary Id \$41	ABS	CARRY OUT the ABS self-test.
U1073	SCP (J1850) Invalid or Missing Data for Engine Coolant	PCM	CARRY OUT the PCM self-test.
U1075	SCP (J1850) Invalid or Missing Data for Engine Oil	FEM	REFER to Section 413-01.
U1083	SCP (J1850) Invalid or Missing Data for Engine Systems Other	PCM	CARRY OUT the PCM self-test.
U1098	SCP (J1850) Invalid or Missing Data for Vehicle	PCM	CARRY OUT the PCM self-test.

	Speed Control		
U1117	SCP (J1850) Invalid or Missing Data for Electrical Energy Management	FEM	CARRY OUT the FEM self-test.
U1123	SCP (J1850) Invalid or Missing Data for Odometer	ABS, stability assist module, TC	CARRY OUT the ABS, stability assist module, and TC self-test.
U1135	SCP (J1850) Invalid or Missing Data for Ignition Switch / Starter	ICM	CARRY OUT the instrument cluster self-test.
U1136	SCP (J1850) Invalid or Missing Data for Telltales	FEM, PCM	CARRY OUT the FEM and PCM self-test.
U1180	SCP (J1850) Invalid or Missing Data for Personalization (Memory) Features	DDM	CARRY OUT the DDM self-test.
U1181	SCP (J1850) Invalid or Missing Data for Personalization (Memory) Features	DDM	CARRY OUT the DDM self-test.
U1199	SCP (J1850) Invalid or Missing Data for External Access (Doors)	REM, FEM, DDM	CARRY OUT the REM, FEM, and DDM self-test.
U1217	SCP (J1850) Invalid or Missing Data for External Lamp Outage	FEM, REM	CARRY OUT the FEM and REM self-test.
U1218	SCP (J1850) Invalid or Missing Data for External Lamps	ICM	CARRY OUT the instrument cluster self-test.
U1222	SCP (J1850) Invalid or Missing Data for Interior Lamps	ICM	CARRY OUT the instrument cluster self-test.

Message Center Module Parameter Identification (PID) Index

PID	Description	Expected Value
CCNT	Number Of Continuous DTCs In Module	one count per bit
FUELSW	Fuel Switch	OFF, ON
RESETSW	Reset Switch	OFF, ON
SETUPSW	Setup Switch	OFF, ON
STATUSSW	Status Switch	OFF, ON

Message Center Module Active Command Index

Active Command	Display	Action
MESSAGE CENTER DISPLAY CHARACTER	SEGMENTS	OFF, ON

Instrument Cluster Diagnostic Trouble Code (DTC) Index

DTC	Description	Source	Action
B1201	Fuel Sender Circuit Failure	ICM	REFER to Section 413-01 .
B1205	EIC Switch-1 Assembly Circuit Failure	ICM	REFER to Section 413-01 .
B1209	EIC Switch-2 Assembly Circuit Failure	ICM	REFER to Section 413-01 .
B1213	Anti-Theft Number of Programmed Keys Is Below Minimum	ICM	REFER to Section 419-01B .
B1246	Dim Panel Potentiometer Switch Circuit Failure	ICM	REFER to Section 413-00 .
B1342	ECU Is Defective	ICM	CLEAR and DOCUMENT the DTCs. CARRY OUT the instrument cluster Self-Test. INSTALL a new instrument cluster if DTC B1342 is retrieved again. REFER to Section 413-01 .
B1352	Ignition Key-In Circuit Failure	ICM	REFER to Section 211-05 .
B1470	Lamp Headlamp Input Circuit Failure	ICM	REFER to Section 417-01 .
B1567	Lamp Headlamp High Beam Circuit Failure	ICM	REFER to Section 417-01 .
B1600	PATS Ignition Key Transponder Signal Is Not Received	ICM	REFER to Section 419-01B .
B1601	PATS Received Incorrect Key-Code From Ignition Key Transponder	ICM	REFER to Section 419-01B .
B1602	PATS Received Invalid Format of Key-Code From Ignition Key Transponder	ICM	REFER to Section 419-01B .
B1676	Battery Pack Voltage Out of Range	ICM	REFER to Section 413-01 .
B1681	PATS Transceiver Module Signal Is Not Received	ICM	REFER to Section 419-01B .
B1689	Autolamp Delay Circuit Failure	ICM	REFER to Section 417-01 .
B1875	Turn Signal / Hazard Switch Signal Circuit Failure	ICM	REFER to Section 417-01 .
B2103	Antenna Not Connected	ICM	REFER to Section 419-01B .
B2139	Data Mismatch (Received Data Does Not Match What Was Expected)	ICM	REFER to Section 419-01A .
B2141	NVM Configuration Failure	ICM	REFER to Section 419-01B .
B2143	NVM Memory Failure	ICM	REFER to Section 419-01B .
B2162	Security Data Mismatch #2 (Received Data Does Not Match What Was Expected)	ICM	REFER to Section 419-01B .
B2328	Column Reach Feedback Potentiometer Circuit Failure	ICM	REFER to Section 211-04 .
B2332	Column Tilt Feedback Potentiometer Circuit Failure	ICM	REFER to Section 211-04 .
B2351	Steering Column Switch Circuit Failure	ICM	REFER to Section 211-04 .

B2431	Transponder Programming Failed	ICM	REFER to Section 419-01A .
B2472	Fog Lamp Switch Failure	ICM	REFER to Section 417-01 .
B2477	Module Configuration Failure	ICM	REFER to Section 418-01 .
U1041	SCP (J1850) Invalid or Missing Data for Vehicle Speed	ABS, ABS/TC, stability assist module	CARRY OUT the ABS, ABS/TC, or stability assist self-test.
U1059	SCP (J1850) Invalid or Missing Data for Transmission/Transaxle/PRNDL	PCM	CARRY OUT the PCM self-test.
U1073	SCP (J1850) Invalid or Missing Data for Engine Coolant Fluid Temperature	PCM	CARRY OUT the PCM self-test.
U1123	SCP (J1850) Invalid or Missing Data for Odometer Rolling Count	ABS, ABS/TC, stability assist module	CARRY OUT the ABS, ABS/TC, stability assist module self-test.
U1147	SCP (J1850) Invalid or Missing Data for Vehicle Security System	PCM	CARRY OUT the PCM self-test.

Instrument Cluster Parameter Identification (PID) Index

PID	Description	Expected Value
ABCHIME	Air Bag Chime	OFF, ON
ANTISCN	Anti-Scan Function	DISABL, ENABLE
ASWSTAT	Autolamp Switch Input Status	OFF, DELAY7, DELAY6, DELAY5, DELAY4, DELAY3, DELAY2, DELAY1, INVLD
CCNT	Number Of Continuous DTCs In Module	one count per bit
D_SBELT	Driver Seat Belt	OUT, IN
DSWSTAT	Dimmer Switch Input Status	ON, LVL1, LVL2, LVL3, LVL4, LVL5, LVL6, LVL7, LVL8, LVL9, LVL10, LVL11, LVL12, LVL13, LVL14, LVL15, LVL16, LVL17, LVL18, LVL19, LVL20, LVL21, INVALID
ENABL_S	Vehicle Enable Status	DISABL, ENABLE
FOG_SW HA2_SW	Fog lamp switch Hazard Switch	OFF, ON OFF, ON
HEAD_L	Headlamp Switch Input Status	OFF, PARK, HEADLP, R_FOG, INVLD, ?
HIBEAM	High Beam Switch Input Status	OFF, HIGH, PASS, INVLD, ?
HORN_SW	Horn Input Switch	OFF, ON
IGN_A	Ignition Switch - ACCY Position	NO, YES
IGN_KEY	Ignition Key In / Out	OUT, IN
IGN_O/U	Ignition Switch - OFF/Unlock Position	NO, YES
IGN_R	Ignition Switch - RUN	NO, YES

	Position	
IGN_S	Ignition Switch - START Position	NO, YES
LIGHTSN	Night (True) / Day (False)	NO, YES
LTURN	Left Turn Switch	OFF, ON
MIN#KEY	Minimum number of keys required	0-67
M_KEY	Master Key Present	notPRE, PRESNT
NUMKEYS	Number Of Keys Stored In Module	one count per bit
PCM_ID	PCM ID Status	notSTR, STORED
RESETSW	Reset Switch	OFF, ON
RTURN	Right turn switch	OFF, ON
SELECT	Select/Mode Switch	OFF, ON
SERVMOD	Service module: 0=No, Y=Yes	0-25
SPAREKY	Spare key programming: 0=enabled, 1=Disabled	0-14
TILT	Steering Column Tilt Switch	SHORT, UP, DOWN, OFF
TELEPOS	Telescope Position Sensor	notSEN, SENSED
TELESCP	Steering Column Telescope Switch	SHORT, IN, OUT, OFF
TILTPOS	Tilt Position Sensor	notSEN, SENSED
TR_PARK	Transmission Select Lever In Park Pos	NO, YES

Instrument Cluster Active Command Index

Active Command	Display	Action
ANTI-THEFT INDICATOR LAMP	THEFT LAMP	OFF, ON
DISPLAY DIMMING CONTROL	ILLUMINAT	OFF, ON
DISPLAY SEGMENT CONTROL II	SEGMENTS	OFF, ON
ENGINE COOLANT GAUGE CONTROL	ENGCOOLNT	0%-100%
FUEL GAUGE CONTROL	FUELLEVEL	0%-100%
MEMORY SELECT CONTROL	MEMORY 1	OFF, ON
MEMORY SELECT CONTROL	MEMORY 2	OFF, ON
PRNDL DISPLAY CONTROL COMMAND	SEGMENTS	OFF, ON
RF SIGNAL	RF	OFF, ON
SPEEDOMETER CONTROL	SPDOMETER	0%-100%
TACHOMETER CONTROL	TCHOMETER	0%-100%
WARNING LAMPS AND CHIME	ALL LAMPS	OFF, ON

FEM Diagnostic Trouble Code (DTC) Index

DTC	Description	Source	Action
B1319	Driver Door Ajar Circuit Failure	FEM	REFER to Section 417-02 .
B1327	Passenger Door Ajar Circuit Failure	FEM	REFER to Section 417-02 .
B1342	ECU Is Defective	FEM	CLEAR the DTC. RETRIEVE the DTCs. If DTC B1342 is retrieved, INSTALL a new FEM. REFER to Section 419-10 . CLEAR the DTCs. REPEAT the self-test.
B1438	Wiper Mode Select Switch Circuit Failure	FEM	REFER to Section 501-16 .
B1446	Wiper Park Sense Circuit Failure	FEM	REFER to Section 501-16 .
B1479	Wiper Washer Fluid Level Sensor Circuit Failure	FEM	REFER to Section 413-01 .
B1499	Lamp Turn Signal Left Circuit Failure	FEM	REFER to Section 417-01 .
B1501	Lamp Turn Signal Left Circuit Short to Battery	FEM	REFER to Section 417-01 .
B1503	Lamp Turn Signal Right Circuit Failure	FEM	REFER to Section 417-01 .
B1505	Lamp Turn Signal Right Circuit Short to Battery	FEM	REFER to Section 417-01 .
B1519	Hood Switch Circuit Failure	FEM	REFER to Section 419-01A .
B1567	Lamp Headlamp High-Beam Circuit Failure	FEM	REFER to Section 417-01 .
B1676	Battery Pack Voltage Out of Range	FEM	REFER to Section 414-00 .
B1794	Lamp Headlamp Low-Beam Circuit Failure	FEM	REFER to Section 417-01 .
B2214	Window Passenger Front Up Switch Short to Battery	FEM	REFER to Section 501-11 .
B2215	Window Passenger Front Down Switch Short to Battery	FEM	REFER to Section 501-11 .
B2312	Mirror Passenger Horizontal Feedback Potentiometer Circuit Failure	FEM	REFER to Section 501-09 .
B2316	Mirror Passenger Vertical Feedback Potentiometer Circuit Failure	FEM	REFER to Section 501-09 .
B2443	Powertrain Performance Mode Switch Circuit Failure	FEM	Not Used
B2477	Module Configuration Failure	FEM	REFER to Section 418-01 .
C1284	Oil Pressure Switch Failure	FEM	REFER to Section 413-01 .

C1446	Brake Switch Circuit Failure	FEM	REFER to Section 413-01 .
C1924	VAPS Solenoid Actuator Output Circuit Short to Ground	FEM	REFER to Section 211-00 .
C1925	VAPS Solenoid Actuator Return Circuit Failure	FEM	REFER to Section 211-00 .
U1027	SCP (J1850) Invalid or Missing Data for Engine RPM	PCM	CARRY OUT the PCM self-test.
U1041	SCP (J1850) Invalid or Missing Data for Vehicle Speed	ABS	CARRY OUT the ABS self-test.
U1059	SCP (J1850) Invalid or Missing Data for Transmission / Transaxle / PRNDL	PCM	CARRY OUT the PCM self-test.
U1218	SCP (J1850) Invalid or Missing Data for External Lamps	ICM	CARRY OUT the ICM self-test.
U1222	SCP (J1850) Invalid or Missing Data for Interior Lamps	ICM	CARRY OUT the ICM self-test.
U1227	SCP (J1850) Invalid or Missing Data for Body Status Request	ICM	CARRY OUT the ICM self-test.

FEM Parameter Identification (PID) Index

PID	Description	Expected Value
AL_EVT1	Last 8 Alarm Events	DROPEN, HOODTR, IGNTAM, PANIC, T_AJAR, RR_SD, LR_SD, P_DOOR, D_DOOR, RADIO, WINDO, ULTRS, NOEVNT, BB_SND
AL_EVT2	Last 8 Alarm Events	DROPEN, HOODTR, IGNTAM, PANIC, T_AJAR, RR_SD, LR_SD, P_DOOR, D_DOOR, RADIO, WINDO, ULTRS, NOEVNT, BB_SND
AL_EVT3	Last 8 Alarm Events	DROPEN, HOODTR, IGNTAM, PANIC, T_AJAR, RR_SD, LR_SD, P_DOOR, D_DOOR, RADIO, WINDO, ULTRS, NOEVNT, BB_SND
AL_EVT4	Last 8 Alarm Events	DROPEN, HOODTR, IGNTAM, PANIC, T_AJAR, RR_SD, LR_SD, P_DOOR, D_DOOR, RADIO, WINDO, ULTRS, NOEVNT, BB_SND
AL_EVT5	Last 8 Alarm Events	DROPEN, HOODTR, IGNTAM, PANIC, T_AJAR, RR_SD, LR_SD, P_DOOR, D_DOOR, RADIO, WINDO, ULTRS, NOEVNT, BB_SND
AL_EVT6	Last 8 Alarm Events	DROPEN, HOODTR, IGNTAM, PANIC, T_AJAR, RR_SD, LR_SD, P_DOOR, D_DOOR, RADIO, WINDO, ULTRS, NOEVNT, BB_SND
AL_EVT7	Last 8 Alarm Events	DROPEN, HOODTR, IGNTAM, PANIC, T_AJAR, RR_SD, LR_SD, P_DOOR, D_DOOR, RADIO, WINDO, ULTRS, NOEVNT, BB_SND
AL_EVT8	Last 8 Alarm Events	DROPEN, HOODTR, IGNTAM, PANIC, T_AJAR, RR_SD, LR_SD, P_DOOR, D_DOOR, RADIO, WINDO, ULTRS, NOEVNT, BB_SND
CCNT	Number Of Continuous DTCs In Module	one count per bit
D_DOOR	Left Front Door Ajar Switch	CLOSED, AJAR

FLUID_1	Brake Fluid Level Switch #1	OFF, ON
HOOD_SW	Hood Ajar Switch	CLOSED, AJAR
IGN_R	Ignition Switch -RUN Position	NO, YES
L_HIGH	Left High Beam Lamp Driver	Off---, Off-B-, On---, On-B-
L_LOW	Left Low Beam Lamp	Off---, Off-B-, On---, On-B-
LF_TURN	Left Front Turn Lamp	Off---, Off-B-, On---, On-B-
LMRKOUT	Left Front Marker Lamp	Off---, Off-B-, On---, On-B-
OILWRN	Oil Level Warning Lamp	Off---, On---
P_DN_SW	Passenger Down Activated	OFF, DOWN
P_DOOR	Passenger Door Ajar Switch	CLOSED, AJAR
P_UP_SW	Passenger Up Activated	OFF, UP
PRK_BRK	Parking Brake Switch Input	OFF, ON
PSMRPSH	Passenger Mirror Position Sensor (Left/Right)	#####
PSMRPSV	Passenger Mirror Position	#####
PSPWAMP	Power Window Passenger's Peak Motor Current	#####
PWM_DC1	PWM Duty Cycle #1	%
R_HIGH	Right High Beam Lamp Driver	Off---, Off-B-, On---, On-B-
R_LOW	Right Low Beam Lamp	Off---, Off-B-, On---, On-B-
RADIO_SW	Security Input Switch Status	OFF, ON
RF_TURN	Right Front Turn Lamp	Off---, Off-B-, On---, On-B-
RMRKSTB	Right Front Marker Lamp	Off---, Off-B-, On---, On-B-
STLKOUT	Steering Column Lock Ground Output	OFF, ON
VBAT	Battery Voltage	Volts
WFLUID	Washer Fluid Level	LOW, OK
WPMODE	Wiper Control Mode Select	WASH, OPEN, INVLD, OFF, INTVL1, INTVL2, INTVL3, INTVL4, INTVL5, INTVL6, INTVL7, LOW, HIGH
WPPRKSW	Windshield Wiper Park Sense	notPRK, PARKED

FEM Active Command Index

Active Command	Display	Action
BACKLIGHTING INTENSITY CONTROL COMMAND	ILLUM	%

BRAKE SYSTEM CONTROL COMMAND	SHFT LOCK	OFF, ON
EXTERIOR LAMP CONTROL	PARKLAMPS	OFF, ON
FRONT WINDOW CONTROL	RR UP	OFF, ON
FRONT WINDOW CONTROL	PR DOWN	OFF, ON
FRONT WINDSHIELD WIPER/WASHER	SPEED RLY	OFF, ON
FRONT WINDSHIELD WIPER/WASHER	WASH RLY	OFF, ON
FRONT WINDSHIELD WIPER/WASHER	WIPER RLY	OFF, ON
HEAD/CORNERING LAMP CONTROL	HIGH BEAM	OFF, ON
HEAD/CORNERING LAMP CONTROL	LOW BEAM	OFF, ON
INDICATOR LAMP CONTROL	NON MIL	OFF, ON
LAMP CONTROL COMMAND	HDLMPWSH	OFF, ON
POWER MIRROR CONTROL	PR DOWN	OFF, ON
POWER MIRROR CONTROL	PR LEFT	OFF, ON
POWER MIRROR CONTROL	PR RIGHT	OFF, ON
POWER MIRROR CONTROL	PR UP	OFF, ON
STEERING COLUMN CONTROL COMMAND	LOCK_GND	OFF, ON
TURN SIGNAL AND MARKER LAMPS	HAZARD	OFF, ON
VAPS II OUTPUT PULSE CONTROL	VAPSIIOUT	%

REM Diagnostic Trouble Code (DTC) Index

DTC	Description	Source	Action
B1201	Fuel Sender Circuit Failure	REM	REFER to Section 413-01 .
B1300	Power Door Lock Circuit Failure	REM	REFER to Section 501-14B .
B1310	Power Door Unlock Circuit Failure	REM	REFER to Section 501-14B .
B1331	Deck Lid Ajar Rear Door Circuit Failure	REM	REFER to Section 417-02 .
B1335	Door Ajar RR Circuit Failure	REM	REFER to Section 417-02 .
B1342	ECU Is Defective	REM	CLEAR the DTC. RETRIEVE the DTCs. If DTC B1342 is retrieved, INSTALL a new REM. REFER to Section 419-10 . CLEAR the DTCs. REPEAT the self-test.
B1483	Brake Pedal Input Circuit Failure	REM	REFER to Section 417-01 .
B1499	Lamp Turn Signal Left Circuit Failure	REM	REFER to Section 417-01 .
B1501	Lamp Turn Signal Left Circuit Short to Battery	REM	REFER to Section 417-01 .
B1503	Lamp Turn Signal Right Circuit Failure	REM	REFER to Section 417-01 .
B1505	Lamp Turn Signal Right Circuit Short to Battery	REM	REFER to Section 417-01 .
B1551	Deck Lid Release Circuit Failure	REM	REFER to Section 501-14B .
B1571	Door Ajar LR Circuit Failure	REM	REFER to Section 417-02 .

B1676	Battery Pack Voltage Out of Range	REM	REFER to Section 414-00 .
B2172	Inertia Switch Input Circuit Open	REM	REFER to Powertrain Control/Emissions Diagnosis (PC/ED) manual.
B2174	Window Driver Rear Remote Up Switch Short to Battery	REM	REFER to Section 501-11 .
B2178	Window Driver Rear Remote Down Switch Short to Battery	REM	REFER to Section 501-11 .
B2190	Window Passenger Rear Remote Up Switch Short to Battery	REM	REFER to Section 501-11 .
B2194	Window Passenger Rear Remote Down Switch Short to Battery	REM	REFER to Section 501-11 .
B2477	Module Configuration Failure	REM	REFER to Section 418-01 .
U1041	SCP (J1850) Invalid or Missing Data for Vehicle Speed	ABS	CARRY OUT the ABS self-test.
U1059	SCP (J1850) Invalid or Missing Data for Transmission/Transaxle/PRNDL	PCM	CARRY OUT the PCM self-test.
U1218	SCP (J1850) Invalid or Missing Data for External Lamps	ICM	CARRY OUT the ICM self-test.

REM Parameter Identification (PID) Index

PID	Description	Expected Value
BOO	Brake Switch Input	OFF, ON
DECKLID	Deck Lid Ajar Switch	CLOSED, AJAR
DL_DSRM	Deck Lid Disarm	NO, YES
DLIDOUT	Deck Lid Driver	Off---, Off--G, Off-B-, Off-BG, OffO--, OffO-G, OffOB-, OffOBG, On---, On--G, On-B-, On-BG, OnO--, OnO-G, OnOB-, OnOBG
DLIDRLS	Deck Lid Release	OFF, ON
L_TAIL	Left & Right Tail Lamp	Off---, Off--G, Off-B-, Off-BG, OffO--, OffO-G, OffOB-, OffOBG, On---, On--G, On-B-, On-BG, OnO--, OnO-G, OnOB-, OnOBG
LMRKOUT	Left Marker Lamp Driver Output State	OFF, ON
LMRKSTB	Left Marker Lamp Driver Short To Battery	NO, YES
LR_TURN	Left & Right Rear Turn Lamp	Off---, Off--G, Off-B-, Off-BG, OffO--, OffO-G, OffOB-, OffOBG, On---, On--G, On-B-, On-BG, OnO--, OnO-G, OnOB-, OnOBG
LRDN_SW	Left Rear Window Down Switch	OFF, UP
LRDR_SW	Left Rear Door Ajar Switch	CLOSED, AJAR
LRUP_SW	Left Rear Window Up Switch	OFF, DOWN

PD_LOCK	Passenger Door Lock	NO, YES
PD_UNLK	Passenger Door Unlock	NOTLOC, LOCK
R_TAIL	Left & Right Tail Lamp	Off---, Off--G, Off-B-, Off-BG, OffO--, OffO-G, OffOB-, OffOBG, On---, On--G, On-B-, On-BG, OnO--, OnO-G, OnOB-, OnOBG
RR_TURN	Left & Right Rear Turn Lamp	Off---, Off--G, Off-B-, Off-BG, OffO--, OffO-G, OffOB-, OffOBG, On---, On--G, On-B-, On-BG, OnO--, OnO-G, OnOB-, OnOBG
RRDN_SW	Right Rear Window Down Switch	OFF, UP
RRDR_SW	Right Rear Door Ajar Switch	CLOSED, AJAR
RRUP_SW	Right Rear Window Up Switch	OFF, DOWN

REM Active Command Index

Active Command	Display	Action
EXTERIOR LAMP CONTROL	BACKUPLMP	OFF, ON
EXTERIOR LAMP CONTROL	H MNT STP	OFF, ON
EXTERIOR LAMP CONTROL	L STOP	OFF, ON
EXTERIOR LAMP CONTROL	PARKLAMPS	OFF, ON
EXTERIOR LAMP CONTROL	R DEF RLY	OFF, ON
EXTERIOR LAMP CONTROL	R FOG LMP	OFF, ON
EXTERIOR LAMP CONTROL	R STOP	OFF, ON
POWER WINDOW ENABLE COMMAND	PSGR RLY	OFF, ON
REAR DOOR LOCK CONTROL	LR LOCK	OFF, ON
REAR DOOR LOCK CONTROL	LR UNLOCK	OFF, ON
REAR DOOR LOCK CONTROL	RELEASE	OFF, ON
REAR WINDOW CONTROL	LR DOWN	OFF, ON
REAR WINDOW CONTROL	LR UP	OFF, ON
REAR WINDOW CONTROL	RR DOWN	OFF, ON
REAR WINDOW CONTROL	RR UP	OFF, ON
TURN SIGNAL AND MARKER LAMPS	HAZARD	OFF, ON

RESCU Diagnostic Trouble Code (DTC) Index

DTC	Description	DTC Caused By	Action
B1216	Emergency Roadside Assistance Switch Circuit Short to Ground	RESCU Module	REFER to Section 419-05 .

B1342	ECU is Defective	RESCU Module	CLEAR the DTCs. RETRIEVE the DTCs. If DTC B1342 is retrieved, INSTALL a new RESCU module. For additional information, REFER to Section 419-10 . CLEAR the DTCs. REPEAT the self-test.
B1871	Passenger Air Bag Disable Module Fault	RESCU Module	REFER to Section 419-05 .
B1874	Cellular Phone Handset Not Present (Phone transceiver is connected but not responding to any RESCU query)	RESCU Module	REFER to Section 419-05 .
B1893	GPS Antenna Open Circuit	RESCU Module	REFER to Section 419-05 .
B2102	Antenna Circuit Short to Ground (GPS)	RESCU Module	REFER to Section 419-05 .
B2141	NVM Configuration Failure [No/invalid telephone number (s) present]	RESCU Module	CLEAR the DTCs. CARRY OUT RESCU on-demand self-test. If DTC B2141 is retrieved, INSTALL a new RESCU module. For additional information, REFER to Section 419-10 . CLEAR the DTCs. REPEAT the self-test.
B2477	Module Configuration Failure (No/invalid VIN present or RESCU configuration error)	RESCU Module	CHECK the RESCU module configuration. For additional information, REFER to Section 418-01 .

RESCU Parameter Identification (PID) Index

PID	Description	Expected Value
AIRBAGI	Airbag Input Status	notACT, ACTIVE
ASSTREQ	Button Status Assistance Request	notACT, ACTIVE
CCNT	Number Of Continuous DTCs In Module	one count per bit
DEP_IND	Airbag Deployment Indication Input	NORMAL, OPEN, STG, STB
INFOREQ	Button Status Information Request	notACT, ACTIVE

Symptom Chart

Symptom Chart


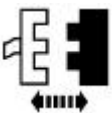
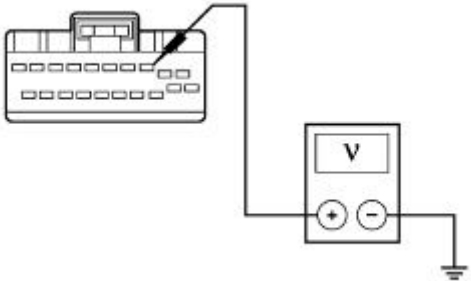
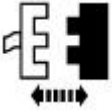

Condition	Possible Sources	Action
<ul style="list-style-type: none"> No communication with the instrument cluster module/message center module 	<ul style="list-style-type: none"> CJB Fuses 220 (10A), 204 (5A). BJB Fuse 425 (40A). Circuitry. J1850 communication network (SCP). Instrument cluster. 	<ul style="list-style-type: none"> GO to Pinpoint Test A.
<ul style="list-style-type: none"> No communication with the front 	<ul style="list-style-type: none"> CJB Fuses 220 (10A), 229 (5A), 	<ul style="list-style-type: none"> GO to Pinpoint Test B.

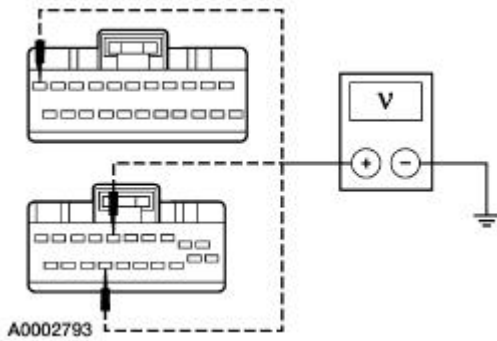
electronic module	<ul style="list-style-type: none"> 230 (5A) ● BJB Fuses 422 (20A), 425 (40A), 426 (20A). ● Circuitry. ● FEM. 	
<ul style="list-style-type: none"> ● No communication with the rear electronic module 	<ul style="list-style-type: none"> ● BJB Fuses 425 (40A), 419 (15A). ● CJB Mini Fuses 207 (5A), 204 (5A), 220 (10A), 235 (5A). ● Circuitry. ● REM. 	<ul style="list-style-type: none"> ● GO to Pinpoint Test C.
<ul style="list-style-type: none"> ● No communication with the remote emergency satellite cellular unit (RESCU) 	<ul style="list-style-type: none"> ● BJB Fuse 414 (5A). ● CJB Fuse 229 (5A). ● Circuitry. ● RESCU module. ● Connectors. 	<ul style="list-style-type: none"> ● GO to Pinpoint Test D.
<ul style="list-style-type: none"> ● The message center display is blank 	<ul style="list-style-type: none"> ● Instrument cluster. 	<ul style="list-style-type: none"> ● NOTE: The message center will be blank if the blank display was selected with the last ignition switch ON. <p>INSTALL a new instrument cluster. REFER to Section 413-01. CLEAR the DTCs. REPEAT the self-test.</p>
<ul style="list-style-type: none"> ● The message center is not operating correctly 	<ul style="list-style-type: none"> ● Instrument cluster. ● Message center switch. 	<ul style="list-style-type: none"> ● GO to Pinpoint Test E.
<ul style="list-style-type: none"> ● The message center switch is not operating correctly 	<ul style="list-style-type: none"> ● Circuitry. ● Message center switch. ● Message center module (part of the instrument cluster). 	<ul style="list-style-type: none"> ● GO to Pinpoint Test F.
<ul style="list-style-type: none"> ● The indicator does not operate correctly — low fuel level display 	<ul style="list-style-type: none"> ● Circuitry. ● Fuel level sender (s). ● REM. ● Instrument cluster. 	<ul style="list-style-type: none"> ● GO to Pinpoint Test G.
<ul style="list-style-type: none"> ● The indicator is inoperative — oil life status, AC filter life 	<ul style="list-style-type: none"> ● Circuitry. ● ABS module. ● Instrument cluster. 	<ul style="list-style-type: none"> ● GO to Pinpoint Test H.
<ul style="list-style-type: none"> ● Lamp out warning indicator is inoperative 	<ul style="list-style-type: none"> ● Circuitry. ● FEM. ● REM. ● Message center module (part of instrument cluster). 	<ul style="list-style-type: none"> ● GO to Pinpoint Test I.

<ul style="list-style-type: none"> ● The indicator does not operate correctly — washer fluid level display 	<ul style="list-style-type: none"> ● Circuitry. ● Washer fluid level switch. ● FEM. ● Message center module (part of instrument cluster). 	<ul style="list-style-type: none"> ● GO to Pinpoint Test J.
<ul style="list-style-type: none"> ● The indicator does not operate correctly — low brake fluid level display 	<ul style="list-style-type: none"> ● Circuitry. ● Brake fluid level switch. ● FEM. ● Message center module (part of instrument cluster). 	<ul style="list-style-type: none"> ● GO to Pinpoint Test K.
<ul style="list-style-type: none"> ● The charging system warning is incorrect 	<ul style="list-style-type: none"> ● Circuitry. ● Generator. ● PCM. ● Instrument cluster. 	<ul style="list-style-type: none"> ● REFER to Section 413-01.
<ul style="list-style-type: none"> ● The distance to empty (DTE) / average / instantaneous fuel economy is incorrect 	<ul style="list-style-type: none"> ● Circuitry. ● Message center module (part of instrument cluster). ● PCM. ● ABS. 	<ul style="list-style-type: none"> ● CHECK the operation of the speedometer, the fuel gauge and the odometer. If inoperative, REFER to Section 413-01. ● If the speedometer, the fuel gauge and the odometer operates correctly but the distance to empty, instantaneous fuel economy, average fuel economy does not operate correctly, INSTALL a new instrument cluster. REFER to Section 413-01. CLEAR the DTCs. REPEAT the self-test.
<ul style="list-style-type: none"> ● Data status message is displayed — door ajar display 	<ul style="list-style-type: none"> ● Circuitry. ● Door ajar switch (es). ● FEM. ● REM. ● Message center module (part of instrument cluster). 	<ul style="list-style-type: none"> ● GO to Pinpoint Test L.
<ul style="list-style-type: none"> ● Data status message is displayed — RESCU message display 	<ul style="list-style-type: none"> ● Overhead switches. ● RESCU module. ● Circuitry. ● Connectors. 	<ul style="list-style-type: none"> ● REFER to Section 419-05.
<ul style="list-style-type: none"> ● Data status message is displayed — traction control and advance traction display 	<ul style="list-style-type: none"> ● Circuitry. ● ABS/TC/stability assist module. ● Message center module (part of instrument cluster). 	<ul style="list-style-type: none"> ● REFER to Section 413-01.

Pinpoint Tests

PINPOINT TEST A: NO COMMUNICATION WITH THE INSTRUMENT CLUSTER MODULE/MESSAGE CENTER MODULE

CONDITIONS	DETAILS/RESULTS/ACTIONS
A1 CHECK HOT AT ALL TIMES POWER SUPPLY CIRCUIT	
<p>1 </p> <p>2  Instrument Cluster C220b</p> <p>3  A0002792</p>	<p>3 Measure the voltage between instrument cluster C220b pin 3, circuit 29-GG11 (OG/BU), harness side and ground.</p> <p>● Is the voltage greater than 10 volts?</p> <p>→ Yes GO to A2 .</p> <p>→ No REPAIR the circuit. TEST the system for normal operation.</p>
A2 CHECK HOT IN RUN POWER SUPPLY CIRCUITS	
<p>1  Instrument Cluster C220a</p> <p>2 </p> <p>3</p>	<p>3 Measure the voltage between the instrument cluster connectors, harness</p>



side and ground as follows:

Connector Pin	Circuit
C220a pin 11	15-JA14 (GN/BK)
C220b pin 6	15-GG14 (GN/RD)
C220b pin 17	75-GG15 (YE/GN)

- Are the voltages greater than 10 volts?

→ **Yes**
GO to [A3](#).

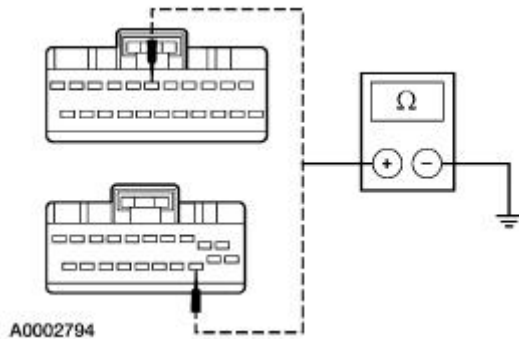
→ **No**
REPAIR the circuit(s). TEST the system for normal operation.

A3 CHECK GROUND CIRCUITS

1



2



- 2 Measure the resistance between the instrument cluster and ground as follows:

Connector Pin	Circuit
C220a pin 6	31-AL11 (BK)
C220b pin 13	91-GG11 (BN/RD)

- Are the resistances less than 5 ohms?

→ **Yes**
REFER to [Section 418-00](#).

→ **No**
REPAIR the circuit(s). TEST the system for normal operation.

PINPOINT TEST B: NO COMMUNICATION WITH THE FRONT ELECTRONIC MODULE

CONDITIONS	DETAILS/RESULTS/ACTIONS
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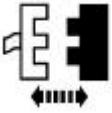
B1 CHECK CIRCUITS 29-DK20 (OG/GN) AND 29S-DK22 (OG/YE) FOR VOLTAGE

NOTE: Cycle ignition switch from OFF to RUN to enable the switched system power feature.

1



2



FEM C201c

3

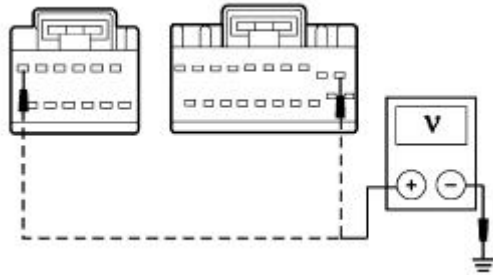


FEM C201f

4



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A0006297

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Measure the voltage between FEM C201c pin 6, circuit 29-DK20 (OG/GN), harness side and ground; and between FEM C201f pin 1, circuit 29S-DK22 (OG/YE) harness side and ground.

- Are the voltages greater than 10 volts?

→ **Yes**
GO to [B2](#).

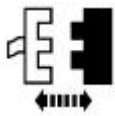
→ **No**
REPAIR the circuit(s) in question. TEST the system for normal operation.

B2 CHECK CIRCUIT S 31-DK20 (BK/RD), 31-DK20A (BK/RD), 31-DK20B (BK/RD), 31-DK20C (BK/RD) AND 31-DK20D (BK/RD) FOR OPENS

1

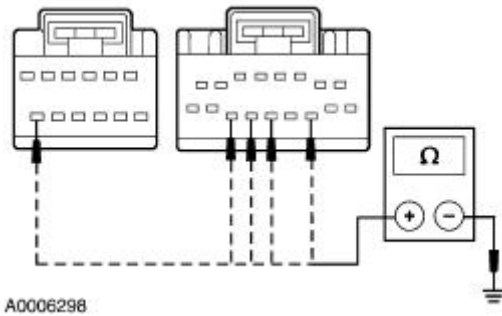


2



FEM C201a

3



3

Measure the resistance between FEM connectors, harness side and ground as follows:

FEM	Pin	Circuit
C201c	12	31-DK20 (BK/RD)
C201a	11	31-DK20A (BK/RD)
C201a	13	31-DK20B (BK/RD)
C201a	14	31-DK20C (BK/RD)
C201a	15	31-DK20D (BK/RD)

- Are the resistances less than 5 ohms?

→ Yes

REFER to [Section 418-00](#).

→ No

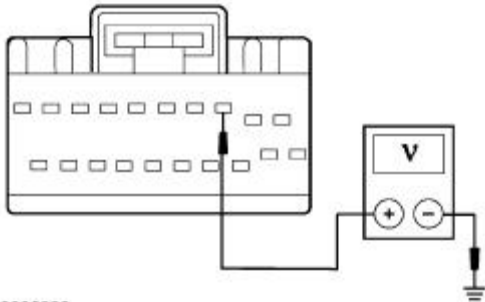
REPAIR the circuit(s) in question. TEST the system for normal operation.

PINPOINT TEST C: NO COMMUNICATION WITH REAR ELECTRONIC MODULE

CONDITIONS	DETAILS/RESULTS/ACTIONS
C1 CHECK CIRCUIT 29-DK31 (OG/BK) FOR VOLTAGE	
<p>1</p>	
<p>2</p> <p>REM C420d</p>	
<p>3</p> <p>REM C420c</p>	
<p>4</p>	



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A0006299

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Measure the voltage between REM C420d pin 3, circuit 29-DK31 (OG/BK), harness side and ground.

• Is the voltage greater than 10 volts?

→ **Yes**
GO to [C2](#).

→ **No**
REPAIR the circuit. TEST the system for normal operation.

C2 CHECK CIRCUITS 29S-DK31 (OG/BK), 31-DK30D (BK), 31-DK30E (BK), 31-DK30F (BK), 31-DK30G (BK) AND 31-DK30H (BK/OG) FOR OPENS

1

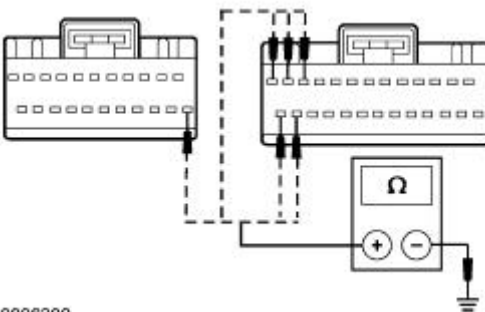


2



REM C420b

3



A0006300

3


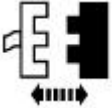

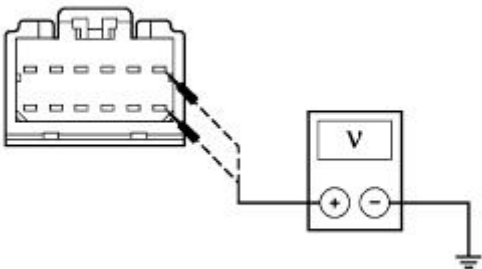
Measure the resistance between REM connectors, harness side and ground as follows:

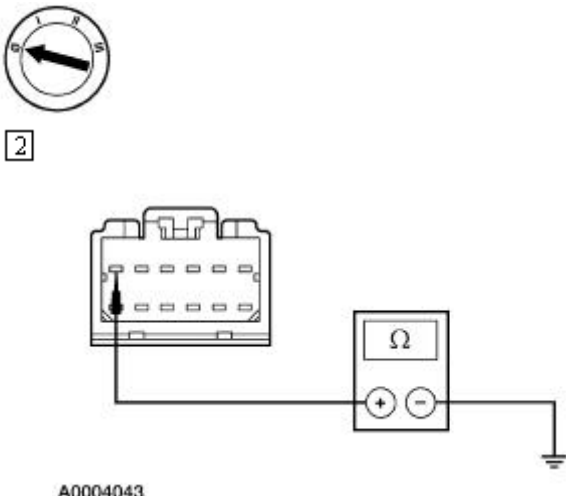
REM	Pin	Circuit
C420c	13	29-DK31 (OG/BK)
C420c	12	31-DK30E (BK)
C420c	11	31-DK30D (BK)
C420c	26	31-DK30G (BK)
C420c	25	31-DK30F (BK)
C420b	12	31-DK30H (BK/OG)

• Are the resistances less than 5 ohms?

- **Yes**
REFER to [Section 418-00](#).
- **No**
REPAIR the circuit(s) in question. TEST the system for normal operation.

PINPOINT TEST D: NO COMMUNICATION WITH THE REMOTE EMERGENCY SATELLITE CELLULAR UNIT (RESCU)

CONDITIONS	DETAILS/RESULTS/ACTIONS
D1 CHECK THE RESCU MODULE FOR VOLTAGE — CIRCUITS 30-GP8 (RD/BK) AND 20-GP8 (PK/OG)	
<p>1 </p> <p>2  RESCU Module C401a</p> <p>3 </p> <p>4  A0004042</p>	<p>4 Measure the voltage between RESCU Module C401a pin 1, circuit 30-GP8 (RD/BK), harness side and ground; and between RESCU Module C401a pin 7, circuit 20-GP8 (PK/OG), harness side and ground.</p> <ul style="list-style-type: none"> ● Are the voltages greater than 10 volts? <p>→ Yes GO to D2.</p> <p>→ No REPAIR the circuit in question. TEST the system for normal operation.</p>
D2 CHECK THE RESCU MODULE GROUND — CIRCUIT 31-GP8 (BK/RD)	
<p>1</p>	



A0004043



2 Measure the resistance between RESCU module C401a pin 6, circuit 31-GP8 (BK/RD), harness side and ground.

● **Is the resistance less than 5 ohms?**




→ **Yes**
REFER to [Section 418-00](#).

→ **No**
REPAIR the circuit. TEST the system for normal operation.

PINPOINT TEST E: THE MESSAGE CENTER IS NOT OPERATING CORRECTLY

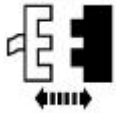
CONDITIONS	DETAILS/RESULTS/ACTIONS
E1 CHECK THE MESSAGE CENTER DISPLAY OPERATION	
<p>1</p>  <p>2</p>  <p>MCM Active Command</p>	<p>2 Select the MCM MESSAGE CENTER DISPLAY CHARACTER active command. Trigger SEGMENTS active command ON.</p> <p>3 Observe the message center display.</p> <p style="margin-left: 20px;">● Does the message center display illuminate all segments?</p> <p>→ Yes The system is OK. If the FUEL, RESET, SETUP or STATUS buttons are inoperative, GO to Pinpoint Test F.</p> <p>→ No INSTALL a new instrument cluster. REFER to Section 413-01. TEST the system for normal operation.</p>

PINPOINT TEST F: THE MESSAGE CENTER SWITCH IS NOT OPERATING CORRECTLY

CONDITIONS	DETAILS/RESULTS/ACTIONS
F1 RETRIEVE THE RECORDED DTC FROM BOTH CONTINUOUS AND ON-DEMAND SELF-TESTS — MESSAGE CENTER MODULE (MCM)	
	<p>1 Use recorded message center DTCs from the continuous and on-demand self-test.</p> <ul style="list-style-type: none"> ● Are any message center DTCs recorded? <p>→ Yes If message center DTC B1205, GO to F3.</p> <p>All other message center DTCs, REFER to the Message Center Module Diagnostic Trouble Code (DTC) Index.</p> <p>→ No GO to F2.</p>
F2 CHECK THE MCM PID FOR THE MESSAGE CENTER SWITCH	
<p>1</p>  <p>MCM PID</p>	<p>1 Select and monitor the MCM PIDs FUELSW, RESETSW, SETUPSW and STATUSSW while pressing each message center button (FUEL, RESET, SETUP and STATUS).</p> <ul style="list-style-type: none"> ● Does each PID agree with each button position? <p>→ Yes INSTALL a new instrument cluster. REFER to Section 413-01. CLEAR the DTCs. REPEAT the self-test.</p> <p>→ No GO to F3.</p>
F3 CHECK THE MESSAGE CENTER SWITCH CIRCUIT 9-GG25 (BN/WH) FOR OPEN AND SHORT TO GROUND	
<p>1</p>  <p>2</p> 	

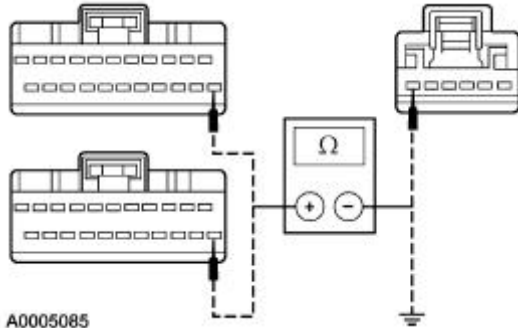
Instrument Cluster C220a

3



Message Center Switch C253

4



4

Measure the resistance between instrument cluster C220a pin 12, circuit 9-GG25 (BN/WH), harness side and message center switch C253 pin 6, circuit 9-GG25 (BN/WH), harness side; and between instrument cluster C220a pin 12, circuit 9-GG25 (BN/WH), harness side and ground.

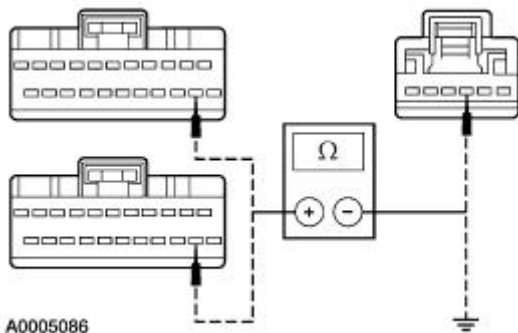
- Is the resistance less than 5 ohms between the instrument cluster and the message center switch; and greater than 10,000 ohms between the instrument cluster and ground?

→ **Yes**
GO to [F4](#).

→ **No**
REPAIR the circuit. TEST the system for normal operation.

F4 CHECK THE MESSAGE CENTER SWITCH CIRCUIT 7-GG25 (YE/VT)

1



1



Measure the resistance between instrument cluster C220a pin 13, circuit 7-GG25 (YE/VT), harness side and message center switch C253 pin 3, circuit 7-GG25 (YE/VT), harness side; and between instrument cluster C220a pin 13, circuit 7-GG25 (YE/VT), harness side and ground.

- Is the resistance less than 5 ohms between the instrument cluster and the message center switch; and greater than 10,000 ohms between the instrument cluster and ground?

→ **Yes**
INSTALL a new message center switch. REFER to [Switch—Message Center](#). TEST the system for normal operation.

→ **No**
REPAIR the circuit. TEST the system for normal operation.

PINPOINT TEST G: THE INDICATOR DOES NOT OPERATE CORRECTLY — LOW FUEL LEVEL DISPLAY

CONDITIONS	DETAILS/RESULTS/ACTIONS
G1 RETRIEVE THE RECORDED DTC FROM BOTH CONTINUOUS AND ON-DEMAND SELF-TESTS — REM AND INSTRUMENT CLUSTER	
NOTE: The fuel gauge does not change indication unless there have been at least 11 liters (three gallons) of fuel added or removed between ignition switch cycles.	
	<p>1 Use recorded REM and instrument cluster DTCs from the continuous and on-demand self-test.</p> <ul style="list-style-type: none"> ● Are any DTCs recorded? <p>→ Yes If REM DTC B1201, or instrument cluster DTC U1131 is retrieved, REFER to Section 413-01.</p> <p>→ No GO to G2.</p>
G2 CHECK THE FUEL GAUGE OPERATION	
<p>1</p> 	<p>2 NOTE: The fuel gauge does not change indication unless there have been at least 11 liters (three gallons) of fuel added or removed between ignition switch cycles.</p> <p>Observe the fuel gauge operation.</p> <ul style="list-style-type: none"> ● Does the fuel gauge operate correctly? <p>→ Yes GO to G3.</p> <p>→ No REFER to Section 413-01.</p>
G3 CHECK THE MESSAGE CENTER DISPLAY ILLUMINATION	
<p>1</p>  <p>MCM Active Command</p> <p>2</p>	<p>1 Select MCM MESSAGE CENTER DISPLAY CHARACTER and trigger ON the active command SEGMENTS.</p> <p>2 Trigger OFF the active command SEGMENTS.</p>





MCM Active Command

- Does the message center display illuminate when triggered ON, and go off when triggered OFF?

→ **Yes**
REFER to the Symptom Chart.

→ **No**
INSTALL a new instrument cluster. REFER to [Section 413-01](#). CLEAR the DTCs. REPEAT the self-test.

PINPOINT TEST H: THE INDICATOR IS INOPERATIVE — OIL LIFE STATUS, AC FILTER LIFE



CONDITIONS	DETAILS/RESULTS/ACTIONS
H1 CHECK THE ODOMETER OPERATION	
	<p>1 Observe the odometer operation.</p> <ul style="list-style-type: none"> ● Does the odometer operate correctly? <p>→ Yes GO to H2.</p> <p>→ No REFER to Section 413-01.</p>
H2 CHECK THE LOW OIL PRESSURE INDICATOR	
<p>1</p>  <p>3</p> 	<p>2 Observe the low oil pressure indicator.</p> <p>4 Observe the low oil pressure indicator.</p> <ul style="list-style-type: none"> ● Does the low oil pressure indicator operate correctly? <p>→ Yes INSTALL a new instrument cluster. REFER to Section 413-01. CLEAR the DTCs. REPEAT the self-test.</p> <p>→ No</p>

REFER to [Section 413-01](#).

PINPOINT TEST I: LAMPOUT WARNING INDICATOR IS INOPERATIVE

CONDITIONS	DETAILS/RESULTS/ACTIONS
NOTE: Verify that the FEM and REM operate correctly and communicate with the instrument cluster and message center.	
I1 CHECK THE EXTERIOR LIGHTS OPERATION	
	<p>1 Operate each exterior light. Observe the operation.</p> <ul style="list-style-type: none"> ● Do all exterior lights operate correctly? <p>→ Yes INSTALL a new instrument cluster. REFER to Section 413-01. CLEAR the DTCs. REPEAT the self-test.</p> <p>→ No REFER to Section 417-01.</p>

PINPOINT TEST J: THE INDICATOR DOES NOT OPERATE CORRECTLY — WASHER FLUID LEVEL DISPLAY

CONDITIONS	DETAILS/RESULTS/ACTIONS
J1 CHECK THE MESSAGE CENTER DISPLAY ILLUMINATION	
<p>1  MCM Active Command</p> <p>2  MCM Active Command</p>	<p>1 Select MCM MESSAGE CENTER DISPLAY CHARACTER and trigger ON the active command SEGMENTS.</p> <p>2 Trigger OFF the active command SEGMENTS.</p> <ul style="list-style-type: none"> ● Does the message center display illuminate when triggered ON, and go off when triggered OFF? <p>→ Yes GO to J2.</p> <p>→ No INSTALL a new instrument cluster. REFER to Section 413-01. CLEAR the DTCs. REPEAT the self-test.</p>
J2 MONITOR FEM PID WFLUID	

1



2



Washer Fluid Level Switch C138

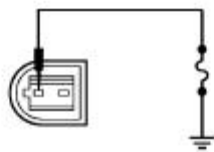
3



4



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A0004841

4 Monitor the FEM PID WFLUID.

5 Connect a 10A fused jumper wire between washer fluid level switch C138, circuit 8-GC8 (WH/GN), harness side and ground.

• Does the FEM PID read ON and OFF alternately?

→ Yes
GO to [J3](#).

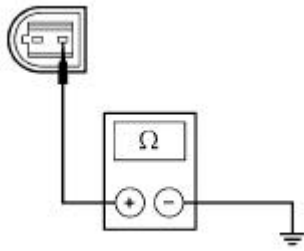
→ No
REMOVE the jumper wire, EXIT the FEM PID, and GO to [J4](#).

If the fused jumper wire fails, REMOVE the jumper and GO to [J5](#).

J3 CHECK WASHER FLUID LEVEL SWITCH GROUND CIRCUIT 31-GC8 (BK) FOR OPEN

1

1 Measure the resistance between washer fluid level switch C138, circuit 31-GC8 (BK), harness side and ground.



A0004810

● Is the resistance less than 5 ohms?

→ **Yes**
 INSTALL a new washer fluid level switch. REFER to [Section 501-16](#). TEST the system for normal operation.

→ **No**
 REPAIR the circuit. TEST the system for normal operation.

J4 CHECK CIRCUIT 8-GC8 (WH/BU) FOR SHORT TO GROUND

1

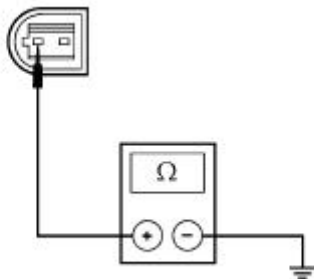


2



FEM C201b

3



A0004806


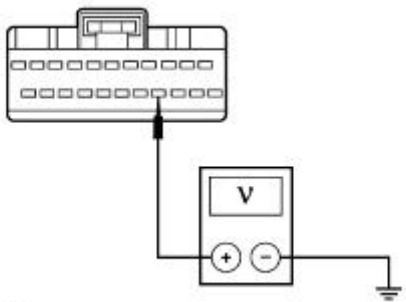
3 Measure the resistance between washer fluid level switch C138, circuit 8-GC8 (WH/BU), harness side and ground.

● Is the resistance less greater than 10,000 ohms?



→ **Yes**
 INSTALL a new FEM. REFER to [Section 419-10](#). CLEAR the DTCs. REPEAT the self-test.

→ **No**
 REPAIR the circuit. TEST the system for normal operation.

J5 CHECK THE LOW WASHER FLUID SWITCH CIRCUIT 8-GC8 (WH/BU) FOR SHORT TO BATTERY

<p>1</p>  <p>2</p>  <p>A0004807</p>	<p>2</p> <p>Measure the voltage between FEM C201b pin 15, circuit 8-GC8 (WH/BU), harness side and ground.</p> <ul style="list-style-type: none"> ● Is any voltage present? <p>→ Yes REPAIR the circuit. CLEAR the DTCs. REPEAT the self-test.</p> <p>→ No INSTALL a new FEM. REFER to Section 419-10. CLEAR the DTCs. REPEAT the self-test.</p>
---	---

PINPOINT TEST K: THE INDICATOR DOES NOT OPERATE CORRECTLY — LOW BRAKE FLUID LEVEL DISPLAY

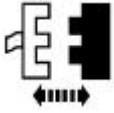
CONDITIONS	DETAILS/RESULTS/ACTIONS
<p>K1 CHECK THE INSTRUMENT CLUSTER BRAKE WARNING INDICATOR ILLUMINATION</p>	
<p>1</p>  <p>ICM Active Command</p> <p>2</p>  <p>ICM Active Command</p>	<p>1</p> <p>Select ICM warning lamps and chime and trigger ON the active command ALL LAMPS.</p> <p>2</p> <p>Select ICM warning lamps and chime and trigger OFF the activate command ALL LAMPS.</p> <ul style="list-style-type: none"> ● Does the BRAKE warning indicator illuminate when triggered ON, and go off when triggered OFF? <p>→ Yes</p>

GO to [K2](#).

→ **No**
INSTALL a new instrument cluster.
REFER to [Section 413-01](#). CLEAR the DTCs. REPEAT the self-test.

K2 CHECK BRAKE FLUID LEVEL SWITCH

1



Brake Fluid Level Switch C124

● Does the BRAKE warning indicator continue to illuminate?

→ **Yes**
GO to [K3](#).

→ **No**
INSTALL a new brake fluid level switch.
REFER to [Section 206-06](#). TEST the system for normal operation.

K3 CHECK BRAKE FLUID LEVEL FEM PID FLUID_1

1

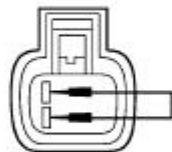


2



FEM PID

3



A0004838

2 Select and monitor FEM PID FLUID_1.

3 Connect a 10A fused jumper wire between brake fluid warning switch C124, circuit 8-GC7 (WH/RD), harness side and ground.

● Does the PID read OFF when the jumper wire is not connected and ON when the jumper wire is connected?

→ **Yes**
INSTALL a new FEM. REFER to [Section](#)

[419-10](#). CLEAR the DTCs. REPEAT the self-test.

→ **No**
GO to [K4](#).

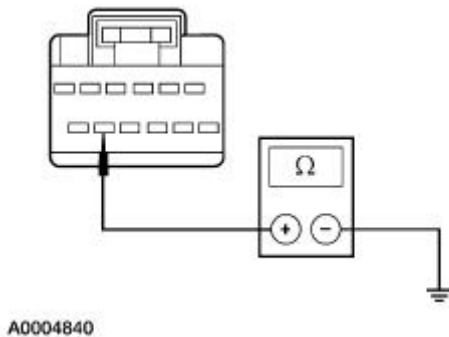
K4 CHECK BRAKE WARNING INDICATOR INPUT CIRCUIT 8-GC7 (WH/RD) FOR SHORT TO GROUND

1



FEM C201c

2



2

Measure the resistance between FEM C201c pin 11, circuit 8-GC7 (WH/RD), harness side and ground.

● **Is the resistance greater than 10,000 ohms?**

→ **Yes**
INSTALL a new FEM. REFER to [Section 419-10](#). CLEAR the DTCs. REPEAT the self-test.

→ **No**
REPAIR the circuit. TEST the system for normal operation.

PINPOINT TEST L: DATA STATUS MESSAGE IS DISPLAYED — DOOR AJAR DISPLAY

CONDITIONS	DETAILS/RESULTS/ACTIONS
L1 RETRIEVE THE RECORDED DTCS FROM BOTH CONTINUOUS AND ON-DEMAND SELF-TESTS — FEM AND REM	<p>1 Use recorded FEM and REM DTCs from the continuous and on-demand self-test.</p> <p>● Are any FEM or REM DTCs recorded?</p> <p>→ Yes REFER to FEM Diagnostic Trouble Code (DTC) Index or REM Diagnostic Trouble Code (DTC) Index.</p>

→ **No**
GO to [L2](#).

L2 CHECK THE MESSAGE CENTER DISPLAY ILLUMINATION

1



1 Select MCM MESSAGE CENTER DISPLAY CHARACTER and trigger ON the active command SEGMENTS.

2



2 Trigger OFF the active command SEGMENTS.

- Does the message center display illuminate when triggered ON, and go off when triggered OFF?

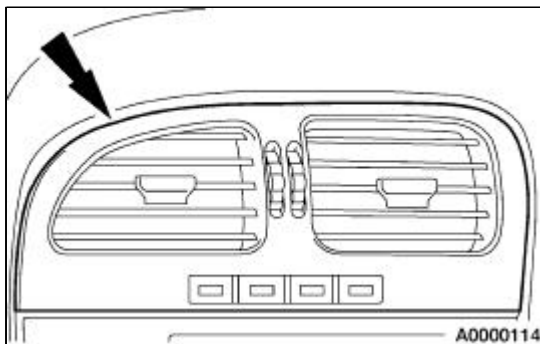
→ **Yes**
REFER to [Section 417-02](#).

→ **No**
INSTALL a new instrument cluster. REFER to [Section 413-01](#). CLEAR the DTCs. REPEAT the self-test.

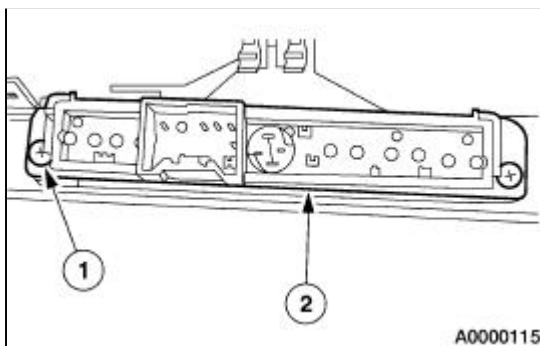
Switch —Message Center

Removal and Installation

1. Disconnect the battery ground cable. Refer to [Section 414-01](#)
2. Remove the center A/C register finish panel.
 - Disconnect the electrical connector.



3. Remove the message center switch.
 1. Remove the screws.
 2. Remove the message center switch.
 - Install a new bulb if necessary.



4. **NOTE:** When the battery is disconnected and then reconnected, some abnormal drive symptoms may occur while the vehicle relearns its adaptive strategy. The vehicle may need to be driven 16 km (10 miles) or more to relearn the strategy.

To install, reverse the removal procedure.

Warning Devices

NOTE: The key-in-ignition warning switch is an integral part of the ignition switch. For additional information, refer to [Section 211-04](#).

The warning device system consists of the following:

- key-in-ignition warning switch
- door ajar switch
- instrument cluster
- front electronic module (FEM)
- rear electronic module (REM)
- safety belt warning switch
- headlamp switch

Belt Minder

NOTE: The belt minder feature is configurable. For additional information, refer to [Section 418-01](#). To configure without using a scan tool, refer to [Belt Minder Deactivating/Activating](#) in this section.

The belt minder feature supplements the current safety belt warning function. The belt minder feature is enabled after the current safety belt warning is complete. The belt minder reminds the driver that their safety belt is unbuckled by intermittently sounding a chime and illuminating the safety belt warning lamp in the instrument cluster once the vehicle speed has exceeded 3 mph (5 kph). While activated, the belt minder alternates the chime and indicator from ON for 6 seconds to OFF for 30 seconds.



The belt minder stops when:

- the driver safety belt is buckled.
 - the ignition is turned to OFF or ACC.
 - five minutes have elapsed since belt minder has started.
-

Warning Devices

Refer to Wiring Diagrams Section [413-09](#), Warning Devices for schematic and connector information.

Special Tool(s)

 <p>ST2332-A</p>	<p>Worldwide Diagnostic System WDS 418-F224 New Generation STAR (NGS) Tester 418-F048 or equivalent</p>
 <p>ST1137-A</p>	<p>73III Automotive Meter or equivalent 105-R0057</p>

Inspection and Verification

1. Verify the customer concern by operating the system.
2. Visually inspect for obvious signs of mechanical and electrical damage.

Visual Inspection Chart

Mechanical	Electrical
<ul style="list-style-type: none"> ● Door ajar switches. ● Key-in-ignition switch. ● Headlamp switch. 	<ul style="list-style-type: none"> ● Central junction box (CJB) Fuses: <ul style="list-style-type: none"> ■ 204 (5A) ■ 213 (5A) ■ 217 (5A) ■ 219 (20A) ■ 220 (10A) ● Battery junction box (BJB) Fuses: <ul style="list-style-type: none"> ■ 422 (20A) ■ 425 (40A) ● Circuitry. ● Instrument cluster.

3. If the concern remains after the inspection, connect the New Generation STAR (NGS) Tester to the data link connector (DLC) located beneath the instrument panel and select the vehicle to be tested from the NGS menu. If the NGS does not communicate with the vehicle:
 - check that the program card is correctly installed.
 - check the connections to the vehicle.
 - check the ignition switch position.

4. If the NGS tester does not power up, refer to the New Generation STAR Tester manual.
5. Carry out the DATA LINK DIAGNOSTICS test. If the NGS responds with:
 - CKT914, CKT915 or CKT70 = ALL ECUS NO RESP/NOT EQUIP, refer to [Section 418-00](#).
 - NO RESP/NOT EQUIP for instrument cluster module (ICM), go to Pinpoint Test A.
 - NO RESP/NOT EQUIP for restraint control module (RCM), refer to [Section 501-20B](#).
 - SYSTEM PASSED, retrieve and record the continuous diagnostic trouble codes (DTCs), erase the continuous DTCs and carry out self-test diagnostics for the ICM and RCM.
6. If the DTCs retrieved from the RCM are related to the concern, refer to [Section 501-20B](#). If the DTCs retrieved from the ICM are related to the concern, go to the Instrument Cluster Diagnostic Trouble Code (DTC) Index to continue diagnostics.
7. If no DTCs related to the concern are retrieved, proceed to Symptom Chart to continue diagnostics.

Instrument Cluster Diagnostic Trouble Code (DTC) Index

DTC	Description	Source	Action
B1201	Fuel Sender Circuit Failure	ICM	REFER to Section 413-01 .
B1205	EIC Switch-1 Assembly Circuit Failure	ICM	REFER to Section 413-01 .
B1209	EIC Switch-2 Assembly Circuit Failure	ICM	REFER to Section 413-01 .
B1213	Anti-Theft Number of Programmed Keys Is Below Minimum	ICM	REFER to Section 419-01A .
B1246	Dim Panel Potentiometer Switch Circuit Failure	ICM	REFER to Section 413-00 .
B1342	ECU Is Defective	ICM	CLEAR the DTCs. CARRY OUT the instrument cluster self-test. If DTC B1342 is retrieved again, install a new instrument cluster. REFER to Section 413-01 .
B1352	Ignition Key-In Circuit Failure	ICM	Go to Pinpoint Test D .
B1470	Lamp Headlamp Input Circuit Failure	ICM	REFER to Section 417-01 .
B1567	Lamp Headlamp High Beam Circuit Failure	ICM	REFER to Section 417-01 .
B1600	PATS Ignition Key Transponder Signal Is Not Received	ICM	REFER to Section 419-01B .
B1601	PATS Received Incorrect Key-Code From Ignition Key Transponder	ICM	REFER to Section 419-01B .
B1602	PATS Received Invalid Format of Key-Code From Ignition Key Transponder	ICM	REFER to Section 419-01B .
B1676	Battery Pack Voltage Out of Range	ICM	REFER to Section 414-00 .

B1681	PATS Transceiver Module Signal Is Not Received	ICM	REFER to Section 419-01B .
B1689	Autolamp Delay Circuit Failure	ICM	REFER to Section 417-01 .
B1875	Turn Signal / Hazard Switch Signal Circuit Failure	ICM	REFER to Section 417-01 .
B2103	Antenna Not Connected	ICM	REFER to Section 419-01B .
B2139	Security Data Mismatch (received PCM ID does not match what was expected)	ICM	REFER to Section 419-01B .
B2141	NVM Configuration Failure	ICM	REFER to Section 419-01B .
B2143	NVM Memory Failure	ICM	REFER to Section 419-01B .
B2162	Security Data Mismatch #2 (received data does not match what was expected)	ICM	REFER to Section 419-01B .
B2328	Column Reach Feedback Potentiometer Circuit Failure	ICM	REFER to Section 211-04 .
B2332	Column Tilt Feedback Potentiometer Circuit Failure	ICM	REFER to Section 211-04 .
B2351	Steering Column Switch Circuit Failure	ICM	REFER to Section 211-04 .
B2431	Transponder Programming Failed	ICM	REFER to Section 419-01B .
B2472	Fog Lamp Switch Failure	ICM	REFER to Section 417-01 .
B2477	Module Configuration Failure	ICM	REFER to Section 418-01 .
U1041	SCP (J1850) Invalid or Missing Data for Vehicle Speed	ABS, ABS/TC, IVD	CARRY OUT the ABS self-test. REFER to Section 206-09A , Section 206-09B , or Section 206-09C .
U1059	SCP (J1850) Invalid or Missing Data for Transmission/ Transaxle/PRNDL	PCM	CARRY OUT the PCM self-test. REFER to the Powertrain Control/Emissions Diagnosis (PC/ED) manual.
U1073	SCP (J1850) Invalid or Missing Data for Engine Coolant Fluid Temperature	PCM	CARRY OUT the PCM self-test. REFER to the Powertrain Control/Emissions Diagnosis (PC/ED) manual.
U1123	SCP (J1850) Invalid or Missing Data for Odometer Rolling Count	ABS, ABS/TC, IVD	CARRY OUT the ABS self-test. REFER to Section 206-09A , Section 206-09B , or Section 206-09C .
U1147	SCP (J1850) Invalid or Missing Data for Vehicle Security System	PCM	CARRY OUT the PCM self-test. REFER to the Powertrain Control/Emissions Diagnosis (PC/ED) manual.

Instrument Cluster Parameter Identification (PID) Index

PID	Description	Expected Value
ABCHIME	Air Bag Chime	OFF, ON
ANTISCN	Anti-Scan Function	DISABL, ENABLE
ASWSTAT	Autolamp Switch Input Status	OFF, DELAY7, DELAY6, DELAY5, DELAY4, DELAY3, DELAY2, DELAY1, INVLD

CCNT	Number Of Continuous DTCs In Module	one count per bit
D_SBELT	Driver Seat Belt	OUT, IN
DSWSTAT	Dimmer Switch Input Status	ON, LVL1, LVL2, LVL3, LVL4, LVL5, LVL6, LVL7, LVL8, LVL9, LVL10, LVL11, LVL12, LVL13, LVL14, LVL15, LVL16, LVL17, LVL18, LVL19, LVL20, LVL21, INVALID
ENABL_S	Vehicle Enable Status	DISABL, ENABLE
FOG_SW HA2_SW	Fog Lamp Switch Hazard Switch	OFF, ON OFF, ON
HEAD_L	Headlamp Switch Input Status	OFF, PARK, HEADLP, R_FOG, INVLD
HIBEAM	High Beam Switch Input Status	OFF, HIGH, PASS, INVLD
HORN_SW	Horn Input Switch	OFF, ON
IGN_A	Ignition Switch -ACCY Position	NO, YES
IGN_KEY	Ignition Key In / Out	OUT, IN
IGN_O/U	Ignition Switch - OFF/Unlock Position	NO, YES
IGN_R	Ignition Switch -RUN Position	NO, YES
IGN_S	Ignition Switch -START Position	NO, YES
LIGHTSN	Night(True) / Day(False)	NO, YES
LTURN	Left Turn Switch	OFF, ON
M_KEY	Master Key Present	notPRE, PRESNT
NUMKEYS	Number Of Keys Stored In Module	one count per bit
PCM_ID	PCM ID Status	notSTR, STORED
PCM_VFY	PCM Verify OK	NO, YES
RESETSW	Reset Switch	OFF, ON
RTURN	Right Turn Switch	OFF, ON
SELECT	Select/Mode Switch	OFF, ON
SERVMOD	Service Module: 0=No, Y=Yes	0-25 0-14
SPAREKY	Spare Key Programming: 0=Enabled, 1=Disabled	
TILT	Steering Column Tilt Switch	SHORT, UP, DOWN, OFF
TELEPOS	Telescope Position Sensor	notSEN, SENSED
TELESCP	Steering Column Telescope Switch	SHORT, IN, OUT, OFF
TILTPOS	Tilt Position Sensor	notSEN, SENSED
TR_PARK	Transmission Select Lever In Park Pos	NO, YES

Instrument Cluster Active Command Index

Active Command	Display	Action
ANTI-THEFT INDICATOR LAMP	THEFT_LAMP	OFF, ON
DISPLAY DIMMING CONTROL	ILLUMINAT	OFF, ON
DISPLAY SEGMENT CONTROL II	SEGMENTS	OFF, ON
ENGINE COOLANT GAUGE CONTROL	ENGCOOLNT	0%-100%
EXTERIOR LAMP CONTROL	R_FOG_LMP	OFF, ON
FUEL GAUGE CONTROL	FUELLEVEL	0%-100%
MEMORY SELECT CONTROL	MEMORY 1	OFF, ON
MEMORY SELECT CONTROL	MEMORY 2	OFF, ON
RF_SIGNAL	RF	OFF, ON
SPEEDOMETER CONTROL	SPDOMETER	0%-100%
TACHOMETER CONTROL	TCHOMETER	0%-100%
WARNING LAMPS AND CHIME	ALL_LAMPS	OFF, ON
WARNING LAMPS AND CHIME	CHIME	OFF, ON

Symptom Chart


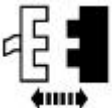
Symptom Chart

Condition	Possible Sources	Action
<ul style="list-style-type: none"> No communication with the instrument cluster 	<ul style="list-style-type: none"> BJB Fuses: <ul style="list-style-type: none"> 422 (20A) 425 (40A) CJB Fuses: <ul style="list-style-type: none"> 204 (5A). 213 (5A). 217 (5A). 219 (20A). 220 (10A). Circuitry. Instrument cluster. 	<ul style="list-style-type: none"> GO to Pinpoint Test A.
<ul style="list-style-type: none"> All chimes are inoperative 	<ul style="list-style-type: none"> Instrument cluster. 	<ul style="list-style-type: none"> INSTALL a new instrument cluster. REFER to Section 413-01. REPEAT the self-test, CLEAR the DTCs.
<ul style="list-style-type: none"> The chime sounds when the driver door is ajar (no key in ignition and 	<ul style="list-style-type: none"> Instrument cluster. Key warning 	<ul style="list-style-type: none"> GO to Pinpoint Test B.

headlamps OFF)	<ul style="list-style-type: none"> switch. ● Circuitry. ● Headlamp switch. 	
<ul style="list-style-type: none"> ● The safety belt warning chime does not operate correctly 	<ul style="list-style-type: none"> ● Driver safety belt switch. ● Instrument cluster. ● Circuitry. 	<ul style="list-style-type: none"> ● GO to Pinpoint Test C.
<ul style="list-style-type: none"> ● The key-in-ignition chime does not operate correctly 	<ul style="list-style-type: none"> ● Key-in-ignition switch. ● Driver door ajar switch. ● Circuitry. ● Instrument cluster. 	<ul style="list-style-type: none"> ● GO to Pinpoint Test D.
<ul style="list-style-type: none"> ● The headlamp on reminder chime does not operate correctly 	<ul style="list-style-type: none"> ● Instrument cluster. ● Headlamp switch. ● Circuitry. ● Driver door ajar switch. 	<ul style="list-style-type: none"> ● GO to Pinpoint Test E.
<ul style="list-style-type: none"> ● A chime does not operate correctly — air bag warning chime 	<ul style="list-style-type: none"> ● Instrument cluster. ● Circuitry. ● Restraint control module (RCM). 	<ul style="list-style-type: none"> ● GO to Pinpoint Test F.
<ul style="list-style-type: none"> ● A chime does not operate correctly — fail safe cooling chime 	<ul style="list-style-type: none"> ● Instrument cluster. ● Circuitry. 	<ul style="list-style-type: none"> ● GO to Pinpoint Test G.
<ul style="list-style-type: none"> ● A chime does not operate correctly — turn signal warning tone 	<ul style="list-style-type: none"> ● Instrument cluster. ● Circuitry. 	<ul style="list-style-type: none"> ● GO to Pinpoint Test H.

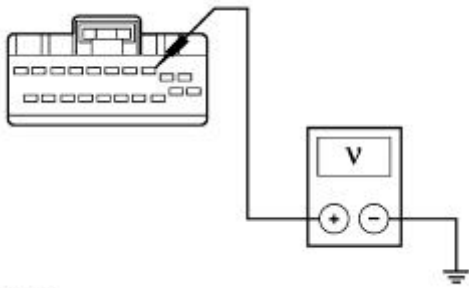
Pinpoint Tests

PINPOINT TEST A: NO COMMUNICATION WITH THE INSTRUMENT CLUSTER

CONDITIONS	DETAILS/RESULTS/ACTIONS
A1 CHECK CONSTANT POWER SUPPLY CIRCUIT	
<p>1</p> 	
<p>2</p> 	

Instrument Cluster C220b

3



A0002792

3

Measure the voltage between instrument cluster C220b pin 3, circuit 29-GG11 (OG/BU), harness side and ground.

• Is the voltage greater than 10 volts?

→ **Yes**
GO to [A2](#).

→ **No**
REPAIR the circuit. REPEAT the self-test.
CLEAR the DTCs.

A2 CHECK IGNITION POWER SUPPLY CIRCUITS

1



2

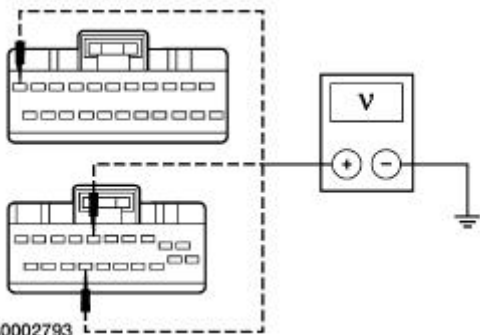


Instrument Cluster C220a

3



4



A0002793

4

Using the following table, measure the voltage between the instrument cluster connectors, harness side and ground.

Connector Pin	Circuit
C220a pin 11	15-JA14 (GN/BK)
C220b pin 6	15-GG14 (GN/RD)
C220b pin 17	75-GG15 (YE/GN)

• Are the voltages greater than 10 volts?

→ **Yes**
GO to [A3](#).

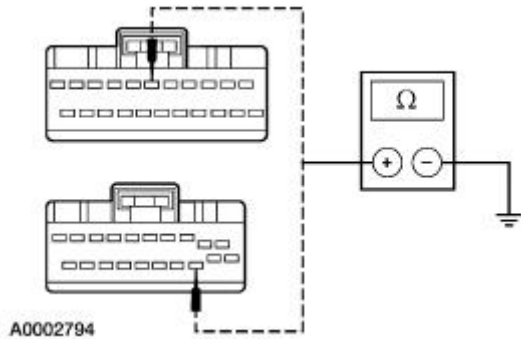
→ **No**
REPAIR the circuit(s). REPEAT the self-test. CLEAR the DTCs.

A3 CHECK GROUND CIRCUITS

1



2



2 Using the following table, measure the resistance between the instrument cluster connectors, harness side and ground.

Connector Pin	Circuit
C220a pin 6	31-AL11 (BK)
C220b pin 13	91-GG11 (BN/RD)

- Are the resistances less than 5 ohms?

→ **Yes**
REFER to [Section 418-00](#).

→ **No**
REPAIR the circuit(s). REPEAT the self-test. CLEAR the DTCs.

PINPOINT TEST B: THE CHIME SOUNDS WHEN THE DRIVER DOOR IS AJAR (NO KEY IN IGNITION AND HEADLAMPS OFF)

CONDITIONS	DETAILS/RESULTS/ACTIONS
B1 MONITOR ICM PID IGN_KEY	
<p>1</p> <p>3</p> <p>NGS</p> <p>4</p>	<p>2 Remove the ignition key.</p> <p>4 Monitor ICM PID IGN_KEY.</p>



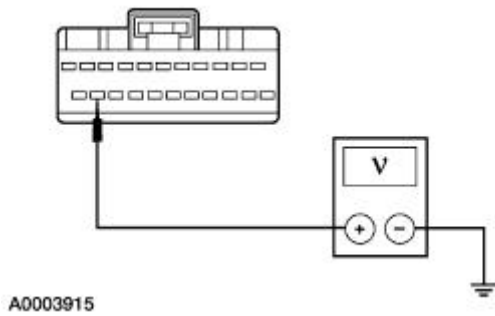
● Does the ICM PID indicate IN?

→ **Yes**
GO to [B2](#).

→ **No**
INSTALL a new instrument cluster.
REFER to [Section 413-01](#). REPEAT the self-test. CLEAR the DTCs.

B2 CHECK CIRCUIT 30S-GM7 (RD/WH) FOR A SHORT TO VOLTAGE

1



1



Measure the voltage between instrument cluster C220a, pin 21, circuit 30S-GM7 (RD/WH), harness side and ground.

● Is any voltage present?

→ **Yes**
INSTALL a new ignition switch. REFER to [Section 211-04](#). REPEAT the self-test. CLEAR the DTCs.

→ **No**
GO to [Pinpoint Test D](#).

PINPOINT TEST C: THE SAFETY BELT WARNING CHIME DOES NOT OPERATE CORRECTLY

CONDITIONS	DETAILS/RESULTS/ACTIONS
C1 CHECK THE SEAT BELT WARNING SWITCH — MONITOR THE ICM PID D_SBELT	
<p>1</p>  <p>2</p>  <p>3</p>	



4



4

Monitor the ICM PID D_SBEL , while inserting and removing the safety belt.

- **Does the ICM PID D_SBELT indicate IN with the safety belt inserted and OUT with the safety belt out?**

→ **Yes**

INSTALL a new instrument cluster. REFER to [Section 413-01](#). REPEAT the self-test. CLEAR the DTCs.

→ **No**

If the ICM PID D_SBELT indicates IN, GO to [C5](#). If the ICM PID D_SBELT indicates OUT GO to [C2](#).

C2 CHECK CIRCUIT 31-GE52 (BK) FOR OPEN

1

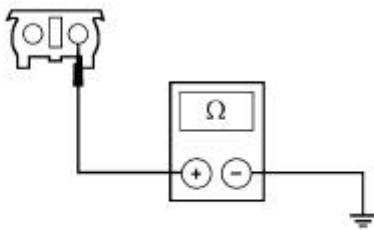


2



Safety Belt Warning Switch C381

3



A0003906

3

Measure the resistance between safety belt warning switch C381, circuit 31-GE52 (BK), harness side and ground.

- **Is the resistance less than 5 ohms?**

→ **Yes**

GO to [C3](#).

→ **No**

REPAIR the circuit. REPEAT the self-test. CLEAR the DTCs.

C3 CHECK SAFETY BELT WARNING SWITCH FOR SOURCE OF CONCERN

1 Connect a jumper wire between safety belt warning switch C381, circuit 8-GE52, harness side and ground.

2 Monitor the ICM PID D_SBELT.

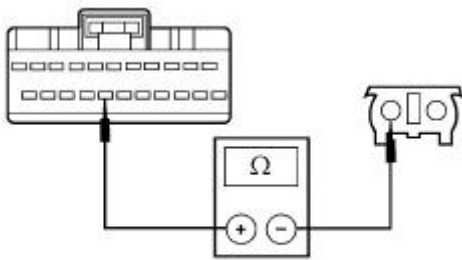
● Does the ICM PID indicate IN?

→ **Yes**
INSTALL a new safety belt buckle.
REFER to [Section 501-20A](#).

→ **No**
GO to [C4](#).

C4 CHECK CIRCUIT 8-GE52 (WH/BK) FOR OPEN

1



A0003907

1 Measure the resistance between instrument cluster C220a pin 18, circuit 8-GE52 (WH/BK), harness side and safety belt warning switch C381, circuit 8-GE52 (WH/BK), harness side.

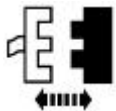
● Is the resistance less than 5 ohms?

→ **Yes**
INSTALL a new instrument cluster.
REFER to [Section 413-01](#). REPEAT the self-test. CLEAR the DTCs.

→ **No**
REPAIR the circuit. REPEAT the self-test. CLEAR the DTCs.

C5 MONITOR THE PID D_SBELT

1



Safety Belt Warning Switch C381

2 Monitor the ICM PID D_SBELT

● Does the PID say OUT?

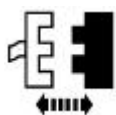
→ **Yes**
INSTALL a new safety belt buckle.
REFER to [Section 501-20A](#).

→ **No**

GO to [C6](#).

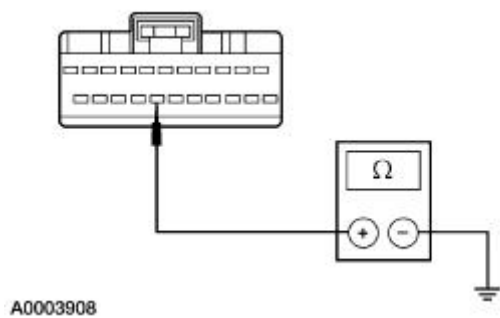
C6 CHECK CIRCUIT 8-GE52 (WH/BK) FOR SHORT TO GROUND

1



Instrument Cluster C220a

2



A0003908

2

Measure the resistance between instrument cluster C220a pin 18, circuit 8-GE52 (WH/BK), harness side and ground.

- Is the resistance greater than 10,000 ohms?

- **Yes**
INSTALL a new instrument cluster. REFER to [Section 413-01](#) . REPEAT the self-test. CLEAR the DTCs.
- **No**
REPAIR the circuit. REPEAT the self-test. CLEAR the DTCs.

PINPOINT TEST D: THE KEY-IN-IGNITION CHIME DOES NOT OPERATE CORRECTLY

CONDITIONS	DETAILS/RESULTS/ACTIONS
D1 RETRIEVE THE RECORDED DTCs FROM BOTH CONTINUOUS AND ON-DEMAND SELF-TEST—ICM	<p>1 Use the recorded ICM DTCs from the continuous and on-demand self-tests.</p> <ul style="list-style-type: none"> ● Are there any DTCs recorded? <p>→ Yes If DTC B1352, GO to D3 .</p> <p>→ No GO to D2 .</p>
D2 CHECK THE COURTESY LAMPS	<p>1 Open the driver front door.</p>

- Do the courtesy lamps illuminate?

→ **Yes**
GO to [D3](#).

→ **No**
REFER to [Section 417-02](#).

D3 MONITOR THE ICM PID IGN_KEY

1



2



3



4 Monitor the ICM PID IGN_KEY.

5 With the key in the ignition, the ICM PID IGN_KEY should indicate IN. With the key out of the ignition, the ICM PID IGN_KEY should indicate OUT.

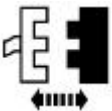
- Does the ICM PID IGN_KEY indicate correctly?

→ **Yes**
INSTALL a new instrument cluster.
REFER to [Section 413-01](#). REPEAT the self-test. CLEAR the DTCs.

→ **No**
GO to [D4](#).

D4 CHECK THE KEY-IN-IGNITION WARNING SWITCH—MONITOR THE PID IGN_KEY

1



Ignition Switch C250

2

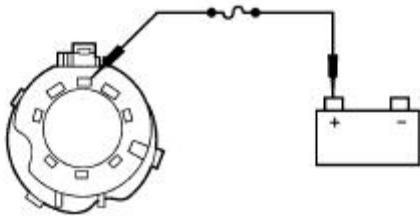


3



3 Monitor the PID IGN_KEY.

4



A0003909

4

Connect a 10A fused jumper wire between ignition switch C250 pin 8, circuit 30S-GM7 (RD/WH), harness side and battery positive.

- Does the ICM PID IGN_KEY indicate IN with the jumper wire connected and OUT with the jumper wire removed?

→ **Yes**
INSTALL a new ignition switch. REFER to [Section 211-04](#) . REPEAT the self-test. CLEAR the DTCs.

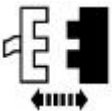
→ **No**
GO to [D5](#) .

D5 CHECK CIRCUIT 30S-GM7 (RD/WH) FOR OPEN

1

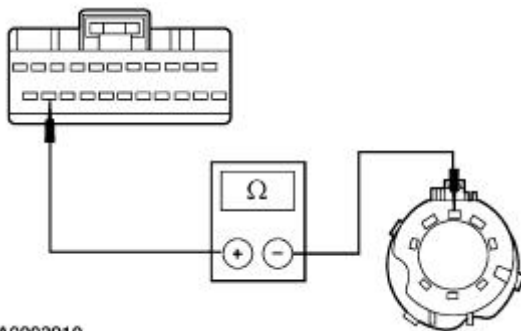


2



Instrument Cluster C220a

3



A0003910

3

Measure the resistance between the instrument cluster C220a pin 21, circuit 30S-GM7 (RD/WH), harness side and ignition switch C250 pin 8, circuit 30S-GM7 (RD/WH).

- Is the resistance less than 5 ohms?

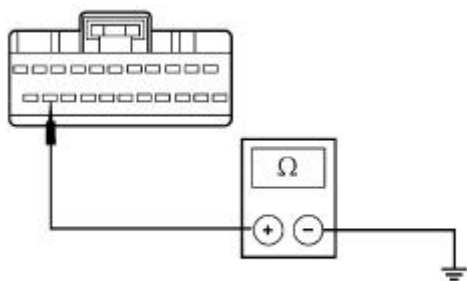
→ **Yes**
GO to [D6](#) .

→ **No**
REPAIR the circuit. REPEAT the self-test.

CLEAR the DTCs.

D6 CHECK CIRCUIT 30S-GM7 (RD/WH) FOR SHORT TO GROUND

1



A0003911

1

Measure the resistance between the instrument cluster C220a pin 21, circuit 30S-GM7 (RD/WH), harness side and ground.

- Is the resistance greater than 10,000 ohms?


→ Yes

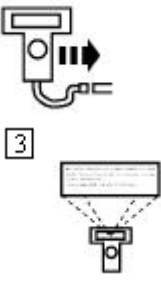
INSTALL a new instrument cluster, REFER to [Section 413-01](#). REPEAT the self-test. CLEAR the DTCs.

→ No

REPAIR the circuit. REPEAT the self-test. CLEAR the DTCs.

PINPOINT TEST E: THE HEADLAMP ON REMINDER CHIME DOES NOT OPERATE CORRECTLY

CONDITIONS	DETAILS/RESULTS/ACTIONS
E1 RETRIEVE THE RECORDED DTCS FROM BOTH CONTINUOUS AND ON-DEMAND SELF-TESTS — ICM	<p>1 Use the recorded ICM DTCs from the continuous and on-demand self-tests.</p> <ul style="list-style-type: none">● Are any DTCs recorded? <p>→ Yes For DTC B1470, REFER to Section 417-01.</p> <p>For all other ICM DTCs, REFER to the Instrument Cluster Diagnostic Trouble Code (DTC) Index.</p> <p>→ No GO to E2.</p>
E2 MONITOR THE ICM PID IGN_KEY	<p>1 </p> <p>2</p>

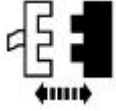
 <p>3</p>	<p>3 Monitor the ICM PID IGN_KEY.</p> <ul style="list-style-type: none"> • Does the ICM PID IGN_KEY indicate IN with the key in the ignition and indicate OUT with the key out of the ignition? <p>→ Yes GO to E3.</p> <p>→ No GO to Pinpoint Test D.</p>
<p>E3 CHECK FOR COURTESY LAMP OPERATION</p>	
	<p>1 Monitor the courtesy lamps while opening and closing the driver door.</p> <ul style="list-style-type: none"> • Do the courtesy lamps illuminate with the driver door open, and go out with the driver door closed after a 20 second delay? <p>→ Yes INSTALL a new instrument cluster, REFER to Section 413-01. REPEAT the self-test. CLEAR the DTCs.</p> <p>→ No REFER to Section 417-02.</p>

PINPOINT TEST F: A CHIME DOES NOT OPERATE CORRECTLY — AIR BAG WARNING CHIME

CONDITIONS	DETAILS/RESULTS/ACTIONS
<p>F1 RETRIEVE THE RECORDED DTCs FROM BOTH CONTINUOUS AND ON-DEMAND SELF-TESTS — RCM</p>	<p>1 Use the recorded RCM DTCs from the continuous and on-demand self-tests.</p> <ul style="list-style-type: none"> • Are any RCM DTCs recorded? <p>→ Yes REFER to Section 501-20B.</p> <p>→ No GO to F2.</p>
<p>F2 CHECK CIRCUIT 8-JA13 (BK/WH) FOR SHORT TO GROUND</p>	
<p>1</p>	



3



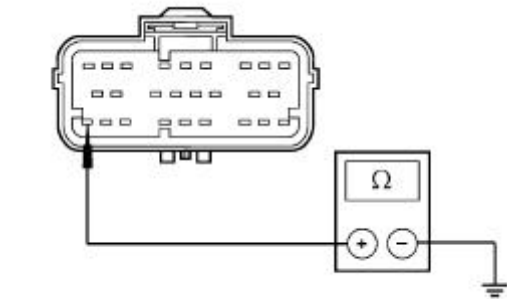
RCM C310a

4



Instrument Cluster C220b

5



A0003912

2 Deactivate the air bag system. REFER to [Section 501-20B](#).

5 Measure the resistance between RCM C310a pin 26, circuit 8-JA13 (WH/BK), harness side and ground.

• Is the resistance greater than 10,000 ohms?

→ **Yes**
GO to [F3](#).

→ **No**
REPAIR the circuit. REPEAT the self-test, CLEAR the DTCs .

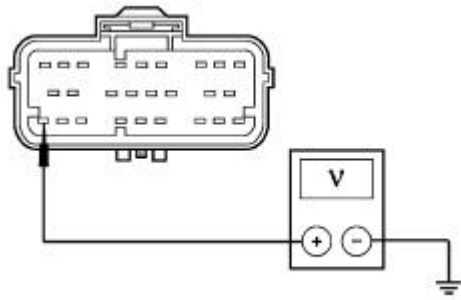
F3 CHECK CIRCUIT 8-JA13 (WH/BK) FOR SHORT TO VOLTAGE

1



2

2 Measure the voltage between RCM C310a pin 26, circuit 8-JA13 (WH/BK), harness side and ground.



A0003913

● Is any voltage indicated?

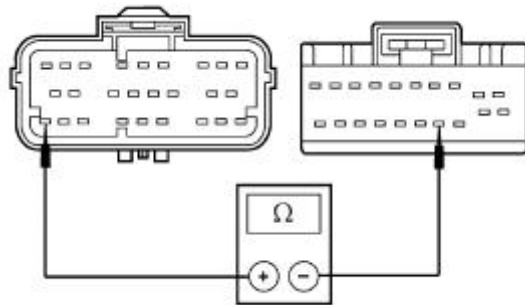
- **Yes**
REPAIR the circuit. REPEAT the self-test, CLEAR the DTCs.
- **No**
GO to [F4](#).

F4 CHECK CIRCUIT 8-JA13 (WH/BK) FOR OPEN

1



2



A0003914

- 2 Measure the resistance between RCM C310a pin 26, circuit 8-JA13 (WH/BK), harness side and instrument cluster C220b pin 14, circuit 8-JA13 (WH/BK), harness side.

● Is the resistance less than 5 ohms?

- **Yes**
INSTALL a new instrument cluster, REFER to [Section 413-01](#). REPEAT the self-test, CLEAR the DTCs.
- **No**
REPAIR the circuit. REPEAT the self-test. CLEAR the DTCs.


PINPOINT TEST G: A CHIME DOES NOT OPERATE CORRECTLY — FAIL SAFE COOLING CHIME IS INOPERATIVE

CONDITIONS	DETAILS/RESULTS/ACTIONS

G1 RETRIEVE THE RECORDED DTCS FROM BOTH CONTINUOUS AND ON-DEMAND SELF TESTS—ICM

	<p>1 Use the recorded ICM DTCs from the continuous and on-demand self-tests.</p> <ul style="list-style-type: none"> ● Are there any DTCs recorded? <p>→ Yes For DTC U1073, REFER to Powertrain Control/Emissions Diagnosis (PC/ED) manual.</p> <p>→ No INSTALL a new instrument cluster, REFER to Section 413-01. REPEAT the self-test. CLEAR the DTCs.</p>
--	---

PINPOINT TEST H: A CHIME DOES NOT OPERATE CORRECTLY — TURN SIGNAL WARNING TONE

CONDITIONS	DETAILS/RESULTS/ACTIONS
<p>H1 RETRIEVE THE RECORDED DTCS FROM BOTH CONTINUOUS AND ON-DEMAND SELF-TESTS — ICM</p>	
	<p>1 Use the recorded ICM DTCs from the continuous and on-demand self-tests.</p> <ul style="list-style-type: none"> ● Are any DTCs recorded? <p>→ Yes For ICM DTC U1123, REFER to Section 206-09A, Section 206-09B, or Section 206-09C.</p> <p>For all other ICM DTCs, REFER to the Instrument Cluster Diagnostic Trouble Code (DTC) Index.</p> <p>→ No GO to H2.</p>
<p>H2 CHECK OPERATION OF THE TURN SIGNALS</p>	
<p>1</p> 	<p>2 Operate the turn signals.</p> <ul style="list-style-type: none"> ● Do the turn signal lamps operate? <p>→ Yes INSTALL a new instrument cluster, REFER to Section 413-01. REPEAT the self-test. CLEAR the DTCs.</p> <p>→ No REFER to Section 417-01.</p>

Belt Minder Deactivating/Activating

Preparation

1. Before deactivating/activating the belt minder, set the parking brake.
2. Place the transmission range selector lever in P (PARK) (automatic transmission) or the NEUTRAL position (manual transmission).
3. Place the ignition switch in the OFF position.
4. Close all the vehicle doors.
5. Unbuckle the driver safety belt.
6. Place the parking lamps/headlamps switch in the OFF position.

Deactivating/Activating

1. Start with the ignition OFF and the driver and passenger safety belts unbuckled.
2. Turn the ignition to RUN (it is not required to start the vehicle.)
3. Wait until the seatbelt warning lamp turns off (approximately one minute.)
4. Buckle then unbuckle the driver or passenger seatbelt three times, ending in the unbuckled state. Step 4 must be completed within 60 seconds.
5. After Step 4 is complete the airbag warning lamp will be turned on for three seconds.
6. After the airbag warning lamp turns off, buckle/then unbuckle the safety belt again. This will enable the belt minder if it is currently disabled, or will disable the belt minder if it is currently enabled.
7. Confirmation of enabling the belt minder is provided to the customer by the airbag warning lamp flashing four times per second for three seconds, followed by three seconds again.
8. Confirmation of disabling the belt minder is provided to the customer by the airbag warning lamp flashing four times per second for three seconds.
9. Customer programming of the belt minder is automatically exited after completion of the customer confirmation.
10. The belt minder will automatically exit the programming mode without changing its enable status if Step 6 does not occur within 10 seconds of the end of Step 4.
11. Performing Steps 1-12 using only the driver safety belt will permanently enable/ disable the driver belt minder feature.

12. Performing Steps 1-12 using only the passenger safety belt will permanently enable/disable the passenger belminder feature.
 13. Only one side (driver or passenger) can be enabled/disabled per key cycle. While programming the driver side, any activity on the passenger safety belt will abort the programming sequence. While programming the passenger side, any activity on the driver safety belt will terminate the programming sequence.
 14. The programming sequence will abort if a system fault occurs that requires the illumination of the restraints indicator lamp (RIL) at any time during programming or confirmation.
-

General Specifications

Item	Specification
Battery	
Manufacturer	Motorcraft
Voltage	12 volts
Amps at -17.7°C (0°F) cold crank	650
Minutes-reserve capacity	130
Amps/hrs. -20 hour rate	72
Generator	
Current output	105 amps @ 6,000 gen rpm
Type	6G with internal voltage regulator
Pulley ratio	2.65:1 (3.0L); 2.78:1 (3.9L)

Charging System

This vehicle is equipped with a powertrain control module (PCM) controlled charging system. The PCM-controlled charging system is a system whereby the PCM determines the optimal voltage setpoint for the charging system and communicates this information to the voltage regulator. The PCM-controlled charging system is unique in that it has two unidirectional communication lines between the PCM and the generator/regulator. Both of these communication lines are pulse-width modulated. The generator communication (GEN COM) line communicates the desired setpoint from the PCM to the voltage regulator and the generator monitor (GEN MON) line communicates the generator load and error conditions to the PCM. The third pin on the voltage regulator, the A circuit pin, is a dedicated battery voltage sense line.

Circuit Description

B+ Output Terminal Circuit 30-BA6 (RD)

Generator output voltage is supplied through the battery positive (B+) output terminal on the rear of the generator to the battery and the electrical system.

Circuit 30-BA25 (RD)

This is the A terminal battery voltage sense circuit and is used to sense battery voltage. The circuit is used to supply current to the generator field (rotor) and to turn on the voltage regulator which determines generator output. This circuit is also used to turn the charging system warning indicator on if there is a fault in the charging system operation.

Circuit 10-BA25 (GY/RD)

This is the generator communication (GEN COM) circuit. The PCM determines the optimal voltage setpoint for the charging system and communicates this information to the voltage regulator via the GEN COM circuit.




Circuit 8-BA25 (WH/RD)

The generator monitor (GEN MON) circuit communicates the generator load and error conditions to the PCM.


Charging System


Refer to Wiring Diagrams Section [414-00](#) for schematic and connector information.


Special Tool(s)

 ST1137-A	73III Automotive Meter 105-R0057 or equivalent
 ST2173-A	SABRE Premium Electrical System Tester 010-00736 or equivalent
 ST2332-A	Worldwide Diagnostic System (WDS) 418-F224, New Generation STAR (NGS) Tester 418-F052, or equivalent diagnostic tool

Inspection and Verification

 **WARNING:** Batteries normally produce explosive gases. Therefore, do not allow flames, sparks or lighted substances to come near the battery. When charging or working near a battery, always shield your face and protect your eyes. Always provide ventilation. Failure to follow these instructions may result in personal injury.

 **WARNING:** When lifting a plastic-cased battery, excessive pressure on the end walls could cause acid to spew through the vent caps, resulting in personal injury, damage to the vehicle or battery. Lift with a battery carrier or with your hands on opposite corners. Failure to follow these instructions may result in personal injury.

 **WARNING:** Keep batteries out of the reach of children. Batteries contain sulfuric acid. Avoid contact with skin, eyes, or clothing. Also, shield your eyes when working near the battery to protect against possible splashing of the acid solution. In case of acid contact with skin or eyes, flush immediately with water for a minimum of 15 minutes and get prompt medical attention. If acid is swallowed, call a physician immediately. Failure to follow these instructions may result in personal injury.

1. Verify the customer concern by operating the engine to duplicate the concern.
2. Inspect to determine if one of the following mechanical or electrical concerns apply:

Visual Inspection Chart

Mechanical	Electrical
<ul style="list-style-type: none"> ● Battery ● Generator drive belt ● Generator pulley 	<ul style="list-style-type: none"> ● Battery junction box (BJB) fuse: <ul style="list-style-type: none"> ■ F415 (5A) ● Central junction box (CJB) fuse: <ul style="list-style-type: none"> ■ F217 (5A) ● Circuitry ● Charging warning indicator ● Cables

3. If the inspection reveals obvious concerns that can be readily identified, repair as necessary. Check the generator sense Fuse F415 located in the battery junction box.
4. Measure the open circuit battery voltage. (Battery is located in the luggage compartment on the RH side). If the battery voltage is less than 12.0 volts, test and recharge the battery before continuing with diagnosis. Refer to [Section 414-01](#).
5. Check the operation of the charging system warning indicator lamp (instrument cluster). Normal operation is as follows:
 - With the ignition switch OFF, the charging system warning indicator should be OFF.
 - With the ignition switch in RUN and the engine off, the charging system warning indicator light should be on.
 - With the engine running, the charging system warning indicator light should be off.
6. Check the battery voltage before and after starting the engine to determine if the battery voltage increases. Refer to the Normal Charging System Voltages chart.

Normal Charging System Voltages and Charging System Warning Indicator Operation

Key Position	30-BA25 (RD)	10-BA25 (GY/RD)	Generator B+ 30-BA6 (RD)	Battery	Engine to Battery Ground	Charging System Warning Indicator Operation
Key OFF	12 volts	0 volts	12 volts	12 volts	0 volts	Off
RUN-engine OFF	12 volts	1-3 volts	12 volts	12 volts	0 volts	Illuminated
RUN-engine running	13- 15V	13- 15V	13- 15V	13- 15V	0V	Off

7. If the concern remains after the inspection, connect the diagnostic tool to the data link connector (DLC) located under the instrument panel and select the vehicle to be tested from the diagnostic tool menu. If the vehicle selection cannot be entered:
 - check that the program card is correctly installed.
 - Check the connections to the vehicle.
 - check the ignition switch position. If the diagnostic tool still does not allow the vehicle selection to be entered, refer to the diagnostic tool manual.
8. If any PCM DTCs are retrieved, go to the PCM Index below to check if the codes retrieved are related to the charging system and continue diagnosis.
9. If no DTCs related to the charging system are retrieved, go to the Symptom Chart to continue

diagnosis.

NOTE: DTC P1246 can be set by the loss of the communication lines, GEN COM Circuit 8-BA25 (WH/RD) and/or GEN MON Circuit 10-BA25 (GY/RD). However, the generator warning indicator lamp will not illuminate since the generator is self-regulating and will function normally.

Powertrain Control Module Diagnostic Trouble Code (DTC) Index

DTC	Description	Action
P1246	System voltage failure	REFER to the Powertrain Control/Emissions Diagnosis (PC/ED) manual.

Symptom Chart

Symptom Chart

Condition	Possible Sources	Action
<ul style="list-style-type: none"> Battery is discharged or voltage is low 	<ul style="list-style-type: none"> Circuitry. High key-off current drain(s). Battery. Generator. 	<ul style="list-style-type: none"> GO to Pinpoint Test A.
<ul style="list-style-type: none"> The charging system warning indicator is on with the engine running (the system voltage does not increase) 	<ul style="list-style-type: none"> Generator. Battery junction box (BJB) fuse F415 (5A) Circuitry. 	<ul style="list-style-type: none"> GO to Pinpoint Test B.
<ul style="list-style-type: none"> The system overcharges (battery voltage greater than 15 volts) 	<ul style="list-style-type: none"> Battery junction box (BJB) fuse F415 (5A). Circuitry. Generator. 	<ul style="list-style-type: none"> GO to Pinpoint Test C.
<ul style="list-style-type: none"> The charging system warning indicator is on with the engine running (the system increases voltage) 	<ul style="list-style-type: none"> Battery junction box (BJB) fuse F415 (5A). Generator. Instrument cluster. PCM. Circuitry. 	<ul style="list-style-type: none"> GO to Pinpoint Test D.
<ul style="list-style-type: none"> The charging system warning indicator is off with the ignition switch in the RUN position and the engine off 	<ul style="list-style-type: none"> Generator connector unplugged C102a. Battery. Circuitry. Instrument cluster. PCM. 	<ul style="list-style-type: none"> GO to Pinpoint Test E.
<ul style="list-style-type: none"> The charging system warning indicator flickers or is intermittent 	<ul style="list-style-type: none"> Battery junction box (BJB) fuse F415 (5A). Generator connector unplugged (C102a). Circuitry. Generator. 	<ul style="list-style-type: none"> GO to Pinpoint Test F.
<ul style="list-style-type: none"> The generator is noisy 	<ul style="list-style-type: none"> Loose bolts/brackets. Drive belt. Generator/pulley. 	<ul style="list-style-type: none"> GO to Pinpoint Test G.
<ul style="list-style-type: none"> Radio interference 	<ul style="list-style-type: none"> Generator. 	<ul style="list-style-type: none"> GO to

- Wiring/routing.
- In-vehicle entertainment system.

[Pinpoint Test H.](#)

Pinpoint Tests



CAUTION: Do not make jumper connections except as directed. Incorrect connections may damage the voltage regulator test terminals, fuses or fuse links.



CAUTION: Do not allow any metal object to come in contact with the generator housing and internal diode cooling fins.

NOTE: While carrying out any pinpoint test, disregard any DTCs set while following any specific pinpoint test. After the completion of any test, be sure to clear all codes in the PCM.

NOTE: All voltage measurements are referenced to the negative (-) battery post unless otherwise specified.

NOTE: When the battery has been disconnected and reconnected, some abnormal drive symptoms may occur while the powertrain control module (PCM) relearns its fuel trim. The vehicle may need to be driven to relearn the strategy.





PINPOINT TEST A: BATTERY IS DISCHARGED OR VOLTAGE IS LOW

CONDITIONS	DETAILS/RESULTS/ACTIONS
A1 CHECK THE GENERATOR OUTPUT	
	<p>1 Carry out the On-Vehicle Generator Load/No Load Tests. Refer to Component Tests in this section.</p> <ul style="list-style-type: none"> ● Is the generator OK? <p>→ Yes GO to A2.</p> <p>→ No GO to Pinpoint Test B.</p>
A2 CHECK FOR CURRENT DRAINS	
	<p>1 Carry out the Battery — Drain Test. Refer to Component Tests in this section.</p> <ul style="list-style-type: none"> ● Are there any excessive current drains? <p>→ Yes REPAIR as necessary. TEST the system for normal operation.</p> <p>→ No GO to A3.</p>
A3 CHECK FOR CURRENT DRAINS WHICH SHUT OFF WHEN THE BATTERY IS	

DISCONNECTED

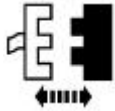
	<p>1 Carry out the Battery — Electronic Drains Which Shut Off When the Battery Cable is Disconnected Test. Refer to Component Tests in this section.</p> <ul style="list-style-type: none"> ● Are there any current drains which shut off when the battery is disconnected? <p>→ Yes REPAIR as necessary. TEST the system for normal operation.</p> <p>→ No GO to Pinpoint Test B.</p>
--	---

PINPOINT TEST B: CHARGING SYSTEM WARNING INDICATOR IS ON WITH THE ENGINE RUNNING (THE SYSTEM VOLTAGE DOES NOT INCREASE)

CONDITIONS	DETAILS/RESULTS/ACTIONS
B1 CHECK THE FAULT CODES IN THE PCM	
<p>1 </p> <p>2 </p> <p>3 </p>	<p>3 Use the recorded PCM DTCs from the continuous and on-demand self-test.</p> <ul style="list-style-type: none"> ● Are any DTCs recorded? <p>→ Yes REFER to PCM Diagnostic Trouble Code (DTC) Index.</p> <p>→ No GO to B2.</p>
B2 CHECK CIRCUIT 10-BA25 (GY/RD)	
<p>1 </p> <p>2</p>	



3



Generator C175c

4



5 Measure the voltage between the generator C175c pin 2, circuit 10-BA25 (GY/RD), harness side and ground.

• Is the voltage 0 volts?

→ Yes
GO to [B4](#).

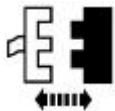
→ No
GO to [B3](#).

B3 CHECK CIRCUIT 10-BA25 (GY/RD) FOR AN OPEN

1

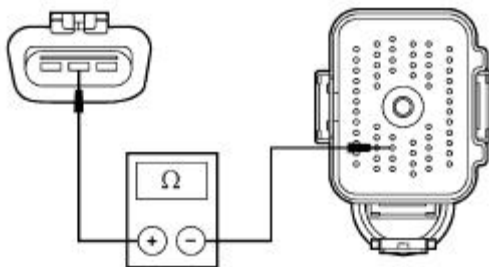


2



PCM C175c

3



A0016592

3 Measure the resistance between the PCM C175c pin 28, circuit 10-BA25 (GY/RD), harness side and the generator C102a pin 2, circuit 10-BA25 (GY/RD), harness side.

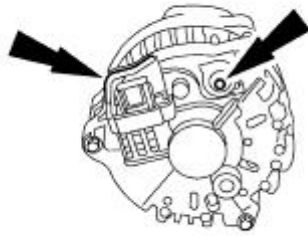
• Is the resistance less than 5 ohms?

→ Yes
GO to [B4](#).

→ **No**
REPAIR the circuit. TEST the system for normal operation.

B4 CHECK THE GENERATOR OUTPUT

1



A0005524

2



PCM C175c

3 Carry out the generator load test. Refer to Component Tests, Generator On-Vehicle Tests in this section.

● **Is the generator OK?**

→ **Yes**
GO to [B5](#).

→ **No**
INSTALL a new generator. REFER to [Section 414-02](#). TEST the system for normal operation.

B5 CHECK FOR CORRECT MODULE OPERATION

1 Check:

- for corrosion
- for pushed-out pins
- connector seated correctly

2 Connect any disconnected connectors.

3 Make sure all other system connectors are fully seated.








4 Operate the system and verify the concern is still present.

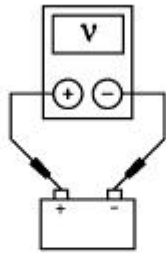
● **Is the concern still present?**

→ **Yes**
INSTALL a new PCM. REFER to [Section 303-14](#). CLEAR the DTCs. REPEAT the PCM self-test.

→ **No**
 The system is operating correctly at this time. Concern may have been caused by a loose or corroded connector. CLEAR the DTCs. REPEAT the self-test.

PINPOINT TEST C: THE SYSTEM OVERCHARGES (BATTERY VOLTAGE GREATER THAN 15 VOLTS)

CONDITIONS	DETAILS/RESULTS/ACTIONS
C1 CHECK THE FAULT CODES IN THE PCM	
<p>1 </p> <p>2 </p> <p>3 </p>	<p>3 Use the recorded PCM DTCs from the continuous and on-demand self-test.</p> <p>● Are any DTCs recorded?</p> <p>→ Yes REFER to PCM Diagnostic Trouble Code (DTC) Index.</p> <p>→ No GO to C2.</p>
C2 CHECK THE BATTERY VOLTAGE	
<p>1 </p> <p>2 </p> <p>3 </p> <p>4 </p>	<p>4 With the engine running and all accessories turned off, measure the</p>



AJ0210-A

voltage at the battery while varying the engine rpm.

- Is the voltage greater than 15 volts?

→ **Yes**
GO to [C4](#).

→ **No**
GO to [C3](#).

C3 CHECK THE VOLTAGE GAUGE OPERATION

1 Vary the engine rpm and monitor the voltage gauge operation.

- Does the voltage gauge read above 15 volts?

→ **Yes**
The voltage gauge is inaccurate. REFER to [Section 413-01](#) to continue gauge diagnostics.

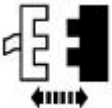
→ **No**
GO to [C4](#).

C4 CHECK THE GENERATOR OUTPUT

1



2



Generator C102a

3

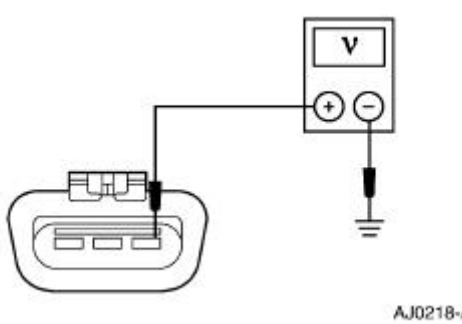


4 Check the generator output. Refer to Component Tests, Generator On-Vehicle Tests in this section.



- Is the generator OK?

	<p>→ Yes GO to C5.</p> <p>→ No INSTALL a new generator. REFER to Section. CLEAR the codes and TEST the system for normal operation.</p>
--	---

C5 CHECK CIRCUIT 30-BA25 (RD)

<p>1</p> 	<p>1 Measure the voltage between the generator C102a pin 3, circuit 30-BA25 (RD), harness side and ground.</p> <ul style="list-style-type: none"> ● Is the voltage less than 0.5 volt from battery voltage. <p>→ Yes INSTALL a new generator. REFER to Section 414-02 . CLEAR codes and test the system for normal operation.</p> <p>→ No REPAIR circuit 30-BA25 (RD) for high resistance. CLEAR codes and TEST the system for normal operation.</p>
--	---

PINPOINT TEST D: CHARGING SYSTEM WARNING INDICATOR IS ON WITH THE ENGINE RUNNING THE SYSTEM INCREASES VOLTAGE

CONDITIONS	DETAILS/RESULTS/ACTIONS
<p>D1 CHECK THE FAULT CODES IN THE PCM</p>	
<p>1</p>  <p>2</p>  <p>3</p>	<p>3 Use the recorded PCM DTCs from the continuous and on-demand self-test.</p>



● Are any DTCs recorded?

→ **Yes**
REFER to PCM Diagnostic Trouble Code (DTC) Index.

→ **No**
GO to [D2](#).

D2 CHECK THE SYSTEM FOR OVER CHARGING

1



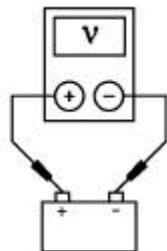
2



3



4



AJ0210-A

4 With the engine running and all accessories off measure the voltage at the battery terminals while varying the engine rpm.

● Is the voltage greater than 15 volts?

→ **Yes**
GO to [Pinpoint Test C](#).

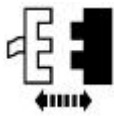
→ **No**
GO to [D3](#).

D3 CHECK CIRCUIT 30-BA25 (RD)

1



2

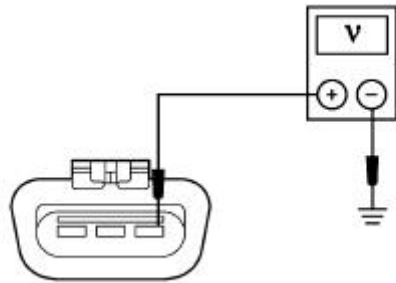


Generator C102a

3



4



AJ0218-A

4 Measure the voltage between generator C102a pin 3, circuit 30-BA25 (RD), harness side, and ground.

• Is the voltage equal to battery voltage?

→ Yes
GO to [D4](#).

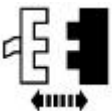
→ No
REPAIR the circuit. TEST the system for normal operation.

D4 CHECK THE CHARGING SYSTEM WARNING INDICATOR OPERATION

1



2



PCM C175c

3



3 Monitor the charging system warning indicator.

• Is the indicator illuminated?

→ Yes
REPAIR circuit 10-BA25 (GY/RD) for a short to ground. TEST the system for normal operation.

→ **No**
GO to [D5](#).

D5 CHECK THE GENERATOR OUTPUT

1



2



PCM C175c

3



Generator C102a

4 Verify the generator output. Refer to Component Tests, Generator On-Vehicle Test — Load Test in this section.

● **Is the generator OK?**

→ **Yes**
GO to [D6](#).

→ **No**
INSTALL a new generator. REFER to [Section 414-02](#). Clear codes and TEST the system for normal operation.

D6 CHECK FOR CORRECT MODULE OPERATION

1 Check:

- for corrosion
- for pushed-out pins
- connector seated correctly

2 Connect any disconnected connectors.

3 Make sure all other system connectors are fully seated.

4 Operate the system and verify the concern is still present.






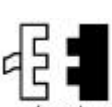
● **Is the concern still present?**

→ **Yes**
INSTALL a new PCM. REFER to [Section 303-14](#). CLEAR the DTCs. REPEAT the PCM self-test.

→ **No**

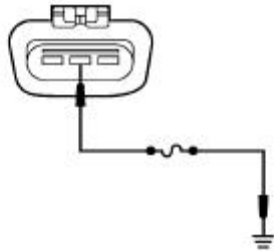
The system is operating correctly at this time. Concern may have been caused by a loose or corroded connector. CLEAR the DTCs. REPEAT the self-test.

PINPOINT TEST E: THE CHARGING SYSTEM WARNING INDICATOR IS OFF WITH THE IGNITION SWITCH IN THE RUN POSITION AND THE ENGINE IS OFF

CONDITIONS	DETAILS/RESULTS/ACTIONS
E1 CHECK THE FAULT CODES IN THE PCM	
<p>1 </p> <p>2 </p> <p>3 </p>	<p>3 Use the recorded PCM DTCs from the continuous and on-demand self-test.</p> <p>● Are any DTCs recorded?</p> <p>→ Yes REFER to PCM Diagnostic Trouble Code (DTC) Index.</p> <p>→ No GO to E2.</p>
E2 CHECK THE CHARGING SYSTEM WARNING INDICATOR OPERATION	
<p>1 </p> <p>2 </p> <p>3 </p> <p>Generator C102a</p> <p>4</p>	



5



A0016591

- 5 With the engine off, connect a fused (15A), jumper wire between the generator C102a pin 2, circuit 10-BA25 (GY/RD), harness side and ground.

- Does the charging system warning indicator illuminate?

→ **Yes**
INSTALL a new generator. REFER to [Section 414-02](#). TEST the system for normal operation.

→ **No**
GO to [E3](#).

E3 CHECK FOR CORRECT MODULE OPERATION

- 1 Check:

- for corrosion
- for pushed-out pins
- connector seated correctly

- 2 Connect any disconnected connectors.

- 3 Make sure all other system connectors are fully seated.

- 4 Operate the system and verify the concern is still present.




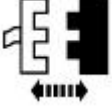

- Is the concern still present?

→ **Yes**
INSTALL a new PCM. REFER to [Section 303-14](#). CLEAR the DTCs. REPEAT the PCM self-test.

→ **No**
The system is operating correctly at this time. Concern may have been caused by a loose or corroded connector. CLEAR the DTCs. REPEAT the self-test.

PINPOINT TEST F: THE CHARGING SYSTEM WARNING INDICATOR

LAMP FLICKERS OR IS INTERMITTENT

CONDITIONS	DETAILS/RESULTS/ACTIONS
F1 CHECK THE FAULT CODES IN THE PCM	
<p>1 </p> <p>2 </p> <p>3 </p>	<p>3 Use the recorded PCM DTCs from the continuous and on-demand self-test.</p> <p>● Are any DTCs recorded?</p> <p>→ Yes REFER to PCM Diagnostic Trouble Code (DTC) Index.</p> <p>→ No GO to F2.</p>
F2 CHECK FOR LOOSE CONNECTIONS	
<p>1  Generator C102a</p> <p>3  Generator C102a</p>	<p>2 Check all generator, battery, and power distribution connections for looseness, corrosion, loose or bent terminals, or loose eyelets.</p> <p>● Are all connections clean and tight?</p> <p>→ Yes GO to F3.</p> <p>→ No REPAIR as necessary. TEST the system for normal operation.</p>

F3 CHECK FUSE CONNECTION

1



2 With the engine running, check BJB fuse F415 (5A) in circuit 30-BA25 (RD) for looseness by wiggling the fuse and noting the charging system warning indicator lamp operation.

● **Does the charging system warning indicator lamp flicker?**

→ **Yes**
REPAIR loose fuse connections as necessary. TEST the system for normal operation.

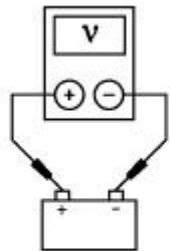
→ **No**
GO to [F4](#).

F4 CHECK THE BATTERY VOLTAGE

1



2



AJ0210-A

2 With the engine running, and all accessories turned off, measure the voltage at the battery while varying the engine rpm.

● **Is the voltage greater than 15 volts?**

→ **Yes**
GO to [Pinpoint Test G](#).

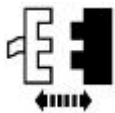
→ **No**
GO to [F5](#).

F5 CHECK THE WARNING SYSTEM INDICATOR OPERATION

1



2



Generator C102a

3



4 Connect a fused jumper wire between generator C102a pin 2, circuit 10-BA25 (GY/RD), harness side and ground.

• Does the charging system warning indicator illuminate?

→ Yes
GO to [F6](#).

→ No
REPAIR the circuit. TEST the system for normal operation.

F6 CHECK THE PCM OPERATION

1



2



Generator C102a

3



3 Monitor the charging system warning indicator operation.

• Is the charging system warning indicator illuminated?

→ Yes
The PCM is operating correctly. RECHECK the generator circuits (including the generator) for intermittent shorts or opens. TEST the system for normal operation.

→ No
GO to [F7](#).

F7 CHECK FOR CORRECT MODULE OPERATION

1 Check:

	<ul style="list-style-type: none"> ● for corrosion ● for pushed-out pins ● connector seated correctly <p>2 Connect any disconnected connectors.</p> <p>3 Make sure all other system connectors are fully seated.</p> <p>4 Operate the system and verify the concern is still present.</p> <p>● Is the concern still present?</p> <p>→ Yes INSTALL a new PCM. REFER to Section 303-14. CLEAR the DTCs. REPEAT the PCM self-test.</p> <p>→ No The system is operating correctly at this time. Concern may have been caused by a loose or corroded connector. CLEAR the DTCs. REPEAT the self-test.</p>
--	--

PINPOINT TEST G: THE GENERATOR IS NOISY

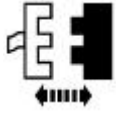
CONDITIONS	DETAILS/RESULTS/ACTIONS
G1 CHECK FOR ACCESSORY DRIVE NOISE AND MOUNTING BRACKETS	
	<p>1 Check the accessory drive belt for damage and correct installation; refer to Section 303-05.</p> <p>2 Check the accessory mounting brackets and generator pulley for looseness or misalignment.</p> <p>● Is the accessory drive OK?</p> <p>→ Yes If equipped with a one-way clutch (OWC) pulley, GO to G2.</p> <p>If not equipped with an OWC pulley, GO to G3.</p> <p>→ No REPAIR as necessary. TEST the system for normal operation.</p>
G2 CHECK ONE-WAY CLUTCH (OWC) PULLEY	
	<p>1 With the front end accessory drive (FEAD) belt removed, spin the OWC pulley in a clockwise direction, then reverse the direction of the pulley by spinning it in a counterclockwise direction. If necessary, refer to Section 303-05 for belt removal.</p> <p>● Does the OWC pulley engage with the rotor when spun in a clockwise direction and free-wheel when spun in a counterclockwise direction with minimal noise as compared to a known good vehicle?</p> <p>→ Yes</p>

GO to [G3](#).

→ **No**
INSTALL a new generator assembly with OWC pulley. REFER to [Section 414-02](#). TEST the system for normal operation.

G3 CHECK GENERATOR FOR ELECTRICAL NOISE

1



Generator C102a

2



3 With the engine running, turn the headlights on, rear defroster on, and the blower motor to HI.

● **Is the noise still present?**

→ **Yes**
GO to [G4](#).

→ **No**
INSTALL a new generator. REFER to [Section 414-02](#). TEST the system for normal operation.

G4 CHECK GENERATOR FOR MECHANICAL NOISE

1



2



Generator C102a

3





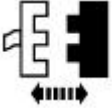

4 Turn all accessories off. With the engine running, use a stethoscope or equivalent listening device to probe the generator for unusual mechanical noise.

● **Is the generator the noise source?**

→ **Yes**
INSTALL a new generator. REFER to [Section 414-02](#). TEST the system for normal operation.

→ **No**
 REFER to [Section 303-00](#) to diagnose the source of the engine noise.

PINPOINT TEST H: RADIO INTERFERENCE

CONDITIONS	DETAILS/RESULTS/ACTIONS
H1 VERIFY GENERATOR IS SOURCE OF RADIO INTERFERENCE	
<p>1 </p> <p>3 </p> <p>4  Generator C102a</p> <p>5 </p>	<p>1 Start and run the engine.</p> <p>2 Tune the radio to a station where the interference is present.</p> <p>● Is the interference present with the generator disconnected?</p> <p>→ Yes REFER to Section 415-00 for diagnosis and testing of the in-vehicle entertainment system.</p> <p>→ No INSTALL a new generator. REFER to Section 414-02 . TEST the system for normal operation.</p>

Component Tests

Battery — Drain Testing

Check for current drains on the battery in excess of 30 milliamps (0.030 amp) with all the electrical accessories off and the vehicle at rest for at least 40 minutes. Current drains can be tested with the following procedure:



WARNING: Do not attempt this test on a lead-acid battery that has recently been recharged. Explosive gases can cause personal injury.



CAUTION: To prevent damage to the meter, do not crank the engine or operate accessories that draw more than 10A.

NOTE: Many electronic modules draw 5 mA or more continuously.

NOTE: Use an in-line digital ammeter between the battery negative post and its respective cable.

1. Make sure the engine/luggage compartments and interior fuse panels are accessible without turning on interior, underhood, or luggage compartment lights.
2. Drive the vehicle at least five minutes and over 48 km/h (30 mph) to turn on and activate vehicle systems.
3. Allow the vehicle to sit with the key off for at least 40 minutes to allow modules to time out/power down.
4. Connect a jumper wire between the negative battery cable and the negative battery post to prevent modules from resetting and to catch capacitive drains.
5. Disconnect the negative battery cable from the negative battery post without breaking the connection of the jumper wire.
6. Connect the battery tester between the negative battery cable and post. The meter must be capable of reading milliamps and should have a 10 amp capacity.

NOTE: It is very important that continuity is not broken between the battery post and the negative cable when connecting the meter. If this happens, the entire procedure must be repeated.

7. Remove the jumper wire.

NOTE: If the meter settings need to be switched or the test leads need to be moved to another jack, the jumper wire must be reinstalled to avoid breaking continuity.

8. Note the amperage draw. Draw will vary from vehicle to vehicle depending on the equipment package. Compare to a comparable vehicle for reference. No factory equipped vehicle should have more than a 30 mA draw (0.030 amp).
9. If the draw is found to be excessive, pull fuses from the central, auxiliary, and battery junction boxes one at a time and note the current reading. Do not reinstall fuses until you have finished testing.
10. If the current draw is still excessive, remove the remaining fuses from all three junction boxes one at a time and note the current drop. Do not reinstall fuses until you have finished testing. When the current level drops after pulling a fuse, the circuit containing the excessive draw has been located.
11. Check the Wiring Diagrams for any circuits that run from the battery without passing through either junction box. If the current draw is still excessive, disconnect these circuits until the draw is found. Also disconnect the generator electrical connections if the draw cannot be located. The generator may be internally shorted, causing current drain.

Generator On-Vehicle Tests



CAUTION: To prevent damage to the generator (10346), do not make jumper wire connections except as directed.



CAUTION: Do not allow any metal object to come in contact with the housing and the internal diode cooling fins with key on or off. A short circuit will result and burn out the diodes.

NOTE: Battery posts and cable clamps must be clean and tight for accurate meter indications.

1. Turn off all lamps and electrical components.
2. Place the vehicle in transmission range NEUTRAL and apply the parking brake.
3. Carry out the Load Test and No-Load Test according to the following component tests:

Generator On-Vehicle Tests — Load Test

1. Switch the tester to the ammeter function.
2. Connect the positive and negative leads of the tester to the corresponding battery terminals.
3. Connect the current probe to the generator B+ output terminal, circuit 38 (BK/OG).
4. With the engine running at 2,000 rpm, adjust the tester load bank to determine the output of the generator.
5. With the engine running, turn the A/C on, the blower motor on high speed and the headlamps on high beam.
6. Increase the engine speed to approximately 2,000 rpm. The voltage should increase a minimum of 0.5 volt above the base voltage.
 - If the voltage does not increase as specified, carry out the Generator On-Vehicle Tests in this section.
 - If the voltage increases as specified, the charging system is operating normally.

Generator On-Vehicle Tests — No Load Test

1. Switch the tester to the voltmeter function.
 2. Connect the voltmeter positive lead to the generator B+ terminal and the negative lead to ground.
 3. Turn all electrical accessories off.
 4. With the engine running at 2,000 rpm, check the generator output voltage. The voltage should be between 13.0 and 15.0 volts. If not, refer to the Symptom Chart.
 5. Turn the A/C on, the blower motor on high speed and the headlamps on high beam.
 6. The voltage should increase a minimum of 0.5 volt above the base voltage.
 - If the voltage does not increase as specified, carry out the Generator On-Vehicle Tests. For additional information, refer to Generator On-Vehicle Tests in this section.
 - If the voltage increases as specified, the charging system is operating normally.
-

General Specifications

Item	Specification
Manufacturer	Motorcraft
Voltage	12 volt
Amps at -17.7°C (0°F) cold crank	650
Minutes-reserve capacity	130
Amps/hrs.-20 hour rate	72
Amps at -17.7°C (0°F) cold crank	750 (Europe only)
Minutes-reserve capacity	140 (Europe only)
Amps/hrs.-20 hour rate	78 (Europe only)
Battery location	Right rear of the luggage compartment
Lubricant	
Premium Long Life Grease XG-1-C or XG-1-K	ESA-M1C75-B

Torque Specifications

Description	Nm	lb-ft	lb-in
Battery ground cable	7	—	62
Battery positive cable	7	—	62
Battery hold-down clamp bolt at battery	8	—	71
Battery positive cable bolt at the power distribution box	12	9	—
Battery negative cable bolt at the body (trunk)	12	9	—
Battery tray bolts	30	22	—
Battery positive cable nut at dash (interior/exterior)	12	9	—
Battery positive cable nut at the starter solenoid	12	9	—
Battery (ignition/start) wire nut at the starter solenoid	6	—	53
Battery positive cable nut at the power distribution box	12	9	—
Battery cable protective tube bolts	6	—	53
Battery hold-down bolt at body	12	9	—

Battery and Cables

Vehicles are equipped with a 12 volt maintenance-free battery (10655) which is located in the luggage compartment, next to the spare tire. The battery purges any battery gases to the outside of the vehicle by means of a vent hose. This vent hose must be attached at all times. New batteries must be of the same vented design.

The battery contains a built-in hydrometer. The hydrometer eye indication is as follows:

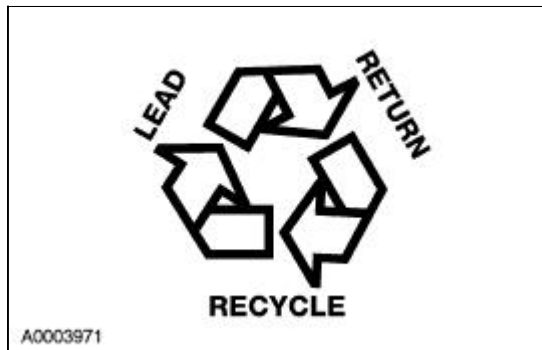
- A green dot means the battery is OK.
- A yellow dot, or a red dot, or when the green dot is not visible, means the battery needs to be charged.

If the battery has a cover/shield, make sure it is reinstalled after the battery has been cleaned or after a new battery has been installed.

The battery normally does not require additional water during its useful life. For longer, trouble-free operation, the top of battery should be clean and dry. Also, make certain the battery cables (14300, 14301) are always tightly fastened to the battery terminals.


If any terminal corrosion is detected, remove the cables from the terminals and clean with a wire brush. Battery acid can be neutralized with a solution of baking soda and water.

Always dispose of automotive batteries in a responsible manner. Follow your local authorized standards for disposal. Call your local authorized recycling center to find out more about recycling automotive batteries.



Battery

Special Tool(s)

 <p>ST2442-A</p>	<p>Micro 490 Digital Battery Analyzer 162-00004</p>
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Inspection and Verification

1. Verify the customer concern by operating the system.
2. Visually inspect for obvious signs of mechanical or electrical damage.

Visual Inspection Chart

Mechanical	Electrical
<ul style="list-style-type: none"> ● Battery ● Battery mounting 	<ul style="list-style-type: none"> ● Battery cables ● Battery posts

3. If an obvious cause for a concern is found, correct the cause before proceeding to the next step.
4. If the fault is not visually evident, proceed to the pinpoint test.

Pinpoint Tests

PINPOINT TEST A: BATTERY CONDITION TEST

CONDITIONS	DETAILS/RESULTS/ACTIONS
A1 TEST BATTERY CONDITION	
	<p>NOTE: No battery with a red test-eye should be replaced. The red eye only means the battery is discharged, not necessarily defective.</p> <p>NOTE: Failure to fully charge the battery before retesting may cause false readings.</p>
	<p>1 Verify the battery condition using the Battery Analyzer.</p> <ul style="list-style-type: none"> ● Is the battery OK? <p>→ Yes Does the meter read, GOOD BATTERY? RETURN the battery to service. REFER to Section 414-00.</p> <p>Does the meter read, GOOD-RECHARGE? CHARGE the battery and</p>

RETURN to service. REFER to [Section 414-00](#).


Does the meter read, CHARGE & RETEST? Fully CHARGE the battery and RETEST.


→ **No**

Does the meter read, REPLACE BATTERY? INSTALL a new battery.

Does the meter read, BAD CELL-REPLACE? INSTALL a new battery.


Battery Disconnect


 **WARNING:** Batteries normally produce explosive gases which can cause personal injury. Therefore, do not allow flames, sparks or lighted substances to come near the battery, always shield your face and protect your eyes. Always provide ventilation.

 **WARNING:** To avoid accidental deployment and possible injury, the backup power supply must be depleted before repairing or installing any front or side air bag supplemental restraint system (SRS) components and before repairing, installing, adjusting or striking components near the front or side air bag sensors, such as doors, instrument panel, console, door latches, strikers, seats and hood latches.

Please refer to the appropriate vehicle shop manual to determine location of the front air bag sensors.

To deplete the backup power supply energy, disconnect the battery ground cable and wait at least one minute. Be sure to disconnect auxiliary batteries and power supplies (if equipped).

 **WARNING:** When lifting a battery, excessive pressure on the end walls could cause acid to spew through the vent caps, resulting in personal injury. Lift with a battery carrier or with your hands on opposite corners.

 **WARNING:** Keep out of the reach of children. Batteries contain sulfuric acid. Avoid contact with skin, eyes or clothing. Also, shield your eyes when working near the battery to protect against possible splashing of the acid solution. In case of acid contact with the skin or eyes, flush immediately with water for a minimum of 15 minutes and get prompt medical attention. If acid is swallowed, call a physician immediately.

1. **NOTE:** When the battery is disconnected and reconnected, some abnormal drive symptoms may occur while the vehicle relearns its adaptive strategy. The vehicle may need to be driven to relearn its strategy.

Disconnect the battery ground cable.

2. Disconnect the positive battery cable.
 3. To install, reverse the removal procedure.
-

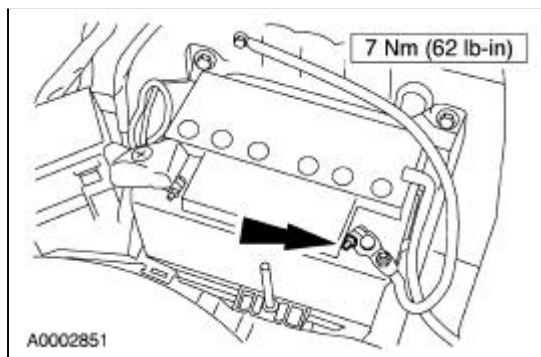
Battery

Removal and Installation

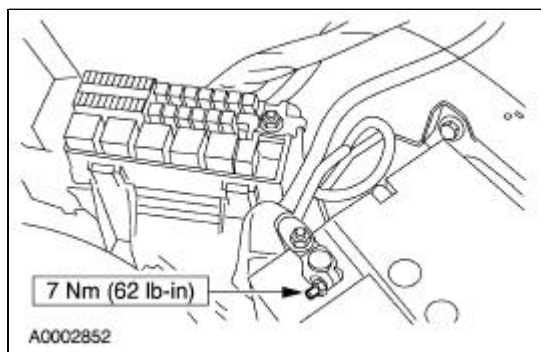
⚠ WARNING: Batteries normally produce explosive gases which can cause personal injury. Therefore, do not allow flames, sparks or lighted substances to come near the battery. When charging or working near a battery, always shield your face and protect your eyes. Always provide ventilation.

⚠ WARNING: Keep out of the reach of children. Batteries contain sulfuric acid. Avoid contact with skin, eyes or clothing. Also, shield your eyes when working near the battery to protect against possible splashing of the acid solution. In case of acid contact with the skin or eyes, flush immediately with water for a minimum of 15 minutes and get prompt medical attention. If acid is swallowed, call a physician immediately.

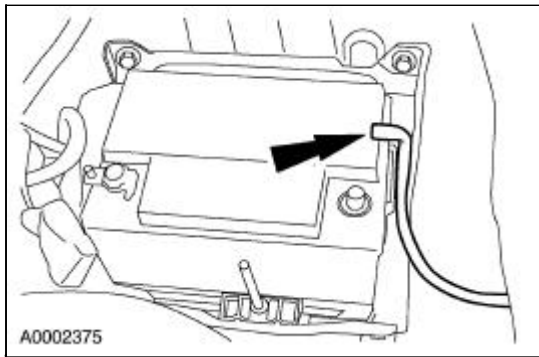
1. Disconnect the battery ground cable (14301).



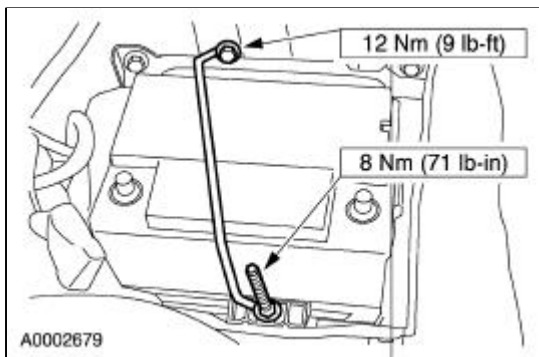
2. Disconnect the battery positive cable (14300).




3. Disconnect the battery vent tube.



4. Remove the bolt and spacer clamp (10B684).



5.  **WARNING:** When lifting a battery, excessive pressure on the end walls could cause acid to spew through the vent caps, resulting in personal injury. Lift with a battery carrier or with your hands on opposite corners.

Remove the battery (10655).

6. **NOTE:** Because the vehicle's engine is electronically controlled by a computer, some control conditions are maintained by power from the battery. When the battery is disconnected or a new battery is installed, the engine must relearn its idle and fuel trim strategy for optimum driveability and performance. Let the engine idle for one minute. The relearning process will automatically complete itself as the vehicle is driven. The vehicle may need to be driven 16 km (10 miles). If the engine is not allowed to relearn its idle trim, the idle quality may be adversely affected until the idle trim is eventually relearned. Additionally, to account for customer driving habits and conditions, the automatic transmission must relearn its adaptive strategy. Optimal shifting will resume within a few hundred kilometers (miles) of operation. The clock and the preset radio stations must be reset once the battery is reconnected.

To install, reverse the removal procedure.

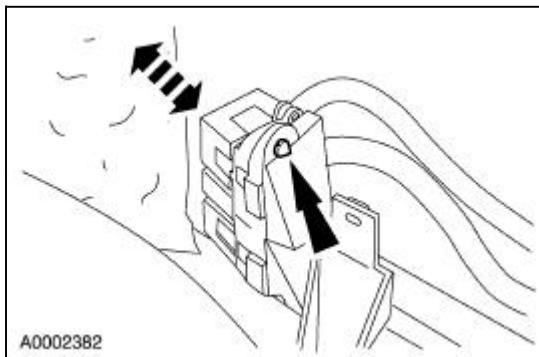
Battery Tray

Removal and Installation

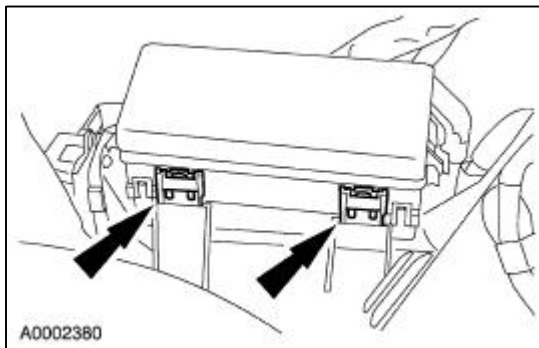
⚠ WARNING: Batteries normally produce explosive gases which can cause personal injury. Therefore, do not allow flames, sparks or lighted substances to come near the battery. When charging or working near a battery, always shield your face and protect your eyes. Always provide ventilation.

⚠ WARNING: Keep out of the reach of children. Batteries contain sulfuric acid. Avoid contact with skin, eyes or clothing. Also, shield your eyes when working near the battery to protect against possible splashing of the acid solution. In case of acid contact with the skin or eyes, flush immediately with water for a minimum of 15 minutes and get prompt medical attention. If acid is swallowed, call a physician immediately.

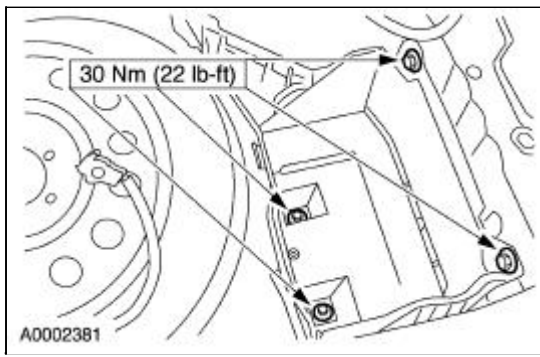
1. Remove the battery (10655). For additional information, refer to [Battery](#).
2. Remove the pin type retainer and position the fuse holder aside.



3. Remove the battery junction box (BJB) cover and remove the BJB from the battery tray (10764) and position it aside.




4. Remove the battery tray bolts and washers and the battery tray.




5. To install, reverse the removal procedure.
-

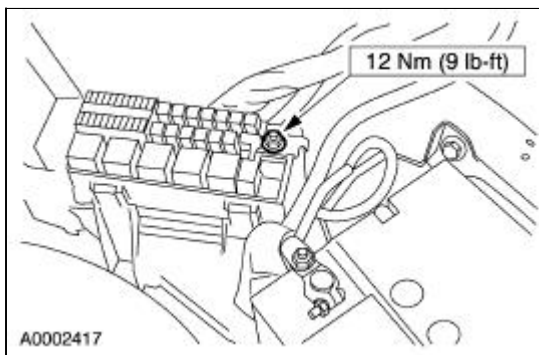
Battery Cables

Removal and Installation

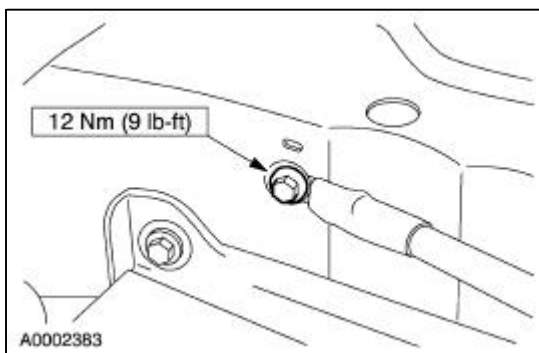
 **WARNING:** Batteries normally produce explosive gases which can cause personal injury. Therefore, do not allow flames, sparks or lighted substances to come near the battery. When charging or working near a battery, always shield your face and protect your eyes. Always provide ventilation.

 **WARNING:** Keep out of the reach of children. Batteries contain sulfuric acid. Avoid contact with skin, eyes or clothing. Also, shield your eyes when working near the battery to protect against possible splashing of the acid solution. In case of acid contact with the skin or eyes, flush immediately with water for a minimum of 15 minutes and get prompt medical attention. If acid is swallowed, call a physician immediately.

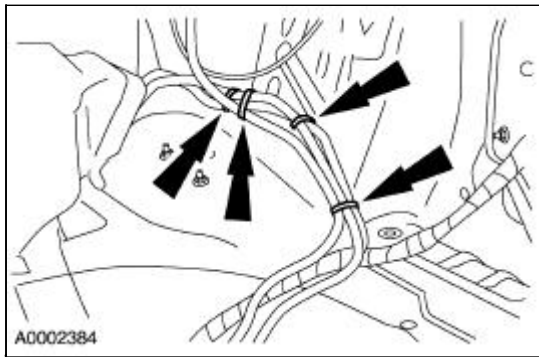
1. Remove the battery (10655). For additional information, refer to [Battery](#).
2. Remove the battery junction box (BJB) cover and remove the attachment nut securing the positive cable.



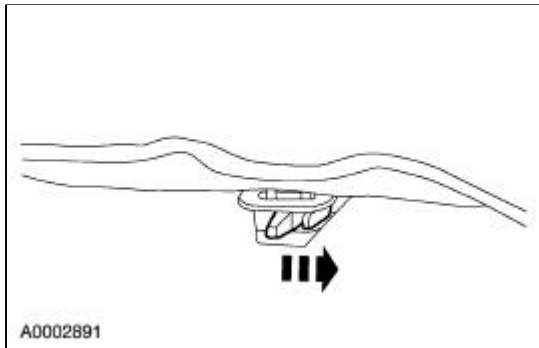
3. Remove the negative cable bolt.



4. Remove the harness clips from the cable in the luggage compartment.



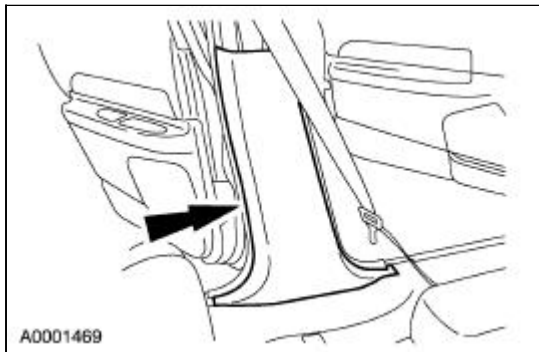
5. Remove the rear seat cushion.



6. Remove the upper RH B-pillar trim panel. For additional information, refer to [Section 501-05](#).

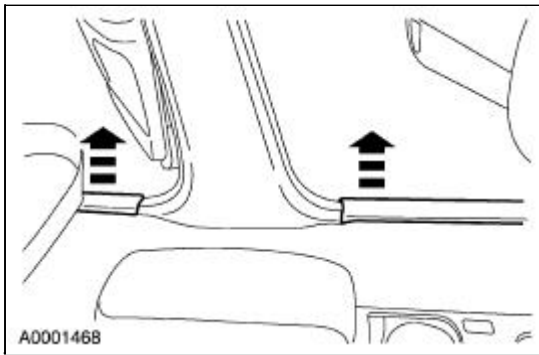
7. **NOTE:** LH shown, RH similar

Remove the lower RH B-pillar trim cover and scuff plate screws .



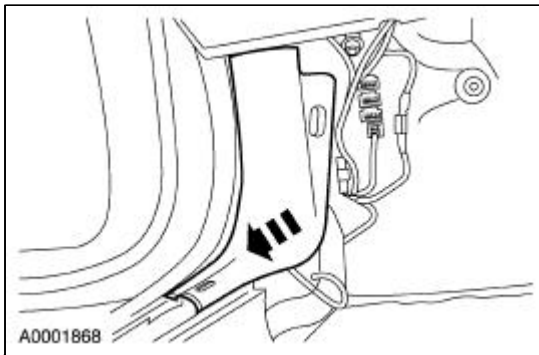
8. **NOTE:** LH shown, RH similar

Remove the RH front and rear scuff plates.

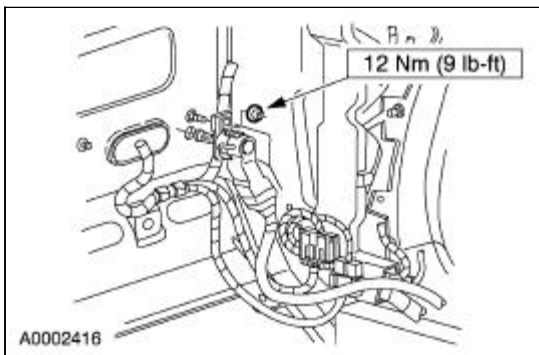


9. **NOTE:** LH shown, RH similar

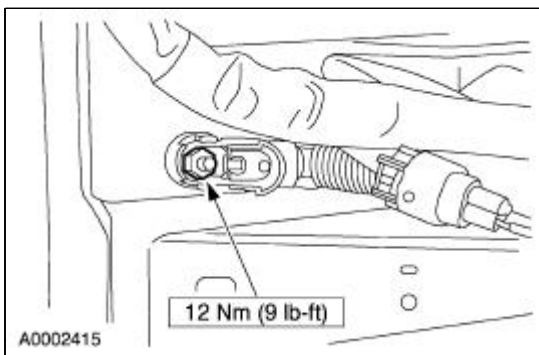
Remove the RH A-pillar lower trim panel and position aside the carpet to expose battery cable.



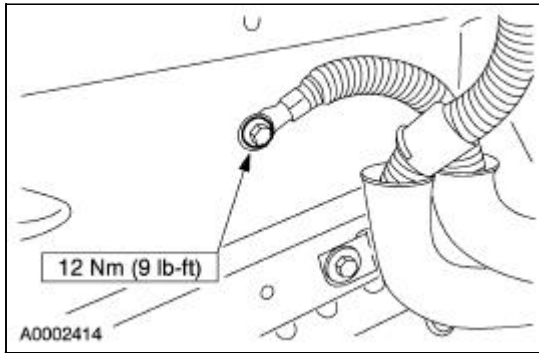
10. Remove the retaining tie straps and detach the cable forward past the rear seatback into the passenger compartment.
11. Remove the cable attachment cover and the nut at the dash through-bolt and remove the cable.



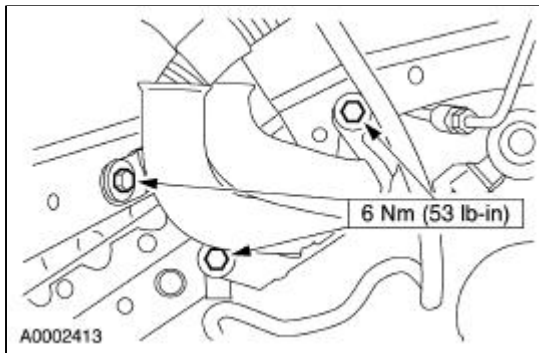
12. In the engine compartment at the dash panel, remove the protective cover and the nut.



13. Remove the bolt at the body.

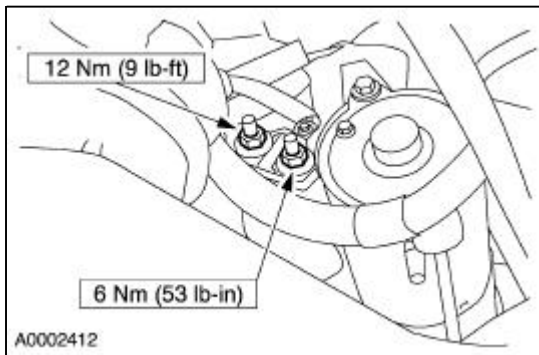


14. Remove the right front wheel well splash shield. For additional information, refer to [Section 501-02](#).
15. Remove the bolts at the harness protective tubes.



16. **NOTE:** 3.0L shown, 3.9L similar.

Remove the cable protective cover at the starter solenoid and remove the nuts and the cable.



17. To install, reverse the removal procedure.
-

General Specifications

Item	Specification
Generator (10300) 3.0L	XR8U-AC
Generator (10300) 3.9L	XR8U-CD
Rating (gen. crank/rev.) 3.0/3.9L	(105 AMP/MAX)
Generator ratio, 3.0L	2.65:1
Generator ratio, 3.9L	2.78:1
Voltage regulator type (10316)	Electronic integral with generator

Torque Specifications

Description	Nm	lb-ft	lb-in
Generator positive cable nut	8	—	71
Generator mounting bolts, 3.0L	45	33	—
Generator mounting bolts, 3.9L	48	35	—
Generator expanding bushing and bolt assembly	20 + 90°	15 + 90°	—

Generator

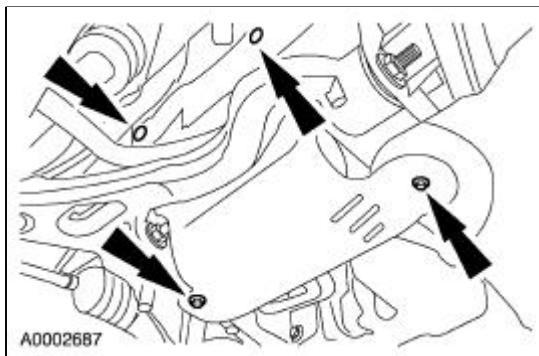
The generator has an internal voltage regulator that is not repaired separately. The generator and voltage regulator must be replaced as an assembly.

All 3.0L V6 manual transmission applications are equipped with a one-way clutch (OWC) in the generator pulley. The OWC pulley temporarily disengages the generator rotor from the front end accessory drive (FEAD) system during high acceleration/deceleration rates on the engine, which may increase belt life and decrease belt chirp. A new OWC pulley and generator/voltage regulator must be installed as an assembly.

Generator —3.0L

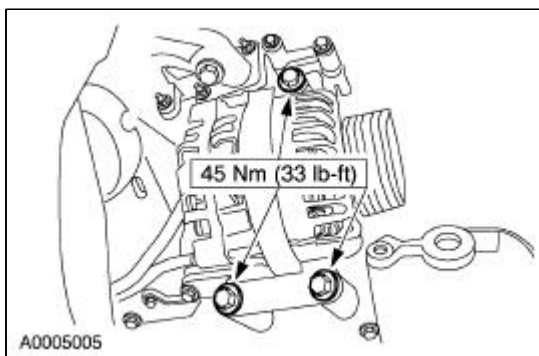
Removal and Installation

1. Disconnect the battery ground cable. Refer to [Section 414-01](#).
2. Relieve the accessory drive belt tension and move the belt off of the generator pulley. For additional information, refer to [Section 303-05](#).
3. Raise the vehicle. For additional information, refer to [Section 100-02](#).
4. Remove the lower splash shield.
 - Remove the bolts.
 - Remove the pin-type retainers.

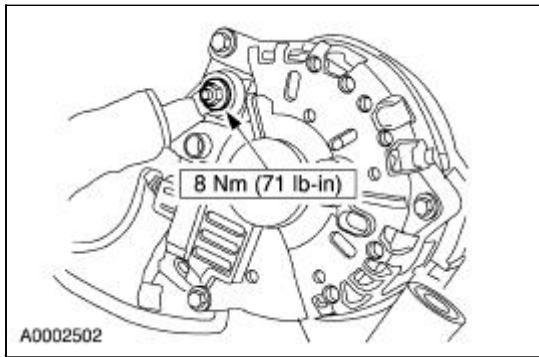


5.  **CAUTION:** The generator must be supported by hand after removing the bolts and prior to disconnecting the electrical connectors or damage to the connectors or wiring could result.

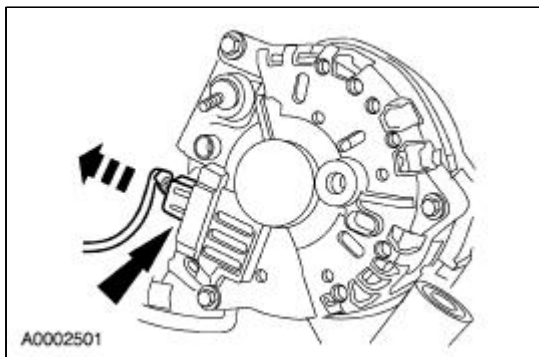
Remove the bolts.



6. Disconnect the generator positive cable.
 - Carefully lower the generator to gain access to the battery generator cable nut.
 - Remove the nut and detach the cable.



7. Remove the generator.
 - Disconnect the electrical connector.
 - Remove the generator.

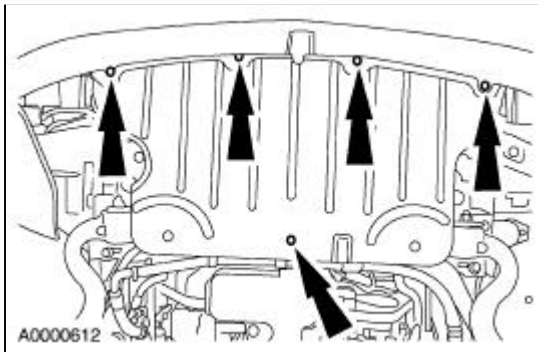


8. To install, reverse the removal procedure.
-

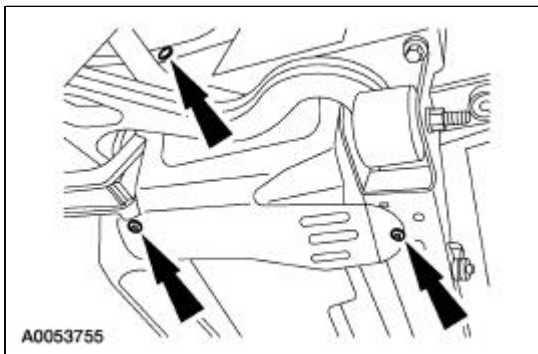
Generator —3.9L

Removal

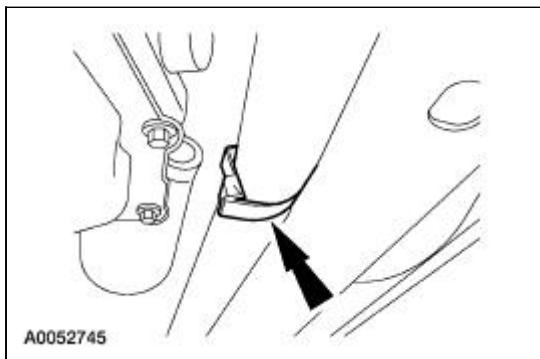
1. Disconnect the battery ground cable. For additional information, refer to [Section 414-01](#).
2. Remove the air intake tube. For additional information, refer to [Section 303-12](#).
3. Relieve the accessory drive belt tension and move the belt off the generator pulley. For additional information, refer to [Section 303-05](#).
4. Raise the vehicle. For additional information, refer to [Section 100-02](#).
5. Remove the front lower splash shield.



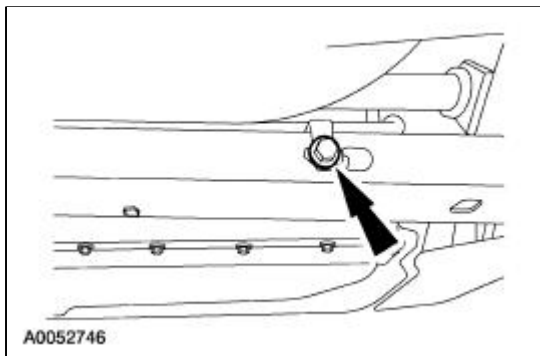
6. Remove the lower RH splash shield.



7. Remove the A/C suction line clip from the radiator core support.

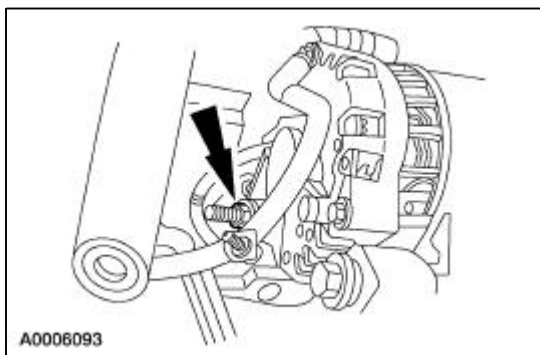


8. Remove the LH A/C suction line lower bracket bolt and position the bracket rearward.

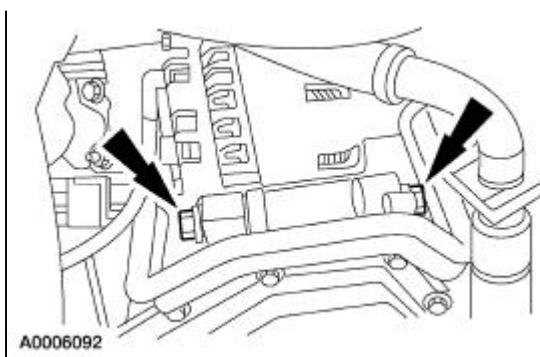


9. **NOTE:** The A/C suction line may need to be positioned rearward to ease generator removal.

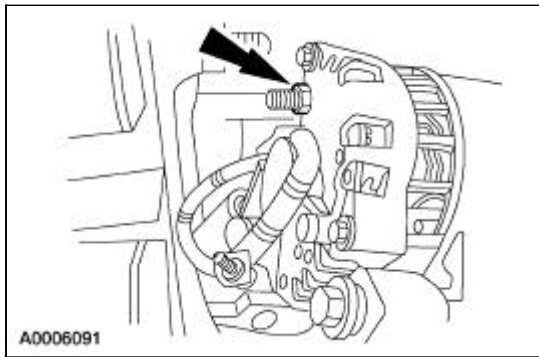
Remove the top nut and through bolt.



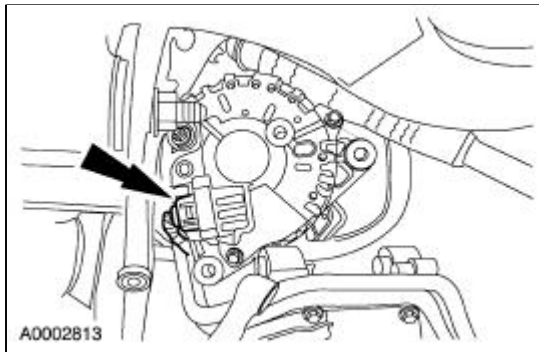
10. Remove the lower bolts.



11. Turn the generator slightly to access the generator positive cable nut and remove the nut.



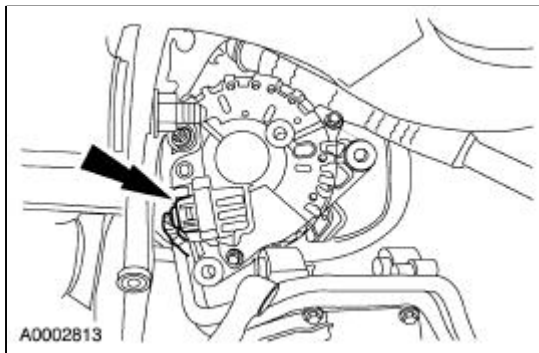
12. Lower the generator slightly and disconnect the electrical connector.



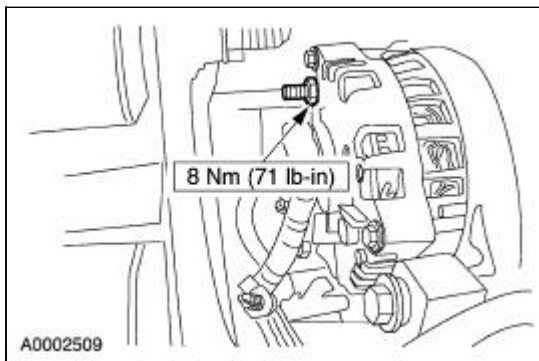
13. Remove the generator.
 - Rotate the generator to gain access for removal.
 - Remove the generator.

Installation

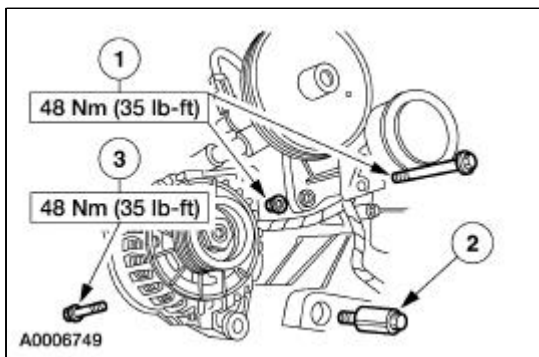
1. Position the generator and connect the electrical connector.



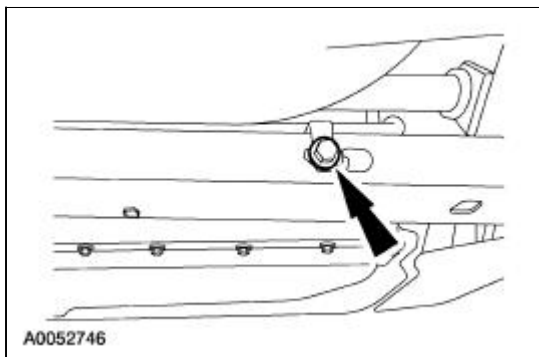
2. Rotate generator to gain access to the generator positive terminal and install cable and nut.



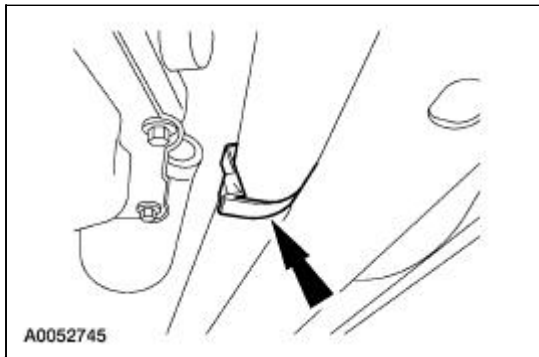
3. Install the generator and tighten in the sequence shown.
 1. Loosely assemble the pivot bolt and nut.
 2. Install the expanding bushing and bolt assembly in two stages.
 - Stage 1: Tighten the bolt to 20 Nm (15 lb-ft).
 - Stage 2: Tighten the bolt an additional 90 degrees.
 3. Install the bolt.



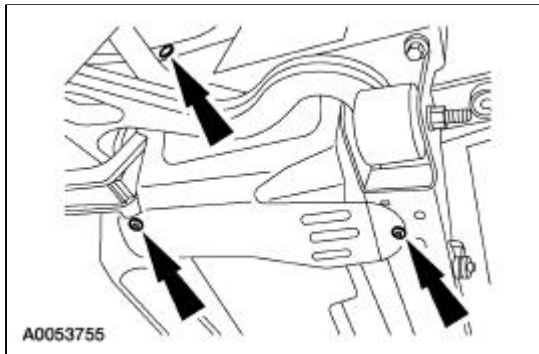
4. Install the LH A/C section line lower bracket and bolt.



5. Install the A/C suction line clip into the radiator core support.



6. Install the lower RH splash shield.





7. Install the front lower splash shield.
 8. Lower the vehicle. For additional information, refer to [Section 100-02](#).
 9. Install the accessory drive belt. For additional information, refer to [Section 303-05](#).
 10. Install the air intake tube. For additional information, refer to [Section 303-12](#).
 11. Connect the battery cable ground cable. For additional information, refer to [Section 414-01](#).
-

Audio System

Refer to Wiring Diagrams Section [415-00](#), Audio System--General Information for schematic and connector information.

Special Tool(s)

 <p>ST1137-A</p>	<p>73III Automotive Meter or equivalent 105-R0057</p>
 <p>ST1217-A</p>	<p>New Generation STAR (NGS) Tester or equivalent 418-F048 (007-00500)</p>

Inspection and Verification

1. **NOTE:** The audio control module (ACM) is also referred to as the audio unit.

Verify the customer concern by operating the electronic audio system with the engine running and the vehicle in and out of motion.

2. Visually inspect for obvious signs of mechanical and electrical damage.

Visual Inspection Chart

Mechanical	Electrical
<ul style="list-style-type: none"> ● ACM physically damaged, misaligned, any control(s) inoperative ● Digital audio compact disc player physically damaged, misaligned, any control(s) inoperative ● Antenna or antenna cable physically damaged, misaligned connection(s) ● Antenna isolator module physically damaged, misaligned connection(s) ● Radio speakers, mounting/speaker cones physically damaged, misaligned ● Radio ignition interference capacitors, radio frequency interference suppression bond, and radio receiver hood bonding strap misaligned (also check for cleanliness and metal-to-metal contact) 	<ul style="list-style-type: none"> ● Central junction box (CJB) Fuse 202 (5A) ● CJB Fuse 227 (10A) ● Battery junction box (BJB) Fuse 414 (5A) ● BJB Fuse 418 (20A) ● BJB Fuse 429 (30A) ● Damaged connector(s) ● Damaged ignition switch ● Damaged circuitry

3. If the fault is not visually evident, proceed to diagnose the audio control module (ACM) by:

- entering the New Generation STAR (NGS) Tester Diagnostics.
- entering ACM Self-Diagnostic Mode.

ACM Self-Diagnostic Mode

NOTE: To enter the speaker walk-around test or ACM Self-Diagnostic Mode, the ACM must be ON and in radio tuner mode (AM/FM). The ACM Self-Diagnostic Mode can only be entered while in the speaker walk-around test.

4. To enter the speaker walk-around test, simultaneously press the ACM Preset Buttons 3 and 6.
5. The speaker walk-around test stops at each speaker and applies a different tone to each speaker for about 1-2 seconds. Each speaker is tested and displayed on the ACM in the following sequence: RF, LF, LR, RR, Subwoofer I, Subwoofer II.
6. The speaker walk-around test automatically continues and tests:
 - for speaker short. If a short is present, SPKR SHORT will be displayed.
 - for CD/DJ. The ACM display will show NO DJ if not present.

The speaker walk-around test will end and the ACM will return to its previous setting.

To enter the following ACM self-diagnostic modes, press the preset button desired while in the speaker walk-around test. This will abort the speaker walk-around test and start the selected test.

7. The ACM Self-Diagnostic Mode has five tests available:
 - Preset button 1 = Audio internal/external SELF TEST. If SELF FAIL is displayed, press TUNE > to scroll view the DTCs stored. Refer to the ACM Diagnostic Trouble Code (DTC) Index. If the system is OK, SELF PASS is displayed.
 - Preset button 2 = View/Clear continuous diagnostic trouble codes (DTCs). NO DTCS is displayed if no DTCs are retrieved. If DTCS FOUND is displayed, press TUNE > button to view the DTCS retrieved. Refer to the ACM Diagnostic Trouble Code (DTC) Index. To clear all DTCS press the EJECT button. DTCS CLEAR will be displayed.
 - Preset button 3 = SIGNAL TEST. This test measures the average strength at the current tuner setting.
 - Preset button 4 = Software configuration level. This test queries each audio system controller for its software configuration level. SOFT LEVELS will be displayed upon completion of the query. Press TUNE > to scroll view the software configuration version level.

Controller	Description	ACM Display Example
Main	Main Micro Software Version	MAIN ##.##.##
CDSP	CDSP Micro Software Version	CDSP ##.##.##
ADSP	ADSP Micro Software Version	ADSP ##.##.##
Auxiliary	Auxiliary Software Version	AUX ##.##.##
CD/DJ	CDDJ Software Version	DJ ##.##.##
CD Changer	CDR Software Version	CD ##.##.##

Tape Deck	Tape Deck Software Version	TAP ##.##.##
RSC	Rear Seat Controller Software Version	RCP ##.##.##

- Preset button 5 = DISPLAY TEST. This test will light all the ACM display segments for 5 seconds and then turn all segments off. When the test is complete, DISPLAY TEST is displayed on the bezel.
 - Preset button 6 = CONFIG LEVELS. This will show the software configuration for the ACM.
8. To exit ACM Self-Diagnostic Mode, turn the ignition switch or the ACM OFF.
 9. If the concern remains and the fault is not detected, proceed to New Generation STAR (NGS) Tester Diagnostics.

New Generation STAR (NGS) Tester Diagnostics

1. If the concern remains after the inspection, connect the New Generation STAR (NGS) Tester to the data link connector (DLC) located beneath the instrument panel and select the vehicle to be tested from the NGS Tester menu. If the NGS does not communicate with the vehicle:
 - check that the program card is correctly installed.
 - check the connections to the vehicle.
 - check the ignition switch position.

2. **NOTE:** The ACM must be in AM, FM1 or FM2 mode to enter NGS Tester diagnostics.

If the NGS still does not communicate with the vehicle, refer to the New Generation STAR Tester manual.

3. Carry out the DATA LINK DIAGNOSTIC TEST. If the NGS responds with:
 - CKT914, CKT915 or CKT70 = ALL ECUS NO RESP/NOT EQUIP, refer to [Section 418-00](#).
 - NO RESP/NOT EQUIP for audio control module (ACM), go to Pinpoint Test A.
 - SYSTEM PASSED, retrieve and record the continuous diagnostic trouble codes (DTCs), erase the continuous DTCs and carry out self-test diagnostics for the ACM.
4. If the DTCs retrieved are related to the concern, go to the ACM Diagnostic Trouble Code (DTC) Index to continue diagnostics.
5. If no DTCs related to the concern are retrieved, proceed to Symptom Chart to continue diagnostics.

ACM Diagnostic Trouble Code (DTC) Index

DTC	Description	Source	Action
B1342	ECU Is Defective	ACM	CLEAR and DOCUMENT the DTCs. CARRY OUT the ACM On-Demand Self-Test. REMOVE the ACM and SEND it to an authorized Ford Audio System repair facility if DTC B1342 is retrieved again.

B2401	Audio Tape Deck Mechanism Fault	ACM	VERIFY that no tape is inserted in the ACM. CLEAR and DOCUMENT the DTCs. CARRY OUT the ACM On-Demand self-test. If DTC B2401 is retrieved again, REMOVE the ACM and SEND it to an authorized Ford Audio System repair facility.
B2402	Audio CD/DJ Thermal Shutdown Fault	ACM	GO to Pinpoint Test C .
B2403	Audio CD/DJ Internal Fault	ACM	GO to Pinpoint Test C .
B2404	Audio Steering Wheel Switch Circuit Fault	ACM	GO to Pinpoint Test M .
B2405	Audio Single-Disc CD Player Thermal Shutdown Fault	ACM	Not applicable.
B2406	Audio Single-Disc CD Player Internal Fault	ACM	Not applicable.
B2477	Module Configuration Fault	ACM	REFER to Section 418-01 .
U2003	Audio CD/D Jockey Is Not Responding	ACM	NOTE: U2003 is retrieved if CDDJ is not present, disconnected, or inoperative. GO to Pinpoint Test C .
U2005	Audio Rear Integrated Control Panel Unit Is Not Responding	ACM	NOTE: U2005 is retrieved if RICP is not present, disconnected, or inoperative. Not applicable.
U2008	Audio Phone Is Not Responding	ACM	REFER to Section 419-08 .
U2014	Audio Subwoofer Unit Is Not Responding	ACM	NOTE: U2014 is retrieved if subwoofer is not present, disconnected, or inoperative. GO to Pinpoint Test L .
U2020	Center Image Amplifier Is Not Responding	ACM	NOTE: U2020 is retrieved if center image amplifier is not present, disconnected, or inoperative. GO to Pinpoint Test I .

ACM Parameter Identification (PID) Index

Display	Description	Expected Value
ASYSON	ASYSON output state	ACTIVE, not ACT
BAND_SW	Band switch (steering wheel controls)	ACTIVE, not ACT
MEM_SW	Memory switch (steering wheel controls)	ACTIVE, not ACT
PHONE	Phone switch (steering wheel controls)	ACTIVE, not ACT
PTA	PTA input state	ACTIVE, not ACT
VOL+_SC	Volume + switch (steering wheel controls)	ACTIVE, not ACT
VOL-_SC	Volume - switch (steering wheel controls)	ACTIVE, not ACT

ACM Active Command Index

Active Command	Display	Action
Speaker Walk-Around Test	SPEAKER WALKAROUND	RF, LF, LR, RR, Subwoofer I, Subwoofer II

Symptom Chart

Symptom Chart


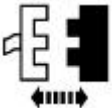

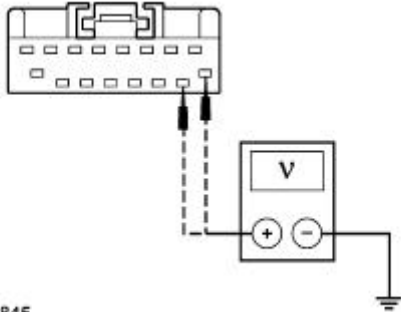
Condition	Possible Sources	Action
<ul style="list-style-type: none"> No communication with the audio control module (ACM) 	<ul style="list-style-type: none"> CJB Fuse 202 (5A). CJB Fuse 227 (10A). BJB Fuse 414 (5A). BJB Fuse 429 (30A). J1850 communication network. Circuitry. ACM. 	<ul style="list-style-type: none"> GO to Pinpoint Test A.
<ul style="list-style-type: none"> The audio unit is inoperative/does not operate correctly 	<ul style="list-style-type: none"> CJB Fuse 202 (5A). CJB Fuse 227 (10A). BJB Fuse 414 (5A). BJB Fuse 429 (30A). Circuitry. ACM. 	<ul style="list-style-type: none"> GO to Pinpoint Test B.
<ul style="list-style-type: none"> The cassette player is inoperative/does not operate correctly 	<ul style="list-style-type: none"> ACM. 	<ul style="list-style-type: none"> REMOVE the audio unit and SEND it to an authorized Ford audio system repair facility. TEST the system for normal operation.
<ul style="list-style-type: none"> The radio does not operate correctly — display is blank 	<ul style="list-style-type: none"> ACM. 	<ul style="list-style-type: none"> REMOVE the audio unit and SEND it to an authorized Ford audio system repair facility. TEST the system for normal operation.
<ul style="list-style-type: none"> The CD changer is inoperative/does not operate correctly 	<ul style="list-style-type: none"> BJB Fuse 414 (5A). Circuitry. ACM. CD changer. 	<ul style="list-style-type: none"> GO to Pinpoint Test C.
<ul style="list-style-type: none"> The audio unit does not display CD changer information 	<ul style="list-style-type: none"> Circuitry. ACM. CD changer. 	<ul style="list-style-type: none"> GO to Pinpoint Test D.

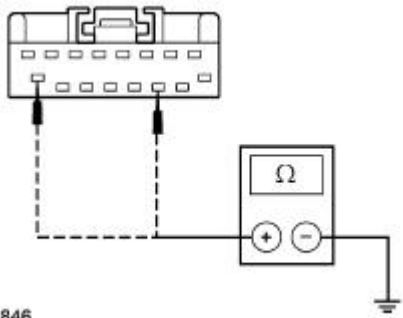
<ul style="list-style-type: none"> Noisy reception 	<ul style="list-style-type: none"> Antenna. Antenna connections. Noise suppression equipment. Antenna isolator module. ACM. 	<ul style="list-style-type: none"> GO to Pinpoint Test E.
<ul style="list-style-type: none"> Continuous SEEK/SCAN in AM/FM 	<ul style="list-style-type: none"> Antenna. Antenna connections. Antenna isolator module. ACM. 	<ul style="list-style-type: none"> GO to Pinpoint Test F.
<ul style="list-style-type: none"> Poor quality/distorted sound from one or more speakers (not all speakers) 	<ul style="list-style-type: none"> Speaker(s). Circuitry. Audio cable. ACM. 	<ul style="list-style-type: none"> GO to Pinpoint Test G.
<ul style="list-style-type: none"> Poor quality/distorted sound from all speakers 	<ul style="list-style-type: none"> ACM. 	<ul style="list-style-type: none"> REMOVE the audio unit and SEND it to an authorized Ford audio system repair facility. TEST the system for normal operation.
<ul style="list-style-type: none"> No sound from one or more speakers (not all speakers) 	<ul style="list-style-type: none"> Speaker(s). Circuitry. ACM. 	<ul style="list-style-type: none"> GO to Pinpoint Test H.
<ul style="list-style-type: none"> No sound from one or more speakers (not all speakers) — center imaging 	<ul style="list-style-type: none"> Speaker(s). Circuitry. ACM. Center imaging speaker amplifier. 	<ul style="list-style-type: none"> GO to Pinpoint Test I.
<ul style="list-style-type: none"> No sound from all speakers 	<ul style="list-style-type: none"> Speaker(s). Circuitry. ACM. Audio cable. 	<ul style="list-style-type: none"> GO to Pinpoint Test J.
<ul style="list-style-type: none"> Loud pops when cycling the ignition switch 	<ul style="list-style-type: none"> Subwoofer. Circuitry. 	<ul style="list-style-type: none"> GO to Pinpoint Test K.
<ul style="list-style-type: none"> The subwoofer is inoperative 	<ul style="list-style-type: none"> BJB Fuse 418 (20A). Circuitry. Subwoofer. 	<ul style="list-style-type: none"> GO to Pinpoint Test L.
<ul style="list-style-type: none"> No radio illumination 	<ul style="list-style-type: none"> Circuitry. ACM. 	<ul style="list-style-type: none"> REFER to Section 413-00.
<ul style="list-style-type: none"> The auxiliary audio control is inoperative/does not operate correctly — steering wheel control switches 	<ul style="list-style-type: none"> Circuitry. ACM. Steering wheel control switches. Horn switch. Air bag sliding contact. 	<ul style="list-style-type: none"> GO to Pinpoint Test M.
<ul style="list-style-type: none"> The speed sensitive volume function is inoperative/does not operate correctly 	<ul style="list-style-type: none"> ACM. 	<ul style="list-style-type: none"> REMOVE the audio unit and SEND it to an authorized Ford audio system repair facility.

		TEST the system for normal operation.
--	--	---------------------------------------

Pinpoint Tests

PINPOINT TEST A: NO COMMUNICATION WITH THE AUDIO CONTROL MODULE (ACM)

CONDITIONS	DETAILS/RESULTS/ACTIONS
A1 CHECK THE VOLTAGE TO THE ACM	
<p>1 </p> <p>2  ACM C240c</p> <p>3 </p> <p>4  A0004845</p>	<p>4 Measure the voltage between ACM C240c pin 9, circuit 29-MD15 (WH/BK), harness side and ground; and between ACM C240c pin 10, circuit 75-MD15 (YE/GN), harness side and ground.</p> <ul style="list-style-type: none"> ● Are the voltages greater than 10 volts? <p>→ Yes GO to A2.</p> <p>→ No REPAIR the circuit in question. REPEAT the data link diagnostic test.</p>
A2 CHECK THE GROUND TO THE ACM	
<p>1</p>	<p>1 Measure the resistance between the ACM C240c pin 11, circuit 31-MD15 (BK), harness side and ground; and</p>



A0004846


between C240c pin 16, circuit 31-MD15 (BK), harness side and ground.

- Are the resistances less than 5 ohms?

→ **Yes**
REFER to [Section 418-00](#).

→ **No**
REPAIR the circuit in question. REPEAT the data link diagnostic test.

PINPOINT TEST B: THE AUDIO UNIT IS INOPERATIVE/DOES NOT OPERATE CORRECTLY

CONDITIONS	DETAILS/RESULTS/ACTIONS
B1 CHECK OPERATION OF THE ACM	
<p>1</p> 	<p>2 Turn on the ACM.</p> <ul style="list-style-type: none"> • Is the ACM display illuminated? <p>→ Yes GO to B2.</p> <p>→ No GO to B4.</p>
B2 CHECK FOR SOUND COMING FROM THE RADIO SPEAKERS	
	<p>1 Carry out the speaker walk-around test by pressing Preset Buttons 3 and 6 simultaneously.</p> <p>2 Check for sound from the radio speakers.</p> <ul style="list-style-type: none"> • Is sound coming from the speakers? <p>→ Yes</p>

GO to [B3](#).

→ **No**
GO to [Pinpoint Test J](#).

B3 CARRY OUT CONTROLS AND FEATURES TEST

1 Verify that all the audio system controls and features operate correctly; refer to the owner literature.

- **Do all the controls and features operate correctly?**

→ **Yes**
The system is OK.

→ **No**
REMOVE the audio unit and SEND it to an authorized Ford audio system repair facility. TEST the system for normal operation.

B4 CHECK THE VOLTAGE TO THE ACM

1



2

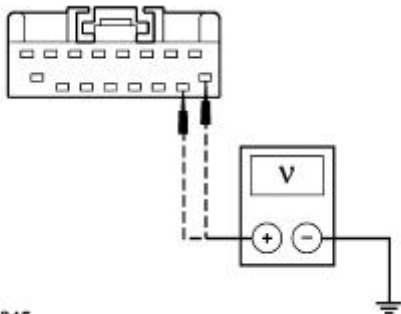


ACM C240c

3



4



4 Measure the voltage between ACM C240c pin 10, circuit 75-MD15 (YE/GN), harness side and ground; and between ACM C240c pin 9, circuit 29-MD15 (WH/BK), harness side and ground.

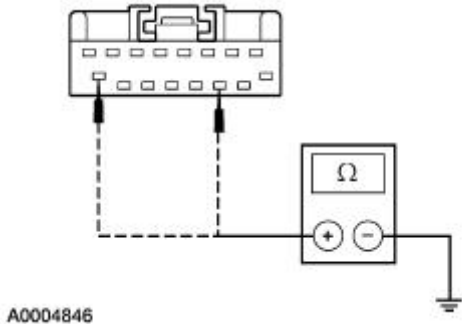
- **Are the voltages greater than 10 volts?**

→ **Yes**
GO to [B5](#).

→ **No**
REPAIR the circuit in question. TEST the system for normal operation.

B5 CHECK THE GROUND TO THE ACM

1



1 Measure the resistance between the ACM C240c pin 11, circuit 31-MD15 (BK), harness side and ground; and between C240c pin 16, circuit 31-MD15 (BK), harness side and ground.

- Are the resistances less than 5 ohms?

→ **Yes**
REMOVE the audio unit and SEND it to an authorized Ford audio system repair facility. TEST the system for normal operation.

→ **No**
REPAIR the circuit in question. TEST the system for normal operation.

PINPOINT TEST C: THE CD CHANGER IS INOPERATIVE/DOES NOT OPERATE CORRECTLY

CONDITIONS	DETAILS/RESULTS/ACTIONS
<p>C1 RETRIEVE THE RECORDED ACM DTCS FROM BOTH THE CONTINUOUS AND ON-DEMAND SELF-TESTS</p>	<p>1 Use the recorded results from the continuous and on-demand self-tests.</p> <ul style="list-style-type: none"> • Are any DTCs retrieved? <p>→ Yes If B2402, B2403, or U2003 is retrieved, GO to C5.</p> <p>→ No GO to C2.</p> <p>All other DTCs, GO to ACM Diagnostic Trouble Code (DTC) Index.</p>
<p>C2 CHECK OPERATION OF THE CD CHANGER</p>	
<p>1</p>	



- 2 Turn on the ACM.
- 3 Verify that the ACM is operating correctly. Refer to the owner literature.
- 4 Verify that the CD changer power loading function is operating correctly. Refer to the owner literature.

● **Is the CD player information displayed on the ACM display?**

→ **Yes**
GO to [C3](#).

→ **No**
GO to [Pinpoint Test D](#).

C3 CHECK FOR SOUND COMING FROM THE RADIO SPEAKERS

- 1 Insert a known good CD and press the CD button.
- 2 Check for sound from the radio speakers.

● **Is sound coming from the speakers?**

→ **Yes**
GO to [C4](#).

→ **No**
GO to [Pinpoint Test J](#).

C4 CD CHANGER PLAY/STOP TEST

- 1 Verify that all CD changer controls and features operate correctly. Refer to the owner literature.

● **Do all controls and features operate correctly?**

→ **Yes**
The system is OK.

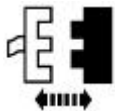
→ **No**
GO to [C5](#).

C5 CHECK THE CIRCUITS BETWEEN THE COMPONENTS FOR OPEN

1

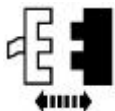


2



CD Changer C243

3



ACM C240a

- 4 Measure the resistances between CD changer C243 and ACM C240a as follows:

CD Changer C243	ACM C240a
pin 6, circuit 1-MD50 (WH/BK)	pin 17, circuit 1-MD50 (WH/BK)
pin 5, circuit 1-MD49 (WH/GN)	pin 19, circuit 1-MD49 (WH/GN)
pin 1, circuit 4-EA6 (GY)	pin 6, circuit 4-EA8 (GY/VT)
pin 12, circuit 2-MD50 (GY/BK)	pin 18, circuit 2-MD50 (GY/BK)
pin 11, circuit 2-MD49 (GY/OG)	pin 20, circuit 2-MD49 (GY/OG)
pin 8, circuit 8-MD51 (WH/BU)	pin 5, circuit 8-MD51 (WH/BU)
pin 7, circuit 5-EA6 (BU)	pin 7, circuit 5-EA8 (BU/WH)

- Are the resistances less than 5 ohms?

→ **Yes**
GO to [C6](#).

→ **No**
REPAIR the circuit in question. TEST the system for normal operation.

C6 CHECK THE CIRCUITS BETWEEN THE COMPONENTS FOR SHORT

- 1 Measure the resistance between the CD changer C243, harness side and ground as follows:

- pin 6, circuit 1-MD50 (WH/BK).
- pin 5, circuit 1-MD49 (WH/GN).
- pin 1, circuit 4-EA6 (GY).

- pin 12, circuit 2-MD50 (GY/BK).
- pin 11, circuit 2-MD49 (GY/OG).
- pin 8, circuit 8-MD51 (WH/BU).
- pin 7, circuit 5-EA6 (BU).

● **Are the resistances greater than 10,000 ohms?**

→ **Yes**
GO to [C7](#).

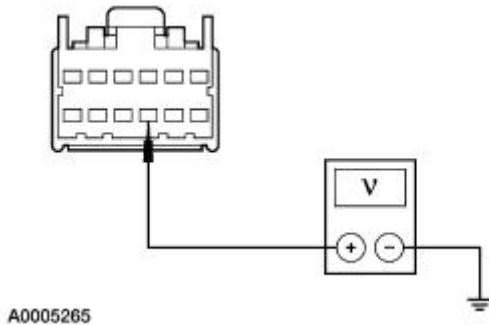
→ **No**
REPAIR the circuit in question. TEST the system for normal operation.

C7 CHECK VOLTAGE TO THE CD CHANGER

1



2



2 Measure the voltage between CD changer C243 pin 9, circuit 29-MD41 (OG), harness side and ground.

● **Is the voltage greater than 10 volts?**

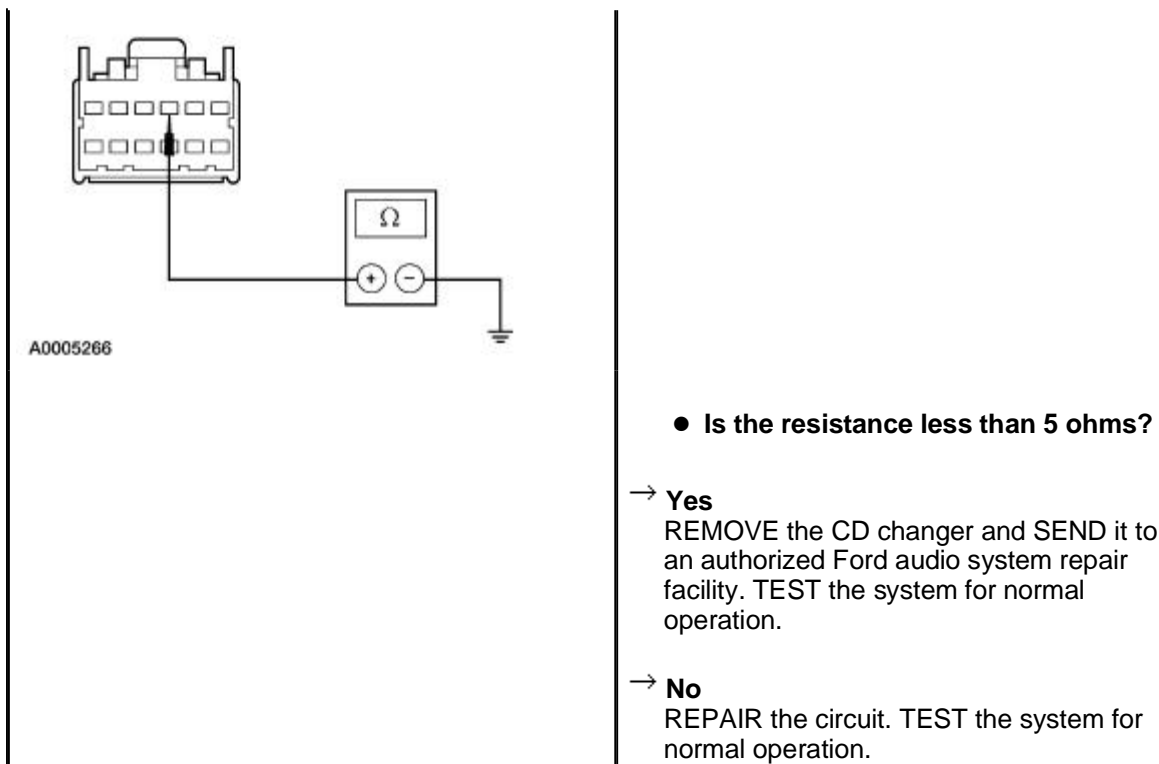
→ **Yes**
GO to [C8](#).

→ **No**
REPAIR the circuit. TEST the system for normal operation.


C8 CHECK CIRCUIT 31-MD41 (BK) FOR OPEN

1

1 Measure the resistance between CD changer C243 pin 3, circuit 31-MD41 (BK), harness side and ground.



PINPOINT TEST D: THE AUDIO UNIT DOES NOT DISPLAY CD CHANGER INFORMATION

CONDITIONS	DETAILS/RESULTS/ACTIONS
D1 CHECK OPERATION OF THE CD CHANGER	
<p>1 </p>	<p>2 Turn on the ACM.</p> <p>3 Verify that the ACM is operating correctly. Refer to the owner literature.</p> <p>4 Verify that the CD changer power loading function is operating correctly. Refer to the owner literature.</p> <ul style="list-style-type: none"> ● Is the CD changer information displayed on the ACM display? <p>→ Yes GO to Pinpoint Test C.</p> <p>→ No GO to D2.</p>
D2 CARRY OUT THE BEZEL DISPLAY TEST	
	<p>1 Carry out the bezel display test. Press Preset Buttons 3 and 6 simultaneously. Within the first five seconds, while in the speaker walk-around test, press Preset Button 5. All segments of the bezel display should illuminate for approximately five seconds and DISPLAY TEST will be shown on the display.</p>

	<ul style="list-style-type: none"> ● Does the display test illuminate all segments? <p>→ Yes GO to D3.</p> <p>→ No REMOVE the audio unit and SEND it to an authorized Ford audio system repair facility. TEST the system for normal operation.</p>
D3 CHECK FOR SOUND COMING FROM THE RADIO SPEAKERS	
	<p>1 Insert a known good CD and press the CD button.</p> <p>2 Carry out the speaker walk-around test by pressing Preset Buttons 3 and 6 simultaneously.</p> <ul style="list-style-type: none"> ● Is sound coming from the speakers? <p>→ Yes REMOVE the CD changer and SEND it to an authorized Ford audio system repair facility. TEST the system for normal operation.</p> <p>→ No GO to Pinpoint Test C.</p>

PINPOINT TEST E: NOISY RECEPTION

CONDITIONS	DETAILS/RESULTS/ACTIONS
E1 CHECK THE RADIO SIGNAL RECEPTION	
	<p>1 Check the radio signal reception with the engine running and with the engine off.</p> <ul style="list-style-type: none"> ● Is the radio signal reception noisy only with the engine running? <p>→ Yes GO to E2.</p> <p>→ No If FM only, GO to E8. If AM only, GO to E10. If both FM and AM, GO to E12.</p>
E2 CHECK SUPPRESSION EQUIPMENT	
	<p>1 Check all required suppression equipment, radio frequency interference suppression bond, and the hood bonding strap for security, cleanliness, and metal-to-metal contact. Refer to Section 415-01.</p> <ul style="list-style-type: none"> ● Are the contacts clean, secure, and in metal-to-metal contact? <p>→ Yes GO to E3.</p>

→ **No**
INSTALL new radio frequency interference suppression bonds or related equipment, CLEAN, or SECURE the connections as necessary. TEST the system for normal operation.

E3 CHECK CAPACITOR MOUNTING AND CONNECTING CIRCUITS

NOTE: The capacitor mounting points are used to complete the electrical circuit and must be mounted securely to clean surfaces.

1 Check the mounting and connecting circuits of the radio ignition interference capacitor(s) for security, cleanliness, and metal-to-metal contact. Refer to [Section 415-01](#).

- **Are the contacts clean, secure, and in metal-to-metal contact?**

→ **Yes**
GO to [E4](#).

→ **No**
CLEAN or SECURE the connections as necessary. TEST the system for normal operation.

E4 CHECK RADIO IGNITION INTERFERENCE CAPACITOR(S) AND GENERATOR

3



1 Check the operation of the radio ignition interference capacitor(s) by installing known good component(s).

2 Check the generator by disconnecting the wiring harness from the voltage regulator.

4 Check the operation of the ACM.

- **Is the noise eliminated?**

→ **Yes**
REPAIR or INSTALL new components as necessary. TEST the system for normal operation.

→ **No**
GO to [E5](#).

E5 CHECK IGNITION CIRCUITS

1



2 Check the ignition circuits for correct routing, grounding, and security of connections.

- **Are the circuits OK?**

→ **Yes**
GO to [E6](#).

→ **No**
REPAIR the circuit as necessary. TEST the system for normal operation.

E6 CHECK THE IGNITION SYSTEM

1 Test the ignition system; refer to [Section 303-07A](#) or [Section 303-07B](#).

● **Is the ignition system OK?**

→ **Yes**
GO to [E7](#).

→ **No**
REPAIR the ignition system. REFER to [Section 303-07A](#) or [Section 303-07B](#). TEST the system for normal operation.

E7 SUBSTITUTE ACM

1



2 Substitute a known good ACM.

3



4 Check the operation of the ACM.

● **Is the noise eliminated?**

→ **Yes**
REMOVE the audio unit and SEND it to an authorized Ford audio system repair facility. TEST the system for normal operation.

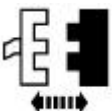
→ **No**
REINSTALL the original audio unit. USE a jumper cable to GROUND various parts of the vehicle to the frame (for example: engine, fenders, quarter panels, stone deflectors, air cleaner, body sheet metal). When the noise is eliminated, PROVIDE a permanent ground where necessary. TEST the system for normal operation.

E8 CHECK FM ANTENNA FOR DAMAGE

1



2



FM Antenna Lead Terminal

3 Measure the resistance between the FM antenna cable lead terminal and

the end of the FM antenna grid wire.

- **Is the resistance less than 8 ohms?**

→ **Yes**
GO to [E9](#).

→ **No**
REPAIR the antenna; REFER to [Section 415-02](#).

E9 SUBSTITUTE FM ANTENNA EXTENSION CABLE

1



2 Substitute a known good antenna cable between the antenna isolator module and the FM antenna.

3



4 Check the operation of the ACM.

- **Is the noise eliminated?**

→ **Yes**
INSTALL a new antenna cable; REFER to [Section 415-02](#). TEST the system for normal operation.

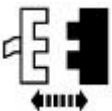
→ **No**
REINSTALL the original antenna cable. GO to [E13](#).

E10 CHECK AM ANTENNA FOR DAMAGE

1



2



Rear Window
Defroster
Grid

3 Measure the resistance between the left side rear window defroster terminal and the right side rear window defroster terminal.

- **Is the resistance less than 1 ohm?**

→ **Yes**
GO to [E11](#).

→ **No**
REPAIR the antenna; REFER to [Section 415-02](#).

E11 SUBSTITUTE AM ANTENNA EXTENSION CABLE

1



2 Substitute a known good antenna cable between the antenna isolator module and the AM antenna (rear window defroster).

3



4 Check the operation of the ACM.

● **Is the noise eliminated?**

→ **Yes**
INSTALL a new antenna cable; REFER to [Section 415-02](#). TEST the system for normal operation.

→ **No**
REINSTALL the original antenna cable. GO to [E13](#).

E12 SUBSTITUTE ANTENNA EXTENSION CABLE(S)

1



2 Substitute a known good antenna cable(s) between the antenna isolator module and the ACM.

3



4 Check the operation of the ACM.



● **Is the noise eliminated?**

→ **Yes**
INSTALL a new antenna cable; REFER to [Section 415-02](#). TEST the system for normal operation.



→ **No**
REINSTALL the original antenna cable. GO to [E13](#).

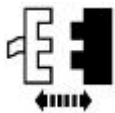
E13 SUBSTITUTE ANTENNA ISOLATOR MODULE

1

	<p>2 Substitute a known good antenna isolator module.</p>
<p>3</p> 	<p>4 Check the operation of the ACM.</p> <ul style="list-style-type: none"> ● Is the noise eliminated? <p>→ Yes INSTALL a new antenna isolator module; REFER to Section 415-02. TEST the system for normal operation.</p> <p>→ No REINSTALL the original antenna isolator module. REMOVE the audio unit and SEND it to an authorized Ford audio system repair facility. TEST the system for normal operation.</p>

PINPOINT TEST F: CONTINUOUS SEEK/SCAN IN AM/FM

CONDITIONS	DETAILS/RESULTS/ACTIONS
F1 CHECK OPERATION OF THE SEEK/SCAN FUNCTIONS	
<p>1</p> 	<p>2 Operate the SEEK/SCAN functions with the ACM in both AM and FM tuner modes.</p> <ul style="list-style-type: none"> ● Do the SEEK/SCAN functions search continuously in both AM and FM tuner modes? <p>→ Yes GO to F6.</p> <p>→ No If FM only, GO to F2. If AM only, GO to F4.</p>
F2 CHECK FM ANTENNA FOR DAMAGE	
<p>1</p> 	<p>2</p>



FM Antenna Lead Terminal

3 Measure the resistance between the FM antenna cable lead terminal and the end of the FM antenna grid wire.

● Is the resistance less than 8 ohms?

→ Yes
GO to [F3](#).

→ No
REPAIR the antenna; REFER to [Section 415-02](#).

F3 SUBSTITUTE FM ANTENNA EXTENSION CABLE

2



1 Substitute a known good antenna cable between the antenna isolator module and the FM antenna.

3 Check the operation of the ACM.

● Is the noise eliminated?

→ Yes
INSTALL a new antenna cable; REFER to [Section 415-02](#). TEST the system for normal operation.

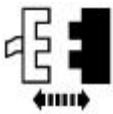
→ No
REINSTALL the original antenna cable. GO to [F7](#).

F4 CHECK AM ANTENNA FOR DAMAGE

1



2



Rear Window Defroster Grid

3 Measure the resistance between the left side rear window defroster terminal and the right side rear window defroster terminal.

● Is the resistance less than 1 ohm?

→ Yes
GO to [F5](#).

→ **No**
REPAIR the antenna; REFER to [Section 415-02](#).

F5 SUBSTITUTE AM ANTENNA EXTENSION CABLE

1



2 Substitute a known good antenna cable between the antenna isolator module and the AM antenna (rear window defroster).

3



4 Check the operation of the ACM.

● **Is the noise eliminated?**

→ **Yes**
INSTALL a new antenna cable; REFER to [Section 415-02](#). TEST the system for normal operation.

→ **No**
REINSTALL the original antenna cable. GO to [F7](#).

F6 SUBSTITUTE ANTENNA EXTENSION CABLE

1



2 Substitute a known good antenna cable between the antenna isolator module and the ACM.

3



4 Check the operation of the ACM.



● **Is the noise eliminated?**

→ **Yes**
INSTALL a new antenna cable; REFER to [Section 415-02](#). TEST the system for normal operation.



→ **No**
REINSTALL the original antenna cable. GO to [F7](#).

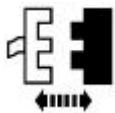
F7 SUBSTITUTE ANTENNA ISOLATOR MODULE

1

	<p>2 Substitute a known good antenna isolator module.</p>
<p>3</p> 	<p>4 Check the operation of the ACM.</p> <ul style="list-style-type: none"> ● Do the SEEK/SCAN functions operate correctly? <p>→ Yes INSTALL a new antenna isolator module; REFER to Section 415-02. TEST the system for normal operation.</p> <p>→ No REINSTALL the original antenna isolator module. REMOVE the audio unit and SEND it to an authorized Ford audio system repair facility. TEST the system for normal operation.</p>

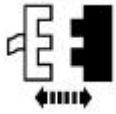
PINPOINT TEST G: POOR QUALITY/DISTORTED SOUND FROM ONE OR MORE SPEAKERS (NOT ALL SPEAKERS)

CONDITIONS	DETAILS/RESULTS/ACTIONS
G1 CHECK FOR POOR SOUND	
<p>1</p> 	<p>2 Turn on the ACM.</p> <p>3 Carry out the speaker walk-around test by pressing Preset Buttons 3 and 6 simultaneously.</p> <ul style="list-style-type: none"> ● Do all the radio speakers have poor sound quality? <p>→ Yes REMOVE the audio unit and SEND it to an authorized Ford audio system repair facility. TEST the system for normal operation.</p> <p>→ No GO to G2.</p>
G2 CHECK THE CIRCUITS TO THE SPEAKER(S)	
<p>1</p>  <p>2</p>	



ACM C240c

3



Poor Sounding
Radio Speaker
(s)

4 Measure the resistances between the distorted radio speaker connector and ACM C240c; and between the following distorted radio speaker connector pins, harness side and ground as follows:

Speaker	Speaker Connector	ACM C240c Pin	Circuit
LR	C702	13	10-MD11 (GY/WH)
LR	C702	12	8-MD11 (WH/VT)
LF	C523	15	10-MD10 (GY/BK)
LF	C523	14	8-MD10 (WH/BK)
RR	C802	6	10-MD18 (GY)
RR	C802	5	8-MD18 (WH)
RF	C612	8	10-MD17 (GY/RD)
RF	C612	7	8-MD17 (WH/RD)

- Are the resistance(s) less than 5 ohms between the distorted radio speaker connector(s) and the ACM, and greater than 10,000 ohms between the radio speaker connector(s) and ground?

→ **Yes**
GO to [G3](#).

→ **No**
REPAIR the circuit in question. TEST the system for normal operation.

G3 CHECK THE SPEAKER

1 Substitute the poor quality speaker with a known good component.

- Is the sound quality OK?

→ **Yes**
INSTALL a new radio speaker(s). TEST the system for normal operation.

→ **No**
REMOVE the audio unit and SEND it to an authorized Ford audio system repair facility. TEST the system for normal operation.

PINPOINT TEST H: NO SOUND FROM ONE OR MORE SPEAKERS (NOT ALL SPEAKERS)

CONDITIONS

DETAILS/RESULTS/ACTIONS

H1 CHECK FOR SOUND

1



- 2 Turn on the ACM.
- 3 Carry out the speaker walk-around test by pressing Preset Buttons 3 and 6 simultaneously.

● **Are all the radio speakers without sound?**

→ **Yes**
GO to [Pinpoint Test J](#).

→ **No**
GO to [H2](#).

H2 CHECK THE CIRCUITS BETWEEN THE SPEAKER(S) AND THE ACM

1

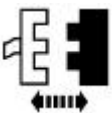


2



ACM C240c


3




Silent Radio Speaker(s)

4 Measure the resistance between the silent radio speaker connector and ACM C240c; and between the silent radio speaker connector, harness side and ground as follows:

Speaker	Speaker Connector	ACM C240c Pin	Circuit
LR	C702	13	10-MD11 (GY/WH)
LR	C702	12	8-MD11 (WH/VT)
LF	C523	15	10-MD10 (GY/BK)
LF	C523	14	8-MD10 (WH/BK)
RR	C802	6	10-MD18 (GY)
RR	C802	5	8-MD18 (WH)
RF	C612	8	10-MD17 (GY/RD)

	RF	C612	7	8-MD17 (WH/RD)
	<ul style="list-style-type: none"> ● Are the resistance(s) less than 5 ohms between the radio speaker connector(s) and the ACM, and greater than 10,000 ohms between the radio speaker connector(s) and ground? <p>→ Yes GO to H3.</p> <p>→ No REPAIR the circuit in question. TEST the system for normal operation.</p>			
H3 SUBSTITUTE SPEAKER				
<p>2</p> 	<p>1 Substitute a known good radio speaker for each silent radio speaker.</p> <p>3 Turn on the ACM.</p> <ul style="list-style-type: none"> ● Are the known good radio speaker(s) silent? <p>→ Yes REMOVE the audio unit and SEND it to an authorized Ford audio system repair facility. TEST the system for normal operation.</p> <p>→ No INSTALL a new radio speaker(s) in question. TEST the system for normal operation.</p>			

PINPOINT TEST I: NO SOUND FROM ONE OR MORE SPEAKERS (NOT ALL SPEAKERS) — CENTER IMAGING

CONDITIONS	DETAILS/RESULTS/ACTIONS
I1 CHECK FOR SOUND	
<p>1</p> 	<p>2 Turn on the ACM.</p> <p>3 Carry out the speaker walk-around test by pressing Preset Buttons 3 and 6 simultaneously.</p> <ul style="list-style-type: none"> ● Are all the radio speakers without sound? <p>→ Yes GO to Pinpoint Test J.</p>

→ **No**

If one center imaging speaker is inoperative, GO to [12](#).

If both center imaging speakers are inoperative, GO to [14](#).

12 CHECK THE CIRCUITS BETWEEN THE SPEAKER(S) AND THE CENTER IMAGING AMPLIFIER

1

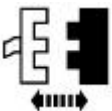


2



Center Imaging Amplifier C225

3



Silent Radio Speaker(s)

4

Measure the resistance between the silent radio speaker connector and center imaging amplifier C225; and between the silent radio speaker connector and ground as follows:

Speaker	Speaker Connector	Center Imaging Amplifier C225 Pin	Circuit
LH	C230	7	8-MD30 (WH/BU)
LH	C230	8	10-MD30 (GY/VT)
RH	C231	5	8-MD31 (WH/GN)
RH	C231	6	10-MD31 (GY/OG)

- Are the resistance(s) less than 5 ohms between the radio speaker connector(s) and the ACM, and greater than 10,000 ohms between the radio speaker connector(s) and ground?

→ **Yes**

GO to [13](#).

→ **No**

REPAIR the circuit in question. TEST the system for normal operation.

I3 SUBSTITUTE SPEAKER

2



1 Substitute a known good radio speaker for each silent radio speaker.

3 Turn on the ACM.

• Are the known good radio speaker(s) silent?

→ **Yes**
REMOVE the center imaging amplifier and SEND it to an authorized Ford audio system repair facility. TEST the system for normal operation.

→ **No**
INSTALL a new radio speaker(s) in question. TEST the system for normal operation.

I4 CHECK CENTER IMAGING AMPLIFIER ENABLE CIRCUIT FOR POWER

1



2

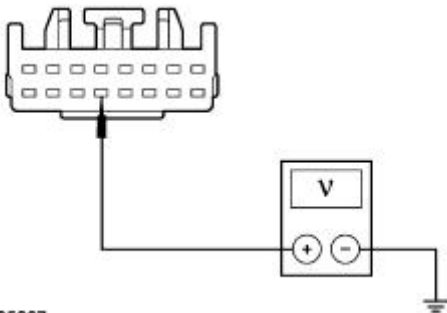


Center Imaging Amplifier C225

3



5



A0005267

4 Turn on the ACM.

5 Measure the voltage between center imaging amplifier C225 pin 13, circuit 7-MD12 (YE), harness side and ground.

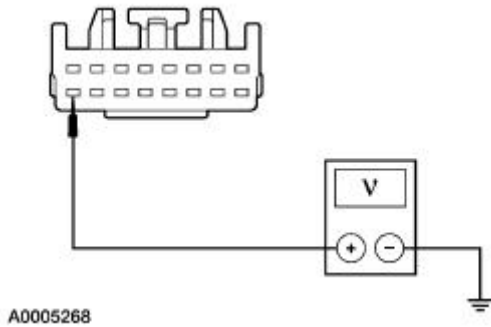
• Is voltage present?

→ **Yes**
GO to [15](#).

→ **No**
GO to [19](#).

15 CHECK POWER TO THE CENTER IMAGING AMPLIFIER

1



1

Measure the voltage between center imaging amplifier C225 pin 16, circuit 29-MD12 (OG/YE), harness side and ground.

● **Is the voltage greater than 10 volts?**

→ **Yes**
GO to [16](#).

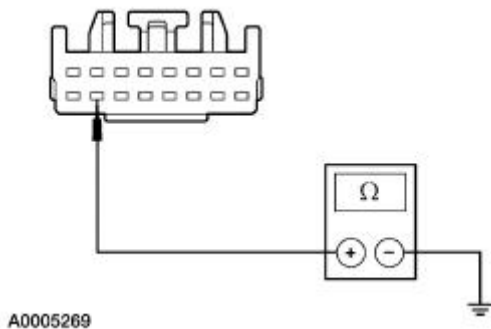
→ **No**
REPAIR the circuit. TEST the system for normal operation.

16 CHECK GROUND TO THE CENTER IMAGING AMPLIFIER

1



2



2

Measure the resistance between center imaging amplifier C225 pin 15, circuit 31-MD12 (BK), harness side and ground.

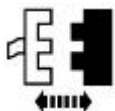
● **Is the resistance less than 5 ohms?**

→ **Yes**
GO to [17](#).

→ **No**
REPAIR the circuit. TEST the system for normal operation.

17 CHECK THE CIRCUITS BETWEEN THE ACM AND THE CENTER IMAGING AMPLIFIER

1



ACM C240b

2 Measure the resistance between ACM C240b and center imaging amplifier C225; and between ACM C240b and ground as follows:

ACM 240b Pin	Center Imaging Amplifier C225 Pin	Circuit
5	2	2-MD12 (GY)
6	1	1-MD12 (WH)

- Are the resistance(s) less than 5 ohms between the ACM and the center imaging amplifier, and greater than 10,000 ohms between the ACM and ground?

→ Yes
GO to 18.

→ No
REPAIR the circuit in question. TEST the system for normal operation.

18 CHECK THE ACM

1 Substitute the ACM with a known good component.

- Do the center imaging speakers operate?

→ Yes
REMOVE the audio unit and SEND it to an authorized Ford audio system repair facility. TEST the system for normal operation.

→ No
REMOVE the center imaging amplifier and SEND it to an authorized Ford audio system repair facility. TEST the system for normal operation.

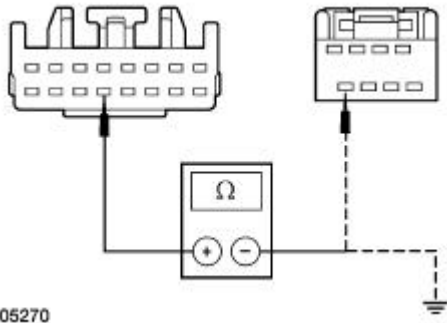
19 CHECK THE ENABLE CIRCUIT TO THE CENTER IMAGING AMPLIFIER

1



2

2 Measure the resistance between center imaging amplifier C225 pin 13, circuit 7-MD12 (YE), harness side and ACM C240b pin 8, circuit 7-MD12 (YE), harness side; and



A0005270

between center imaging amplifier C225 pin 13, circuit 7-MD12 (YE), harness side and ground.

- Is the resistance less than 5 ohms between the center imaging amplifier and the ACM and greater than 10,000 ohms between the center imaging amplifier and ground?


→ **Yes**

REMOVE the audio unit and SEND it to an authorized Ford audio system repair facility. TEST the system for normal operation.

→ **No**

REPAIR the circuit. TEST the system for normal operation.


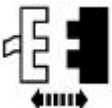
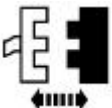
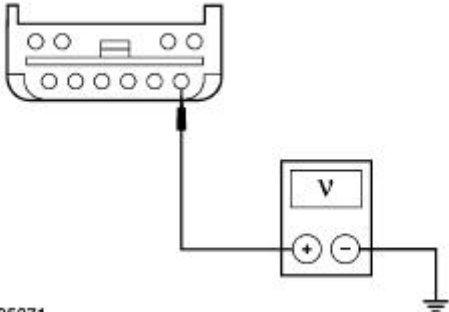
PINPOINT TEST J: NO SOUND FROM ALL SPEAKERS

CONDITIONS	DETAILS/RESULTS/ACTIONS
J1 CHECK FOR ACM POWER	
<p>1</p> 	<p>2 Turn on the ACM.</p> <ul style="list-style-type: none"> ● Does the display on the ACM illuminate? <p>→ Yes GO to J2.</p> <p>→ No GO to Pinpoint Test B.</p>
J2 CHECK FOR SOUND	
	<p>1 Carry out the speaker walk-around test by pressing Preset Buttons 3 and 6 simultaneously.</p> <ul style="list-style-type: none"> ● Are all the radio speakers without sound? <p>→ Yes REMOVE the audio unit and SEND it to an authorized Ford audio system</p>



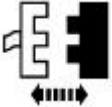

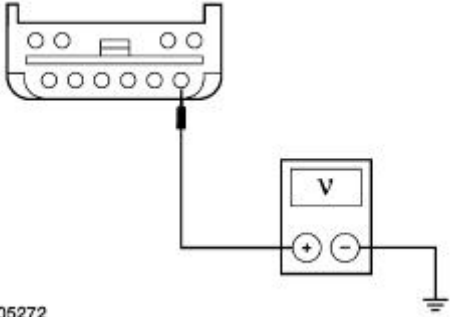
repair facility. TEST the system for normal operation.

→ **No**
GO to [Pinpoint Test H](#).

PINPOINT TEST K: LOUD POPS WHEN CYCLING THE IGNITION SWITCH

CONDITIONS	DETAILS/RESULTS/ACTIONS
K1 CHECK CIRCUIT 7-MD19 (WH/RD) AND 8-MD19 (WH/RD) FOR POWER	
<p>1</p>  <p>2</p>  <p>ACM C240b</p> <p>3</p>  <p>Subwoofer Amplifier C466</p> <p>4</p>  <p>A0005271</p>	<p>4 Measure the voltage between the subwoofer amplifier C466 pin 1, circuit 8-MD19 (WH/RD), harness side and ground.</p> <p>● Is voltage present?</p> <p>→ Yes REPAIR the circuit. TEST the system for normal operation.</p> <p>→ No REMOVE the audio unit and SEND it to an authorized Ford audio system repair facility. TEST the system for normal operation.</p>

PINPOINT TEST L: THE SUBWOOFER IS INOPERATIVE

CONDITIONS	DETAILS/RESULTS/ACTIONS
L1 CHECK THE SUBWOOFER OPERATION	
<p>1</p> 	<p>2 Turn the ACM on.</p> <p>3 Check the operation of the subwoofer speakers.</p> <ul style="list-style-type: none"> • Are both subwoofer speakers inoperative? <p>→ Yes GO to L2.</p> <p>→ No GO to L7.</p>
L2 CHECK CIRCUIT 7-MD19 (YE/RD) FOR POWER	
<p>1</p>  <p>2</p>  <p>Subwoofer Amplifier C466</p> <p>3</p>  <p>4</p>  <p>A0005272</p>	<p>4 Measure the voltage between subwoofer amplifier C466 pin 1, circuit 7-MD19 (YE/RD), harness side and ground.</p> <ul style="list-style-type: none"> • Is voltage present? <p>→ Yes GO to L3.</p> <p>→ No</p>

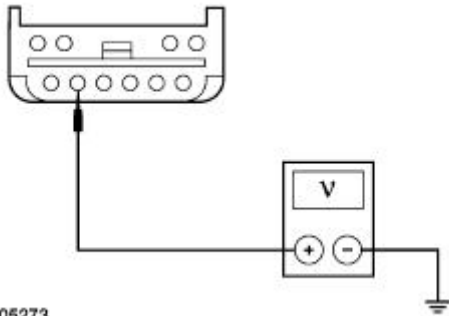
GO to [L8](#).

L3 CHECK CIRCUIT 30-MD19 (RD) FOR VOLTAGE

1



2



A0005273

2 Measure the voltage between subwoofer amplifier C466 pin 5, circuit 30-MD19 (RD), harness side and ground.

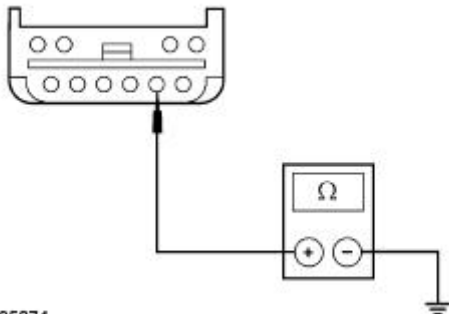
● Is the voltage greater than 10 volts?

→ **Yes**
GO to [L4](#).

→ **No**
REPAIR the circuit. TEST the system for normal operation.

L4 CHECK GROUND CIRCUIT 31-MD19 (BK)

1



A0005274

1 Measure the resistance between subwoofer amplifier C466 pin 2, circuit 31-MD19 (BK), harness side and ground.

● Is the resistance less than 5 ohms?

→ **Yes**
GO to [L5](#).

→ **No**
REPAIR the circuit. TEST the system for normal operation.

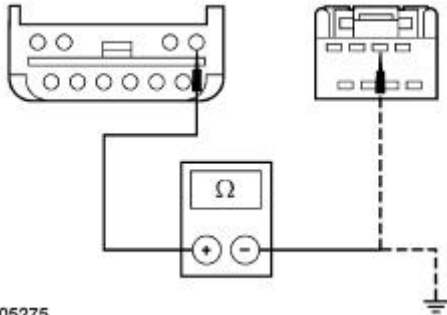
L5 CHECK CIRCUIT 1-MD19 (WH/RD)

1



ACM C240b

2



2

Measure the resistance between subwoofer amplifier C466 pin 7, circuit 1-MD19 (WH/RD), and ACM C240b pin 2, circuit 1-MD19 (WH/RD); and between subwoofer amplifier C466 pin 7, circuit 1-MD19 (WH/RD), harness side and ground.

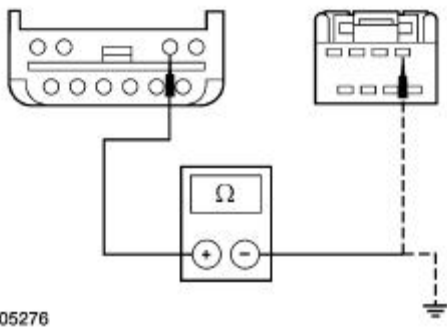
- Is the resistance less than 5 ohms between the subwoofer amplifier and the ACM, and greater than 10,000 ohms between the subwoofer amplifier and ground?

→ **Yes**
GO to [L6](#).

→ **No**
REPAIR the circuit. TEST the system for normal operation.

L6 CHECK CIRCUIT 2-MD19 (GY/RD)

1



1

Measure the resistance between subwoofer amplifier C466 pin 8, circuit 2-MD19 (GY/RD), harness side and ACM C240b pin 1, circuit 2-MD19 (GY/RD), harness side; and between subwoofer amplifier C466 pin 8, circuit 2-MD19 (GY/RD), harness side and ground.

- Is the resistance less than 5 ohms between the subwoofer amplifier and the ACM, and greater than 10,000 ohms between the subwoofer amplifier and ground?

→ **Yes**
REMOVE the subwoofer amplifier and SEND it to an authorized Ford audio system repair facility. TEST the system for normal operation.

→ **No**

REPAIR the circuit. TEST the system for normal operation.

L7 CHECK SUBWOOFER SPEAKER

1



3



2 Substitute the inoperative subwoofer speaker with a known good subwoofer speaker.

4 Check the operation of the subwoofer speakers.

• **Does the known good subwoofer speaker operate correctly?**

→ **Yes**
INSTALL a new subwoofer speaker;
REFER to [Section 415-03](#). TEST the system for normal operation.

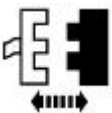
→ **No**
REPAIR the circuit between the subwoofer amplifier and the inoperative subwoofer speaker. TEST the system for normal operation.

L8 CHECK CIRCUIT 7-MD19 (YE/RD) FOR OPEN

1

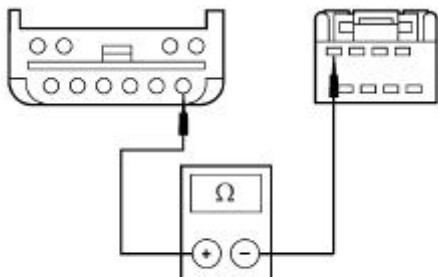


2



ACM C240b

3






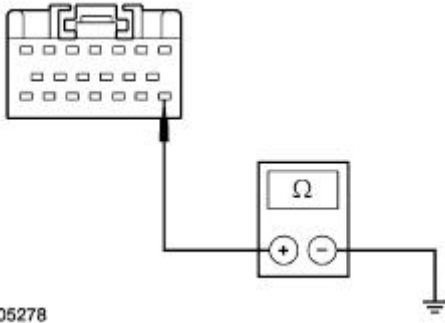
3 Measure the resistance between subwoofer amplifier C466 pin 1, circuit 7-MD19 (YE/RD), harness side and ACM C240b pin 4, circuit 7-MD19 (YE/RD), harness side.

- Is the resistance less than 5 ohms?

→ **Yes**
REMOVE the subwoofer amplifier and SEND it to an authorized Ford audio system repair facility. TEST the system for normal operation.

→ **No**
REPAIR the circuit. TEST the system for normal operation.

PINPOINT TEST M: THE AUXILIARY AUDIO CONTROL IS INOPERATIVE/DOES NOT OPERATE CORRECTLY — STEERING WHEEL CONTROL SWITCHES

CONDITIONS	DETAILS/RESULTS/ACTIONS																
M1 CHECK THE STEERING WHEEL CONTROL SWITCH RESISTANCES																	
<p>1 </p> <p>2  ACM C240a</p> <p>3 </p> <p>4  A0005278</p>	<p>4 Measure the resistance between ACM C240a pin 14, circuit 8-MD26 (WH/BK), harness side and ground while depressing the steering wheel control switches as follows:</p> <table border="1"> <thead> <tr> <th>Switch</th> <th>Resistance range</th> </tr> </thead> <tbody> <tr> <td>VOL Down</td> <td>53.1-54.1 ohms</td> </tr> <tr> <td>VOL Up</td> <td>145.3-148.1 ohms</td> </tr> <tr> <td>SEEK Up</td> <td>297.7-303.7 ohms</td> </tr> <tr> <td>SEEK Down</td> <td>556.1-567.3 ohms</td> </tr> <tr> <td>MEDIA</td> <td>1026.4-1047.0 ohms</td> </tr> <tr> <td>Phone/Mute</td> <td>2016.4-2057.0 ohms</td> </tr> <tr> <td>None</td> <td>greater than 10,000 ohms</td> </tr> </tbody> </table>	Switch	Resistance range	VOL Down	53.1-54.1 ohms	VOL Up	145.3-148.1 ohms	SEEK Up	297.7-303.7 ohms	SEEK Down	556.1-567.3 ohms	MEDIA	1026.4-1047.0 ohms	Phone/Mute	2016.4-2057.0 ohms	None	greater than 10,000 ohms
Switch	Resistance range																
VOL Down	53.1-54.1 ohms																
VOL Up	145.3-148.1 ohms																
SEEK Up	297.7-303.7 ohms																
SEEK Down	556.1-567.3 ohms																
MEDIA	1026.4-1047.0 ohms																
Phone/Mute	2016.4-2057.0 ohms																
None	greater than 10,000 ohms																

- Are the resistances within specification?

→ **Yes**

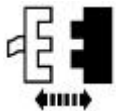
REMOVE the audio unit and SEND it to an authorized Ford audio system repair facility. TEST the system for normal operation.

→ **No**

GO to [M2](#).

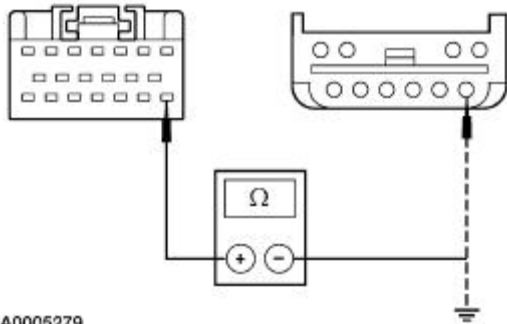
M2 CHECK CIRCUIT 8-MD26 (WH/BK)

1



Air Bag Sliding Contact C218a

2



A0005279

2

Measure the resistance between ACM C240a pin 14, circuit 8-MD26 (WH/BK), harness side and air bag sliding contact C218a pin 1, circuit 8-MD26 (WH/BK), harness side; and between ACM C240a pin 14, circuit 8-MD26 (WH/BK), harness side and ground.

- Is the resistance less than 5 ohms between the ACM and the air bag sliding contact, and greater than 10,000 ohms between the ACM and ground?

→ **Yes**

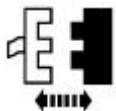
GO to [M3](#).

→ **No**

REPAIR the circuit. TEST the system for normal operation.

M3 CHECK CIRCUIT 31S-PG24 (BK/OG)

1

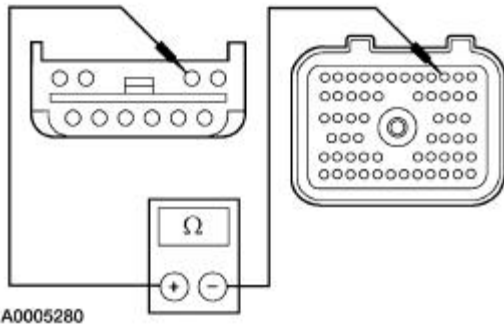


PCM 175a

2

2

Measure the resistance between air bag sliding contact C218a pin 8, circuit 31S-PG24 (BK/OG), harness side and PCM C175a pin 56, circuit 31S-PG24 (BK/OG), harness side; and between air bag sliding contact C218a pin 8, circuit



A0005280

31S-PG24 (BK/OG), harness side and ground.

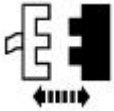
- Is the resistance less than 5 ohms?

→ **Yes**
GO to [M4](#).

→ **No**
REPAIR the circuit. TEST the system for normal operation.

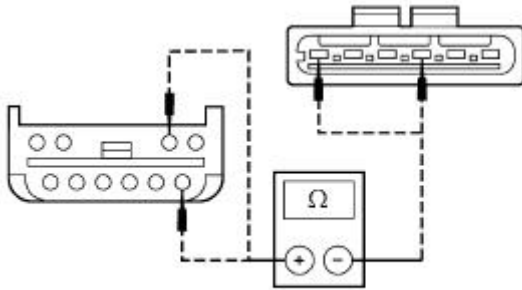
M4 CHECK THE AIR BAG SLIDING CONTACT

1



Air Bag Sliding Contact C217

2



A0005281

- 2 Measure the resistance between air bag sliding contact C218a pin 1, component side and horn switch C217 pin 6, component side; and between air bag sliding contact C218a pin 8, component side and horn switch C217 pin 3, component side.

- Are the resistances less than 5 ohms?

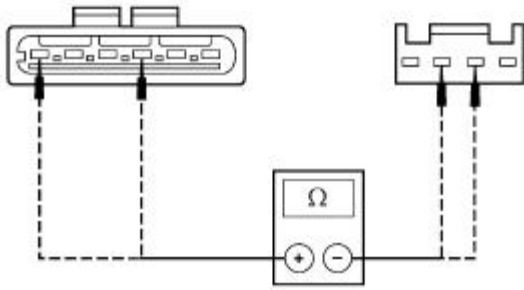
→ **Yes**
GO to [M5](#).

→ **No**
INSTALL a new air bag sliding contact; REFER to [Section 501-20B](#). TEST the system for normal operation.

M5 CHECK THE HORN SWITCH

1

- 1 Measure the resistance between horn switch C217 pin 6, component side and steering wheel control switch C208 pin 3, component side; and between horn switch C217 pin 3, component side and



A0005282

steering wheel control switch C208 pin 2,
component side.

- Are the resistances less than 5 ohms?

→ **Yes**

INSTALL new steering wheel control switches. TEST the system for normal operation.

→ **No**

INSTALL a new horn switch; REFER to [Section 413-06](#). TEST the system for normal operation.

Cassette Player Cleaning

1. For best performance, it is recommended that the tape player be cleaned once for every 10 to 12 hours of playing time. The tape player should be cleaned using a Ford tape player cleaning cartridge, available at your Ford or Lincoln-Mercury Dealer. The use of other cleaning products is not recommended, as these products could cause damage to the player or cassette tapes.
-

Torque Specifications

Description	Nm	lb-in
Battery ground cable	10	89
CD changer bolts	5	44
CD changer nut	5	44
Center imaging amplifier nuts	5	44

Audio System

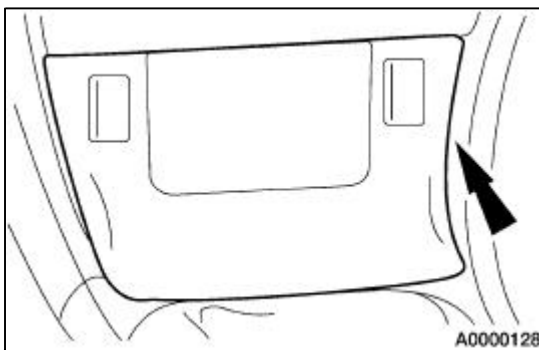
The audio system consists of the following:

- P100i audio unit
 - audiophile system
 - four premium speakers (premium model, audiophile)(18971)
 - two subwoofer speakers (audiophile only) (19A068)
 - two center imaging speakers (audiophile only)
 - center imaging amplifier (audiophile only)(located in the left side of instrument panel)
 - CD changer (located in the glove compartment)(if equipped)
 - antenna isolator module (AIM)(located in the rear package tray)
 - steering wheel controls
-

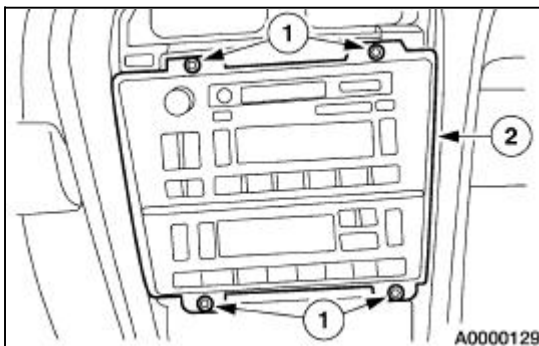
Audio Unit

Removal and Installation

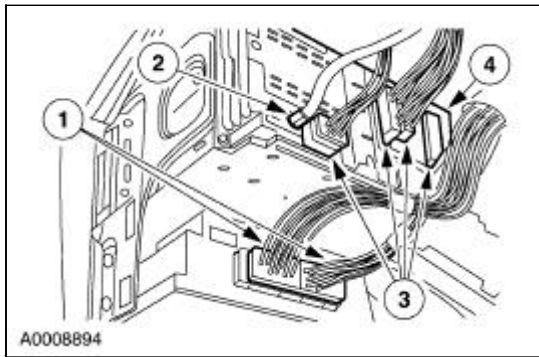
1. Disconnect the battery ground cable. Refer to [Section 414-01](#).
2. Remove the center A/C register finish panel. For additional information, refer to [Section 412-01](#).
3. Remove the ashtray finish panel.
 - Disconnect the electrical connectors.



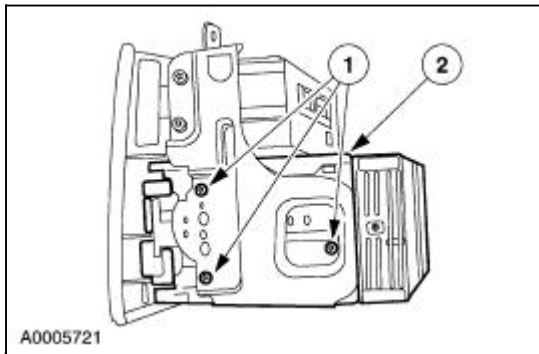
4. Position the audio/DATC assembly.
 1. Remove the bolts.
 2. Position the audio unit.



5. Remove the audio/DATC assembly.
 1. Disconnect the DATC electrical connectors.
 2. Disconnect the antenna lead-in cable.
 3. Disconnect the audio unit electrical connectors.
 4. Remove the audio unit.



6. Separate the audio unit from the audio/DATC assembly.
 1. Remove the six screws.
 2. Separate the audio unit.



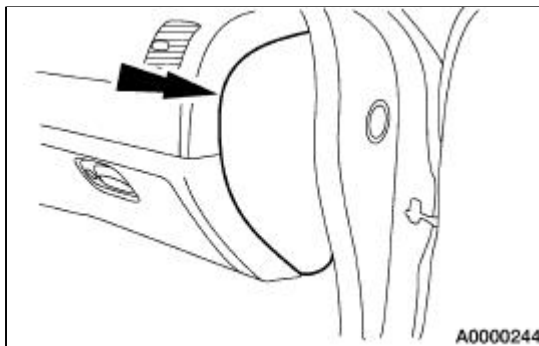
7. To install, reverse the removal procedure.
-

Compact Disc (CD) Changer

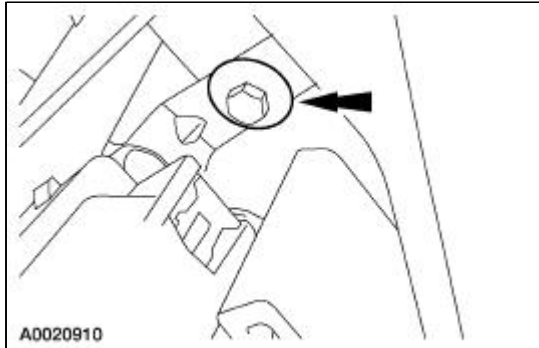
Removal and Installation

NOTE: Prior to the removal of the CD changer, it is necessary to remove the magazine.

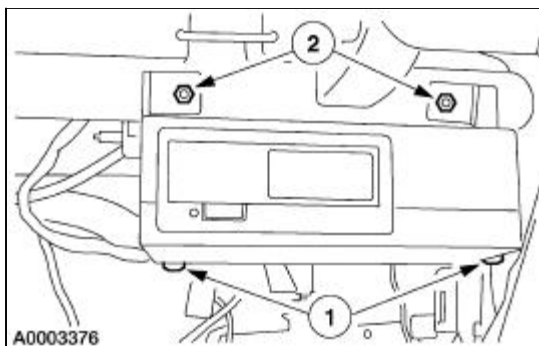
1. Remove the glove compartment. For additional information, refer to [Section 501-12](#).
2. Remove the RH end panel.



3. Remove the CD changer bracket bolt.



4. Remove the CD changer.
 1. Remove the two bolts.
 2. Remove the nuts.
 - Disconnect the electrical connector.



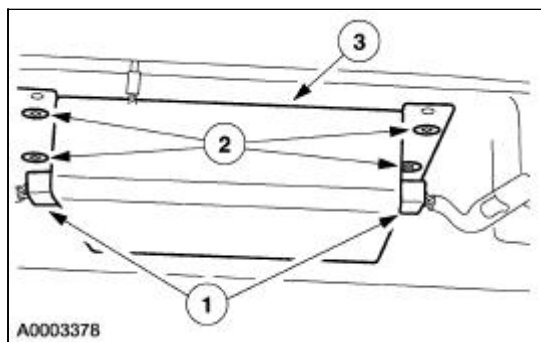
5. Remove the brackets from the CD changer.

6. To install, reverse the removal procedure.

Amplifier —Subwoofer

Removal and Installation

1. Disconnect the battery ground cable. [Section 414-01](#).
2. Open the deck lid.
3. Remove the subwoofer amplifier.
 1. Disconnect the electrical connectors.
 2. Remove the bolts.
 3. Remove the subwoofer amplifier.

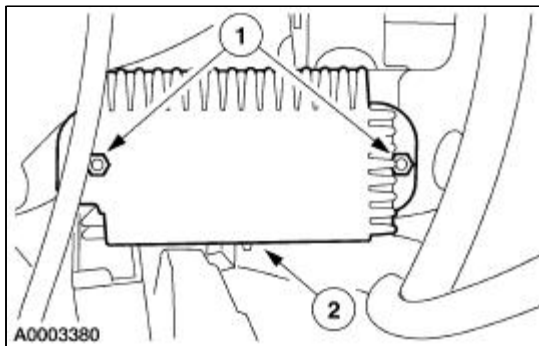


4. To install, reverse the removal procedure.
-

Amplifier —Center Imaging

Removal and Installation

1. Disconnect the battery ground cable. Refer to [Section 414-01](#).
2. Remove the driver side instrument panel insulator.
3. Remove the driver side lower heat duct.
4. Remove the center imaging amplifier.
 1. Remove the nuts.
 2. Disconnect the electrical connector.

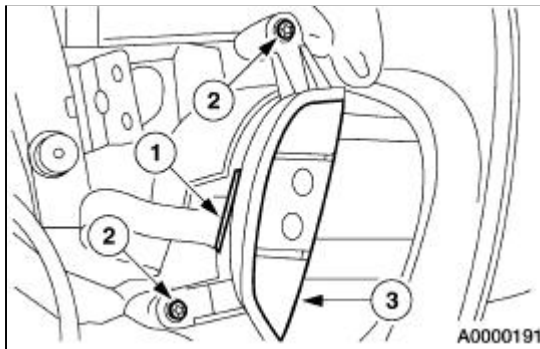


5. To install, reverse the removal procedure.
-

Auxiliary Control —Steering Wheel Switch

Removal and Installation

1. Remove the driver side air bag module (043B13). Refer to [Section 501-20B](#).
2. Remove the auxiliary control.
 1. Disconnect the electrical connector.
 2. Remove the screws.
 3. Remove the auxiliary control.



3. To install, reverse the removal procedure.
-

General Specifications

Item	Specification
Grid wire repair kit	ESB-M4J58-A
D8AZ-19562-AA	

Torque Specifications

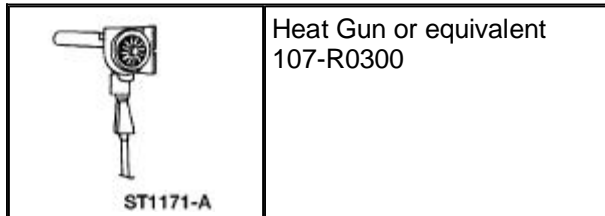
Description	Nm	lb-in
Antenna isolator module bolts	9	80
Battery ground cable bolt	10	89

Antenna

The radio antenna is concealed on the inside of the rear window glass. The AM antenna consists of the rear window defroster grid and the FM antenna is the conductive tracing above the rear window defroster grid. The radio antenna uses an antenna isolator module mounted under the rear package tray trim panel to separate the AM signals, FM signals, and rear defroster power.

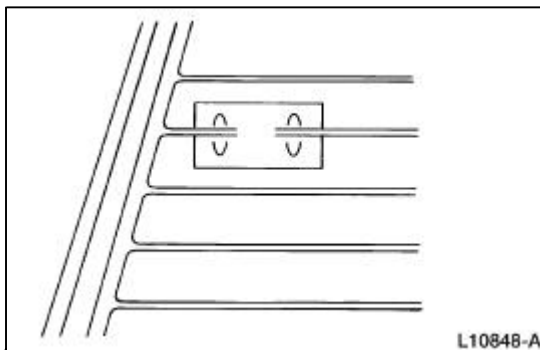
Antenna Grid Wire Repair

Special Tool(s)



NOTE: Any breaks longer than 25.4 mm (1 in) in one grid cannot be repaired. The back window glass must be replaced. Breaks equal to or shorter than 25.4 mm (1 in) in the heated back window grid wire can be successfully repaired by using the following procedure:

1. Obtain a grid wire repair repair kit meeting Ford specification ESB-M4J58-A.
2. The vehicle should be brought inside and allowed to reach 16°C (60°F) or above.
3. Clean the repair area with denatured alcohol.
4. Place the grid line mask over the break aligning the cut out slots on either side of the repair area.



5. Apply the epoxy to the repair area.
6. Remove the mask without disturbing the epoxy.
7. Use Heat Gun to heat the repair area for one to two minutes at a distance of about 25-50 mm (1-2 in). This procedure should heat the repair area to approximately 149°C (300°F).
8. The heated back window may be energized immediately after the repair. Optimum hardness and adhesion will occur after 24 hours. Do not disturb the repaired area until that time.


Antenna

Removal

1. The antenna is integral to the back window glass and can be repaired, but not replaced separately. For removal and installation of the back window glass, refer to [Section 501-11](#) . For repair procedures, refer to [Antenna Grid Wire Repair](#) .
-

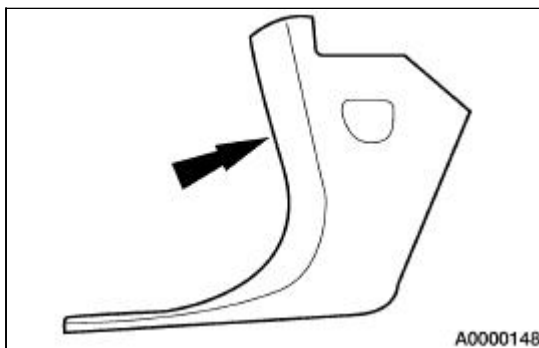
Cable

Removal and Installation

1.  **CAUTION:** The antenna lead-in cable is not removable from the rear lamp wiring harness. If the cable needs to be replaced, leave it in the rear lamp wiring harness, install a new cable on top and secure it with ties.

Disconnect the battery ground cable. Refer to [Section 414-01](#).

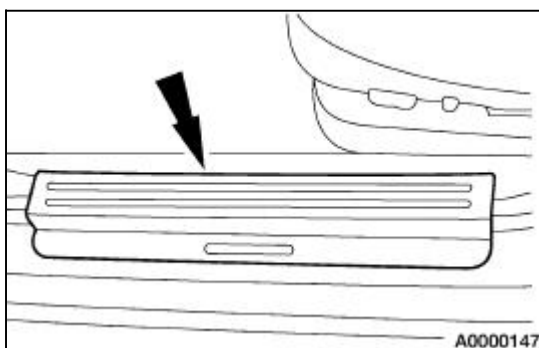
2. Remove the instrument panel. Refer to [Section 501-12](#).
3. Remove the LH A-pillar lower trim panel.



4. **NOTE:** Front LH scuff plate shown. Rear LH scuff plate similar.

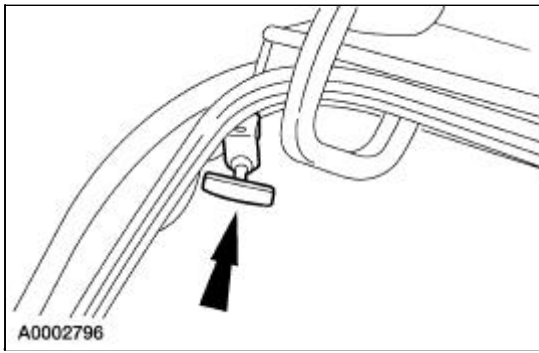
Remove the front and rear LH scuff plates.

- Remove the protective covers to expose the wiring harness.

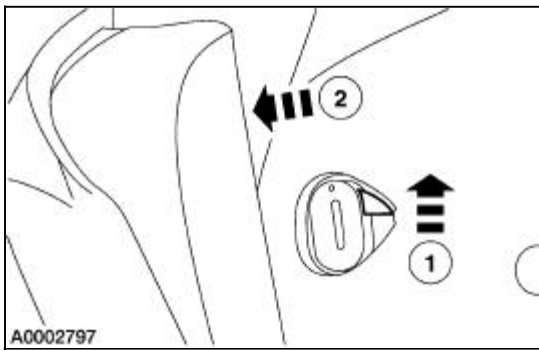


5. Remove the rear seat. For additional information, refer to [Section 501-10](#)
6. **NOTE:** The rear seat back release handles are located in the luggage compartment.

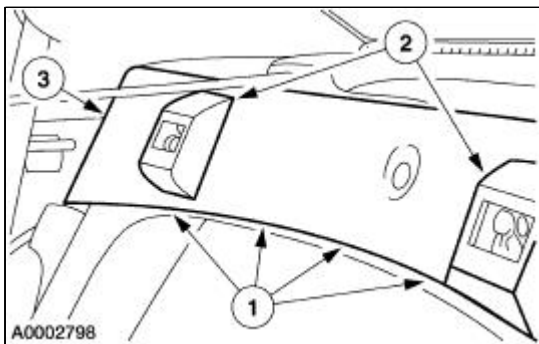
Lower the LH and RH rear seat backrests.



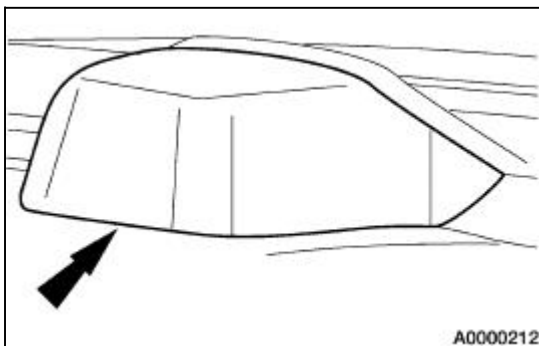
7. Position the LH and RH rear seat side bolsters aside.
 1. Release the upper retaining latches.
 2. Position the rear seat side bolsters aside.



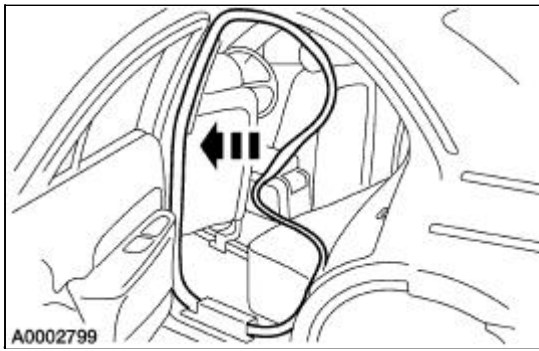
8. Remove the upper pass-through trim panel.
 1. Remove the five pin-type retainers.
 2. Release the latch covers.
 3. Remove the upper pass-through trim panel.



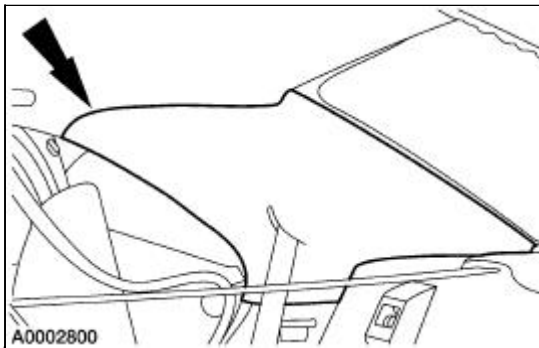
9. Remove the high mounted stoplamp cover.



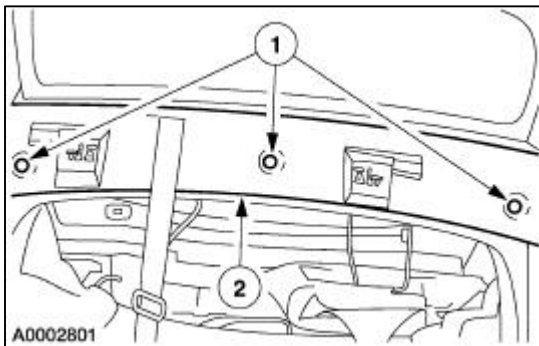
10. Position the LH and RH rear door opening sealing strips aside.



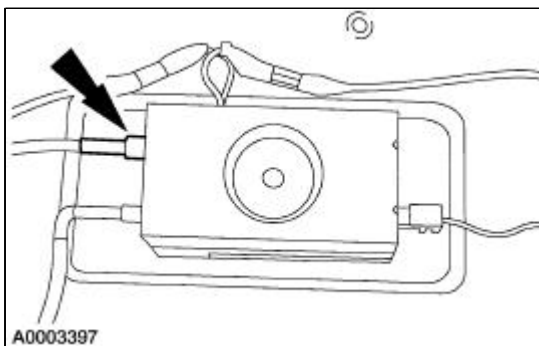
11. Position the LH and RH rear quarter panel trim panels aside.
 - Grasp trim panels at the top and gently pull outward to release the clips.



12. Remove the package tray.
 1. Remove the pin-type retainers.
 2. Remove the package tray.



13. Disconnect the antenna lead-in cable from the antenna isolator module.



14.  **CAUTION:** The antenna lead-in cable is not removable from the rear lamp wiring

harness. If the cable needs to be replaced, leave it in the rear lamp wiring harness, install a new cable on top and secure it with ties.

NOTE: To avoid noise after the new antenna lead-in cable has been installed, cut both ends of the old antenna lead-in cable to remove the metal connectors.

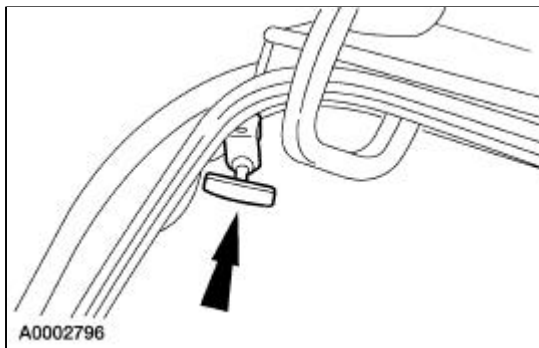
To install, reverse the removal procedure.

Module —Isolator

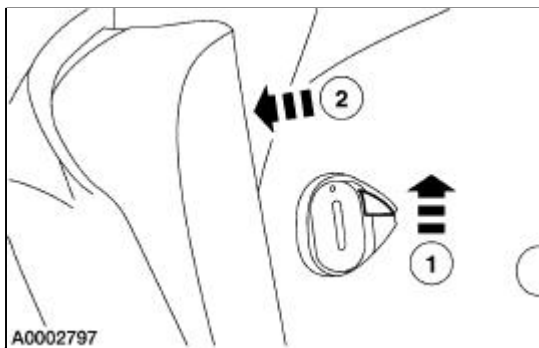
Removal and Installation

1. Disconnect the battery ground cable. Refer to [Section 414-01](#).
2. **NOTE:** The rear seat back release handles are located in the luggage compartment.

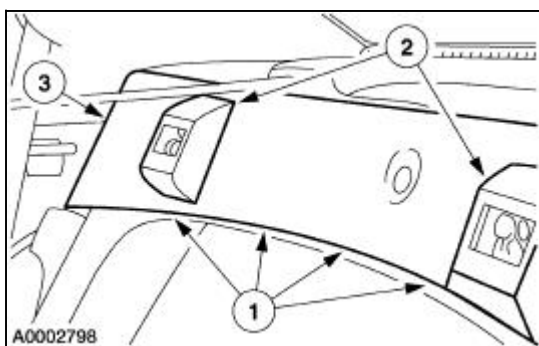
Lower the LH and RH rear seat backrests.



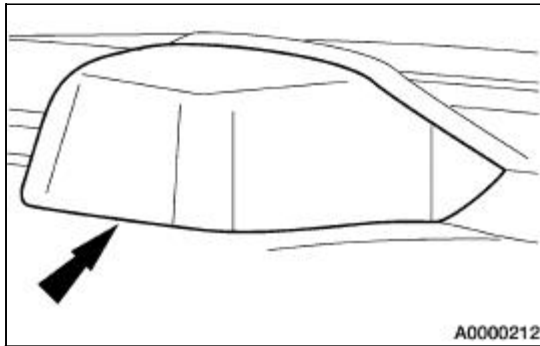
3. Position the LH and RH rear seat side bolsters aside.
 1. Release the upper retaining latches.
 2. Position the rear seat side bolsters aside.



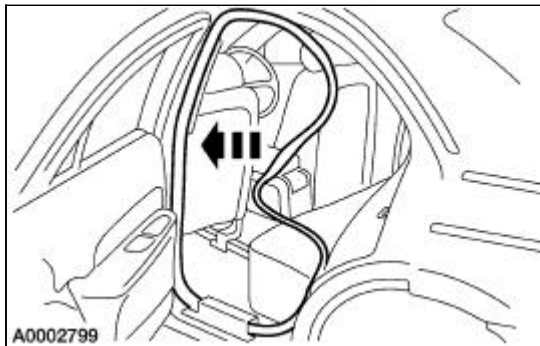
4. Remove the upper pass-through trim panel.
 1. Remove the five pin-type retainers.
 2. Release the latch covers.
 3. Remove the upper pass-through trim panel.



5. Remove the high mounted stoplamp cover.

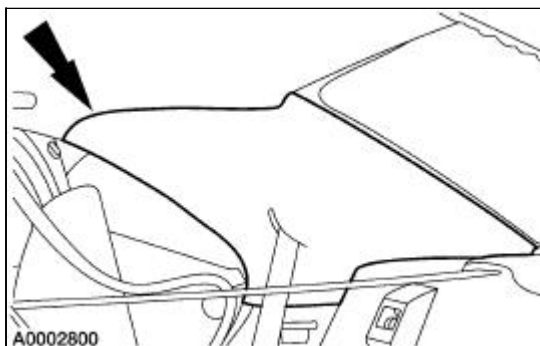


6. Position the LH and RH rear door opening sealing strips aside.



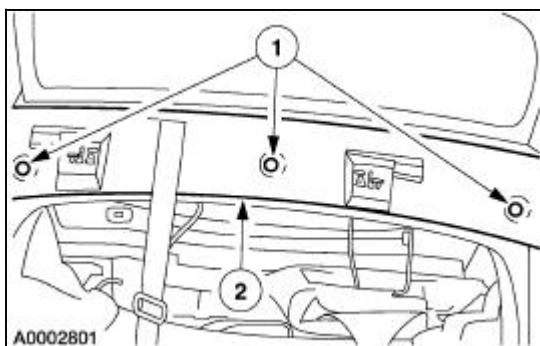
7. Position the LH and RH rear quarter panel trim panels aside.

- Grasp trim panels at the top and gently pull outward to release the clips.



8. Remove the package tray.

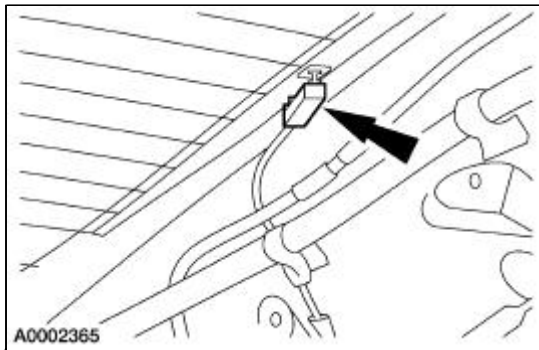
1. Remove the pin-type retainers.
2. Remove the package tray.



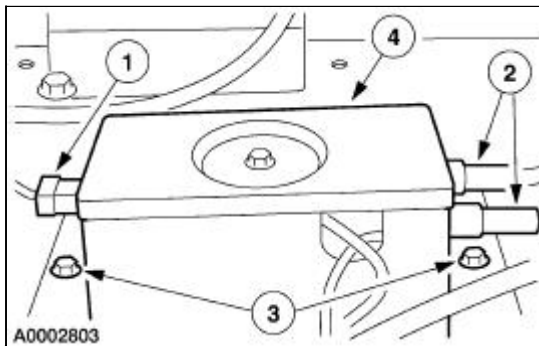
9. **NOTE:** RH rear defroster grid wiring harness shown, LH similar.

Disconnect the LH and RH rear defroster grid wiring harness.

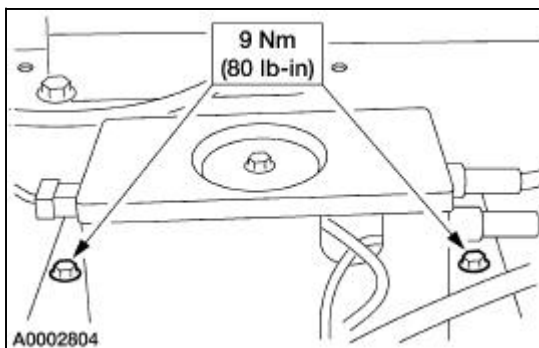
- Release the harness retainers.



10. Remove the isolator module.
1. Disconnect the electrical connector.
 2. Disconnect the antenna lead-in cables.
 3. Remove the bolts.
 4. Remove the isolator module.



11. To install, reverse the removal procedure.



Speakers

There are two speaker systems available:

- The premium sound speaker system.
- The optional audiophile speaker system.

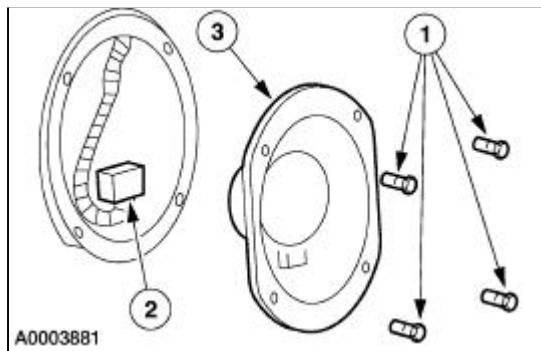
The premium sound system has one speaker mounted in each door.

The optional audiophile system has one two-way speaker mounted in each door, two subwoofer speakers in an enclosure mounted to the package tray, and two center imaging speakers mounted in the center stack area of the instrument panel.

Speaker —Door Mounted

Removal and Installation

1. Remove the door trim panel. Refer to [Section 501-05](#).
2. Remove the speakers.
 1. Remove the screws.
 2. Disconnect the electrical connector.
 3. Remove the speakers.

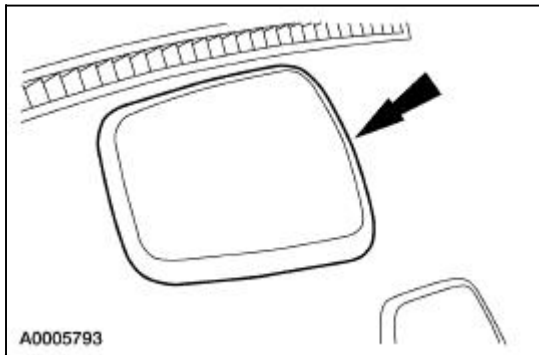


3. To install, reverse the removal procedure.
-

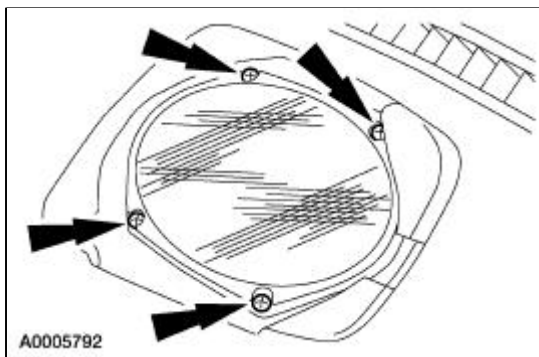
Speaker —Subwoofer

Removal and Installation

1. Remove the subwoofer speaker grill.



2. Remove the screws.

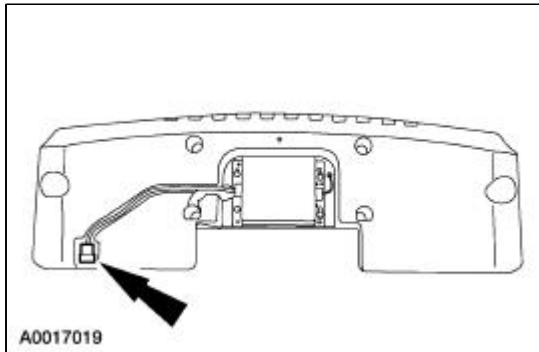


3. Disconnect the electrical connector.
 4. Remove the speaker.
 5. To install, reverse the removal procedure.
-

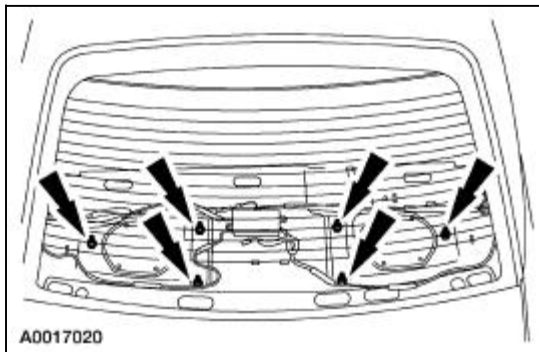
Speaker —Subwoofer Enclosure

Removal and Installation

1. Remove the package tray trim panel. For additional information, refer to [Section 501-05](#).
2. Disconnect the electrical connector.



3. Support the housing and remove the nuts.



4. Transfer all the components to the new housing as necessary.
 5. To install, reverse the removal procedure.
-

Torque Specifications

Description	Nm	lb-ft	lb-in
Battery ground cable bolt	10	—	89
Fog lamp assembly nuts	5	—	44
Headlamp assembly bolts	6	—	53
Stoplamp assembly nuts	5	—	44

Exterior Lighting


The exterior lighting system consists of:

- headlamps
 - autolamps
 - parking lamps
 - front marker lamps
 - fog lamps
 - rear lamps
 - stoplamps
 - high mounted stoplamp
 - license plate lamps
 - turn signals
 - reversing lamps
 - headlamp switch
 - brake pedal position (BPP) switch
-

Headlamps

Refer to Wiring Diagrams Section [417-01](#), Exterior Lighting for schematic and connector information.

Special Tool(s)

 ST2332-A	Worldwide Diagnostic System (WDS) 418-F224, New Generation STAR (NGS) Tester 418-F052 or equivalent diagnostic tool
 ST1137-A	73III Automotive Meter 105-R0057 or equivalent

Principles of Operation

NOTE: The front electronic module (FEM), the rear electronic module (REM) and the instrument cluster module (ICM) must be reconfigured before installing a new module. Refer to [Section 418-01](#).

The vehicle electronic functions are divided into zones. The FEM controls the front portion of the vehicle and the REM controls the rear portion of the vehicle. These systems rely on the standard corporate protocol (SCP) communication network in order to transmit and receive signals. As a technician it is very important to understand:

- where the input (command) originates from.
- all information (messages) necessary in order for a feature to operate.
- which module(s) receive(s) the input or command message.
- does the module which received the input (message) control the output of the feature, or does it output a message over the SCP communication network to another module.
- which module controls the output of the feature.

Exterior Lighting

The exterior lighting outputs are zone controlled by the FEM and REM. The front exterior lights are controlled by the FEM and the rear exterior lights are controlled by the REM. An additional function of the lighting system is a lamp outage function which indicates to the driver if certain exterior bulbs are not functioning. With a bulb inoperative, the FEM or REM will send a message to the instrument cluster and message center (if equipped with the message center), which will indicate to the driver that the lamp is inoperative with a lamp out indicator (with the message center a message will be displayed). To provide complete input and output functionality, each exterior lamp feature will be described individually. All exterior lighting is powered by the switched system power (SSP) feature (refer to Switched System Power [SSP]). A failure of all or any of the SSP features will cause inoperative

exterior lighting. When diagnosing exterior lighting, it is essential to determine if all related symptoms and DTCs are controlled by the SSP feature.

Headlamps

The headlamps are controlled by the FEM and instrument cluster module. The headlamp and multifunction switches are hardwired to the instrument cluster. When the headlamp switch is in any position, the instrument cluster module will send a command to the FEM through the SCP communication network. The FEM will process this information and output the appropriate command to the headlamps, which are hardwired to the FEM. This is the same for the low and high beams and flash-to-pass position. Daytime running lamps (DRL) is an additional feature which the FEM may be configured to include. Left and right low, as well as high beams will provide a lamp outage indication. Fault management of the headlamps will provide some headlamp functionality. In the event of all multifunction switch, all headlamp switch or ignition switch invalid or missing data failures, the low beams will be illuminated. There is also a headlamp battery saver feature. This feature turns off the headlamps in ten minutes after the ignition is turned off.

The vehicle electronic functions are divided into zones. The FEM controls the front portion of the vehicle and the REM controls the rear portion of the vehicle. These systems rely heavily on the SCP communication network in order to transmit and receive signals. As a technician it is very important to understand:

- where the input (command) originates from.
- all information (messages) necessary in order for a feature to operate.
- which module(s) receive(s) the input or command message.
- does the module which received the input (message) control the output of the feature, or does it output a message over the SCP communication network to another module.
- which module controls the output of the feature.

Switched System Power (SSP)

The SSP is invoked by both the FEM and REM. This function removes power from relays that provide power to the exterior lamps, interior lamps, and power door locks. This is only accomplished when both the FEM and the REM are in sleep mode. The sleep function of the FEM and REM places the modules in sleep mode when the ignition switch is in the OFF position, and no wake up (input) signals occur for 30 minutes. The module will not sleep if the parking lamps or the hazard lamps are active. The following relays are controlled by the SSP function: SSP1, SSP2, SSP3, and SSP4. When either the FEM or REM are not in sleep mode, all SSP relays will be energized. When energized, each relay will supply power to multiple features/functions. For additional information, refer to the SSP Index for diagnosis and testing of SSP related issues.

Inspection and Verification

1. Verify the customer concern by operating the headlamps following these steps:
 1. Place the ignition switch in the ON position.
 2. Place the headlamp switch in the ON position.
 3. **NOTE:** For autolamp concerns, refer to [Autolamps](#).

Verify the low and high beam operation.

 4. Place the headlamps in the OFF position.
2. Visually inspect for obvious signs of mechanical and electrical damage.

Visual Inspection Chart

Mechanical	Electrical
<ul style="list-style-type: none"> ● Damaged FEM ● Damaged instrument cluster 	<ul style="list-style-type: none"> ● Battery junction box (BJB) Fuses: <ul style="list-style-type: none"> ■ 423 (30A) ■ 424 (30A) ■ 427 (30A) ■ 432 (30A) ■ 425 (40A) ■ 422 (20A) ● Central junction box (CJB) Fuses: <ul style="list-style-type: none"> ■ 204 (5A) ■ 208 (5A) ■ 209 (10A) ■ 210 (5A) ■ 211 (10A) ■ 213 (5A) ■ 217 (5A) ■ 223 (10A) ■ 225 (10A) ■ 235 (5A) ■ 205 (5A) ■ 220 (10A) ■ 207 (5A) ● Damaged wiring harness ● Loose or corroded connections ● Damaged headlamp switch

3. If the concern remains after the inspection, connect the diagnostic tool to the data link connector (DLC) located beneath the instrument panel and select the vehicle to be tested from the diagnostic tool menu. If the diagnostic tool does not communicate with the vehicle:
 - check that the program card is correctly installed.
 - check the connections to the vehicle.
 - check the ignition switch position.
4. If the diagnostic tool still does not communicate with the vehicle, refer to the diagnostic tool manual.
5. Carry out the DATA LINK DIAGNOSTIC TEST. If the diagnostic tool responds with:
 - CKT914, CKT915 or CKT70 =ALL ECUS NO RESP/NOT EQUIP, refer to [Section 418-00](#).
 - NO RESP/NOT EQUIP for FEM, go to Pinpoint Test A.
 - NO RESP/NOT EQUIP for REM, go to Pinpoint Test B.
 - NO RESP/NOT EQUIP for instrument cluster, go to Pinpoint Test C.
 - SYSTEM PASSED, retrieve and record the continuous diagnostic trouble codes (DTCs), erase the continuous DTCs and carry out self-test diagnostics for the FEM.
6. If the DTCs retrieved are related to the concern, go to FEM Diagnostic Trouble Code (DTC) Index, and Instrument Cluster Module (ICM) Diagnostic Trouble Code (DTC) Index, or SSP Relay Index to continue diagnostics.
7. If no DTCs related to the concern are retrieved, proceed to Symptom Chart to continue diagnostics.

FEM Diagnostic Trouble Code (DTC) Index

FEM Diagnostic Trouble Code (DTC) Index

DTC	Description	Source	Action
B1319	Driver Door Ajar Circuit Failure	FEM	REFER to Section 417-02 .
B1327	Passenger Door Ajar Circuit Failure	FEM	REFER to Section 417-02 .
B1342	ECU Is Defective	FEM	CLEAR the DTCs. RETRIEVE the DTCs. If DTC B1342 is retrieved, INSTALL a new FEM. REFER to Section 419-10 .
B1438	Wiper Mode Select Switch Circuit Failure	FEM	REFER to Section 501-16 .
B1446	Wiper Park Sense Circuit Failure	FEM	REFER to Section 501-16 .
B1479	Wiper Washer Fluid Level Sensor Circuit Failure	FEM	REFER to Section 413-01 .
B1499	Lamp Turn Signal Left Circuit Failure	FEM	GO to Pinpoint Test AD .
B1501	Lamp Turn Signal Left Circuit Short to Battery	FEM	GO to Pinpoint Test AD .
B1503	Lamp Turn Signal Right Circuit Failure	FEM	GO to Pinpoint Test AD .
B1505	Lamp Turn Signal Right Circuit Short to Battery	FEM	GO to Pinpoint Test AD .
B1519	Hood Switch Circuit Failure	FEM	REFER to Section 419-01A .
B1567	Lamp Headlamp High-Beam Circuit Failure	FEM	GO to Pinpoint Test E .
B1676	Battery Pack Voltage Out of Range	FEM	REFER to Section 414-00 .
B1794	Lamp Headlamp Low-Beam Circuit Failure	FEM	GO to Pinpoint Test D .
B2214	Window Passenger Front Up Switch Short to Battery	FEM	REFER to Section 501-11 .
B2215	Window Passenger Front Down Switch Short to Battery	FEM	REFER to Section 501-11 .
B2312	Mirror Passenger Horizontal Feedback Potentiometer Circuit Failure	FEM	REFER to Section 501-09 .
B2316	Mirror Passenger Vertical Feedback Potentiometer Circuit Failure	FEM	REFER to Section 501-09 .
B2442	Intrusion Sensor Fault	FEM	REFER to Section 419-01A .
B2477	Module Configuration Failure	FEM	REFER to Section 418-01 .
C1284	Oil Pressure Switch Failure	FEM	REFER to Section 413-01 .
C1446	Brake Switch Circuit Failure	FEM	REFER to Section 413-01 .
C1924	VAPS Solenoid Actuator Output Circuit Short to Ground	FEM	REFER to Section 211-00 .
C1925	VAPS Solenoid Actuator Return Circuit Failure	FEM	REFER to Section 211-00 .
U1027	SCP (J1850) Invalid or Missing	PCM	CARRY OUT the PCM self-test.

	Data for Engine RPM		
U1041	SCP (J1850) Invalid or Missing Data for Vehicle Speed	ABS, ABS/TC, IVD	CARRY OUT the ABS, ABS/TC, or IVD self-test.
U1059	SCP (J1850) Invalid or Missing Data for Transmission / Transaxle / PRNDL	PCM	CARRY OUT the PCM self-test.
U1218	SCP (J1850) Invalid or Missing Data for External Lamps	ICM	CARRY OUT the ICM self-test.
U1222	SCP (J1850) Invalid or Missing Data for Interior Lamps	ICM	CARRY OUT the ICM self-test.
U1227	SCP (J1850) Invalid or Missing Data for Body Status Request	ICM	CARRY OUT the ICM self-test.

FEM Parameter Identification (PID) Index

PID	Description	Expected Value
AL_EVT1	Last 8 Alarm Events	DROPEN, HOODTR, IGNTAM, PANIC, T_AJAR, RR_SD, LR_SD, P_DOOR, D_DOOR, RADIO, WINDO, ULTRS, NOEVNT, BB_SND
AL_EVT2	Last 8 Alarm Events	DROPEN, HOODTR, IGNTAM, PANIC, T_AJAR, RR_SD, LR_SD, P_DOOR, D_DOOR, RADIO, WINDO, ULTRS, NOEVNT, BB_SND
AL_EVT3	Last 8 Alarm Events	DROPEN, HOODTR, IGNTAM, PANIC, T_AJAR, RR_SD, LR_SD, P_DOOR, D_DOOR, RADIO, WINDO, ULTRS, NOEVNT, BB_SND
AL_EVT4	Last 8 Alarm Events	DROPEN, HOODTR, IGNTAM, PANIC, T_AJAR, RR_SD, LR_SD, P_DOOR, D_DOOR, RADIO, WINDO, ULTRS, NOEVNT, BB_SND
AL_EVT5	Last 8 Alarm Events	DROPEN, HOODTR, IGNTAM, PANIC, T_AJAR, RR_SD, LR_SD, P_DOOR, D_DOOR, RADIO, WINDO, ULTRS, NOEVNT, BB_SND
AL_EVT6	Last 8 Alarm Events	DROPEN, HOODTR, IGNTAM, PANIC, T_AJAR, RR_SD, LR_SD, P_DOOR, D_DOOR, RADIO, WINDO, ULTRS, NOEVNT, BB_SND
AL_EVT7	Last 8 Alarm Events	DROPEN, HOODTR, IGNTAM, PANIC, T_AJAR, RR_SD, LR_SD, P_DOOR, D_DOOR, RADIO, WINDO, ULTRS, NOEVNT, BB_SND
AL_EVT8	Last 8 Alarm Events	DROPEN, HOODTR, IGNTAM, PANIC, T_AJAR, RR_SD, LR_SD, P_DOOR, D_DOOR, RADIO, WINDO, ULTRS, NOEVNT, BB_SND
CCNT	Number Of Continuous DTCs In Module	one count per bit
D_DOOR	Left Front Door Ajar Switch	CLOSED, AJAR
FLUID_1	Brake Fluid Level Switch #1	OFF, ON
HOOD_SW	Hood Ajar Switch	CLOSED, AJAR
IGN_R	Ignition Switch -RUN Position	NO, YES

L_HIGH	Left High Beam Lamp Driver	Off---, Off-B-, On---, On-B-
L_LOW	Left Low Beam Lamp	Off---, Off-B-, On---, On-B-
LF_TURN	Left Front Turn Lamp	Off---, Off-B-, On---, On-B-
LMRKOUT	Left Front Marker Lamp	Off---, Off-B-, On---, On-B-
OILWRN	Oil Level Warning Lamp	Off---, On---
P_DN_SW	Passenger Down Activated	OFF, DOWN
P_DOOR	Passenger Door Ajar Switch	CLOSED, AJAR
P_UP_SW	Passenger Up Activated	OFF, UP
PRK_BRK	Parking Brake Switch Input	OFF, ON
PSMRPSH	Passenger Mirror Position Sensor (Left/Right)	#####
PSMRPSV	Passenger Mirror Position	#####
PSPWAMP	Power Window Passenger's Peak Motor Current	#####
PWM_DC1	PWM Duty Cycle #1	%
R_HIGH	Right High Beam Lamp Driver	Off---, Off-B-, On---, On-B-
R_LOW	Right Low Beam Lamp	Off---, Off-B-, On---, On-B-
RADIOSW	Security Input Switch Status	OFF, ON
RF_TURN	Right Front Turn Lamp	Off---, Off-B-, On---, On-B-
RMRKSTB	Right Front Marker Lamp	Off---, Off-B-, On---, On-B-
STLKOUT	Steering Column Lock Ground Output	OFF, ON
VBAT	Battery Voltage	V
WFLUID	Washer Fluid Level	LOW, OK
WPMODE	Wiper Control Mode Select	WASH, OPEN, INVLD, OFF, INTVL1, INTVL2, INTVL3, INTVL4, INTVL5, INTVL6, INTVL7, LOW, HIGH
WPPRKSW	Windshield Wiper Park Sense	notPRK, PARKED

FEM Active Command Index

Active Command	Display	Action
BACKLIGHTING INTENSITY CONTROL COMMAND	ILLUM	%
BRAKE SYSTEM CONTROL COMMAND	SHFT LOCK	OFF, ON
EXTERIOR LAMP CONTROL	PARKLAMPS	OFF, ON
FRONT WINDOW CONTROL	RR UP	OFF, ON
FRONT WINDOW CONTROL	PR DOWN	OFF, ON

FRONT WINDSHIELD WIPER/WASHER	SPEED RLY	OFF, ON
FRONT WINDSHIELD WIPER/WASHER	WASH RLY	OFF, ON
FRONT WINDSHIELD WIPER/WASHER	WIPER RLY	OFF, ON
HEAD/CORNERING LAMP CONTROL	HIGH BEAM	OFF, ON
HEAD/CORNERING LAMP CONTROL	LOW BEAM	OFF, ON
INDICATOR LAMP CONTROL	NON MIL	OFF, ON
LAMP CONTROL COMMAND	HDLMPWSH	OFF, ON
POWER MIRROR CONTROL	PR DOWN	OFF, ON
POWER MIRROR CONTROL	PR LEFT	OFF, ON
POWER MIRROR CONTROL	PR RIGHT	OFF, ON
POWER MIRROR CONTROL	PR UP	OFF, ON
STEERING COLUMN CONTROL COMMAND	LOCK_GND	OFF, ON
TURN SIGNAL AND MARKER LAMPS	HAZARD	OFF, ON
VAPS II OUTPUT PULSE CONTROL	VAPSIIOUT	%

REM Diagnostic Trouble Code (DTC) Index

DTC	Description	Source	Action
B1201	Fuel Sender Circuit Failure	REM	REFER to Section 413-01 .
B1300	Power Door Lock Circuit Failure	REM	REFER to Section 501-14B .
B1310	Power Door Unlock Circuit Failure	REM	REFER to Section 501-14B .
B1331	Decklid Ajar Rear Door Circuit Failure	REM	REFER to Section 417-02 .
B1335	Door Ajar RR Circuit Failure	REM	REFER to Section 417-02 .
B1342	ECU Is Defective	REM	CLEAR and DOCUMENT the DTCs. CARRY OUT the instrument cluster self-test. INSTALL a new REM if DTC B1342 is retrieved again. REFER to Section 419-10 .
B1483	Brake Pedal Input Circuit Failure	REM	GO to Pinpoint Test P .
B1499	Lamp Turn Signal Left Circuit Failure	REM	GO to Pinpoint Test AA .
B1501	Lamp Turn Signal Left Circuit Short to Battery	REM	GO to Pinpoint Test AB .
B1503	Lamp Turn Signal Right Circuit Failure	REM	GO to Pinpoint Test Z .
B1505	Lamp Turn Signal Right Circuit Short to Battery	REM	GO to Pinpoint Test AC .
B1551	Decklid Release Circuit Failure	REM	REFER to Section 501-14B .
B1571	Door Ajar LR Circuit Failure	REM	REFER to Section 417-02 .
B1676	Battery Pack Voltage Out of Range	REM	REFER to Section 414-00 .
B2172	Inertia Switch Input Circuit Open	REM	REFER to Powertrain Control/Emissions

			Diagnosis (PC/ED) manual.
B2174	Window Driver Rear Remote Up Switch Short to Battery	REM	REFER to Section 501-16 .
B2178	Window Driver Rear Remote Down Switch Short to Battery	REM	REFER to Section 501-16 .
B2190	Window Passenger Rear Remote Up Switch Short to Battery	REM	REFER to Section 501-16 .
B2194	Window Passenger Rear Remote Down Switch Short to Battery	REM	REFER to Section 501-16 .
B2477	Module Configuration Failure	REM	REFER to Section 418-01 .
U1041	SCP (J1850) Invalid or Missing Data for Vehicle Speed	ABS,ABS/TC, or IVD	CARRY OUT the ABS, ABS/TC, or IVD self-test.
U1059	SCP (J1850) Invalid or Missing Data for Transmission/Transaxle/PRNDL	PCM	CARRY OUT the PCM self-test.
U1218	SCP (J1850) Invalid or Missing Data for External Lamps	ICM	CARRY OUT the ICM self-test

REM Parameter Identification (PID) Index

PID	Description	Expected Value
BOO	Brake Switch Input	OFF, ON
DECKLID	Decklid Ajar Switch	CLOSED, AJAR
DL_DSRM	Decklid Disarm	NO, YES
DLIDOUT	Decklid Driver	Off---, Off--G, Off-B-, Off-BG, OffO--, OffO-G, OffOB-, OffOBG, On---, On--G, On-B-, On-BG, OnO--, OnO-G, OnOB-, OnOBG
DLIDRLS	Deck Lid Release	OFF, ON
L_TAIL	Left & Right Tail Lamp	Off---, Off--G, Off-B-, Off-BG, OffO--, OffO-G, OffOB-, OffOBG, On---, On--G, On-B-, On-BG, OnO--, OnO-G, OnOB-, OnOBG
LMRKOUT	Left Marker Lamp Driver Output State	OFF, ON
LMRKSTB	Left Marker Lamp Driver Short To Battery	NO, YES
LR_TURN	Left & Right Rear Turn Lamp	Off---, Off--G, Off-B-, Off-BG, OffO--, OffO-G, OffOB-, OffOBG, On---, On--G, On-B-, On-BG, OnO--, OnO-G, OnOB-, OnOBG
LRDN_SW	Left Rear Window Down Switch	OFF, UP
LRDR_SW	Left Rear Door Ajar Switch	CLOSED, AJAR
LRUP_SW	Left Rear Window UP Switch	OFF, DOWN
PD_LOCK	Passenger Door Lock	NO, YES

PD_UNLK	Passenger Door Unlock	NOTLOC, LOCK
R_TAIL	Left & Right Tail Lamp	Off---, Off--G, Off-B-, Off-BG, OffO--, OffO-G, OffOB-, OffOBG, On---, On--G, On-B-, On-BG, OnO--, OnO-G, OnOB-, OnOBG
RR_TURN	Left & Right Rear Turn Lamp	Off---, Off--G, Off-B-, Off-BG, OffO--, OffO-G, OffOB-, OffOBG, On---, On--G, On-B-, On-BG, OnO--, OnO-G, OnOB-, OnOBG
RRDN_SW	Right Rear Window Down Switch	OFF, UP
RRDR_SW	Right Rear Door Ajar Switch	CLOSED, AJAR
RRUP_SW	Right Rear Window UP Switch	OFF, DOWN

REM Active Command Index

Active Command	Display	Action
EXTERIOR LAMP CONTROL	BACKUPLMP	OFF, ON
EXTERIOR LAMP CONTROL	H MNT STP	OFF, ON
EXTERIOR LAMP CONTROL	L STOP	OFF, ON
EXTERIOR LAMP CONTROL	PARKLAMPS	OFF, ON
EXTERIOR LAMP CONTROL	R DEF RLY	OFF, ON
EXTERIOR LAMP CONTROL	R STOP	OFF, ON
POWER WINDOW ENABLE COMMAND	PSGR RLY	OFF, ON
REAR DOOR LOCK CONTROL	LR LOCK	OFF, ON
REAR DOOR LOCK CONTROL	LR UNLOCK	OFF, ON
REAR DOOR LOCK CONTROL	RELEASE	OFF, ON
REAR WINDOW CONTROL	LR DOWN	OFF, ON
REAR WINDOW CONTROL	RR DOWN	OFF, ON
TURN SIGNAL AND MARKER LAMPS	HAZARD	OFF, ON

Instrument Cluster Diagnostic Trouble Code (DTC) Index

DTC	Description	Source	Action
B1201	Fuel Sender Circuit Failure	ICM	REFER to Section 413-01 .
B1205	EIC Switch-1 Assembly Circuit Failure	ICM	INSTALL a new instrument cluster; REFER to Section 413-01 . TEST the system for normal operation.
B1209	EIC Switch-2 Assembly Circuit Failure	ICM	INSTALL a new instrument cluster; REFER to Section 413-01 . TEST the system for normal operation.
B1213	Anti-Theft Number of Programmed Keys Is Below Minimum	ICM	REFER to Section 419-01B .

B1246	Dim Panel Potentiometer Switch Circuit Failure	ICM	REFER to Section 413-00 .
B1342	ECU Is Defective	ICM	CLEAR and DOCUMENT the DTCs. CARRY OUT the instrument cluster Self-Test. INSTALL a new instrument cluster if DTC B1342 is retrieved again. REFER to Section 413-01 .
B1352	Ignition Key-In Circuit Failure	ICM	REFER to Section 211-05 .
B1470	Lamp Headlamp Input Circuit Failure	ICM	GO to Pinpoint Test D .
B1492	Ignition Cylinder Sensor Open Circuit	ICM	REFER to Section 419-01B .
B1567	Lamp Headlamp High-Beam Circuit Failure	ICM	GO to Pinpoint Test E .
B1600	PATS Ignition Key Transponder Signal Is Not Received	ICM	REFER to Section 419-01B .
B1601	PATS Received Incorrect Key-Code From Ignition Key Transponder	ICM	REFER to Section 419-01B .
B1602	PATS Received Invalid Format of Key-Code From Ignition Key Transponder	ICM	REFER to Section 419-01B .
B1676	Battery Pack Voltage Out of Range	ICM	GO to Pinpoint Test J .
B1681	PATS Transceiver Module Signal Is Not Received	ICM	REFER to Section 419-01B .
B1689	Autolamp Delay Circuit Failure	ICM	GO to Pinpoint Test N .
B1875	Turn Signal / Hazard Switch Signal Circuit Failure	ICM	GO to Pinpoint Test AE .
B2103	Antenna Not Connected	ICM	REFER to Section 419-01B .
B2139	Data Mismatch (Receive Data Does Not Match What Was Expected)	ICM	REFER to Section 419-01A .
B2141	NVM Configuration Failure	ICM	REFER to Section 419-01B .
B2143	NVM Memory Failure	ICM	REFER to Section 419-01B .
B2162	Data Mismatch #2 (receive data does not match what was expected)	ICM	REFER to Section 419-01B .
B2328	Column Reach Feedback Potentiometer Circuit Failure	ICM	REFER to Section 211-04 .
B2332	Column Tilt Feedback Potentiometer Circuit Failure	ICM	REFER to Section 211-04 .
B2351	Steering Column Switch Circuit Failure	ICM	REFER to Section 211-04 .
B2431	Transponder Programming Failed	ICM	REFER to Section 419-01A .
B2472	Fog Lamp Switch Failure	ICM	GO to Pinpoint Test AS .
B2477	Module Configuration Failure	ICM	REFER to Section 418-01 .
U1041	SCP (J1850) Invalid or Missing Data for Vehicle Speed	ABS/TC/IVD	CARRY OUT the ABS/TC/IVD self-test.
U1059	SCP (J1850) Invalid or Missing Data for Transmission/Transaxle/PRNDL	PCM	CARRY OUT the PCM self-test.
U1073	SCP (J1850) Invalid or Missing Data for Engine Coolant Fluid Temperature	PCM	CARRY OUT the PCM self-test.
U1123	SCP (J1850) Invalid or Missing Data for Odometer Rolling Count	ABS/TC/IVD	CARRY OUT the ABS/TC/IVD self-test.
U1131	SCP (J1850) Invalid or Missing Data	ICM	GO to Pinpoint Test D .

	for Fuel System		
U1147	SCP (J1850) Invalid or Missing Data for Vehicle Security System	PCM	CARRY OUT the PCM self-test.

Instrument Cluster Parameter Identification (PID) Index

PID	Description	Expected Value
ABCHIME	Air Bag Chime	OFF, ON
ANTISCN	Anti-Scan Function	DISABL, ENABLE
ASWSTAT	Autolamp Switch Input Status	1 KEY, 2 KEY, 3 KEY, 4 KEY, 5 KEY, 6 KEY, 7 KEY, 8 KEY, 9 KEY, 0 KEY, NO KEY
CCNT	Number Of Continuous DTCs In Module	one count per bit
D_SBELT	Driver Seat Belt	OUT, IN
DSWSTAT	Dimmer Switch Input Status	ON, LVL1, LVL2, LVL3, LVL4, LVL5, LVL6, LVL7, LVL8, LVL9, LVL10, LVL11, LVL12, LVL13, LVL14, LVL15, LVL16, LVL17, LVL18, LVL19, LVL20, LVL21,
ENABL_S	Vehicle Enable Status	DISABL, ENABLE
HEAD_L	Headlamp Switch Input Status	OFF, PARK, HEADLP, R_FOG, INVLD,
HIBEAM	High Beam Switch Input Status	OFF, HIGH, PASS, INVLD,
HORN_SW	Horn Input Switch	OFF, ON
IGN_A	Ignition Switch -ACCY Position	NO, YES
IGN_KEY	Ignition Key In / Out	OUT, IN
IGN_O/U	Ignition Switch - OFF/Unlock Position	NO, YES
IGN_R	Ignition Switch -RUN Position	NO, YES
IGN_S	Ignition Switch - START Position	NO, YES
LIGHTSN	Night(True) / Day (False)	NO, YES
M_KEY	Master Key Present	notPRE, PRESNT
NUMKEYS	Number Of Keys Stored In Module	one count per bit
PCM_ID	PCM ID Status	notSTR, STORED
PCM_VFY	PCM Verify OK	NO, YES
RESETSW	Reset Switch	OFF, ON
SELECT	Select/Mode Switch	OFF, ON
TILT	Steering Column Tilt Switch	SHORT, UP, DOWN, OFF
TELEPOS	Telescope Position Sensor	notSEN, SENSED

TELESCP	Steering Column Telescope Switch	SHORT, IN, OUT, OFF
TILTPOS	Tilt Position Sensor	notSEN, SENSED
TR_PARK	Transmission Select Lever In Park Pos	NO, YES

Instrument Cluster Active Command Index

Active Command	Display	Action
ANTI-THEFT INDICATOR LAMP	THEFT LAMP	OFF, ON
DISPLAY DIMMING CONTROL	ILLUMINAT	OFF, ON
DISPLAY SEGMENT CONTROL II	SEGMENTS	OFF, ON
ENGINE COOLANT GAUGE CONTROL	ENGCOOLNT	0%-100%
FUEL GAUGE CONTROL	FUELLEVEL	0%-100%
MEMORY SELECT CONTROL	MEMORY 1	OFF, ON
MEMORY SELECT CONTROL	MEMORY 2	OFF, ON
PRNDL DISPLAY CONTROL COMMAND	SEGMENTS	OFF, ON
RF SIGNAL	RF	OFF, ON
SPEEDOMETER CONTROL	SPDOMETER	0%-100%
TACHOMETER CONTROL	TCHOMETER	0%-100%
WARNING LAMPS AND CHIME	ALL LAMPS	OFF, ON
WARNING LAMPS AND CHIME	CHIME	OFF, ON

SSP Relay Index

Relay	Fuse	Controlled System(s)
SSP1	BJB Fuse 427 (30A)	<ul style="list-style-type: none"> ● Driver power door lock (FEM) ● LH/RH high beam headlamps (FEM) ● RF park/turn/side marker lamps (FEM) ● RH low beam headlamp ● Driver power mirror
SSP2	BJB Fuse 432 (30A)	<ul style="list-style-type: none"> ● LH low beam headlamp (FEM) ● LF park/turn/side marker lamps (FEM) ● Interior courtesy/ demand lighting ● Windshield wiper washer pump ● Switch illumination backlighting
SSP3	BJB Fuse 424 (30A)	<ul style="list-style-type: none"> ● High mounted stoplamp (REM) ● RR park/stoplamps (REM) ● Reversing lamps (REM) ● LR turn signal (REM) ● Passenger power mirror ● Trailer stoplamps/turn signals (if equipped with trailer tow)
SSP4	BJB Fuse 423 (30A)	<ul style="list-style-type: none"> ● LR park/stoplamps (REM) ● RR turn signal (REM) ● Passenger door/side locks (REM)

	<ul style="list-style-type: none"> ● License lamps ● Luggage compartment lid release solenoid/switch ● Fuel door release solenoid/switch ● Luggage compartment lamp ● Trailer park lamps (if equipped with trailer tow)
--	--

When diagnosing an SSP relay, check that all systems for that relay are inoperative. Refer to Symptom Chart if:

- all systems for one SSP relay are inoperative.
- all systems for all SSP relays are inoperative.

Symptom Chart

Symptom Chart

Condition	Possible Sources	Action
<ul style="list-style-type: none"> ● No communication with the front electronic module 	<ul style="list-style-type: none"> ● Fuses 425 (40A), 422 (20A). ● Circuitry. ● FEM. 	<ul style="list-style-type: none"> ● GO to Pinpoint Test A.
<ul style="list-style-type: none"> ● No communication with the rear electronic module 	<ul style="list-style-type: none"> ● Battery junction box (BJB) Fuse 425 (40A). ● Circuitry. ● REM. 	<ul style="list-style-type: none"> ● GO to Pinpoint Test B.
<ul style="list-style-type: none"> ● No communication with the instrument cluster module 	<ul style="list-style-type: none"> ● CJB Fuses 204 (5A), 213 (5A), 220 (5A). ● Circuitry. ● Instrument cluster. 	<ul style="list-style-type: none"> ● GO to Pinpoint Test C.
<ul style="list-style-type: none"> ● The high beams are inoperative — both 	<ul style="list-style-type: none"> ● FEM. 	<ul style="list-style-type: none"> ● INSTALL a new FEM; REFER to Section 419-10. TEST the system for normal operation.
<ul style="list-style-type: none"> ● One low beam headlamp is inoperative 	<ul style="list-style-type: none"> ● BJB Fuses 427 (30A), 432 (30A). ● CJB Fuses 225 (10A), 209 (10A). ● Bulb. ● Circuitry. ● FEM. ● Instrument cluster. ● Multifunction switch. 	<ul style="list-style-type: none"> ● GO to Pinpoint Test D.
<ul style="list-style-type: none"> ● One high beam headlamp is inoperative 	<ul style="list-style-type: none"> ● BJB Fuses 427 (30A), 432 (30A). ● CJB Fuses 211 (10A), 223 (10A). ● Bulb. ● Circuitry. ● FEM. ● Instrument cluster. 	<ul style="list-style-type: none"> ● GO to Pinpoint Test E.

	<ul style="list-style-type: none"> ● Multifunction switch. 	
<ul style="list-style-type: none"> ● Exterior lamps are inoperative — RF park, RF turn, RF side marker lamps, RF low beam, LF high beam, LF park, LF turn and LF side marker 	<ul style="list-style-type: none"> ● CJB Fuses 208 (5A), 209 (10A), 210 (5A), 223 (10A), 211 (10A). ● Bulbs. ● Circuitry. ● SSP relay. 	<ul style="list-style-type: none"> ● GO to Pinpoint Test F.
<ul style="list-style-type: none"> ● The headlamps are on continuously — both low beams 	<ul style="list-style-type: none"> ● Circuitry. ● FEM. ● Instrument cluster. 	<ul style="list-style-type: none"> ● GO to Pinpoint Test G.
<ul style="list-style-type: none"> ● The headlamps are on continuously — single low/high beams 	<ul style="list-style-type: none"> ● Circuitry. ● FEM. ● Instrument cluster. 	<ul style="list-style-type: none"> ● GO to Pinpoint Test H.
<ul style="list-style-type: none"> ● The power supply relay is inoperative — all SSP features 	<ul style="list-style-type: none"> ● Circuitry. ● Relay. ● FEM. ● REM. 	<ul style="list-style-type: none"> ● GO to Pinpoint Test I.
<ul style="list-style-type: none"> ● The power supply relay is inoperative —SSP1 	<ul style="list-style-type: none"> ● BJB Fuse 427 (30A). ● Circuitry. ● Relay. ● FEM. ● REM. 	<ul style="list-style-type: none"> ● GO to Pinpoint Test J.
<ul style="list-style-type: none"> ● The power supply relay is inoperative —SSP2 	<ul style="list-style-type: none"> ● BJB Fuse 432 (30A). ● Circuitry. ● Relay. ● REM. ● FEM. 	<ul style="list-style-type: none"> ● GO to Pinpoint Test K.
<ul style="list-style-type: none"> ● The power supply relay is inoperative —SSP3 	<ul style="list-style-type: none"> ● BJB Fuse 424 (30A). ● Circuitry. ● Relay. ● FEM. ● REM. 	<ul style="list-style-type: none"> ● GO to Pinpoint Test L.
<ul style="list-style-type: none"> ● The power supply relay is inoperative —SSP4 	<ul style="list-style-type: none"> ● BJB Fuse 423 (30A). ● Circuitry. ● Relay. ● REM. ● FEM. 	<ul style="list-style-type: none"> ● GO to Pinpoint Test M.

Pinpoint Tests



CAUTION: Electronic modules are sensitive to electrical charges. If exposed to these charges, damage may result.

PINPOINT TEST A: NO COMMUNICATION WITH THE FRONT ELECTRONIC MODULE

CONDITIONS	DETAILS/RESULTS/ACTIONS
------------	-------------------------

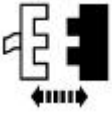
A1 CHECK CIRCUITS 29-DK20 (OG/GN) AND 29S-DK22 (OG/YE) FOR VOLTAGE

NOTE: Cycle ignition switch from OFF to RUN to enable the switched system power feature.

1

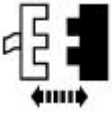


2



FEM C201c

3

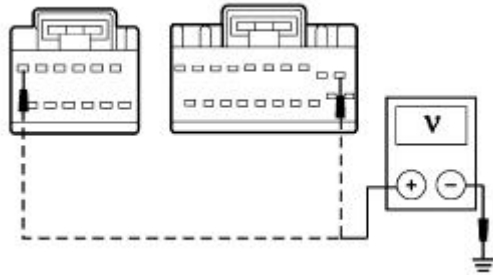


FEM C201f

4



5



A0006297

5

Measure the voltage between FEM C201c pin 6, circuit 29-DK20 (OG/GN), harness side and ground; and between FEM C201f pin 1, circuit 29S-DK22 (OG/YE), harness side and ground.

- Are the voltages greater than 10 volts?

→ **Yes**
GO to [A2](#).

→ **No**
REPAIR the circuit(s) in question. TEST the system for normal operation.

A2 CHECK CIRCUITS 31-DK20 (BK/RD), 31-DK20A (BK/RD), 31-DK20B (BK/RD), 31-DK20C (BK/RD) AND 31-DK20D (BK/RD) FOR OPENS

1



2

FEM C201a

3

A0006298

3 Measure the resistance between FEM connectors, harness side and ground:

FEM	Pin	Circuit
C201c	12	31-DK20 (BK/RD)
C201a	11	31-DK20A (BK/RD)
C201a	13	31-DK20B (BK/RD)
C201a	14	31-DK20C (BK/RD)
C201a	15	31-DK20D (BK/RD)

- Is the resistance less than 5 ohms?

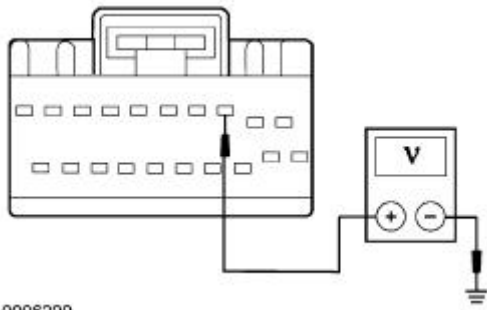
→ **Yes**
REFER to [Section 418-00](#) .

→ **No**
REPAIR the circuit(s) in question. TEST the system for normal operation.

PINPOINT TEST B: NO COMMUNICATION WITH THE REAR ELECTRONIC MODULE

CONDITIONS	DETAILS/RESULTS/ACTIONS
B1 CHECK CIRCUIT 29-DK31 (OG/BK) FOR VOLTAGE	
NOTE: Cycle ignition switch from OFF to RUN to enable the switched system power feature.	
<p>1</p> <p>2</p> <p style="text-align: center;">REM C420d</p> <p>3</p> <p style="text-align: center;">REM C420c</p> <p>4</p>	

5



A0006299

5

Measure the voltage between REM C420d pin 3, circuit 29-DK31 (OG/BK), harness side and ground.

● Is the voltage greater than 10 volts?

→ **Yes**
GO to [B2](#).

→ **No**
REPAIR the circuit. TEST the system for normal operation.

B2 CHECK CIRCUITS 29S-DK31 (OG/BK), 31-DK30D (BK), 31-DK30E (BK), 31-DK30F (BK), 31-DK30G (BK) AND 31-DK30H (BK), FOR OPENS

1

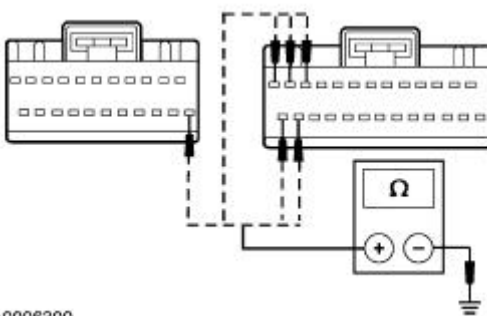


2



REM C420b

3



A0006300

3

Measure the resistance between REM connectors, harness side and ground:



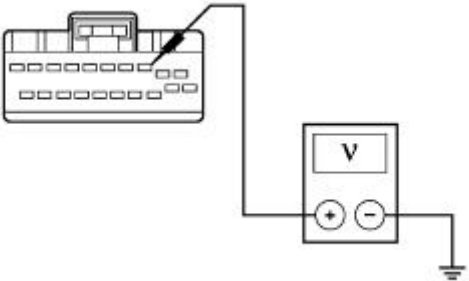


REM	Pin	Circuit
C420c	13	29S-DK31 (OG/BK)
C420c	12	31-DK30E (BK)
C420c	11	31-DK30D (BK)
C420c	26	31-DK30G (BK)
C420c	25	31-DK30F (BK)
C420b	12	31-DK30H (BK)

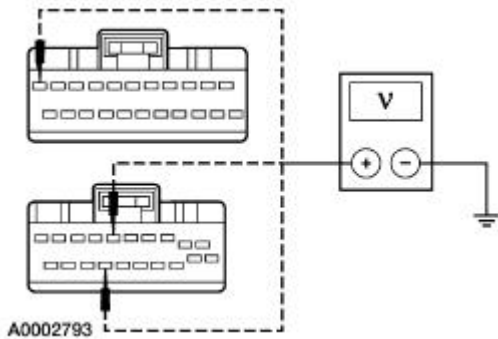
● Is the resistance less than 5 ohms?

→ **Yes**
REFER to [Section 418-00](#).

→ **No**
REPAIR the circuit(s) in question. TEST the system for normal operation.

PINPOINT TEST C: NO COMMUNICATION WITH THE INSTRUMENT CLUSTER MODULE

CONDITIONS	DETAILS/RESULTS/ACTIONS								
C1 CHECK HOT AT ALL TIMES POWER SUPPLY CIRCUIT									
<p>1 </p> <p>2 </p> <p>3 </p>	<p>3 Measure the voltage between instrument cluster C220b pin 3, circuit 29-GG11 (OG/BU), harness side and ground.</p> <p>● Is the voltage greater than 10 volts?</p> <p>→ Yes GO to C2.</p> <p>→ No REPAIR the circuit. TEST the system for normal operation.</p>								
C2 CHECK HOT IN RUN POWER SUPPLY CIRCUITS									
<p>1 </p> <p>2 </p>	<p>2 Measure the voltage between the instrument cluster and ground as follows:</p> <table border="1"> <thead> <tr> <th>Connector pin</th> <th>Circuit</th> </tr> </thead> <tbody> <tr> <td>C220a pin 11</td> <td>15-JA14 (GN/BK)</td> </tr> <tr> <td>C220b pin 6</td> <td>15-GG14 (GN/RD)</td> </tr> <tr> <td>C220b pin 17</td> <td>75-GG15 (YE/GN)</td> </tr> </tbody> </table>	Connector pin	Circuit	C220a pin 11	15-JA14 (GN/BK)	C220b pin 6	15-GG14 (GN/RD)	C220b pin 17	75-GG15 (YE/GN)
Connector pin	Circuit								
C220a pin 11	15-JA14 (GN/BK)								
C220b pin 6	15-GG14 (GN/RD)								
C220b pin 17	75-GG15 (YE/GN)								



A0002793

- Are the voltages greater than 10 volts?

→ **Yes**
GO to [C3](#).

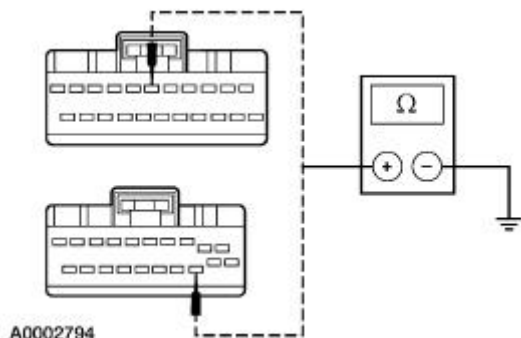
→ **No**
REPAIR the circuit(s). TEST the system for normal operation.

C3 CHECK GROUND CIRCUITS

1



2



A0002794

2 Measure the resistance between the instrument cluster and ground as follows:

Connector pin	Circuit
C220a pin 6	31-AL11 (BK)
C220b pin 13	91-GG11 (BN/RD)

- Are the resistances less than 5 ohms?

→ **Yes**
REFER to [Section 418-00](#).

→ **No**
REPAIR the circuit(s). TEST the system for normal operation.

PINPOINT TEST D: ONE LOW BEAM HEADLAMP IS INOPERATIVE

CONDITIONS	DETAILS/RESULTS/ACTIONS
NOTE: The ignition switch must be cycled from OFF to RUN to enable the SSP feature.	

D1 CHECK OPERATION OF THE HEADLAMPS

1



2 Place the headlamp switch in the ON position.

- **Do the low beams operate correctly?**

→ **Yes**
The system is working correctly.

→ **No**
If the left low beam is inoperative, GO to [D2](#).
If the right low beam is inoperative, GO to [D7](#).

D2 CHECK THE FEM OUTPUT

1



2



Diagnostic Tool

3



4



5 While observing the left low beam lamp trigger the FEM active command LEFT LOW ON and then OFF.

- **Does the left low beam turn ON?**

→ **Yes**
INSTALL a new FEM; REFER to [Section 419-10](#). CLEAR the DTCs. REPEAT the self-test.

→ **No**
GO to [D3](#).

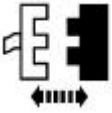
D3 CHECK CJB FUSE 225 (10A) FOR POWER

NOTE: The ignition switch must be cycled from OFF to RUN to enable the SSP feature.

1



2

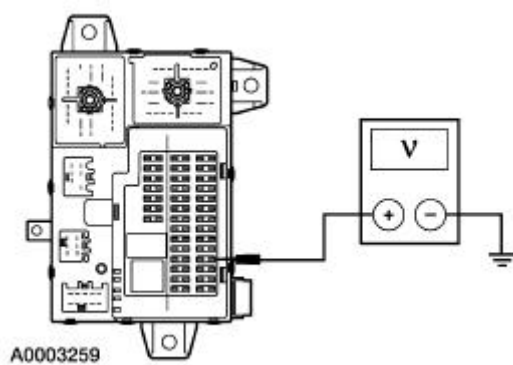


CJB 225 (10A)

3



4



4

Measure the voltage between CJB Fuse 225 (10A), input side and ground.

● Is the voltage greater than 10 volts?

→ **Yes**
GO to [D4](#).

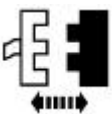
→ **No**
REFER to the SSP Relay Index in this section.

D4 CHECK CIRCUIT 29S-LE16 (OG/GN) FOR AN OPEN

1



2

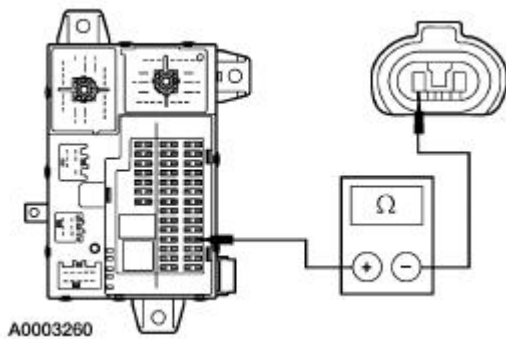


LH Low Beam Headlamp C1021

3

3

Measure the resistance between CJB Fuse 225 (10A) output side, circuit 29S-LE16 (OG/GN) and LH low beam headlamp C1021 pin 2, circuit 29S-LE16



(OG/GN), harness side.

- Is the resistance less than 5 ohms?

→ **Yes**
REINSTALL CJB Fuse 225 (10A).GO to [D5](#).

→ **No**
REPAIR the circuit. TEST the system for normal operation.

D5 CHECK CIRCUIT 31S-LE16 (BK/RD) FOR AN OPEN

NOTE: The ignition switch must be cycled from OFF to RUN to enable the SSP feature.

1

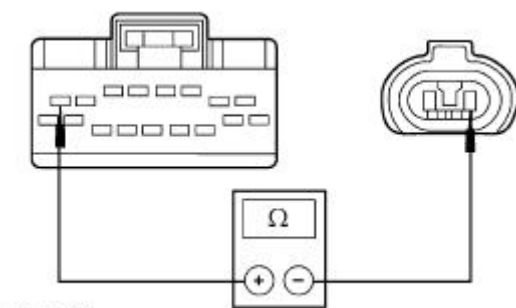


2



FEM C201a

3



3

Measure the resistance between FEM C201a pin 8, circuit 31S-LE16 (BK/RD), harness side and LH low beam headlamp C1021 pin 1, circuit 31S-LE16 (BK/RD), harness side.

- Is the resistance less than 5 ohms?

→ **Yes**
GO to [D6](#).

→ **No**
REPAIR the circuit. TEST the system for normal operation.

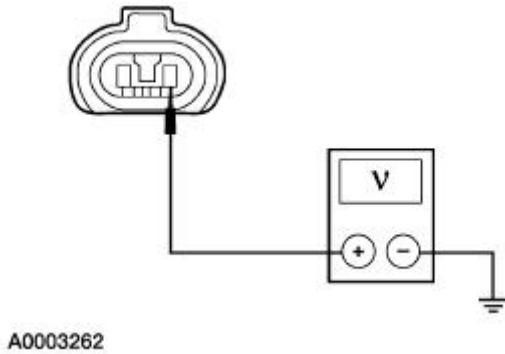
D6 CHECK CIRCUIT 31S-LE16 (BK/RD) FOR A SHORT TO POWER

NOTE: Cycle the ignition switch from OFF to RUN to enable SSP feature.

1



2



2

Measure the voltage between LH low beam headlamp C1021 pin 1, circuit 31S-LE16 (BK/RD), harness side and ground.

• **Is any voltage indicated?**

→ **Yes**
REPAIR the circuit. TEST the system for normal operation.

→ **No**
INSTALL a new FEM; REFER to [Section 419-10](#). CLEAR the DTCs. REPEAT the self-test.

D7 CHECK RIGHT LOW BEAM ACTIVE COMMANDS

1



Diagnostic Tool

2



3



3

Trigger the FEM active commands RIGHT LOW ON then RIGHT HIGH ON.

• **Do the low beams operate correctly?**

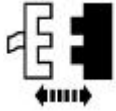
→ **Yes**
INSTALL a new FEM; REFER to [Section 419-10](#). CLEAR the DTCs. REPEAT the self-test.

→ **No**

TRIGGER the FEM active commands RIGHT LOW and RIGHT HIGH OFF. GO to [D8](#).

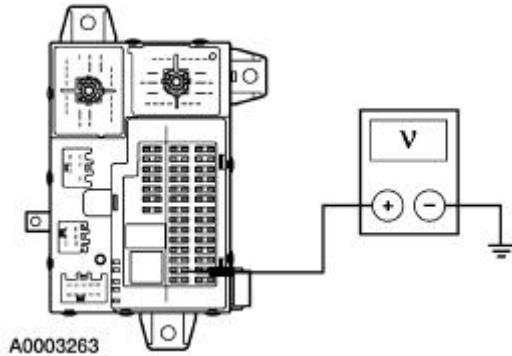
D8 CHECK CJB FUSE 209 (10A) FOR POWER

1



CJB Fuse 209 (10A)

2



2

Measure the voltage between CJB Fuse 209 (10A), input side and ground.

● Is the voltage greater than 10 volts?

→ **Yes**
GO to [D9](#).

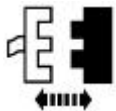
→ **No**
REFER to the SSP Relay Index in this section.

D9 CHECK CIRCUIT 29S-LE16 (OG/GN) FOR AN OPEN

1

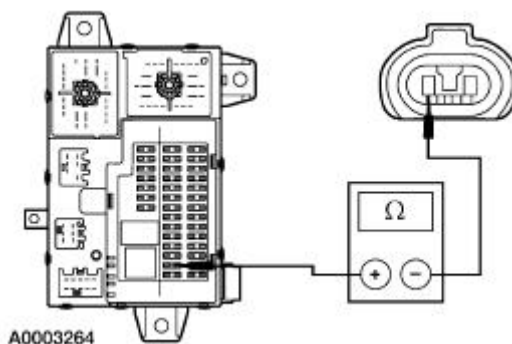


2



RH Low Beam Headlamp C1041

3



3

Measure the resistance between RH low beam headlamp C1041 pin 2, circuit 29S-LE16 (OG/GN), harness side and CJB Fuse 209 (10A), output side circuit 29S-LE23 (OG/WH).

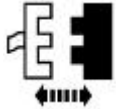
● Is the resistance less than 5 ohms?

→ **Yes**
REINSTALL CJB Fuse 209 (10A), GO to [D10](#).

→ **No**
REPAIR the circuit. TEST the system for normal operation.

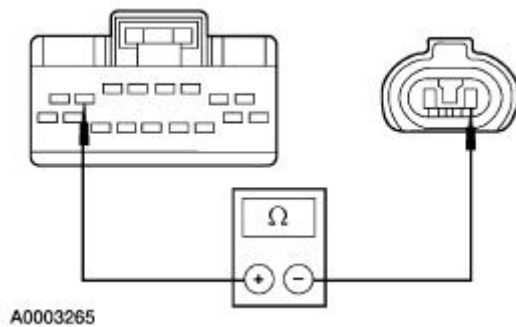
D10 CHECK CIRCUIT 31S-LE23 (BK/WH) FOR AN OPEN

1



FEM C201a

2



2

Measure the resistance between headlamp C1041 pin 1, circuit 31S-LE16 (BK/RD), harness side, and FEM C201a pin 7, circuit 31S-LE23 (BK/WH), harness side.

● Is the resistance less than 5 ohms?

→ **Yes**
GO to [D11](#).

→ **No**
REPAIR the circuit. TEST the system for normal operation.

D11 CHECK CIRCUIT 31S-LE16 (BK/RD) FOR A SHORT TO POWER

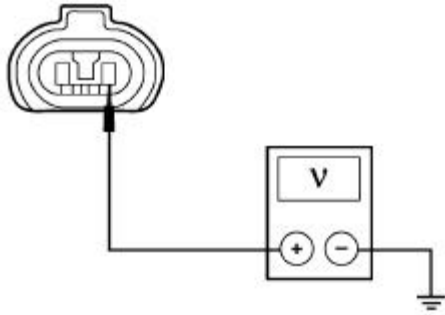
1



2

2

Measure the voltage between RH low beam headlamp C1041 pin 1, circuit 31S-LE16 (BK/RD), harness side and ground.




A0003262

- Is any voltage indicated?

- **Yes**
REPAIR the circuit. TEST the system for normal operation.
- **No**
INSTALL a new FEM; REFER to [Section 419-10](#). CLEAR the DTCs. REPEAT the self-test.

PINPOINT TEST E: ONE HIGH BEAM HEADLAMP IS INOPERATIVE

CONDITIONS	DETAILS/RESULTS/ACTIONS
NOTE: The ignition switch must be cycled from OFF to RUN to enable the SSP feature.	
E1 CHECK OPERATION OF THE HEADLAMP	
<p>1</p> 	<p>2 Place the headlamp switch in the ON position.</p> <ul style="list-style-type: none"> ● Do the high beams operate correctly? <p>→ Yes The system is working correctly.</p> <p>→ No If the left high beam is inoperative, GO to E2. If the right high beam is inoperative, GO to E6.</p>
E2 CHECK THE FEM OUTPUT	
NOTE: Cycle the ignition switch from OFF to RUN to enable the SSP feature.	
<p>1</p>	



2



Diagnostic Tool

3



4



5 While observing the left high beam lamp, trigger the FEM active command LEFT HIGH ON and then OFF.

• Do the high beams illuminate?

→ Yes
INSTALL a new FEM; REFER to [Section 419-10](#). CLEAR the DTCs. REPEAT the self-test.

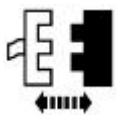
→ No
GO to [E3](#).

E3 CHECK CIRCUIT 29S-LE15 (OG/BK) FOR AN OPEN

1



2



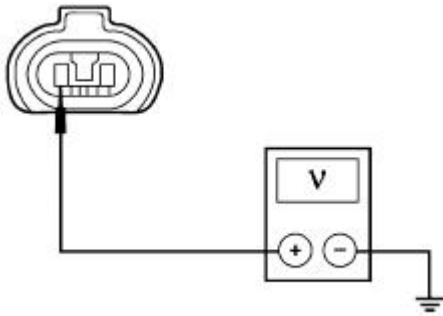
LH High Beam headlamp C1020

3



4

4 Measure the voltage between LH high beam headlamp C1020 pin 2, circuit 29S-LE15 (OG/BK), harness side and ground.



A0003266

● Is the voltage greater than 10 volts?

→ **Yes**
GO to [E4](#).

→ **No**
REPAIR the circuit. TEST the system for normal operation.

E4 CHECK CIRCUIT 31S-LE15 (BK/GN) FOR AN OPEN

1

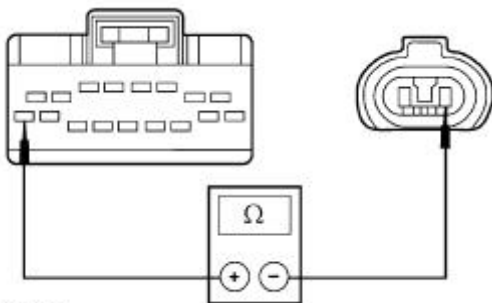


2



FEM C201a

3



A0003267

3 Measure the resistance between FEM C201a pin 17, circuit 31S-LE15 (BK/GN), harness side and LH headlamp C1020 pin 1, circuit 31S-LE15 (BK/GN), harness side.

● Is the resistance less than 5 ohms?

→ **Yes**
GO to [E5](#).

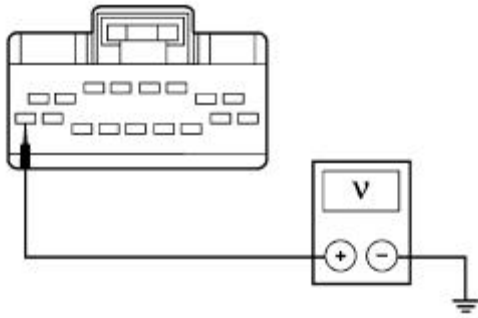
→ **No**
REPAIR the circuit. TEST the system for normal operation.

E5 CHECK CIRCUIT 31S-LE15 (BK/GN) FOR A SHORT TO POWER

1



2



A0003268

2

Measure the voltage between C201a pin 17, circuit 31S-LE15 (BK/GN), harness side and ground.

• Is any voltage indicated?

→ Yes

REPAIR the circuit. TEST the system for normal operation.

→ No

INSTALL a new FEM; REFER to [Section 419-10](#). CLEAR the DTCs. REPEAT the self-test.

E6 CHECK THE FEM OUTPUT

1



2



Diagnostic Tool

3



4



5

While observing the left high beam lamp trigger the FEM active command RIGHT HIGH ON and then OFF.

• Do the high beams illuminate?

→ Yes

INSTALL a new FEM; REFER to [Section 419-10](#). CLEAR the DTCs. REPEAT the self-test.

→ **No**
GO to [E7](#).

E7 CHECK CIRCUIT 29S-LE15 (OG/BK) FOR AN OPEN

1

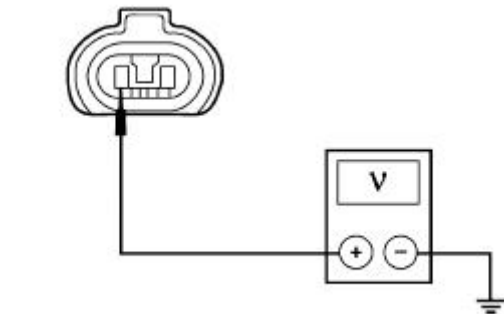


2



RH High Beam Headlamp C1040

3



A0003266

3 Measure the voltage between RH high beam headlamp C1040 pin 2, circuit 29S-LE15 (OG/BK), harness side and ground.

● Is the voltage greater than 10 volts?

→ **Yes**
GO to [E8](#).

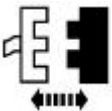
→ **No**
REPAIR the circuit. TEST the system for normal operation.

E8 CHECK CIRCUIT 31S-LE22 (BK/RD) FOR AN OPEN

1



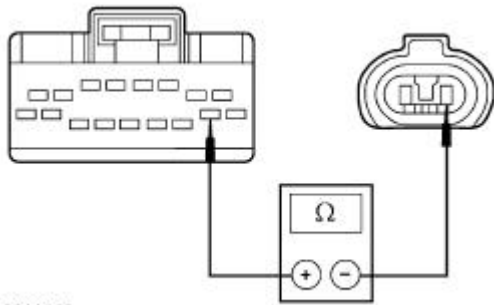
2



FEM C201a

3

3 Measure the resistance between FEM C201a pin 10, circuit 31S-LE22 (BK/RD), harness side and headlamp C1040 pin 1, circuit 31S-LE15 (BK/GN), harness side.



A0003269

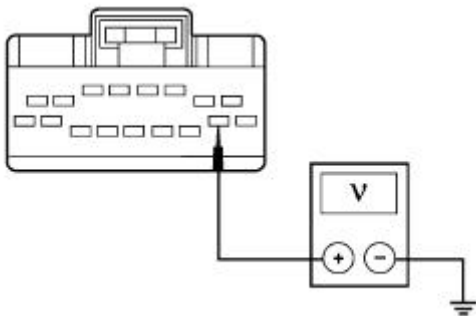
- Is the resistance less than 5 ohms?

→ **Yes**
GO to [E9](#).

→ **No**
REPAIR the circuit. TEST the system for normal operation.

E9 CHECK CIRCUIT 31S-LE22 (BK/RD) FOR A SHORT TO POWER

1



A0003270

1

Measure the voltage between FEM C201a pin 10, circuit 31S-LE22 (BK/RD), harness side and ground.

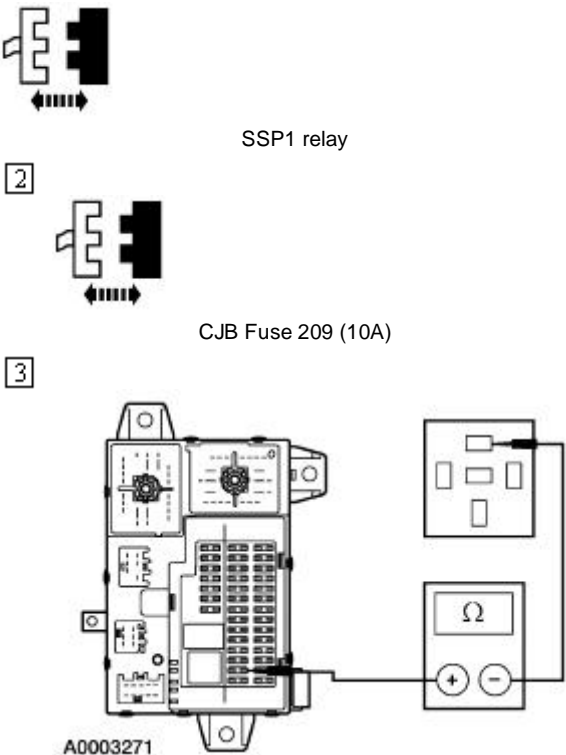
- Is any voltage indicated?

→ **Yes**
REPAIR the circuit. TEST the system for normal operation.

→ **No**
INSTALL a new FEM; REFER to [Section 419-10](#). CLEAR the DTCs. REPEAT the self-test.

PINPOINT TEST F: EXTERIOR LAMPS ARE INOPERATIVE — RF PARK, RF TURN, RF SIDE MARKER LAMPS, RF LOW BEAM, LF HIGH BEAM, LF PARK, LF TURN, AND LF SIDE MARKER

CONDITIONS	DETAILS/RESULTS/ACTIONS
F1 CHECK CIRCUIT 30-DD3 (RD) FOR AN OPEN	
1	



SSP1 relay

2

CJB Fuse 209 (10A)

3

A0003271



3 Measure the resistance between SSP1 relay pin 87, circuit 30-DD3 (RD), harness side, and CJB Fuse 209 (10A) input side.

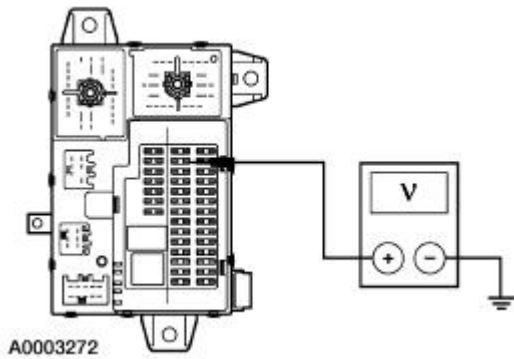
- Is the resistance less than 5 ohms?

→ **Yes**
REFER to SSP Relay Index in this section.

→ **No**
REPAIR the circuit. TEST the system for normal operation.

PINPOINT TEST G: THE HEADLAMPS ARE ON CONTINUOUSLY — BOTH LOW BEAMS

CONDITIONS	DETAILS/RESULTS/ACTIONS
NOTE: The ignition switch must be cycled from OFF to RUN to enable the SSP feature.	
G1 CHECK CJB FUSE 220 (5A) FOR POWER	
<p>1</p>  <p>CJB Fuse 220 (5A)</p> <p>2</p>  <p>3</p>	<p>3 Measure the voltage between CJB Fuse 220 (5A) input side, circuit 30-DD1</p>



(RD/YE), and ground.

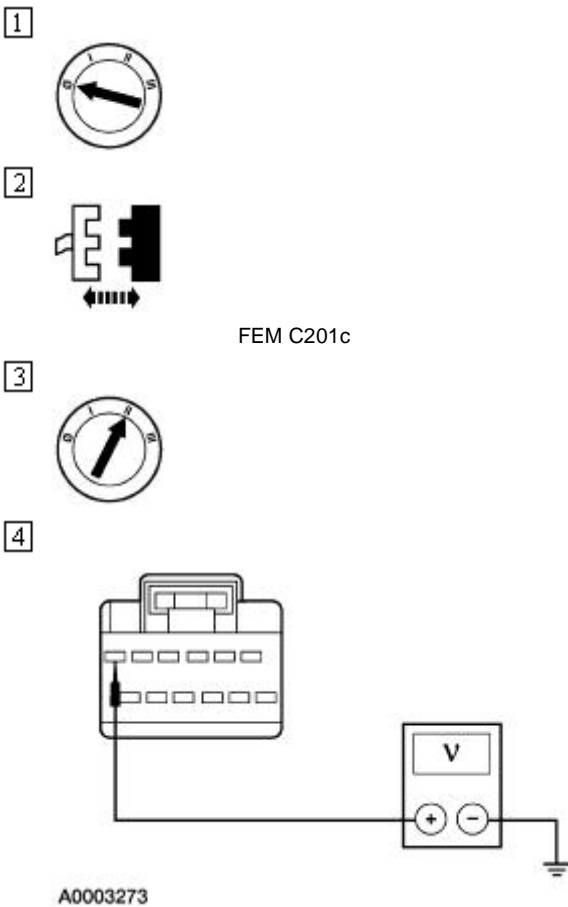
- Is the voltage greater than 10 volts?

→ **Yes**
REINSTALL CJB Fuse 220 (5A).GO to [G2](#).

→ **No**
REPAIR the circuit. TEST the system for normal operation.

G2 CHECK CIRCUIT 29-DK20 (OG/GN) FOR AN OPEN

NOTE: Cycle the ignition switch from OFF to RUN to enable the SSP feature.



- 4 Measure the voltage between FEM C201c pin 6, circuit 29-DK20 (OG/GN), harness side and ground.



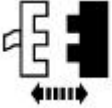
- Is the voltage greater than 10 volts?

→ **Yes**

INSTALL a new FEM; REFER to [Section 419-10](#). TEST the system for normal operation.

→ **No**
REPAIR the circuit. TEST the system for normal operation.

PINPOINT TEST H: THE HEADLAMPS ARE ON CONTINUOUSLY — SINGLE LOW/HIGH BEAMS

CONDITIONS	DETAILS/RESULTS/ACTIONS
NOTE: The ignition switch must be cycled from OFF to RUN to enable the SSP feature.	
H1 CHECK OPERATION OF THE HEADLAMP	
<p>1</p> 	<p>2 Place the headlamp switch in the ON position.</p> <p>3 Using the multifunction switch, place the high beams in the ON, and then OFF position.</p> <ul style="list-style-type: none"> ● Do the headlamps operate correctly? <p>→ Yes The system is working correctly.</p> <p>→ No If the left low beam operates correctly, GO to H2. If the right low beam operates correctly, GO to H3. If the left high beam operates correctly, GO to H4. If the right high beam operates correctly, GO to H5.</p>
H2 CHECK LH LOW BEAM FOR A SHORT TO GROUND	
NOTE: The ignition switch must be cycled from OFF to RUN to enable the SSP feature.	
<p>1</p>  <p>2</p>  <p>FEM C201a</p> <p>3</p>	



● Does the LH low beam turn OFF?

→ **Yes**

INSTALL a new FEM; REFER to [Section 419-10](#). TEST the system for normal operation.

→ **No**

REPAIR circuit 31S-LE16 (BK/RD). TEST the system for normal operation.

H3 CHECK THE RH LOW BEAM FOR A SHORT TO GROUND

NOTE: The ignition switch must be cycled from OFF to RUN to enable the SSP feature.

1



2



FEM C201a

3



● Does the RH low beam turn OFF?

→ **Yes**

INSTALL a new FEM; REFER to [Section 419-10](#). TEST the system for normal operation.

→ **No**

REPAIR circuit 31S-LE23 (BK/WH). TEST the system for normal operation.

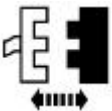
H4 CHECK THE LH HIGH BEAM FOR A SHORT TO GROUND

NOTE: The ignition switch must be cycled from OFF to RUN to enable the SSP feature.

1



2



FEM C201a

3



● Does the LH high beam turn OFF?

→ **Yes**

INSTALL a new FEM; REFER to [Section 419-10](#). TEST the system for normal operation.

→ **No**

REPAIR circuit 31S-LE15 (BK/GN). TEST the system for normal operation.

H5 CHECK THE RH HIGH BEAM FOR A SHORT TO GROUND

NOTE: The ignition switch must be cycled from OFF to RUN to enable the SSP feature.

1



2



FEM C201a

3



● Does the RH high beam turn OFF?

→ **Yes**

INSTALL a new FEM; REFER to [Section 419-10](#). TEST the system for normal operation.

→ **No**

REPAIR circuit 31S-LE22 (BK/RD). TEST the system for normal operation.

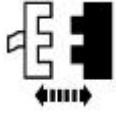
PINPOINT TEST I: THE POWER SUPPLY RELAY IS INOPERATIVE — ALL SSP FEATURES

CONDITIONS	DETAILS/RESULTS/ACTIONS
<p>NOTE: The ignition switch must be cycled from OFF to RUN to enable the SSP feature.</p>	
<p>NOTE: Refer to Principles of Operation and SSP Relay Index for complete detail of SSP powered features.</p>	
<p>I1 CHECK THE BJB FUSES FOR POWER</p>	
<p>1</p>	



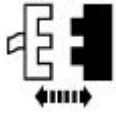
BJB Fuse 427 (30A)

2



BJB Fuse 432 (30A)

3



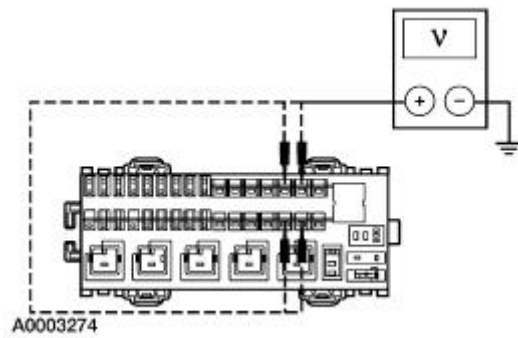
BJB Fuse 424 (30A)

4



BJB Fuse 423 (30A)

5



5 Measure the voltage between the BJB Fuses, input side and ground as follows:

BJB Fuse
423 (30A)
424 (30A)
427 (30A)
432 (30A)

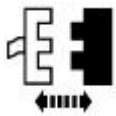
• Are the voltages greater than 10 volts?

→ **Yes**
REINSTALL all the fuses.GO to [I2](#).

→ **No**
REPAIR the power supply circuit. TEST the system for normal operation.

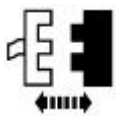
I2 CHECK BJB RELAYS FOR POWER

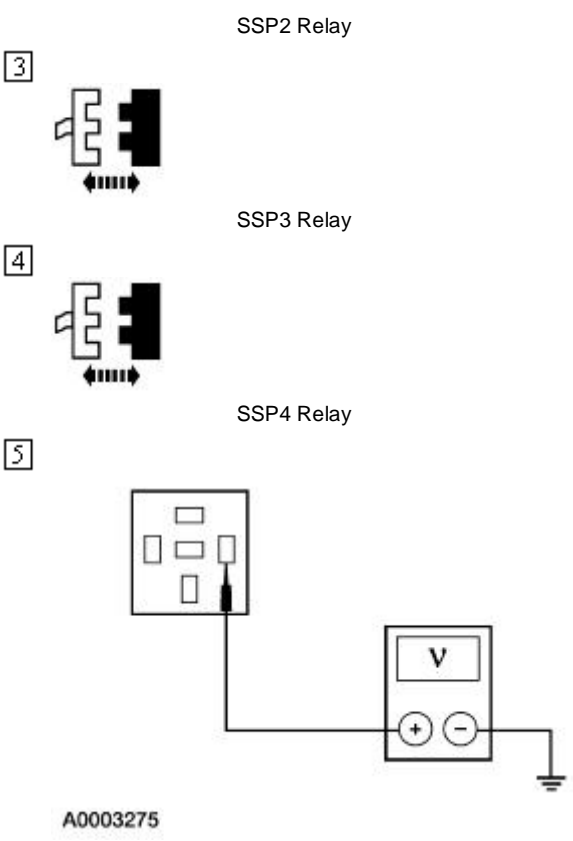
1



SSP1 Relay

2





5 Measure the voltage between BJB relay pin 86, harness side and ground as follows:

BJB Relay	Circuit
SSP1	30-DG51 (BK/YE)
SSP2	30-DG53 (RD/OG)
SSP3	30-DG55 (RD/BK)
SSP4	30-DG57 (RD/YE)

• Are the voltages greater than 10 volts?

→ Yes
GO to 13.

→ No
REPAIR or INSTALL a new BJB. TEST the system for normal operation.

13 CHECK SSP RELAY(S)

NOTE: The ignition switch must be cycled from OFF to RUN to enable the SSP feature.

1 Carry out the relay component test on each SSP relay; refer to Wiring Diagrams Section 700-09, Component Testing.

• Does each relay pass the component test?

→ Yes
GO to 14.

→ No
INSTALL a new SSP relay(s). TEST the system for normal operation.

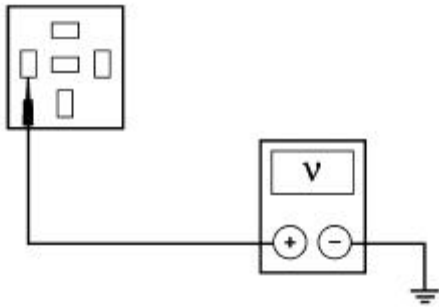
14 CHECK CIRCUIT(S) FOR A SHORT TO POWER

NOTE: The ignition switch must be cycled from OFF to RUN to enable the SSP feature.

1



2



A0003276

2

Measure the voltage between SSP relay BJB pin 85, harness side and ground as follows:

Relay	Circuit
SSP1	31S-DG51 (BK/YE)
SSP2	31S-DG53 (BK/OG)
SSP3	31S-DG55 (BK/RD)
SSP4	31S-DG57 (BK/YE)

• Is any voltage indicated?

→ Yes
GO to [15](#).

→ No
INSTALL a new FEM. REFER to [Section 419-10](#). CLEAR the DTCs. REPEAT the self-test.

15 CHECK THE FEM FOR A SHORT TO POWER

NOTE: The ignition switch must be cycled from OFF to RUN to enable the SSP feature.

1

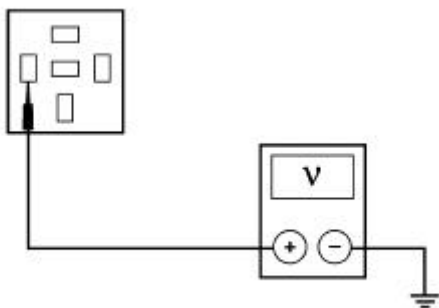


2



FEM C201c

3



A0003276

3

Measure the voltage between SSP relay pin 85, harness side and ground as follows:

Relay	Circuit
SSP1	31S-DG51 (BK/YE)
SSP2	31S-DG53 (BK/OG)
SSP3	31S-DG55 (BK/RD)
SSP4	31S-DG57 (BK/YE)

• Is any voltage indicated?

→ Yes

GO to [16](#).

→ **No**
 INSTALL a new FEM. REFER to [Section 419-10](#). CLEAR the DTCs. REPEAT the self-test.

I6 CHECK THE REM FOR A SHORT TO POWER

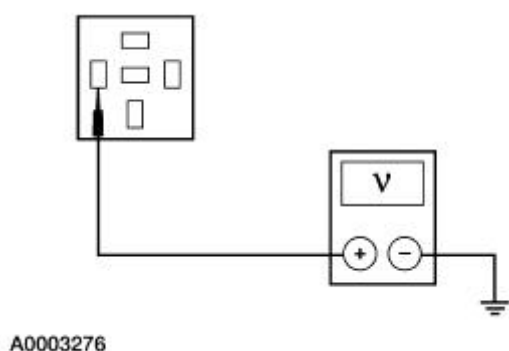
NOTE: The ignition switch must be cycled from OFF to RUN to enable the SSP feature.

1



REM C420d

2



2 Measure the voltage between SSP relay pin 85, harness side and ground as follows:

Relay	Circuit
SSP1	31S-DG51 (BK/YE)
SSP2	31S-DG53 (BK/OG)
SSP3	31S-DG55 (BK/RD)
SSP4	31S-DG57 (BK/YE)

● Is any voltage indicated?

→ **Yes**
 REPAIR the circuit. TEST the system for normal operation.

→ **No**
 INSTALL a new REM. REFER to [Section 419-10](#). CLEAR the DTCs. REPEAT the self-test.

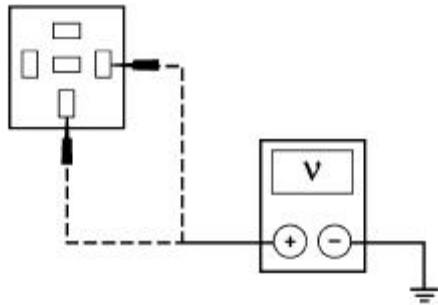
PINPOINT TEST J: THE POWER SUPPLY RELAY IS INOPERATIVE — SSP1

CONDITIONS	DETAILS/RESULTS/ACTIONS
<p>NOTE: The ignition switch must be cycled from OFF to RUN to enable the SSP feature.</p> <p>NOTE: Refer to Principles of Operation and SSP Relay Index for complete details of SSP1 powered features.</p>	
<p>J1 CHECK THE BJB FOR POWER</p>	
<p>1</p> <p>SSP1 Relay</p>	

2



3



A0003277

3

Measure the voltage between SSP1 relay BJB pin 86, circuit 30-DG51 (BK/YE), harness side and ground; and between SSP1 relay BJB pin 30, circuit 30-DG52 (RD/BU), harness side and ground.

- Are the voltages greater than 10 volts?

→ **Yes**
GO to [J2](#).

→ **No**
REPAIR the power supply circuit. TEST the system for normal operation.

J2 CHECK SSP1 RELAY

1

Carry out the relay component test; refer to Wiring Diagrams Section 700-09, Component Testing.

- Does the relay pass the component test?

→ **Yes**
GO to [J3](#).

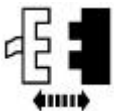
→ **No**
INSTALL a new relay. TEST the system for normal operation.

J3 CHECK CIRCUIT 31S-DG51 (BK/YE) FOR AN OPEN

1



2



FEM C201b

3

3

Measure the resistance between SSP1 relay BJB pin 85, circuit 31S-DG51

A0003278



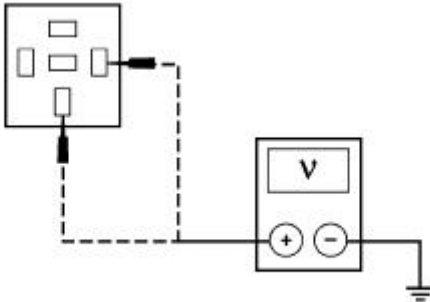
(BK/YE), harness side and FEM C201b pin 21, circuit 31S-DK21 (BK/WH), harness side.

- Is the resistance less than 5 ohms?

→ **Yes**
REPAIR circuit 30-DD3 (RD). TEST the system for normal operation.

→ **No**
REPAIR circuit 31S-DG51 (BK/YE). TEST the system for normal operation.

PINPOINT TEST K: THE POWER SUPPLY RELAY IS INOPERATIVE — SSP2

CONDITIONS	DETAILS/RESULTS/ACTIONS
<p>NOTE: The ignition switch must be cycled from OFF to RUN to enable the SSP feature.</p> <p>NOTE: Refer to Principles of Operation and SSP Relay Index for complete details of SSP2 powered features.</p>	
<p>K1 CHECK THE BJB FOR POWER</p>	
<p>1</p>  <p>SSP2 Relay</p> <p>2</p>  <p>3</p>  <p>A0003277</p>	<p>3 Measure the voltage between SSP2 relay BJB pin 86, circuit 30-DG53 (RD/OG), harness side and ground; and between SSP2 relay BJB pin 30, circuit 30-DG54 (RD/GN), harness side and ground.</p>

- Are the voltages greater than 10 volts?

→ **Yes**
GO to [K2](#).

→ **No**
REPAIR the power supply circuit. TEST the system for normal operation.

K2 CHECK SSP2 RELAY

1 Carry out the relay component test; refer to Wiring Diagrams Section 700-09, Component Testing.

- Does the relay pass the component test?

→ **Yes**
GO to [K3](#).

→ **No**
INSTALL a new relay. TEST the system for normal operation.

K3 CHECK CIRCUIT 31S-DG53 (BK/OG) FOR AN OPEN

1

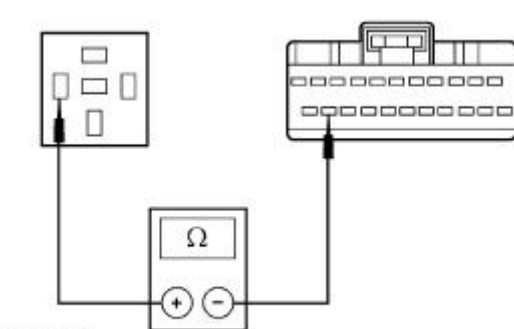


2



FEM C201b

3



A0003278

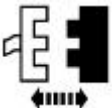

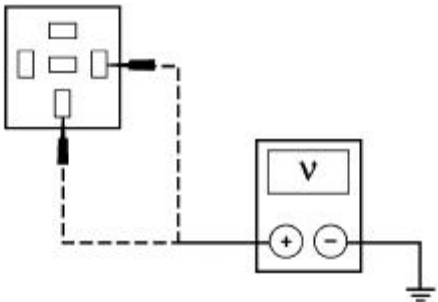
3 Measure the resistance between SSP2 relay BJB pin 85, circuit 31S-DG53 (BK/OG), harness side and FEM C201b pin 21, circuit 31S-DK21 (BK/WH), harness side.

- Is the resistance less than 5 ohms?

→ **Yes**
REPAIR or INSTALL a new BJB. TEST the system for normal operation.

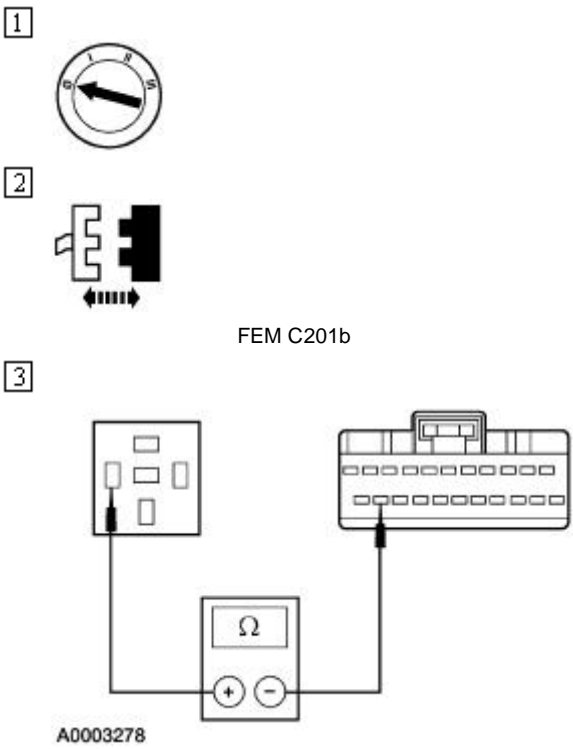
→ **No**
REPAIR the circuit. TEST the system for normal operation.

PINPOINT TEST L: THE POWER SUPPLY RELAY IS INOPERATIVE — SSP3

CONDITIONS	DETAILS/RESULTS/ACTIONS
<p>NOTE: The ignition switch must be cycled from OFF to RUN to enable the SSP feature.</p> <p>NOTE: Refer to Principles of Operation and SSP Relay Index for complete details of SSP3 powered features.</p>	
<p>L1 CHECK THE BJB FOR POWER</p>	
<p>1</p>  <p>SSP3 Relay</p> <p>2</p>  <p>3</p>  <p>A0003277</p>	<p>3 Measure the voltage between SSP3 relay BJB pin 86, circuit 30-DG55 (BK/RD), harness side and ground; and between SSP3 relay BJB pin 30 circuit 30-DG56 (RD/WH), harness side and ground.</p> <ul style="list-style-type: none"> • Are the voltages greater than 10 volts? <p>→ Yes GO to L2.</p> <p>→ No REPAIR the power supply circuit. TEST the system for normal operation.</p>
<p>L2 CHECK SSP3 RELAY</p>	
	<p>1 Carry out the relay component test; refer to Wiring Diagrams Section 700-09.</p> <ul style="list-style-type: none"> • Does the relay pass the component test?

- **Yes**
GO to [L3](#).
- **No**
INSTALL a new relay. TEST the system for normal operation.

L3 CHECK CIRCUIT 31S-DG55 (BK/RD) FOR AN OPEN



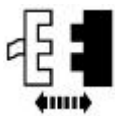
3 Measure the resistance between SSP3 relay BJB pin 85, circuit 31S-DG55 (BK/RD), harness side and FEM C201b pin 21, circuit 31S-DK21 (BK/WH), harness side.

● **Is the resistance less than 5 ohms?**

- **Yes**
REPAIR or INSTALL a new BJB. TEST the system for normal operation.
- **No**
REPAIR circuit. TEST the system for normal operation.

PINPOINT TEST M: THE POWER SUPPLY RELAY IS INOPERATIVE — SSP4

CONDITIONS	DETAILS/RESULTS/ACTIONS
<p>NOTE: The ignition switch must be cycled from OFF to RUN to enable the SSP feature.</p> <p>NOTE: Refer to Principles of Operation and SSP Relay Index for complete details of SSP4 powered features.</p>	
<p>M1 CHECK THE BJB FOR POWER</p>	
<p>1</p>	

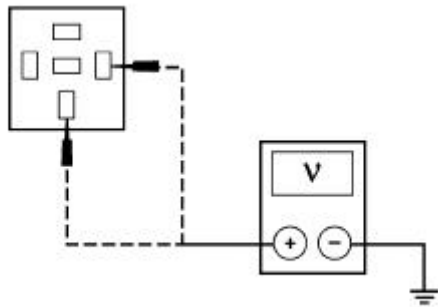


SSP4 Relay

2



3



A0003277

3 Measure the voltage between SSP4 relay BJB pin 86, circuit 31S-DG57 (BK/YE), harness side and ground; and between SSP4 relay BJB pin 30, circuit 30-DG58 (RD/BU), harness side and ground.

• Are the voltages greater than 10 volts?

→ Yes
GO to [M2](#).

→ No
REPAIR the power supply circuit. TEST the system for normal operation.

M2 CHECK SSP4 RELAY

1 Carry out the relay component test; refer to Wiring Diagrams Section 700-09, Component Testing.

• Does the relay pass the component test?

→ Yes
GO to [M3](#).

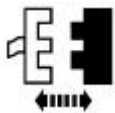
→ No
INSTALL a new relay. TEST the system for normal operation.

M3 CHECK CIRCUIT 31S-DG57 (BK/YE) FOR AN OPEN

1

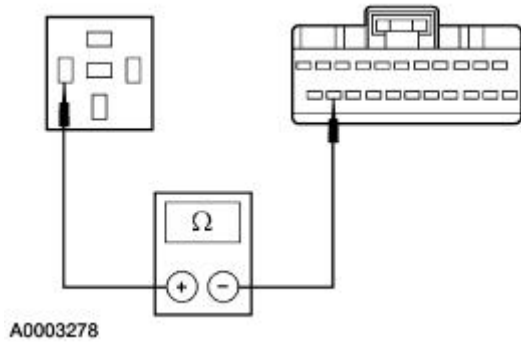


2



FEM C201b

3



3

Measure the resistance between SSP4 relay BJB pin 85, circuit 31S-DG57 (BK/YE), harness side and FEM C201b pin 21, circuit 31S-DK21 (BK/WH), harness side.

● **Is the resistance less than 5 ohms?**

→ **Yes**

REPAIR or INSTALL a new BJB. TEST the system for normal operation.

→ **No**

REPAIR the circuit. TEST the system for normal operation.

Autolamps

Refer to Wiring Diagrams Section [417-01](#), Exterior Lighting for schematic and connector information.

Special Tool(s)

 ST2332-A	Worldwide Diagnostic System (WDS) 418-F224, New Generation STAR (NGS) Tester 418-F052 or equivalent diagnostic tool
 ST1137-A	73III Automotive Meter 105-R0057 or equivalent

Principles of Operation

NOTE: The front electronic module (FEM), the rear electronic module (REM) and the instrument cluster module (ICM) must be reconfigured before installing a new module. Refer to [Section 418-01](#).

The vehicle's electronic functions are divided into zones. The FEM controls the front portion of the vehicle and the REM controls the rear portion of the vehicle. These systems rely heavily on the standard corporate protocol (SCP) communication network in order to transmit and receive signals. As a technician it is very important to understand:

- where the input (command) originates from.
- all information (messages) necessary in order for a feature to operate.
- which module(s) receive(s) the input or command message.
- does the module which received the input (message) control the output of the feature, or does it output a message over the SCP communication network to another module.
- which module controls the output of the feature.

Exterior lighting

The exterior lighting outputs are zone controlled by the front electronic module (FEM) and rear electronic module (REM). The FEM and REM. An additional function of the lighting system is a lamp outage function which indicates to the driver if certain exterior bulbs are not functioning. With a bulb inoperative, the FEM or REM will send a message to the instrument cluster and message center (if equipped with the message center) which will in turn indicate to the driver that the lamp is inoperative with a lamp out indicator (with the message center a message will be displayed). To provide complete input and output functionality, each exterior lamp feature will be described individually. All exterior lighting is powered by the switched system power (SSP) feature (refer to Switched System Power [SSP]). A failure of all or any of the SSP features will cause inoperative exterior lighting. When

diagnosing exterior lighting, it is essential to determine if all related symptoms and DTCs are controlled by the SSP feature.

Autolamps

The autolamps are controlled by the headlamp switch, autolamp sensor, instrument cluster module and the FEM. The headlamps may be in the high or low beam position depending on the multifunction switch position. When the headlamp switch is in the autolamp position, the instrument cluster module will send an ON or OFF command to the FEM, depending on the signal from the autolamp sensor. The FEM will process this information and output the appropriate command to the headlamps, which are hardwired to the FEM. The autolamps will remain ON for approximately 20 seconds after the ignition switch is changed from the RUN position to the ACC or OFF position.

Autolamps and daytime running lamps (DRL) are two functions which the FEM may be configured to include.

Left and right low, as well as high beams will provide a lamp outage indication. Fault management of the headlamps will provide some headlamp functionality. In the event of all multifunction switch, all headlamp switch or ignition switch invalid or missing data failures, the low beams will be illuminated.

The vehicle's electronic functions are divided into zones. The FEM controls the front portion of the vehicle and the REM controls the rear portion of the vehicle. These systems rely heavily on the SCP communication network in order to transmit and receive signals. As a technician it is very important to understand:

- where the input (command) originates from.
- all information (messages) necessary in order for a feature to operate.
- which module(s) receive(s) the input or command message.
- does the module which received the input (message), control the output of the feature, or does it output a message over the SCP communication network to another module.
- which module controls the output of the feature.

Switched System Power (SSP)

The SSP is invoked by both the FEM and REM. This function removes power from relays that provide power to the exterior lamps, interior lamps, and power door locks. This is only accomplished when both the FEM and the REM are in sleep mode. The sleep function of the FEM and REM places the modules in sleep mode when the ignition switch is in the OFF position, and no wake up (input) signals occur for 30 minutes. The module will not sleep if the parking lamps or the hazard lamps are active. The following relays are controlled by the SSP function: SSP1, SSP2, SSP3, and SSP4. When either the FEM or REM are not in sleep mode, all SSP relays will be energized. When energized, each relay will supply power to multiple features/functions. For additional information, go to the SSP Index for diagnosis and testing of SSP related issues. Refer to [Headlamps](#).

Inspection and Verification

1. Verify the customer concern by operating the autolamps following these steps:
 1. Place the ignition switch (11572) in the ON position.
 2. Place the headlamp switch (11654) in the ON position.
 3. **NOTE:** For headlamp concerns, refer to [Headlamps](#).
- Verify the low beam operation.
4. Place the headlamps in the autolamp position.
5. **NOTE:** When aiming light and covering the light sensor amplifier, there may be a one minute delay for the autolamps to change conditions.

Verify the autolamp operation by aiming a light at the light sensor amplifier and removing the light source and covering the light sensor amplifier. The headlamps should turn OFF with the light and illuminate with the light sensor amplifier covered.

2. Visually inspect for obvious signs of mechanical and electrical damage.

Visual Inspection Chart

Mechanical	Electrical
<ul style="list-style-type: none"> ● Damaged FEM ● Damaged instrument cluster (10849) 	<ul style="list-style-type: none"> ● Battery junction box (BJB) Fuses: <ul style="list-style-type: none"> ■ 427 (30A) ■ 432 (30A) ■ 422 (20A) ■ 423 (30A) ■ 424 (30A) ■ 425 (40A) ● Central junction box (CJB) Fuses: <ul style="list-style-type: none"> ■ 204 (5A) ■ 205 (5A) ■ 213 (5A) ■ 220 (5A) ● Damaged wiring harness ● Loose or corroded connections ● Damaged headlamp switch

3. If the concern remains after the inspection, connect the diagnostic tool to the data link connector (DLC) located beneath the instrument panel and select the vehicle to be tested from the diagnostic tool menu. If the diagnostic tool does not communicate with the vehicle:
 - check that the program card is correctly installed.
 - check the connections to the vehicle.
 - check the ignition switch position.
4. If the diagnostic tool still does not communicate with the vehicle, refer to the diagnostic tool manual.
5. Carry out the DATA LINK DIAGNOSTIC TEST. If the diagnostic tool responds with:
 - CKT 914, CKT 915 or CKT 70 = ALL ECUS NO RESP/NOT EQUIP, refer to [Section 418-00](#).
 - NO RESP/NOT EQUIP for FEM, go to Pinpoint Test A.
 - NO RESP/NOT EQUIP for instrument cluster, go to Pinpoint Test C.
 - SYSTEM PASSED, retrieve and record the continuous diagnostic trouble codes (DTCs), erase the continuous DTCs and carry out self-test diagnostics for the FEM.
6. If the DTCs retrieved are related to the concern, go to FEM Diagnostic Trouble Code (DTC) Index, REM Diagnostic Trouble Code (DTC) Index, Instrument Cluster Diagnostic Trouble Code (DTC) Index, or SSP Relay Index to continue diagnostics. Refer to [Headlamps](#).
7. If no DTCs related to the concern are retrieved, proceed to Symptom Chart to continue diagnostics.




Symptom Chart

Symptom Chart

Condition	Possible Sources	Action
<ul style="list-style-type: none"> No communication with the front electronic module 	<ul style="list-style-type: none"> Battery junction box (BJB) Fuses 425 (40A), 422 (20A). Circuitry. FEM. 	<ul style="list-style-type: none"> GO to Pinpoint Test A.
<ul style="list-style-type: none"> No communication with the instrument cluster module 	<ul style="list-style-type: none"> CJB Fuses 204 (5A), 213 (5A), 220 (5A). Circuitry. Instrument cluster. 	<ul style="list-style-type: none"> GO to Pinpoint Test C.
<ul style="list-style-type: none"> The power supply relay is inoperative — all SSP features 	<ul style="list-style-type: none"> Circuitry. Relay. FEM. REM. 	<ul style="list-style-type: none"> GO to Pinpoint Test I.
<ul style="list-style-type: none"> The power supply relay is inoperative — SSP1 	<ul style="list-style-type: none"> BJB Fuse 427 (30A). Circuitry. Relay. FEM. 	<ul style="list-style-type: none"> GO to Pinpoint Test J.
<ul style="list-style-type: none"> The power supply relay is inoperative — SSP2 	<ul style="list-style-type: none"> BJB Fuse 432 (30A). Circuitry. Relay. REM. 	<ul style="list-style-type: none"> GO to Pinpoint Test K.
<ul style="list-style-type: none"> The power supply relay is inoperative — SSP3 	<ul style="list-style-type: none"> BJB Fuse 424 (30A). Circuitry. Relay. FEM. REM. 	<ul style="list-style-type: none"> GO to Pinpoint Test L.
<ul style="list-style-type: none"> The power supply relay is inoperative — SSP4 	<ul style="list-style-type: none"> BJB Fuse 423 (30A). Circuitry. Relay. REM. 	<ul style="list-style-type: none"> GO to Pinpoint Test M.
<ul style="list-style-type: none"> The autolamps are inoperative 	<ul style="list-style-type: none"> CJB Fuse 205 (5A). Circuitry. Headlamp switch. Autolamp sensor. Instrument cluster. 	<ul style="list-style-type: none"> GO to Pinpoint Test N.
<ul style="list-style-type: none"> The autolamps are ON continuously 	<ul style="list-style-type: none"> Circuitry. Autolamp sensor. Instrument cluster. 	<ul style="list-style-type: none"> GO to Pinpoint Test O.
<ul style="list-style-type: none"> The autolamp time delay is inoperative 	<ul style="list-style-type: none"> FEM. 	<ul style="list-style-type: none"> INSTALL a new FEM; REFER to Section 419-10. TEST the system for normal operation.

Pinpoint Tests

PINPOINT TEST N: THE AUTOLAMPS ARE INOPERATIVE

CONDITIONS	DETAILS/RESULTS/ACTIONS
<p>NOTE: The ignition switch must be cycled from OFF to RUN to enable the SSP feature.</p>	
<p>N1 CHECK HEADLAMPS</p>	
	<p>1 Place the headlamp switch in the ON position.</p> <ul style="list-style-type: none"> ● Do the low beams illuminate? <p>→ Yes GO to N2.</p> <p>→ No GO to Pinpoint Test D.</p>
<p>N2 CHECK HEADLAMP SWITCH</p>	
	<p>1 Carry out the Headlamp Switch Component Test; refer to Wiring Diagrams, Section 700-09.</p> <ul style="list-style-type: none"> ● Is the headlamp switch OK? <p>→ Yes GO to N3.</p> <p>→ No INSTALL a new headlamp switch; REFER to Lamp Switch—Headlamp in this section. TEST the system for normal operation.</p>
<p>N3 CHECK LIGHT SENSOR AMPLIFIER INPUT</p>	
<p>1  Diagnostic Tool</p> <p>2 </p> <p>4 </p>	<p>3 Place the headlamp switch in the autolamps position.</p> <p>4 Monitor instrument cluster PID LIGHTSN while illuminating the light sensor amplifier, then remove the light source.</p> <ul style="list-style-type: none"> ● Does the PID indicate NO with the light applied and YES with the light removed?

→ **Yes**
GO to [N4](#).

→ **No**
GO to [N8](#).

N4 CHECK CIRCUIT 15-LE42 (GN/RD) FOR POWER

1



2

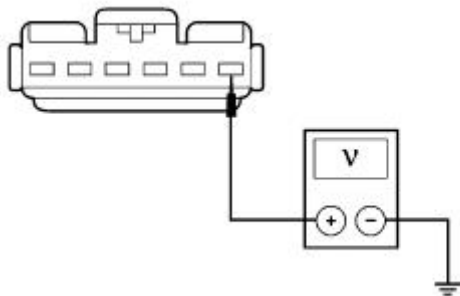


Autolamp Sensor C287

3



4



A0003279

4 Measure the voltage between autolamp sensor C287 pin 6, circuit 15-LE42 (GN/RD), harness side and ground.

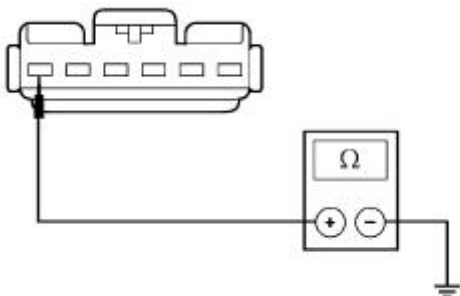
• Is the voltage greater than 10 volts?

→ **Yes**
GO to [N5](#).

→ **No**
REPAIR the circuit. TEST the system for normal operation.

N5 CHECK CIRCUIT 31-LE42 (BK) FOR OPEN

1



A0003280

1 Measure the resistance between autolamp sensor C287 pin 1, circuit 31-LE42 (BK), harness side and ground.

● Is the resistance less than 5 ohms?

→ **Yes**
GO to [N6](#).

→ **No**
REPAIR the circuit. TEST the system for normal operation.

N6 CHECK CIRCUIT 8-LE42 (WH/BU) FOR SHORT TO POWER

1



2

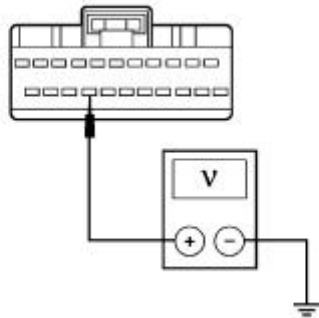


Instrument Cluster C220a

3



4



A0003281

4 Measure the voltage between instrument cluster C220a pin 19, circuit 8-LE42 (WH/BU), harness side and ground.

● Is any voltage indicated?

→ **Yes**
REPAIR the circuit. TEST the system for normal operation.

→ **No**
GO to [N7](#).

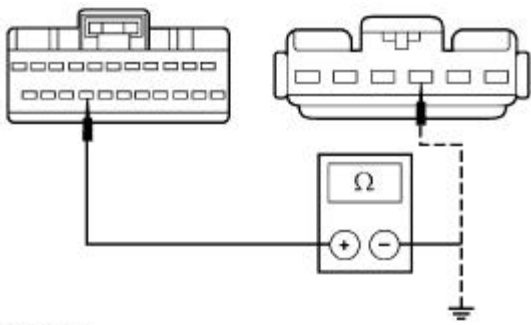
N7 CHECK CIRCUIT 8-LE42 (WH/BU) FOR OPEN OR SHORT TO GROUND

1



2

2 Measure the resistance between instrument cluster C220a pin 19, circuit 8-LE42 (WH/BU), harness side and



A0003282

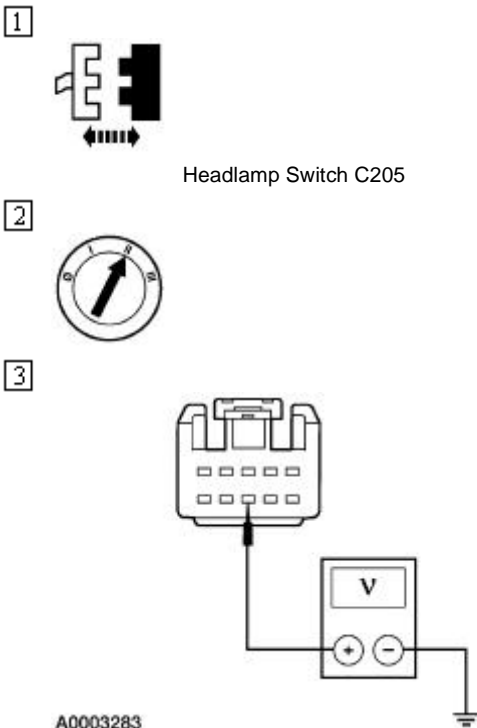
ground; and between instrument cluster C220a pin 19, circuit 8-LE42 (WH/BU), harness side and autolamp sensor C278 pin 4, circuit 8-LE42 (WH/BU), harness side.

- Is the resistance greater than 10,000 ohms between instrument cluster C220a and ground and less than 5 ohms between instrument cluster C220a and autolamp sensor C278?

→ **Yes**
 INSTALL a new autolamp sensor; REFER to [Photocell and Amplifier—Light Sensor](#) in this section. TEST the system for normal operation.

→ **No**
 REPAIR the circuit. TEST the system for normal operation.

N8 CHECK CIRCUIT 10-LE47 (GY/OG) FOR SHORT TO POWER



A0003283

- 3 Measure the voltage between headlamp switch C205 pin 8, circuit 10-LE47 (GY/OG), harness side and ground.

- Is any voltage indicated?

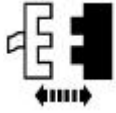
→ **Yes**
 REPAIR the circuit. TEST the system for

normal operation.

→ **No**
GO to [N9](#).

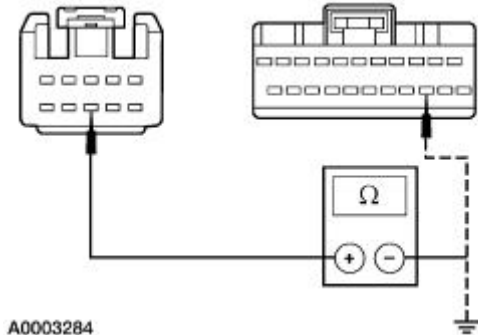
N9 CHECK CIRCUIT 10-LE47 (GY/OG) FOR OPEN OR SHORT TO GROUND

1



Instrument Cluster C220c

2



A0003284

2


Measure the resistance between headlamp switch C205 pin 8, circuit 10-LE47 (GY/OG), harness side and ground; and between headlamp switch C205 pin 8, circuit 10-LE47 (GY/OG), harness side and instrument cluster C220c pin 14, circuit 10-LE47 (GY/OG), harness side.

- **Is the resistance greater than 10,000 ohms between headlamp C205 and ground and less than 5 ohms between headlamp C205 and instrument cluster C220c?**

→ **Yes**
INSTALL a new instrument cluster;
REFER to [Section 413-01](#). TEST the system for normal operation.

→ **No**
REPAIR the circuit. TEST the system for normal operation.

PINPOINT TEST O: THE AUTO LAMPS ARE ON CONTINUOUSLY

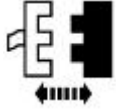
CONDITIONS	DETAILS/RESULTS/ACTIONS
O1 CHECK THE OPERATION OF THE AUTOLAMPS	
<p>1</p> 	<p>2</p> <p>Place the autolamp switch in the OFF position.</p> <ul style="list-style-type: none">● Do the headlamps turn off? <p>→ Yes</p>

The system is operating correctly.

→ **No**
GO to [O2](#).

O2 CHECK THE OPERATION OF THE AUTOLAMP SENSOR

1



Autolamp sensor C287

- Do the headlamps turn off?

→ **Yes**
INSTALL a new autolamp sensor; REFER to [Photocell and Amplifier—Light Sensor](#) in this section. TEST the system for normal operation.

→ **No**
GO to [O3](#).

O3 CHECK INSTRUMENT CLUSTER OUTPUT

1



Instrument Cluster C220c

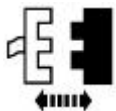
- Do the headlamps turn off?

→ **Yes**
INSTALL a new instrument cluster; REFER to [Section 413-01](#). TEST the system for normal operation.

→ **No**
GO to [O4](#).

O4 CHECK CIRCUIT 10-LE47 FOR A SHORT TO POWER

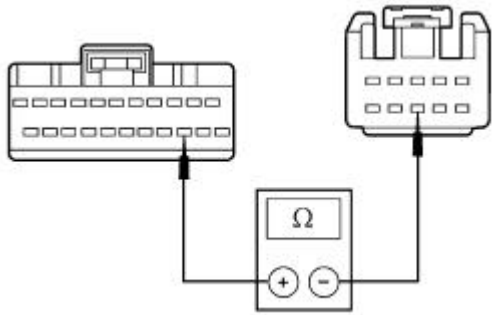
1



Headlamp Switch C205

2

2 Measure the resistance between headlamp switch C205 pin 8 circuit 10-LE47 (GY/OG), harness side and instrument cluster C220c pin 14 circuit 10-LE47 (GY/OG), harness side.



A0005098

- Is the resistance less than 5 ohms?

→ **Yes**
INSTALL a new headlamp switch;
REFER to [Lamp Switch—Headlamp](#) in
this section. TEST the system for normal
operation.

→ **No**
REPAIR the circuit. TEST the system for
normal operation.

Stoplamps

Refer to Wiring Diagrams Section [417-01](#), Exterior Lighting for schematic and connector information.

Special Tool(s)

 ST2332-A	Worldwide Diagnostic System (WDS) 418-F224, New Generation STAR (NGS) Tester 418-F052 or equivalent diagnostic tool
 ST1137-A	73III Automotive Meter 105-R0057 or equivalent

Principles of Operation

NOTE: The front electronic module (FEM), the rear electronic module (REM) and the instrument cluster module (ICM) must be reconfigured before installing a new module. Refer to [Section 418-01](#).

The vehicle's electronic functions are divided into zones. The FEM controls the front portion of the vehicle and the REM controls the rear portion of the vehicle. These systems rely heavily on the standard corporate protocol (SCP) communication network in order to transmit and receive signals. As a technician it is very important to understand:

- where the input (command) originates from.
- all information (messages) necessary in order for a feature to operate.
- which module(s) receive(s) the input or command message.
- does the module which received the input (message), control the output of the feature, or does it output a message over the SCP communication network to another module.
- which module controls the output of the feature.

Exterior Lighting

The exterior lighting outputs are zone controlled by the FEM and REM. The front exterior lights are controlled by the FEM and the rear exterior lights are controlled by the REM. An additional function of the lighting system is a lamp outage function which indicates to the driver if certain exterior bulbs are not functioning. With a bulb inoperative, the FEM or REM will send a message to the instrument cluster and message center (if equipped with the message center) which will in turn indicate to the driver that the lamp is inoperative with a lamp out indicator (with the message center a message will be displayed). To provide complete input and output functionality, each exterior lamp feature will be described individually. All exterior lighting is powered by the switched system power (SSP) feature (refer to Switched System Power [SSP]). A failure of all or any of the SSP features will cause

inoperative exterior lighting. When diagnosing exterior lighting, it is essential to determine if all related symptoms and DTCs are controlled by the SSP feature.

Stoplamps

Brake lighting is controlled by the REM. The brake pedal position (BPP) switch is hardwired to the REM. When the brake pedal is depressed, the BPP switch will input information to the REM. Then, the REM will process the information and output to the left, right, and high mounted stoplamps. Only the left and right stoplamps will provide lamp outage indication.

The vehicle's electronic functions are divided into zones. The FEM controls the front portion of the vehicle and the REM controls the rear portion of the vehicle. These systems rely heavily on the SCP communication network in order to transmit and receive signals. As a technician it is very important to understand:

- where the input (command) originates from.
- all information (messages) necessary in order for a feature to operate.
- which module(s) receive(s) the input or command message.
- does the module which received the input (message), control the output of the feature, or does it output a message over the SCP communication network to another module.
- which module controls the output of the feature.

Switched System Power (SSP)

The SSP is invoked by both the FEM and REM. This function removes power from relays that provide power to the exterior lamps, interior lamps, and power door locks. This is only accomplished when both the FEM and the REM are in sleep mode. The sleep function of the FEM and REM places the modules in sleep mode when the ignition switch is in the OFF position, and no wake up (input) signals occur for 30 minutes. The module will not sleep if the parking lamps or the hazard lamps are active. The following relays are controlled by the SSP function: SSP1, SSP2, SSP3, and SSP4. When either the FEM or REM are not in sleep mode, all SSP relays will be energized. When energized, each relay will supply power to multiple features/functions. For additional information, go to the SSP Index for diagnosis and testing of SSP related issues. Refer to [Headlamps](#)

Inspection and Verification

1. Verify the customer concern by operating the stoplamps.
2. Visually inspect for obvious signs of mechanical and electrical damage.

Visual Inspection Chart

Mechanical	Electrical
<ul style="list-style-type: none"> ● Damaged REM 	<ul style="list-style-type: none"> ● Battery junction box (BJB) Fuses: <ul style="list-style-type: none"> ■ 403 (5A) ■ 407 (5A) ■ 423 (30A) ■ 424 (30A) ■ 430 (30A) ■ 431 (30A) ● Central junction box (CJB) Fuses: <ul style="list-style-type: none"> ■ 204 (5A) ■ 220 (10A) ■ 235 (5A)

- Damaged wiring harness
- Loose or corroded connections
- Damaged BPP switch

3. If the concern remains after the inspection, connect the diagnostic tool to the data link connector (DLC) located beneath the instrument panel and select the vehicle to be tested from the diagnostic tool menu. If the diagnostic tool does not communicate with the vehicle:
 - check that the program card is correctly installed.
 - check the connections to the vehicle.
 - check the ignition switch position.
4. If the diagnostic tool still does not communicate with the vehicle, refer to the diagnostic tool manual.
5. Carry out the DATA LINK DIAGNOSTIC TEST. If the diagnostic tool responds with:
 - CKT914, CKT915 or CKT70 =ALL ECUS NO RESP/NOT EQUIP, refer to [Section 418-00](#).
 - NO RESP/NOT EQUIP for REM, go to Pinpoint Test B.
 - SYSTEM PASSED, retrieve and record the continuous diagnostic trouble codes (DTCs), erase the continuous DTCs and carry out self-test diagnostics for the FEM.
6. If the DTCs retrieved are related to the concern, go to FEM Diagnostic Trouble Code (DTC) Index, and Instrument Cluster Diagnostic Trouble Code (DTC) Index, or SSP Relay Index to continue diagnostics. Refer to [Headlamps](#).
7. If no DTCs related to the concern are retrieved, proceed to Symptom Chart to continue diagnostics.

Symptom Chart

Symptom Chart

Condition	Possible Sources	Action
<ul style="list-style-type: none"> ● No communication with the rear electronic module 	<ul style="list-style-type: none"> ● Battery junction box (BJB) Fuse 425 (40A). ● Circuitry. ● REM. 	<ul style="list-style-type: none"> ● GO to Pinpoint Test B.
<ul style="list-style-type: none"> ● The power supply relay is inoperative — all SSP features 	<ul style="list-style-type: none"> ● Circuitry. ● Relay. ● FEM. ● REM. 	<ul style="list-style-type: none"> ● GO to Pinpoint Test L.
<ul style="list-style-type: none"> ● The power supply relay is inoperative — SSP1 	<ul style="list-style-type: none"> ● BJB Fuse 4271 (30A). ● Circuitry. ● Relay. ● FEM. 	<ul style="list-style-type: none"> ● GO to Pinpoint Test J.
<ul style="list-style-type: none"> ● The power supply relay is inoperative — SSP2 	<ul style="list-style-type: none"> ● BJB Fuse 432 (30A). ● Circuitry. ● Relay. ● FEM. 	<ul style="list-style-type: none"> ● GO to Pinpoint Test K.
<ul style="list-style-type: none"> ● The power supply relay is inoperative — SSP3 	<ul style="list-style-type: none"> ● BJB Fuse 424 (30A). ● Circuitry. 	<ul style="list-style-type: none"> ● GO to Pinpoint Test L.

	<ul style="list-style-type: none"> ● Relay. ● REM. 	
<ul style="list-style-type: none"> ● The power supply relay is inoperative — SSP4 	<ul style="list-style-type: none"> ● BJB Fuse 423 (30A). ● Circuitry. ● Relay. ● REM. 	<ul style="list-style-type: none"> ● GO to Pinpoint Test M.
<ul style="list-style-type: none"> ● The stoplamps are inoperative 	<ul style="list-style-type: none"> ● Brake pedal position (BPP) switch. ● Bulb. ● Circuitry. ● REM. 	<ul style="list-style-type: none"> ● GO to Pinpoint Test P.
<ul style="list-style-type: none"> ● One or more stoplamps are inoperative — RR stoplamp 	<ul style="list-style-type: none"> ● Bulb. ● Circuitry. ● REM. 	<ul style="list-style-type: none"> ● GO to Pinpoint Test Q.
<ul style="list-style-type: none"> ● One or more stoplamps are inoperative — LR stoplamp 	<ul style="list-style-type: none"> ● Bulb. ● Circuitry. ● REM. 	<ul style="list-style-type: none"> ● GO to Pinpoint Test R.
<ul style="list-style-type: none"> ● One or more stoplamps are inoperative — high mounted stoplamp 	<ul style="list-style-type: none"> ● Bulb. ● Circuitry. ● REM. 	<ul style="list-style-type: none"> ● GO to Pinpoint Test S.
<ul style="list-style-type: none"> ● The exterior lamp(s) are inoperative — LR stop and rear lamps 	<ul style="list-style-type: none"> ● BJB 403 (5A). ● Bulb. ● Circuitry. 	<ul style="list-style-type: none"> ● GO to Pinpoint Test T.
<ul style="list-style-type: none"> ● The exterior lamp(s) are inoperative — RR stop and park lamps 	<ul style="list-style-type: none"> ● BJB 407 (5A). ● Bulb. ● Circuitry. 	<ul style="list-style-type: none"> ● GO to Pinpoint Test U.
<ul style="list-style-type: none"> ● The stoplamps are on continuously — all stoplamps 	<ul style="list-style-type: none"> ● Circuitry. ● BPP switch. ● REM. 	<ul style="list-style-type: none"> ● GO to Pinpoint Test V.
<ul style="list-style-type: none"> ● The stoplamps are on continuously — RR stoplamp only 	<ul style="list-style-type: none"> ● Circuitry. ● REM. 	<ul style="list-style-type: none"> ● GO to Pinpoint Test W.
<ul style="list-style-type: none"> ● The stoplamps are on continuously — LR stoplamp only 	<ul style="list-style-type: none"> ● Circuitry. ● REM. 	<ul style="list-style-type: none"> ● GO to Pinpoint Test X.
<ul style="list-style-type: none"> ● The stoplamps are on continuously — high mounted stoplamp only 	<ul style="list-style-type: none"> ● Circuitry. ● REM. 	<ul style="list-style-type: none"> ● GO to Pinpoint Test Y.

Pinpoint Tests

PINPOINT TEST P: THE STOPLAMPS ARE INOPERATIVE

CONDITIONS	DETAILS/RESULTS/ACTIONS
NOTE: The ignition switch must be cycled from OFF to RUN to enable the SSP feature.	
P1 CHECK FOR DTCs	
	<ol style="list-style-type: none"> Retrieve the recorded DTC results from the REM for the continuous and on-demand self-test.

● Are any DTCs recorded?

- **Yes**
If DTC B1483, GO to [P2](#). For all other DTCs, GO to REM Diagnostic Trouble Code (DTC) Index. REFER to [Headlamps](#).
- **No**
GO to [P2](#).

P2 CHECK THE REM INPUT

1



1

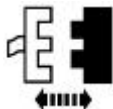
Monitor the REM PID BOO while pressing and releasing the brake pedal.

● Does the PID change states?

- **Yes**
INSTALL a new REM; REFER to [Section 419-10](#). TEST the system for normal operation.
- **No**
GO to [P3](#).

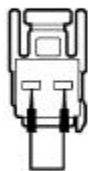
P3 CHECK BPP SWITCH OPERATION

1



BPP Switch C278

2



A0003286

2

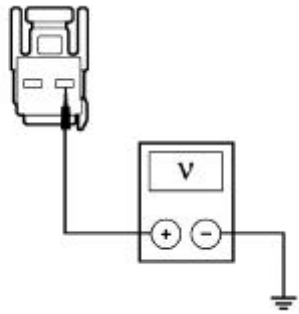
Connect a 10A fused jumper wire between BPP switch C278 pin 1, circuit 29-CF58 (OG/GN), harness side and BPP switch C278 pin 2, circuit 29S-CF1 (OG/YE), harness side.

● Do the stoplamps illuminate?

- **Yes**
INSTALL a new BPP switch; REFER to [Lamp Switch—Brake Pedal Position \(BPP\)](#) in this section. TEST the system for normal operation.
- **No**
GO to [P4](#).

P4 CHECK POWER TO BPP SWITCH

1



A0003287

1

Measure the voltage between BPP switch C278 pin 1, circuit 29-CF58 (OG/GN), harness side and ground.

● Is the voltage greater than 10 volts?

→ **Yes**
GO to [P5](#).

→ **No**
REPAIR the circuit. TEST the system for normal operation.

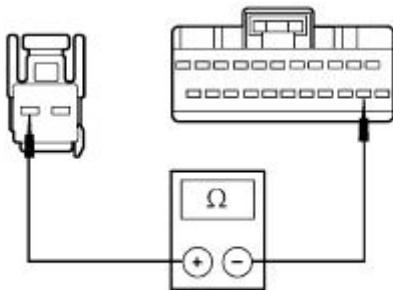
P5 CHECK CIRCUIT 29S-CF1 (OG/BU) FOR AN OPEN

1



REM C420b

2



A0003288

2


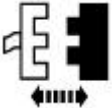

Measure the resistance between BPP switch C278 pin 2, circuit 29S-CF1 (OG/YE), harness side and REM C420b pin 13, circuit 29S-DK30 (OG), harness side.

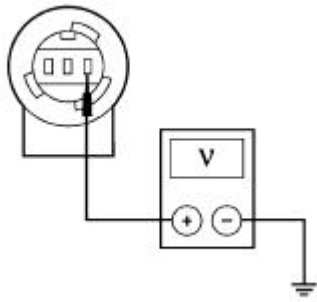
● Is the resistance less than 5 ohms?

→ **Yes**
INSTALL a new REM; REFER to [Section 419-10](#). TEST the system for normal operation.

→ **No**
REPAIR the circuit. TEST the system for normal operation.

PINPOINT TEST Q: ONE OR MORE STOPLAMPS ARE INOPERATIVE — RR STOPLAMP

CONDITIONS	DETAILS/RESULTS/ACTIONS
Q1 CHECK FOR DTCs	
NOTE: The ignition switch must be cycled from OFF to RUN to enable the SSP feature.	
	<p>1 Retrieve the recorded DTC results from the REM for the continuous and on-demand self-test.</p> <ul style="list-style-type: none"> ● Are any DTCs recorded? <p>→ Yes GO to REM Diagnostic Trouble Code (DTC) Index. REFER to Headlamps in this section.</p> <p>→ No GO to Q2.</p>
Q2 CHECK INPUT TO REM	
	<p>1 While observing the RR stoplamp, trigger the active command R STOP ON and then OFF.</p> <ul style="list-style-type: none"> ● Does RR stoplamp operate correctly? <p>→ Yes INSTALL a new REM; REFER to Section 419-10. CLEAR the DTCs. REPEAT the self-test.</p> <p>→ No GO to Q3.</p>
Q3 CHECK CIRCUIT 29S-LF23 (OG) FOR POWER	
<p>1</p>  <p>2</p>  <p>RR Combination Lamp C417</p> <p>3</p>  <p>4</p>	<p>4 Measure the voltage between RR combination lamp C417 pin 1, circuit 29S-LF23 (OG), harness side and ground.</p>



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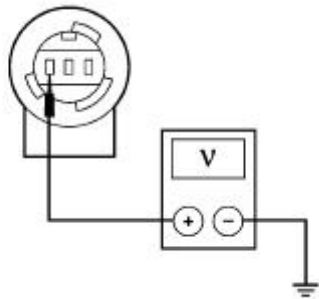
● Is the voltage greater than 10 volts?

→ **Yes**
GO to [Q4](#).

→ **No**
REPAIR the circuit. TEST the system for normal operation

Q4 CHECK CIRCUIT 31S-LG14 (BK/OG) FOR SHORT TO POWER

1



A0003290

1 Measure the voltage between RR combination lamp C417 pin 3, circuit 31S-LG14 (BK/OG), harness side and ground.

● Is any voltage indicated?

→ **Yes**
GO to [Q5](#).

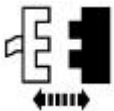
→ **No**
GO to [Q6](#).

Q5 CHECK REM FOR SHORT TO POWER

1



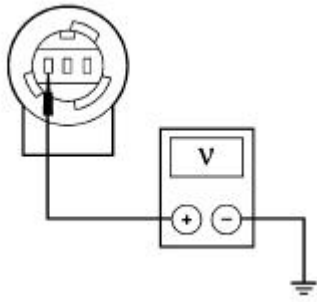
2



REM C420e

3

3 Measure the voltage between RR combination lamp C417 pin 3, circuit 31S-LG14 (BK/OG), harness side and



A0003290

ground.

- Is any voltage indicated?

→ **Yes**
REPAIR the circuit. TEST the system for normal operation.

→ **No**
INSTALL a new REM; REFER to [Section 419-10](#). CLEAR the DTCs. REPEAT the self-test.

Q6 CHECK CIRCUIT 31S-LG14 (BK/OG) FOR AN OPEN

1

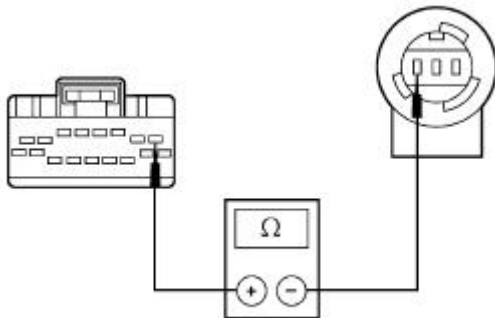


2



REM C420e

3



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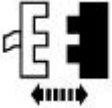

3 Measure the resistance between REM C420e pin 1, circuit 31S-LG21 (BK/GN), harness side and RR combination lamp C417 pin 3, circuit 31S-LG14 (BK/OG), harness side.

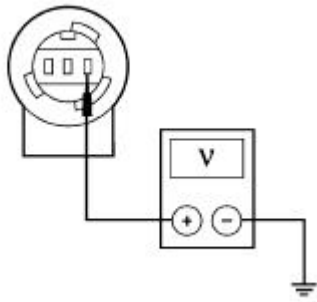
- Is the resistance less than 5 ohms?

→ **Yes**
INSTALL a new REM; REFER to [Section 419-10](#). CLEAR the DTCs. REPEAT the self-test.

→ **No**
REPAIR the circuit. TEST the system for normal operation.

PINPOINT TEST R: ONE OR MORE STOPLAMPS ARE INOPERATIVE — LR STOPLAMP

CONDITIONS	DETAILS/RESULTS/ACTIONS
<p>NOTE: The ignition switch must be cycled from OFF to RUN to enable the SSP feature.</p>	
<p>R1 CHECK FOR DTCs</p>	
	<p>1 Retrieve the recorded DTC results from the REM for the continuous and on-demand self-test.</p> <ul style="list-style-type: none"> ● Are any DTCs recorded? <p>→ Yes GO to REM Diagnostic Trouble Code (DTC) Index. REFER to Headlamps.</p> <p>→ No GO to R2.</p>
<p>R2 CHECK REM OUTPUT</p>	
	<p>1 While observing the LR stoplamp, trigger the active command L STOP ON and then OFF.</p> <ul style="list-style-type: none"> ● Does LR stoplamp operate correctly? <p>→ Yes INSTALL a new REM; REFER to Section 419-10. CLEAR the DTCs. REPEAT the self-test.</p> <p>→ No GO to R3.</p>
<p>R3 CHECK POWER TO THE LR STOP LAMP</p>	
<p>NOTE: Cycle ignition switch from OFF to RUN to enable the SSP feature.</p>	
<p>1</p>  <p>LR Combination Lamp C414</p> <p>2</p>  <p>3</p>	<p>3 Measure the voltage between LR stop lamp C414 pin 1, circuit 29S-LF23 (OG), harness side and ground.</p>



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● Is the voltage greater than 10 volts?

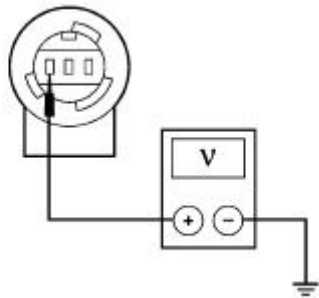
→ **Yes**
GO to [R4](#).

→ **No**
REPAIR the circuit. TEST the system for normal operation.

R4 CHECK CIRCUIT 31S-LG14 (BK/OG) FOR A SHORT TO POWER

NOTE: The ignition switch must be cycled from OFF to RUN to enable the SSP feature.

1



A0003290

1 Measure the voltage between LR combination lamp C414 pin 3, circuit 31S-LG14 (BK/OG), harness side and ground.

● Is any voltage indicated?

→ **Yes**
GO to [R5](#).

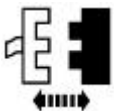
→ **No**
GO to [R6](#).

R5 CHECK REM FOR A SHORT TO POWER

1



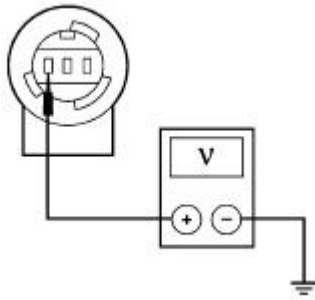
2



REM C420e

3

3 Measure the voltage between LR combination lamp C414 pin 3, circuit



A0003290

31S-LG14 (BK/OG), harness side and ground.

● Is any voltage indicated?

→ **Yes**
REPAIR the circuit. TEST the system for normal operation.

→ **No**
INSTALL a new REM; REFER to [Section 419-10](#). CLEAR the DTCs. REPEAT the self-test.

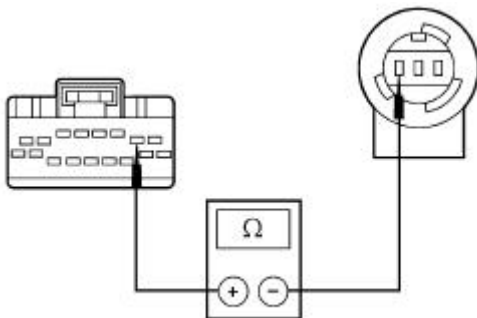
R6 CHECK CIRCUIT 31S-LG14 (BK/OG) FOR AN OPEN

1



REM C420e

2



A0003292




2 Measure the resistance between LR combination lamp C414 pin 3, circuit 31S-LG14 (BK/OG), harness side and REM C420e pin 2, circuit 31S-LG14 (BK/OG), harness side.

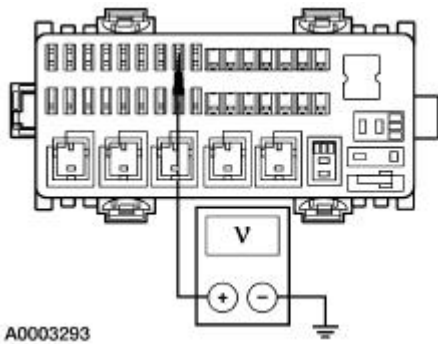
● Is the resistance less than 5 ohms?

→ **Yes**
INSTALL a new REM; REFER to [Section 419-10](#). CLEAR the DTCs. REPEAT the self-test.

→ **No**
REPAIR the circuit. TEST the system for normal operation.

PINPOINT TEST S: ONE OR MORE STOPLAMPS ARE INOPERATIVE — HIGH MOUNTED STOPLAMP

CONDITIONS	DETAILS/RESULTS/ACTIONS
S1 CHECK FOR DTCs	
NOTE: The ignition switch must be cycled from OFF to RUN to enable the SSP feature.	
	<p>1 Retrieve the recorded DTC results from the REM for the continuous and on-demand self-test.</p> <ul style="list-style-type: none"> <li>● Are any DTCs recorded? <p>→ Yes GO to REM Diagnostic Trouble Code (DTC) Index. REFER to Headlamps in this section.</p> <p>→ No GO to S2.</p>
S2 CHECK REM OUTPUT	
<p>1</p>  <p>2</p> 	<p>2 While observing the high mounted stoplamp, trigger the active command H MNT STP ON and then OFF.</p> <ul style="list-style-type: none"> <li>● Does the high mounted stoplamp operate correctly? <p>→ Yes INSTALL a new REM; REFER to Section 419-10. CLEAR the DTCs. REPEAT the self-test.</p> <p>→ No GO to S3.</p>
S3 CHECK POWER TO BJB 408 (10A)	
NOTE: The ignition switch must be cycled from OFF to RUN to enable the SSP feature.	
<p>1</p>  <p>2</p>	<p>2 Measure the voltage between BJB Fuse 408 (10A), input terminal and ground.</p>



A0003293

- Is the voltage greater than 10 volts?

- **Yes**
REINSTALL the fuse.GO to [S4](#).
- **No**
INSTALL a new or REPAIR the BJB.
TEST the system for normal operation.

S4 CHECK CIRCUIT 29S-LG6 (OG/YE) FOR AN OPEN

1

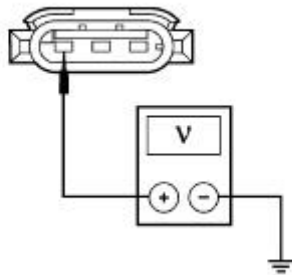


2



High Mounted Stoplamp C302

3



A0003294

- 3 Measure the voltage between high mounted stoplamp C302 pin 1, circuit 29S-LG6 (OG/YE), harness side and ground.

- Is the voltage greater than 10 volts?

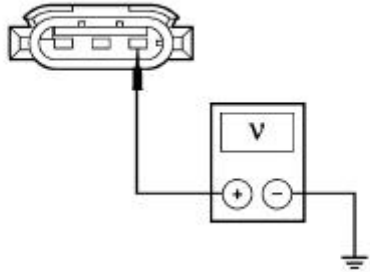
- **Yes**
GO to [S5](#).
- **No**
REPAIR the circuit. TEST the system for normal operation.

S5 CHECK CIRCUIT 31S-LG6 (BK/YE) FOR A SHORT TO POWER

1



2



A0003295

2

Measure the voltage between high mounted stoplamp C302 pin 3, circuit 31S-LG6 (BK/YE), harness side and ground.

● Is any voltage indicated?

→ Yes
GO to [S6](#).

→ No
GO to [S7](#).

S6 CHECK REM FOR A SHORT TO POWER

NOTE: The ignition switch must be cycled from OFF to RUN to enable the SSP feature.

1



2

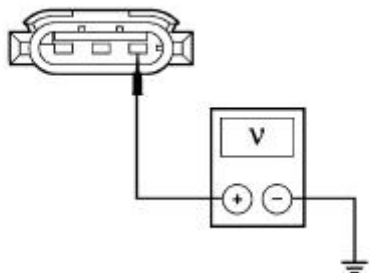


REM C420e

3



4



A0003295

4

Measure the voltage between high mounted stoplamp C302 pin 3, circuit 31S-LG6 (BK/YE), harness side and ground.

● Is any voltage indicated?

→ **Yes**
REPAIR the circuit. TEST the system for normal operation.

→ **No**
INSTALL a new REM; REFER to [Section 419-10](#). CLEAR the DTCs. REPEAT the self-test.

S7 CHECK CIRCUIT 31S-LG6 (BK/YE) FOR AN OPEN

1

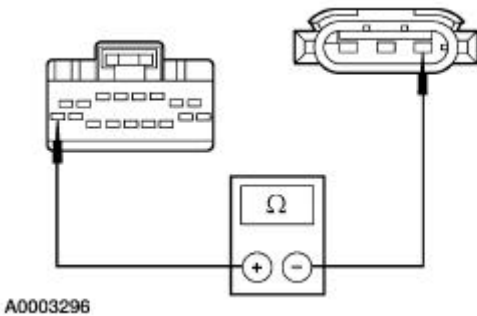


2



REM C420e

3



3 Measure the resistance between high mounted stoplamp C302 pin 3, circuit 31S-LG6 (BK/YE), harness side and REM C420e pin 17, circuit 31S-LG6 (BK/YE), harness side.

● Is the resistance less than 5 ohms?

→ **Yes**
INSTALL a new REM; REFER to [Section 419-10](#). CLEAR the DTCs. REPEAT the self-test.

→ **No**
REPAIR the circuit. TEST the system for normal operation.

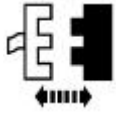
PINPOINT TEST T: THE EXTERIOR LAMP(S) ARE INOPERATIVE — LR STOP AND PARK LAMPS

CONDITIONS	DETAILS/RESULTS/ACTIONS
T1 CHECK FOR DTCs	
	<p>1 Retrieve the recorded DTC results from the REM for the continuous and on-demand self-test.</p> <p>● Are any DTCs recorded?</p>

- **Yes**
GO to REM Diagnostic Trouble Code (DTC) Index. REFER to [Headlamps](#).
- **No**
GO to [T2](#).

T2 CHECK POWER TO BJB FUSE 403 (5A)

1

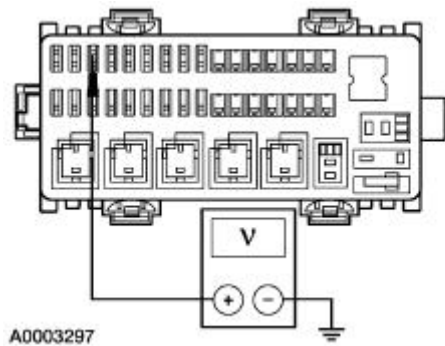


BJB Fuse 403 (5A)

2



3



- 3 Measure the voltage between BJB Fuse 403 (5A), circuit 30S-DB16 (RD/GN), input side and ground.

● **Is the voltage greater than 10 volts?**

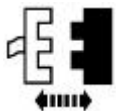
- **Yes**
GO to [T3](#).
- **No**
REPAIR or INSTALL a new BJB. TEST the system for normal operation.

T3 CHECK POWER TO LR STOP AND PARK LAMPS

1

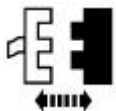


2



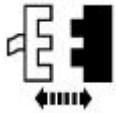
LR Combination Lamp C414

3



Park Lamp C412

4

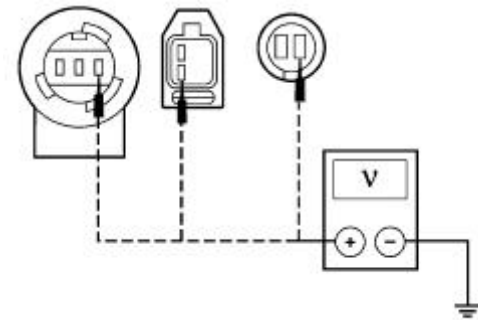


Park Lamp C419

5



6



A0003298

6

Measure the voltage between the LR combination lamp C414 pin 1, circuit 29S-LF23 (OG), harness side and ground; between LR park lamp C412 pin 1, circuit 29S-LF11 (OG/WH), harness side and ground; and between LR park lamp C419 pin 1, circuit 29S-LF11 (OG/WH), harness side and ground.

● Is the voltage greater than 10 volts?

→ Yes
GO to [T4](#).

→ No
REPAIR the circuit. TEST the system for normal operation.

T4 CHECK REM OUTPUT

1



2



Diagnostic Tool

3



4



4



While observing the LR park lamps, trigger the REM active command PARKLAMPS ON and then OFF.

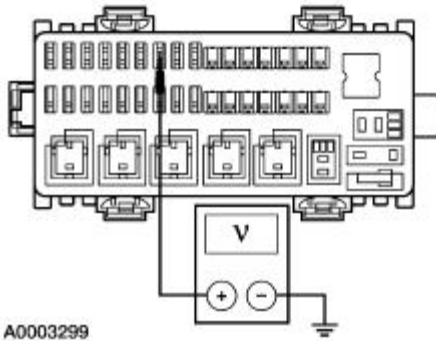
5

While observing the LR stop and park lamps, trigger the REM active command

	<p>L STOP ON and then OFF.</p> <ul style="list-style-type: none"> ● Do all the LR stop and park lamps illuminate? <p>→ Yes INSTALL a new REM; REFER to Section 419-10. CLEAR the DTCs. REPEAT the self-test.</p> <p>→ No REFER to Symptom Chart to REPAIR individual lighting concerns.</p>
--	---

PINPOINT TEST U: THE EXTERIOR LAMP(S) ARE INOPERATIVE — RR STOP AND PARK LAMPS

CONDITIONS	DETAILS/RESULTS/ACTIONS
U1 CHECK FOR DTCs	
	<p>1 Retrieve the recorded DTC results from the REM for the continuous and on-demand self-test.</p> <ul style="list-style-type: none"> ● Are any DTCs recorded? <p>→ Yes GO to REM Diagnostic Trouble Code (DTC) Index. REFER to Headlamps in this section.</p> <p>→ No GO to U2.</p>
U2 CHECK POWER TO THE BJB FUSE 407 (5A)	
<p>1</p>  <p>2</p>  <p>3</p>	<p>3 Measure the voltage between BJB Fuse 407, circuit 30S-DB16 (RD/GN), input side and ground.</p>



A0003299

- Is the voltage greater than 10 volts?

→ **Yes**

GO to [U3](#).

→ **No**

REPAIR or INSTALL a new BJB. TEST the system for normal operation.

U3 CHECK POWER TO RR STOP AND PARK LAMPS

1



2



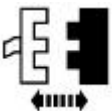
RR Combination Lamp C417

3



RR Park Lamp C418

4



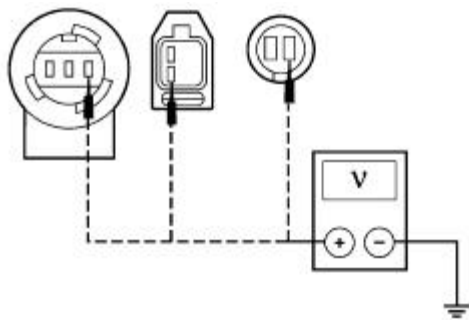
RR Park Lamp C415

5



6

- 6 Measure the voltage between RR combination lamp C417 pin 1, circuit 29S-LF23 (OG), harness side and ground; between RR park lamp C418 pin 1, circuit 29S-LF20 (OG), harness side and ground; and between RR park lamp C415 pin 1, circuit 29S-LF11 (OG/WH), harness side and ground.



A0003298

● Is the voltage greater than 10 volts?

→ **Yes**
GO to [U4](#).

→ **No**
REPAIR the circuit. TEST the system for normal operation.

U4 CHECK REM OUTPUT

1



2



Diagnostic Tool

3



4



4 While observing the RR park lamps, trigger the REM active command PARKLAMPS ON and then OFF.




5 While observing the RR stop and park lamps, trigger the REM active command R STOP ON and then OFF.

● Did all the RR stop and park lamps illuminate?

→ **Yes**
INSTALL a new REM; REFER to [Section 419-10](#). CLEAR the DTCs. REPEAT the self-test.

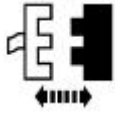
→ **No**
REFER to Symptom Chart to REPAIR individual lighting concerns.

PINPOINT TEST V: THE STOPLAMPS ARE ON CONTINUOUSLY — ALL STOPLAMPS

CONDITIONS	DETAILS/RESULTS/ACTIONS
<p>NOTE: The ignition switch must be cycled from OFF to RUN to enable the SSP feature.</p>	
<p>V1 CHECK FOR DTCs</p>	
	<p>1 Retrieve the recorded DTC results from the REM for the continuous and on-demand self-test.</p> <ul style="list-style-type: none"> ● Are any DTCs recorded? <p>→ Yes GO to REM Diagnostic Trouble Code (DTC) Index. REFER to Headlamps in this section.</p> <p>→ No GO to V2.</p>
<p>V2 CHECK INPUT TO REM</p>	
<p>1  Diagnostic Tool</p> <p>2 </p> <p>3 </p>	<p>3 Monitor the REM PID BOO.</p> <p>4 Depress and release the brake pedal.</p> <ul style="list-style-type: none"> ● Does the PID change value when the brake pedal is depressed and released? <p>→ Yes INSTALL a new REM; REFER to Section 419-10. CLEAR the DTCs. REPEAT the self-test.</p> <p>→ No GO to V3.</p>
<p>V3 CHECK BPP SWITCH OPERATION</p>	
<p>1</p>	



2



BPP Switch C278

● Do the stoplamps turn off?

→ Yes

INSTALL a new BPP switch; REFER to [Lamp Switch—Brake Pedal Position \(BPP\)](#) in this section. CLEAR the DTCs. REPEAT the self-test.

→ No

GO to [V4](#).

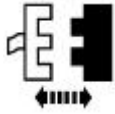
V4 CHECK CIRCUIT 29S-CF1 (OG/YE) FOR A SHORT TO POWER

NOTE: The ignition switch must be cycled from OFF to RUN to enable the SSP feature.

1

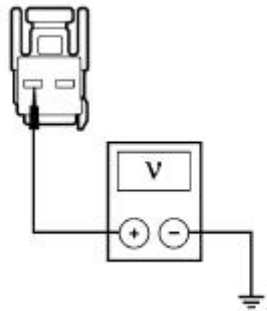


2



REM C420b

3



A0003300

3

Measure the voltage between BPP C278 pin 2, circuit 29S-CF1 (OG/YE), harness side and ground.

● Is any voltage indicated?


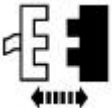

→ Yes

REPAIR the circuit. TEST the system for normal operation.

→ No







INSTALL a new REM; REFER to [Section 419-10](#). CLEAR the DTCs. REPEAT the self-test.

PINPOINT TEST W: THE STOPLAMPS ARE ON CONTINUOUSLY — RR STOPLAMP ONLY


CONDITIONS	DETAILS/RESULTS/ACTIONS
NOTE: The ignition switch must be cycled from OFF to RUN to enable the SSP feature.	
W1 CHECK FOR DTCs	
	<p>1 Retrieve the recorded DTC results from the REM for the continuous and on-demand self-test.</p> <ul style="list-style-type: none"> ● Are any DTCs recorded? <p>→ Yes GO to REM Diagnostic Trouble Code (DTC) Index. REFER to Headlamps in this section.</p> <p>→ No GO to W2.</p>
W2 CHECK CIRCUIT 31S-LG14 (BK/OG) FOR A SHORT TO GROUND	
<p>1 </p> <p>2  REM C420e</p> <p>3 </p>	<ul style="list-style-type: none"> ● Does the RR stoplamp turn off? <p>→ Yes INSTALL a new REM; REFER to Section 419-10. CLEAR the DTCs. REPEAT the self-test.</p> <p>→ No REPAIR the circuit. TEST the system for normal operation.</p>

PINPOINT TEST X: THE STOPLAMPS ARE ON CONTINUOUSLY — LR STOPLAMP ONLY

CONDITIONS	DETAILS/RESULTS/ACTIONS
NOTE: The ignition switch must be cycled from OFF to RUN to enable the SSP feature.	

X1 CHECK FOR DTCs	
<p>1</p>  <p>2</p>  <p>REM C420e</p> <p>3</p> 	<p>1 Retrieve the recorded DTC results from the REM for the continuous and on-demand self-test.</p> <ul style="list-style-type: none"> ● Are any DTCs recorded? <p>→ Yes</p> <p>GO to REM Diagnostic Trouble Code (DTC) Index. REFER to Headlamps .</p> <p>→ No GO to X2 .</p>
X2 CHECK CIRCUIT 31S-LG14 (BK/OG) FOR A SHORT TO GROUND	
<p>1</p>  <p>2</p>  <p>REM C420e</p> <p>3</p> 	<ul style="list-style-type: none"> ● Does the LR stoplamp turn off? <p>→ Yes INSTALL a new REM; REFER to Section 419-10 . CLEAR the DTCs. REPEAT the self-test.</p> <p>→ No REPAIR the circuit. TEST the system for normal operation.</p>

PINPOINT TEST Y: THE STOPLAMPS ARE ON CONTINUOUSLY — HIGH MOUNTED STOPLAMP ONLY

CONDITIONS	DETAILS/RESULTS/ACTIONS
NOTE: The ignition switch must be cycled from OFF to RUN to enable the SSP feature.	
Y1 CHECK FOR DTCs	
<p>1</p> 	<p>1 Retrieve the recorded DTC results from the REM for the continuous and on-demand self-test.</p> <ul style="list-style-type: none"> ● Are any DTCs recorded? <p>→ Yes</p>

GO to REM Diagnostic Trouble Code (DTC) Index. REFER to [Headlamps](#).

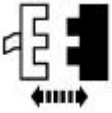
→ **No**
GO to [Y2](#).

Y2 CHECK CIRCUIT 31S-LG6 (BK/YE) FOR A SHORT TO GROUND

1



2



REM C420e

3



● **Does the high mounted stoplamp turn off?**


→ **Yes**
INSTALL a new REM; REFER to [Section 419-10](#). CLEAR the DTCs.
REPEAT the self-test.

→ **No**
REPAIR the circuit. TEST the system for normal operation.

Turn Signal and Hazard Lamps

Refer to Wiring Diagrams Section [417-01](#), Exterior Lighting for schematic and connector information.

Special Tool(s)

 ST2332-A	Worldwide Diagnostic System (WDS) 418-F224, New Generation STAR (NGS) Tester 418-F052 or equivalent diagnostic tool
 ST1137-A	73III Automotive Meter 105-R0057 or equivalent

Principles of Operation

NOTE: The front electronic module (FEM), the rear electronic module (REM), and the instrument cluster module (ICM) must all be reconfigured before installing a new module. Refer to [Section 418-01](#).

The vehicle electronic functions are divided into zones. The FEM controls the front portion of the vehicle and the REM controls the rear portion of the vehicle. These systems rely heavily on the standard corporate protocol (SCP) communication network in order to transmit and receive signals. As a technician it is very important to understand:

- where the input (command) originates from.
- all information (messages) necessary in order for a feature to operate.
- which module(s) receive(s) the input or command message.
- does the module which received the input (message), control the output of the feature, or does it output a message over the SCP communication network to another module.
- which module controls the output of the feature.

Exterior Lighting

The exterior lighting outputs are zone controlled by the FEM and REM. The front exterior lights are controlled by the FEM and the rear exterior lights are controlled by the REM. An additional function of the lighting system is a lamp outage function which indicates to the driver if certain exterior bulbs are not functioning. With a bulb inoperative, the FEM or REM will send a message to the instrument cluster and message center (if equipped with the message center) which will in turn indicate to the driver that the lamp is inoperative with a lamp out indicator (with the message center a message will be displayed). To provide complete input and output functionality, each exterior lamp feature will be described individually. All exterior lighting is powered by the switched system power (SSP) feature

(refer to Switched System Power [SSP]). A failure of all or any of the SSP features will cause inoperative exterior lighting. When diagnosing exterior lighting, it is essential to determine if all related symptoms and DTCs are controlled by the SSP feature.

Turn Signal, Cornering and Hazard Lamps

The LF and RF turn signal, LR and RR turn signal outputs, front and rear hazard lamp outputs, and the cornering lamp outputs are controlled by the FEM and REM. The multifunction switch and the hazard switch are hardwired to the instrument cluster. When the switch is in the left or right turn position, or the hazard switch is placed in the ON position, the instrument cluster will send a command through the standard corporate protocol (SCP) network to the FEM and REM, which will process this information and output the appropriate command to the front and rear turn, and hazard lamps. When the instrument cluster commands a turn signal ON, the FEM and REM additionally command the appropriate cornering lamp, which is hard-wired to the FEM. All turn lamps will provide lamp outage indication.

The vehicle's electronic functions are divided into zones. The FEM controls the front portion of the vehicle and the REM controls the rear portion of the vehicle. These systems rely heavily on the SCP communication network in order to transmit and receive signals. As a technician it is very important to understand:

- where the input (command) originates from.
- all information (messages) necessary in order for a feature to operate.
- which module(s) receive(s) the input or command message.
- does the module which received the input (message), control the output of the feature, or does it output a message over the SCP communication network to another module.
- which module controls the output of the feature.

Switched System Power (SSP)

The SSP is invoked by both the FEM and REM. This function removes power from relays that provide power to the exterior lamps, interior lamps, and power door locks. This is only accomplished when both the FEM and the REM are in sleep mode. The sleep function of the FEM and REM places the modules in sleep mode when the ignition switch is in the OFF position, and no wake up (input) signals occur for 30 minutes. The module will not sleep if the parking lamps or the hazard lamps are active. The following relays are controlled by the SSP function: SSP1, SSP2, SSP3, and SSP4. When either the FEM or REM are not in sleep mode, all SSP relays will be energized. When energized, each relay will supply power to multiple features/functions. For additional information, go to the SSP Index for diagnosis and testing of SSP related issues. Refer to [Headlamps](#).

Inspection and Verification

1. Verify the customer concern by operating the turn signal, and hazard lamps.
2. Visually inspect for obvious signs of mechanical and electrical damage.

Visual Inspection Chart

Mechanical	Electrical
<ul style="list-style-type: none">● Damaged FEM● Damaged REM	<ul style="list-style-type: none">● Battery junction box (BJB) fuses:<ul style="list-style-type: none">■ 402 (10A)

<ul style="list-style-type: none"> ● Damaged instrument cluster ● Damaged multifunction switch 	<ul style="list-style-type: none"> ■ 406 (10A) ■ 412 (5A) ■ 422 (20A) ■ 423 (30A) ■ 424 (30A) ■ 425 (40A) ■ 427 (30A) ■ 432 (30A) ● Central junction box (CJB) fuses: <ul style="list-style-type: none"> ■ 208 (5A) ■ 210 (5A) ■ 213 (5A) ■ 220 (5A) ● Damaged wiring harness ● Loose or corroded connections ● Damaged bulbs
--	--

3. If the concern remains after the inspection, connect the diagnostic tool to the data link connector (DLC) located beneath the instrument panel and select the vehicle to be tested from the diagnostic tool menu. If the diagnostic tool does not communicate with the vehicle:
 - check that the program card is correctly installed.
 - check the connections to the vehicle.
 - check the ignition switch position.

4. If the diagnostic tool still does not communicate with the vehicle, refer to the diagnostic tool manual.

5. Carry out the DATA LINK DIAGNOSTIC TEST. If the diagnostic tool responds with:
 - CKT914, CKT915 or CKT70 =ALL ECUS NO RESP/NOT EQUIP, REFER to [Section 418-00](#).
 - NO RESP/NOT EQUIP for FEM, go to Pinpoint Test A.
 - NO RESP/NOT EQUIP for REM, go to Pinpoint Test B.
 - NO RESP/NOT EQUIP for instrument cluster, go to Pinpoint Test C.
 - SYSTEM PASSED, retrieve and record the continuous diagnostic trouble codes (DTCs), erase the continuous DTCs and carry out self-test diagnostics for the FEM.

6. If the DTCs retrieved are related to the concern, go to FEM Diagnostic Trouble Code (DTC) Index, REM Diagnostic Trouble Code (DTC) Index, Instrument Cluster Diagnostic Trouble Code (DTC) Index, or SSP Relay Index to continue diagnostics. Refer to [Headlamps](#).

7. If no DTCs related to the concern are retrieved, proceed to Symptom Chart to continue diagnostics.

Symptom Chart

Symptom Chart



Condition	Possible Sources	Action
<ul style="list-style-type: none"> ● No communication with the front electronic module 	<ul style="list-style-type: none"> ● BJB Fuses 425 (40A), 422 (20A). ● Circuitry. ● FEM. 	<ul style="list-style-type: none"> ● GO to Pinpoint Test A.
<ul style="list-style-type: none"> ● No communication with 	<ul style="list-style-type: none"> ● Battery junction box 	<ul style="list-style-type: none"> ● GO to Pinpoint Test

the rear electronic module	(BJB) Fuse 425 (40A). ● Circuitry. ● REM.	B.
● No communication with the instrument cluster module	● CJB Fuses 204 (5A), 213 (5A), 220 (5A). ● Circuitry. ● Instrument cluster.	● GO to Pinpoint Test C.
● The power supply relay is inoperative — all SSP features	● Circuitry. ● Relay. ● FEM. ● REM.	● GO to Pinpoint Test L.
● The power supply relay is inoperative — SSP1	● BJB Fuse 427 (30A). ● Circuitry. ● Relay. ● FEM.	● GO to Pinpoint Test J.
● The power supply relay is inoperative — SSP2	● BJB Fuse 432 (30A). ● Circuitry. ● Relay. ● FEM.	● GO to Pinpoint Test K.
● The power supply relay is inoperative — SSP3	● BJB Fuse 424 (30A). ● Circuitry. ● Relay. ● REM.	● GO to Pinpoint Test L.
● The power supply relay is inoperative — SSP4	● BJB Fuse 423 (30A). ● Circuitry. ● Relay. ● REM.	● GO to Pinpoint Test M.
● One turn signal lamp is never on — RR turn lamp	● Bulb. ● Circuitry. ● REM.	● GO to Pinpoint Test Z.
● One turn signal lamp is never on — LR turn lamp	● Bulb. ● Circuitry. ● REM.	● GO to Pinpoint Test AA.
● The exterior lamp(s) are inoperative — LR turn, LR and RR reverse lamps	● BJB Fuses , 406 (10A), 423 (30A), 424 (30A). ● BJB.	● REPAIR or INSTALL a new BJB. TEST the system for normal operation.
● The exterior lamp(s) are inoperative — RR turn and license lamps	● BJB Fuses 402 (10A), 423 (30A). ● BJB.	● REPAIR or INSTALL a new BJB. TEST the system for normal operation.
● One turn signal lamp is always on — LR turn lamp	● Bulb. ● Circuitry. ● FEM.	● GO to Pinpoint Test AB.
● One turn signal lamp is always on — RR turn lamp	● Bulb. ● Circuitry. ● FEM.	● GO to Pinpoint Test AC.
● One turn signal lamp is never on — front	● BJB Fuses 270 (30A), 432 (30A). ● CJB Fuses 208 (5A), 210 (5A). ● Bulb. ● Circuitry.	● GO to Pinpoint Test AD.

	<ul style="list-style-type: none"> ● FEM. 	
<ul style="list-style-type: none"> ● The hazard flasher lamps are never/always on 	<ul style="list-style-type: none"> ● BJB Fuses 402 (10A), 406 (10A), 423 (30A), 424 (30A), 427 (30A), 432 (30A). ● CJB Fuses 208 (5A), 210 (5A). ● Bulbs. ● Circuitry. ● REM. ● FEM. 	<ul style="list-style-type: none"> ● GO to Pinpoint Test AE.

Pinpoint Tests

PINPOINT TEST Z: ONE TURN SIGNAL LAMP IS NEVER ON — RR TURN LAMP

CONDITIONS	DETAILS/RESULTS/ACTIONS
NOTE: The ignition switch must be cycled from OFF to RUN to enable the SSP feature.	
Z1 CHECK FOR DTCs	
	<p>1 Retrieve the recorded DTC results from the REM for the continuous and on-demand self-test.</p> <ul style="list-style-type: none"> ● Are any DTCs recorded? <p>→ Yes If REM DTC B1505, GO to Z4.</p> <p>If REM DTC B1503, GO to Z3.</p> <p>All other DTCs, GO to REM Diagnostic Trouble Code (DTC) Index. REFER to Headlamps in this section.</p> <p>→ No GO to Z2.</p>
Z2 CHECK REM OUTPUT	
<p>1</p>  <p>Diagnostic Tool</p> <p>2</p>  <p>3</p>	<p>3 While observing the RR turn signal lamp, trigger the REM active command RR TURN ON and then OFF.</p>



- Do the RR turn signal operate correctly?

→ **Yes**
INSTALL a new REM; REFER to [Section 419-10](#). CLEAR the DTCs. REPEAT the self-test.

→ **No**
GO to [Z3](#).

Z3 CHECK POWER TO THE RR TURN LAMP

NOTE: The ignition switch must be cycled from OFF to RUN to enable the SSP feature.

1



2

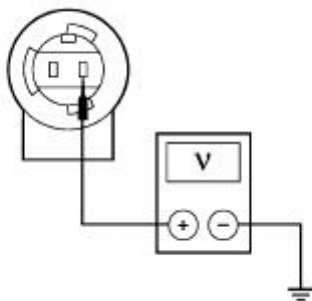


RR Turn Lamp C416

3



4



A0003347

4 Measure the voltage between RR turn lamp C416 pin 2, circuit 29S-LG12 (OG/YE), harness side and ground.

- Is the voltage greater than 10 volts?

→ **Yes**
GO to [Z5](#).

→ **No**
REPAIR the circuit. TEST the system for normal operation.

Z4 CHECK REM FOR A SHORT TO POWER

1



2



REM C420e

3

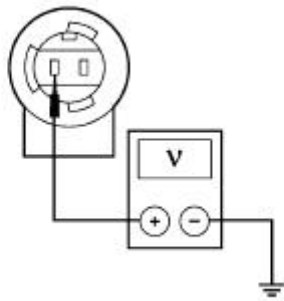


RR Turn Lamp C416

4



5



A0003348

5 Measure the voltage between RR turn lamp C416 pin 2, circuit 31S-LG12 (BK/YE), harness side and ground.

• Is any voltage indicated?

→ Yes
INSTALL a new REM; REFER to [Section 419-10](#). CLEAR the DTCs. REPEAT the self-test.

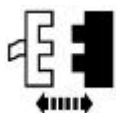
→ No
REPAIR the circuit. TEST the system for normal operation.

Z5 CHECK CIRCUIT 31S-LG12 (BK/YE) FOR AN OPEN

1



2



REM C420e

3

4

A0003349

4 Measure the resistance between RR turn lamp C416 pin 2, circuit 31S-LG12 (BK/YE), harness side and REM C420e pin 4, circuit 31S-LG19 (BK/BU), harness side.

● **Is the resistance less than 5 ohms?**

→ **Yes**
INSTALL a new REM; REFER to [Section 419-10](#). CLEAR the DTCs. REPEAT the self-test.

→ **No**
REPAIR the circuit. TEST the system for normal operation.

PINPOINT TEST AA: ONE TURN SIGNAL LAMP IS NEVER ON — LR TURN LAMP

CONDITIONS	DETAILS/RESULTS/ACTIONS
NOTE: The ignition switch must be cycled from OFF to RUN to enable the SSP feature.	
AA1 CHECK FOR DTCs	
	<p>1 Retrieve the recorded DTC results from the REM for the continuous and on-demand self-test.</p> <p style="margin-top: 10px;">● Are any DTCs recorded?</p> <p>→ Yes If REM DTC B1501, GO to AA4. If REM DTC B1499, GO to AA5. All other DTCs, GO to REM Diagnostic Trouble Code (DTC) Index. REFER to Headlamps in this section.</p> <p>→ No GO to AA2.</p>
AA2 CHECK REM OUTPUT	
1	



Diagnostic Tool

2



3



3 While observing the LR turn lamp, trigger the REM active command LR TURN ON and then OFF.

• Does the LR turn signal operate correctly?

→ Yes
INSTALL a new REM; REFER to [Section 419-10](#). CLEAR the DTCs. REPEAT the self-test.

→ No
GO to [AA3](#).

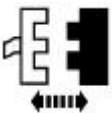
AA3 CHECK POWER TO THE LR TURN LAMP

NOTE: The ignition switch must be cycled from OFF to RUN to enable the SSP feature.

1



2

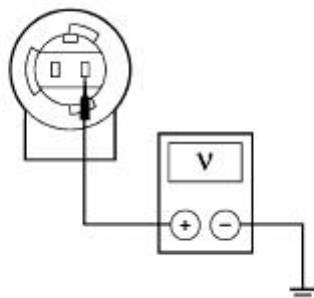


LR Turn Lamp C413

3



4



4 Measure the voltage between LR turn lamp C413 pin 1, circuit 29S-LG12 (OG/YE), harness side and ground.

● Is the voltage greater than 10 volts?

→ **Yes**
GO to [AA4](#).

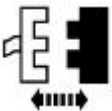
→ **No**
REPAIR the circuit. TEST the system for normal operation.

AA4 CHECK REM FOR A SHORT TO POWER

1

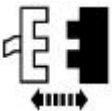


2



REM C420e

3

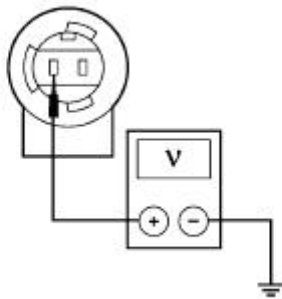


LR Turn Lamp C413

4



5



A0003348

5 Measure the voltage between LR turn lamp C413 pin 2, circuit 31S-LG12 (BK/YE), harness side and ground.

● Is any voltage indicated?

→ **Yes**
INSTALL a new REM; REFER to [Section 419-10](#). CLEAR the DTCs. REPEAT the self-test.

→ **No**
REPAIR the circuit. TEST the system for normal operation.

AA5 CHECK CIRCUIT 31S-LG12 (BK/YE) FOR AN OPEN

1

REM C420e

4 Measure the resistance between LR turn lamp C413 pin 2, circuit 31S-LG12 (BK/YE), harness side and REM C420e pin 3, circuit 31S-LG12 (BK/BU), harness side.

- Is the resistance less than 5 ohms?

→ **Yes**
INSTALL a new REM; REFER to [Section 419-10](#). CLEAR the DTCs. REPEAT the self-test.

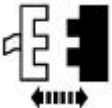
→ **No**
REPAIR the circuit. TEST the system for normal operation.

PINPOINT TEST AB: ONE TURN SIGNAL LAMP IS ALWAYS ON — LR TURN LAMP

CONDITIONS	DETAILS/RESULTS/ACTIONS
	AB1 CHECK CIRCUIT 31S-LG12 (BK/YE) FOR SHORT TO GROUND
	NOTE: The ignition switch must be cycled from OFF to RUN to enable the SSP feature.
<p>1</p> <p>REM C420e</p>	<ul style="list-style-type: none"> ● Does the LR turn lamp turn off?

	<p>→ Yes INSTALL a new REM; REFER to Section 419-10. CLEAR the DTCs. REPEAT the self-test.</p> <p>→ No REPAIR the circuit. TEST the system for normal operation.</p>
--	--

PINPOINT TEST AC: ONE TURN SIGNAL LAMP IS ALWAYS ON — RR TURN LAMP

CONDITIONS	DETAILS/RESULTS/ACTIONS
	AC1 CHECK CIRCUIT 31S-LG19 (BK/BU) FOR SHORT TO GROUND
	NOTE: The ignition switch must be cycled from OFF to RUN to enable the SSP feature.
<p>1</p>  <p>REM C420e</p>	<ul style="list-style-type: none"> • Does the RR turn/hazard lamp turn OFF? <p>→ Yes INSTALL a new REM; REFER to Section 419-10. CLEAR the DTCs. REPEAT the self-test.</p> <p>→ No REPAIR the circuit. TEST the system for normal operation.</p>

PINPOINT TEST AD: ONE TURN SIGNAL/HAZARD LAMP IS NEVER/ALWAYS ON — FRONT

CONDITIONS	DETAILS/RESULTS/ACTIONS
	NOTE: The ignition switch must be cycled from OFF to RUN to enable the SSP feature.
	AD1 CHECK FOR DTCs
	<p>1 Retrieve the recorded DTC results from the FEM for the continuous and on-demand self-test.</p> <ul style="list-style-type: none"> • Are any DTCs recorded? <p>→ Yes IF DTC B1499, GO to AD2. If DTC B1501, GO to AD5. If DTC B1503, GO to AD6. If DTC B1505, GO to AD9.</p> <p>All other DTCs, GO to FEM Diagnostic Trouble Code (DTC) Index. REFER to Headlamps in this section.</p>

→ **No**
INSTALL a new FEM; REFER to [Section 419-10](#). CLEAR the DTCs. REPEAT the self-test.

AD2 CHECK OPERATION OF LF TURN SIGNAL LAMP

1



2 Place the multifunction switch in the LH turn signal ON position.

- Does the LF turn signal lamp operate correctly?

→ **Yes**
GO to [AD6](#).

→ **No**
For continuously on, GO to [AD3](#).

For inoperative, GO to [AD4](#).

AD3 CHECK CIRCUIT 31S-LG11 (BK/WH) FOR A SHORT TO GROUND

1



2



FEM C201a

3



- Does the LF turn signal lamp turn off?

→ **Yes**
INSTALL a new FEM; REFER to [Section 419-10](#). CLEAR the DTCs. REPEAT the self-test.

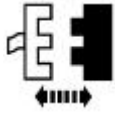
→ **No**
REPAIR the circuit. TEST the system for normal operation.

AD4 CHECK CIRCUIT 31S-LG11 (BK/WH) FOR AN OPEN

1

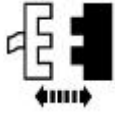


2



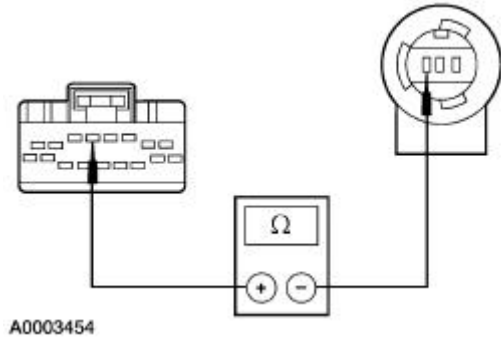
LF Turn Lamp C1022

3



FEM C201a

4



4

Measure the resistance between FEM C201a pin 5, circuit 31S-LG11 (BK/WH), harness side and LF turn lamp C1022 pin 3 circuit 31S-LG11 (BK/WH), harness side.

● Is the resistance less than 5 ohms?

→ Yes

INSTALL a new FEM; REFER to [Section 419-10](#). CLEAR the DTCs. REPEAT the self-test.

→ No

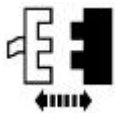
REPAIR the circuit. TEST the system for normal operation.

AD5 CHECK CIRCUIT 31S-LG11 (BK/WH) FOR A SHORT TO POWER

1

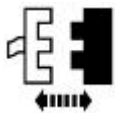


2



LF Turn Lamp C1022

3

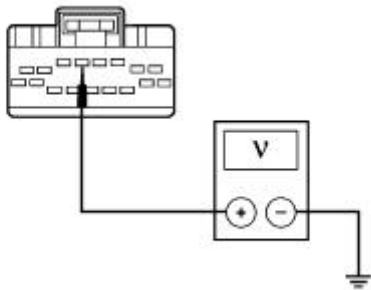


FEM C201a

4



5



A0003414

5

Measure the voltage between FEM C201a pin 5, circuit 31S-LG11 (BK/WH), harness side and ground.

● **Is any voltage indicated?**

→ **Yes**

REPAIR the circuit. TEST the system for normal operation.

→ **No**

INSTALL a new FEM; REFER to [Section 419-10](#). CLEAR the DTCs. REPEAT the self-test.

AD6 CHECK OPERATION OF RF TURN SIGNAL LAMP

1



2

Place the multifunction switch in the RH turn signal ON position.

● **Does the RF turn signal lamp operate correctly?**

→ **Yes**

System is operating correctly.

→ **No**

For continuously on, GO to [AD7](#).

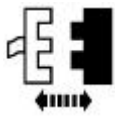
For inoperative, GO to [AD8](#).

AD7 CHECK 31S-LG18 (BK/YE) FOR A SHORT TO GROUND

1



2



FEM C201a

- Does the RF turn signal lamp turn off?

→ **Yes**
 INSTALL a new FEM; REFER to [Section 419-10](#). CLEAR the DTCs. REPEAT the self-test.

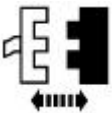
→ **No**
 REPAIR the circuit. TEST the system for normal operation.

AD8 CHECK CIRCUIT 31S-LG18 (BK/YE) FOR AN OPEN

1



2



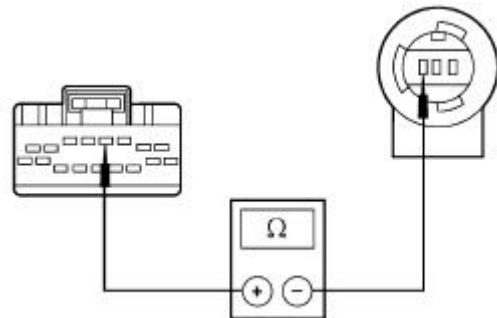
RF Turn Lamp C1042

3



FEM C201a

4



A0003415

4 Measure the resistance between FEM C201a pin 4, circuit 31S-LG18 (BK/YE), harness side and RF park/turn lamp C1042 pin 3, circuit 31S-LG11 (BK/WH), harness side.

- Is the resistance less than 5 ohms?

→ **Yes**
 INSTALL a new FEM; REFER to [Section 419-10](#). CLEAR the DTCs. REPEAT the self-test.

→ **No**
 REPAIR the circuit. TEST the system for

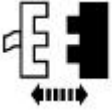
normal operation.

AD9 CHECK CIRCUIT 31S-LG18 (BK/YE) FOR A SHORT TO POWER

1



2



RF Parking/Turn Lamp C1042

3

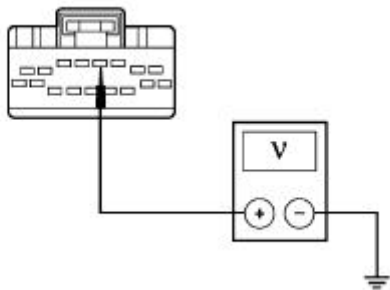


FEM C201a

4



5



A0003416

5 Measure the voltage between FEM C201a pin 4, circuit 31S-LG18 (BK/YE), harness side and ground.

● Is any voltage indicated?

→ **Yes**
REPAIR the circuit. TEST the system for normal operation.

→ **No**
INSTALL a new FEM; REFER to [Section 419-10](#). CLEAR the DTCs. REPEAT the self-test.

PINPOINT TEST AE: THE HAZARD FLASHER LAMPS ARE NEVER/ALWAYS ON

CONDITIONS	DETAILS/RESULTS/ACTIONS
	NOTE: The ignition switch must be cycled from OFF to RUN to enable the SSP feature.
	AE1 CHECK FOR DTCs FROM FEM

1 Retrieve the recorded DTC results from the FEM for the continuous and on-demand self-test.

● **Are any DTCs recorded?**

→ **Yes**
GO to FEM Diagnostic Trouble Code (DTC) Index. REFER to [Headlamps](#) in this section.

→ **No**
GO to [AE2](#).

AE2 CHECK FOR DTCs FROM REM

1 Retrieve the recorded DTC results from the REM for the continuous and on-demand self-test.

● **Are any DTCs recorded?**

→ **Yes**
GO to REM Diagnostic Trouble Code (DTC) Index. REFER to [Headlamps](#) .

→ **No**
GO to [AE3](#).

AE3 CHECK TURN SIGNAL OPERATION

1 Check the turn signal operation.

● **Do the turn signal lamps operate correctly?**


→ **Yes**
INSTALL a new multifunction switch; REFER to [Section 211-05](#) . TEST the system for normal operation.

→ **No**
REFER to Symptom Chart for inoperative turn signals.

Parking, Rear and License Lamps

Refer to Wiring Diagrams Section [417-01](#), Exterior Lighting for schematic and connector information.

Special Tool(s)

 ST2332-A	Worldwide Diagnostic System (WDS) 418-F224, New Generation STAR (NGS) Tester 418-F052 or equivalent diagnostic tool
 ST1137-A	73III Automotive Meter 105-R0057 or equivalent

Principles of Operation

NOTE: The front electronic module (FEM), the rear electronic module (REM), and the instrument cluster module (ICM) must be reconfigured before installing a new module. Refer to [Section 418-01](#).

The vehicle electronic functions are divided into zones. The FEM controls the front portion of the vehicle and the REM controls the rear portion of the vehicle. These systems rely heavily on the standard corporate protocol (SCP) communication network in order to transmit and receive signals. As a technician it is very important to understand:

- where the input (command) originates from.
- all information (messages) necessary in order for a feature to operate.
- which module(s) receive(s) the input or command message.
- does the module which received the input (message), control the output of the feature, or does it output a message over the SCP communication network to another module.
- which module controls the output of the feature.

Exterior Lighting

The exterior lighting outputs are zone controlled by the FEM and REM. The front exterior lights are controlled by the FEM and the rear exterior lights are controlled by the REM. An additional function of the lighting system is a lamp outage function which indicates to the driver if certain exterior bulbs are not functioning. With a bulb inoperative, the FEM or REM will send a message to the instrument cluster and message center (if equipped with the message center), which will indicate to the driver that the lamp is inoperative with a lamp out indicator (with the message center a message will be displayed). To provide complete input and output functionality, each exterior lamp feature will be described individually. All exterior lighting is powered by the switched system power (SSP) feature (refer to Switched System Power [SSP]). A failure of all or any of the SSP features will cause inoperative

exterior lighting. When diagnosing exterior lighting, it is essential to determine if all related symptoms and DTCs are controlled by the SSP feature.

Parking, Rear or License Lamps

For the LH and RH rear park, license, and LH and RH front park lamps, outputs are controlled by the REM and FEM. The headlamp switch is hardwired to the ICM. When the switch is in the headlamp or park position, the ICM will send a command via the network link to the FEM and REM. The REM and FEM will process this information and output the appropriate command to the rear park, license, and front park lamps, which are hardwired to the REM and FEM. Only the left and right rear lamps will provide lamp outage indication. Fault management of the park lamps will provide rear park lamp functionality in the event of certain multifunction switch, headlamp switch, ignition switch, REM or FEM failures. The park lamps are also part of the daytime running lamps (DRL) feature.

The vehicle's electronic functions are divided into zones. The FEM controls the front portion of the vehicle and the REM controls the rear portion of the vehicle. These systems rely heavily on the SCP communication network in order to transmit and receive signals. As a technician it is very important to understand:

- where the input (command) originates from.
- all information (messages) necessary in order for a feature to operate.
- which module(s) receive(s) the input or command message.
- does the module which received the input (message), control the output of the feature, or does it output a message over the SCP communication network to another module.
- which module controls the output of the feature.

Switched System Power (SSP)

The SSP is invoked by both the FEM and REM. This function removes power from relays that provide power to the exterior lamps, interior lamps, and power door locks. This is only accomplished when both the FEM and the REM are in sleep mode. The sleep function of the FEM and REM places the modules in sleep mode when the ignition switch is in the OFF position, and no wake up (input) signals occur for 30 minutes. The module will not sleep if the parking lamps or the hazard lamps are active. The following relays are controlled by the SSP function: SSP1, SSP2, SSP3, and SSP4. When either the FEM or REM are not in sleep mode, all SSP relays will be energized. When energized, each relay will supply power to multiple features/functions. For additional information, go to the SSP Index for diagnosis and testing of SSP related issues. Refer to [Headlamps](#).

Inspection and Verification

1. Verify the customer concern by operating the turn signal, cornering and hazard lamps.
2. Visually inspect for obvious signs of mechanical and electrical damage.

Visual Inspection Chart

Mechanical	Electrical
<ul style="list-style-type: none"> ● Damaged FEM ● Damaged REM ● Damaged instrument cluster 	<ul style="list-style-type: none"> ● Battery junction box (BJB) Fuses: <ul style="list-style-type: none"> ■ 402 (10A) ■ 403 (5A) ■ 407 (5A)

	<ul style="list-style-type: none"> ■ 412 (5A) ■ 423 (30A) ■ 424 (30A) ■ 425 (40A) ■ 427 (30A) ■ 432 (30A) ● Central junction box (CJB) Fuses: <ul style="list-style-type: none"> ■ 204 (5A) ■ 208 (5A) ■ 210 (5A) ■ 213 (5A) ■ 220 (10A) ● Damaged wiring harness ● Loose or corroded connections ● Damaged bulbs
--	---

3. If the concern remains after the inspection, connect the diagnostic tool to the data link connector (DLC) located beneath the instrument panel and select the vehicle to be tested from the diagnostic tool menu. If the diagnostic tool does not communicate with the vehicle:
 - check that the program card is correctly installed.
 - check the connections to the vehicle.
 - check the ignition switch position.
4. If the diagnostic tool still does not communicate with the vehicle, refer to the diagnostic tool manual.
5. Carry out the DATA LINK DIAGNOSTIC TEST. If the diagnostic tool responds with:
 - CKT914, CKT915 or CKT70 =ALL ECUS NO RESP/NOT EQUIP, refer to [Section 418-00](#).
 - NO RESP/NOT EQUIP for FEM, go to Pinpoint Test A.
 - NO RESP/NOT EQUIP for REM, go to Pinpoint Test B.
 - NO RESP/NOT EQUIP for instrument cluster, go to Pinpoint Test C.
 - SYSTEM PASSED, retrieve and record the continuous diagnostic trouble codes (DTCs), erase the continuous DTCs and carry out self-test diagnostics for the REM .
6. If the DTCs retrieved are related to the concern, go to the FEM Diagnostic Trouble Code (DTC) Index, REM Diagnostic Trouble Code (DTC) Index, Instrument Cluster Diagnostic Trouble Code (DTC) Index, or SSP Relay Index to continue diagnostics. Refer to [Headlamps](#).
7. If no DTCs related to the concern are retrieved, proceed to Symptom Chart to continue diagnostics.

Symptom Chart

Symptom Chart

Condition	Possible Sources	Action
<ul style="list-style-type: none"> ● No communication with the front electronic module 	<ul style="list-style-type: none"> ● BJB Fuses 425 (40A), 422 (20A). ● Circuitry. ● FEM. 	<ul style="list-style-type: none"> ● GO to Pinpoint Test A.
<ul style="list-style-type: none"> ● No communication with the rear electronic module 	<ul style="list-style-type: none"> ● Battery junction box (BJB) Fuse 425 	<ul style="list-style-type: none"> ● GO to Pinpoint

	<ul style="list-style-type: none"> (40A). ● Circuitry. ● REM. 	Test B .
<ul style="list-style-type: none"> ● No communication with the instrument cluster module 	<ul style="list-style-type: none"> ● CJB Fuses 204 (5A), 213 (5A), 220 (5A). ● Circuitry. ● Instrument cluster. 	<ul style="list-style-type: none"> ● GO to Pinpoint Test C .
<ul style="list-style-type: none"> ● The power supply relay is inoperative — all SSP features 	<ul style="list-style-type: none"> ● Circuitry. ● Relay. ● FEM. ● REM. 	<ul style="list-style-type: none"> ● GO to Pinpoint Test I .
<ul style="list-style-type: none"> ● The power supply relay is inoperative — SSP1 	<ul style="list-style-type: none"> ● BJB Fuse 427 (30A). ● Circuitry. ● Relay. ● FEM. 	<ul style="list-style-type: none"> ● GO to Pinpoint Test J .
<ul style="list-style-type: none"> ● The power supply relay is inoperative — SSP2 	<ul style="list-style-type: none"> ● BJB Fuse 432 (30A). ● Circuitry. ● Relay. ● FEM. 	<ul style="list-style-type: none"> ● GO to Pinpoint Test K .
<ul style="list-style-type: none"> ● The power supply relay is inoperative — SSP3 	<ul style="list-style-type: none"> ● BJB Fuse 424 (30A). ● Circuitry. ● Relay. ● REM. 	<ul style="list-style-type: none"> ● GO to Pinpoint Test L .
<ul style="list-style-type: none"> ● The power supply relay is inoperative — SSP4 	<ul style="list-style-type: none"> ● BJB Fuse 423 (30A). ● Circuitry. ● Relay. ● REM. 	<ul style="list-style-type: none"> ● GO to Pinpoint Test M .
<ul style="list-style-type: none"> ● The parking, rear or license lamps are inoperative — front parking and side marker lamps 	<ul style="list-style-type: none"> ● BJB Fuses 427 (30A), 210 (5A), 208 (5A), 220 (10A). ● Bulb. ● Circuitry. ● REM. 	<ul style="list-style-type: none"> ● GO to Pinpoint Test AF .
<ul style="list-style-type: none"> ● One or more parking, rear, or license lamp is inoperative — LR parking lamps 	<ul style="list-style-type: none"> ● BJB Fuses 423 (30A), 403 (5A). ● Bulb. ● Circuitry. ● FEM. 	<ul style="list-style-type: none"> ● GO to Pinpoint Test AG .
<ul style="list-style-type: none"> ● One or more parking, rear, or license lamp is inoperative — RR parking lamps 	<ul style="list-style-type: none"> ● BJB Fuses 424 (30A), 407 (5A). ● Bulb. ● Circuitry. ● REM. 	<ul style="list-style-type: none"> ● GO to Pinpoint Test AH .
<ul style="list-style-type: none"> ● The parking, rear, or license lamps are inoperative — license lamps 	<ul style="list-style-type: none"> ● BJB Fuses 423 (30A), 402 (10A). ● Circuitry. ● REM. 	<ul style="list-style-type: none"> ● GO to Pinpoint Test AI .
<ul style="list-style-type: none"> ● The exterior lamp(s) are inoperative — LF or RF park and turn lamps 	<ul style="list-style-type: none"> ● CJB Fuses 208 (5A), 210 (5A). ● Circuitry. ● FEM. 	<ul style="list-style-type: none"> ● GO to Pinpoint Test AJ .
<ul style="list-style-type: none"> ● The exterior lamp(s) are inoperative — LF or RF park, turn and side marker lamps 	<ul style="list-style-type: none"> ● CJB Fuses 208 (5A), 210 (5A). ● CJB. ● Circuitry. ● FEM. 	<ul style="list-style-type: none"> ● GO to Pinpoint Test AK .

<ul style="list-style-type: none"> ● The exterior lamp(s) are inoperative — LF park, turn, side marker, and low beam lamps 	<ul style="list-style-type: none"> ● BJB Fuse 427 (30A). ● CJB Fuses 210 (5A), 225 (10A). ● SSP2. ● Circuitry. 	<ul style="list-style-type: none"> ● GO to Pinpoint Test AL.
<ul style="list-style-type: none"> ● The parking, rear or license lamps are on continuously — front parking and marker lamps 	<ul style="list-style-type: none"> ● Circuitry. ● REM. 	<ul style="list-style-type: none"> ● GO to Pinpoint Test AM.
<ul style="list-style-type: none"> ● The parking, rear or license lamps are on continuously — license lamps 	<ul style="list-style-type: none"> ● Circuitry. ● REM. 	<ul style="list-style-type: none"> ● GO to Pinpoint Test AN.
<ul style="list-style-type: none"> ● The parking, rear or license lamps are on continuously — LR parking lamps 	<ul style="list-style-type: none"> ● Circuitry. ● REM. 	<ul style="list-style-type: none"> ● GO to Pinpoint Test AO.
<ul style="list-style-type: none"> ● The parking, rear or license lamps are on continuously — RR parking lamps 	<ul style="list-style-type: none"> ● Circuitry. ● REM. 	<ul style="list-style-type: none"> ● GO to Pinpoint Test AP.

Pinpoint Tests

PINPOINT TEST AF: ONE OR MORE PARKING, REAR, OR LICENSE LAMP IS INOPERATIVE — FRONT PARKING AND MARKER LAMPS

CONDITIONS	DETAILS/RESULTS/ACTIONS
NOTE: The ignition switch must be cycled from OFF to RUN to enable the SSP feature.	
AF1 CHECK OPERATION OF FRONT PARKING AND SIDE MARKER LAMP	
	<p>1 Place the headlamp switch in the parking lamps ON position.</p> <ul style="list-style-type: none"> ● Do the front parking and marker lamps illuminate? <p>→ Yes The system is operating correctly.</p> <p>→ No If the LF parking lamp is inoperative, GO to AF2.</p> <p>If the LF side marker lamp is inoperative, GO to AF5.</p> <p>If the RF parking lamp is inoperative, GO to AF9.</p> <p>If the RF side marker lamp is inoperative, GO to AF12.</p>
AF2 CHECK THE OPERATION OF THE LF PARKING LAMP	
1	



Diagnostic Tool

2



3



3 While observing the left parking lamp trigger the FEM active command PARKLAMPS ON and then OFF.

• Does the LF parking lamp illuminate?

→ Yes
INSTALL a new FEM; REFER to [Section 419-10](#). TEST the system for normal operation.

→ No
GO to [AF3](#).

AF3 CHECK CIRCUIT 31S-LF7 (BK/BU) FOR AN OPEN

1

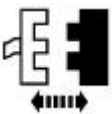


2



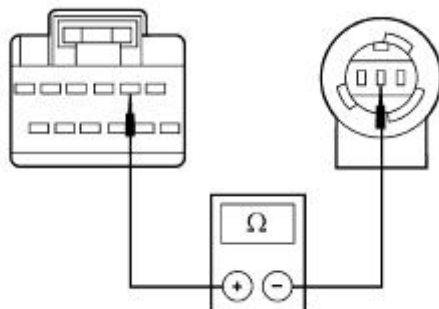
LF Parking Lamp C1022

3



FEM C201c

4



A0003301

4 Measure the resistance between LF parking lamp C1022 pin 2 circuit 31S-LF7 (BK/BU), harness side and FEM C201c pin 2 circuit 31S-LF7 (BK/BU), harness side.

● Is the resistance less than 5 ohms?

→ **Yes**
GO to [AF4](#).

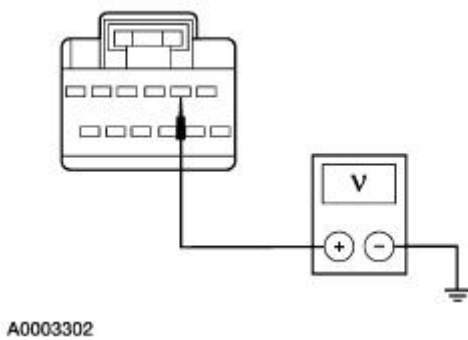
→ **No**
REPAIR the circuit. TEST the system for normal operation.

AF4 CHECK CIRCUIT 31S-LF7 (BK/BU) FOR SHORT TO POWER

1



2



A0003302

2 Measure the voltage between FEM C201c pin 2, circuit 31S-LF7 (BK/BU), harness side and ground.

● Is any voltage indicated?

→ **Yes**
REPAIR the circuit. TEST the system for normal operation.

→ **No**
INSTALL a new FEM; REFER to [Section 419-10](#). CLEAR the DTCs. REPEAT the self-test.

AF5 CHECK THE OPERATION OF THE LF MARKER LAMP

1



Diagnostic Tool

2



3



4 While observing the LF side marker lamp trigger the FEM active command

PARKLAMP ON and then OFF.

- Does the LF side marker lamp turn ON?

→ **Yes**

INSTALL a new FEM; REFER to [Section 419-10](#). CLEAR the DTCs. REPEAT the self-test.

→ **No**

GO to [AF6](#).

AF6 CHECK CIRCUIT 29S-LF8 (OG) FOR AN OPEN

NOTE: Cycle ignition switch from OFF to RUN to enable the SSP feature.

1



2

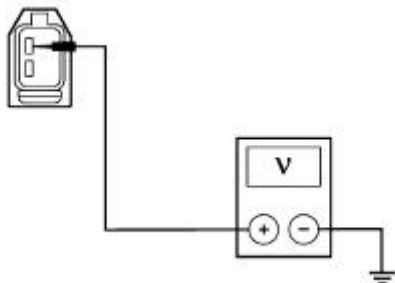


LF Side Marker C151

3



4



A0003303

4

Measure the voltage between LF side marker C151 pin 1, circuit 29S-LF8 (OG), harness side and ground.

- Is the voltage greater than 10 volts?

→ **Yes**

GO to [AF7](#).

→ **No**

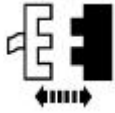
REPAIR the circuit. TEST the system for normal operation.

AF7 CHECK CIRCUIT 31S-LF8 (BK/OG) FOR AN OPEN

1

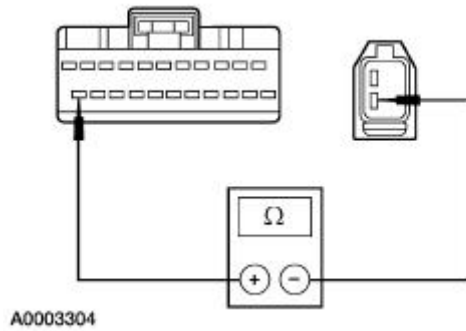


2



FEM C201b

3



3 Measure the resistance between FEM C201b pin 22, circuit 31S-LF8 (BK/OG), harness side, and LF side marker C151 pin 2, circuit 31S-LF8 (BK/OG), harness side.

● Is the resistance less than 5 ohms?

→ **Yes**
GO to [AF8](#).

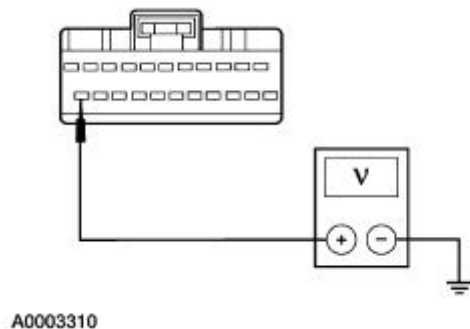
→ **No**
REPAIR the circuit. TEST the system for normal operation.

AF8 CHECK CIRCUIT 31S-LF8 (BK/OG) FOR A SHORT TO POWER

1



2



2 Measure the voltage between FEM C201b pin 22, circuit 31S-LF8 (BK/OG), harness side and ground.

● Is any voltage indicated?

→ **Yes**
REPAIR the circuit. TEST the system for normal operation.

→ **No**

INSTALL a new FEM; REFER to [Section 419-10](#). CLEAR the DTCs. REPEAT the self-test.

AF9 CHECK THE OPERATION OF THE RF PARKING LAMP

1



Diagnostic Tool

2



3



4 While observing the RF parking lamp trigger the FEM active command PARKLAMP ON and then OFF.

• Does the RF parking lamp illuminate?

→ **Yes**
INSTALL a new FEM; REFER to [Section 419-10](#). CLEAR the DTCs. REPEAT the self-test.

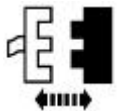
→ **No**
GO to [AF10](#).

AF10 CHECK CIRCUIT 31S-LF16 (BK/RD) FOR AN OPEN

1

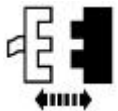


2



FEM C201c

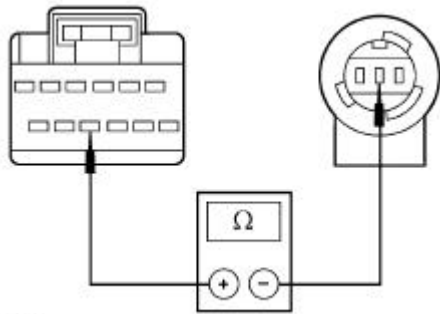
3



LF Parking/Turn Lamp C1042

4

4 Measure the resistance between FEM C201c pin 10, circuit 31S-LF16 (BK/RD), harness side and RF parking/turn lamp C1042 pin 2, circuit 31S-LF7 (BK/BU),



A0003305

harness side.

- Is the resistance less than 5 ohms?

→ **Yes**
GO to [AF11](#).

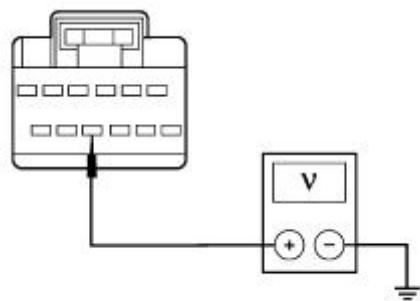
→ **No**
REPAIR the circuit. TEST the system for normal operation.

AF11 CHECK CIRCUIT 31S-LF16 (BK/RD) FOR SHORT TO POWER

1



2



A0003306

- 2 Measure the voltage between FEM C201c pin 10, circuit 31S-LF16 (BK/RD), harness side and ground.

- Is any voltage indicated?

→ **Yes**
REPAIR the circuit. TEST the system for normal operation.

→ **No**
INSTALL a new FEM; REFER to [Section 419-10](#). CLEAR the DTCs. REPEAT the self-test.

AF12 CHECK THE OPERATION OF THE RF SIDE MARKER LAMP

NOTE: Cycle ignition switch from OFF to RUN to enable the SSP feature.

1



Diagnostic Tool

2



3



4 While observing the RF side marker lamp trigger the FEM active command PARKLAMP ON and then OFF.

• Does the right marker lamp illuminate?

→ **Yes**
INSTALL a new FEM; REFER to [Section 419-10](#). CLEAR the DTCs. REPEAT the self-test.

→ **No**
GO to [AF13](#).

AF13 CHECK CIRCUIT 29S-LF17 (OG/WH) FOR AN OPEN

1



2

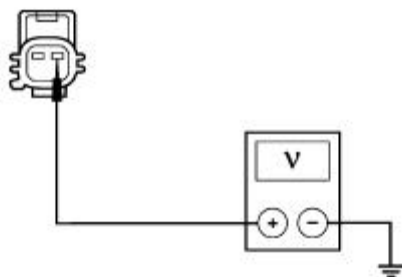


RF Side Marker C161

3



4



A0003307

4 Measure the voltage between RF side marker C161 pin 2, circuit 29S-LF17 (OG/WH), harness side and ground.

• Is the voltage greater than 10 volts?

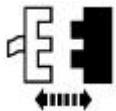
- **Yes**
GO to [AF14](#).
- **No**
REPAIR the circuit. TEST the system for normal operation.

AF14 CHECK CIRCUIT 31S-LF17 (BK/WH) FOR AN OPEN

1

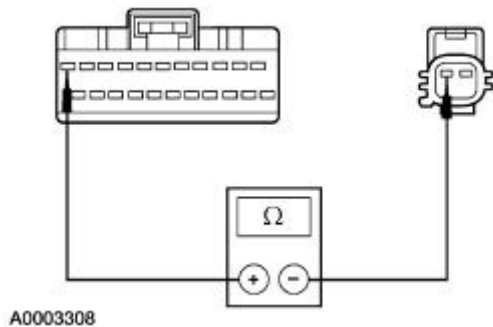


2



FEM C201b

3



A0003308

- 3 Measure the resistance between FEM C201b pin 11, circuit 31S-LF17 (BK/WH), harness side and RF side marker C161 pin 1, circuit 31S-LF17 (BK/WH), harness side.

- Is the resistance less than 5 ohms?

- **Yes**
GO to [AF15](#).
- **No**
REPAIR the circuit. TEST the system for normal operation.

AF15 CHECK CIRCUIT 31S-LF17 FOR SHORT TO POWER

1



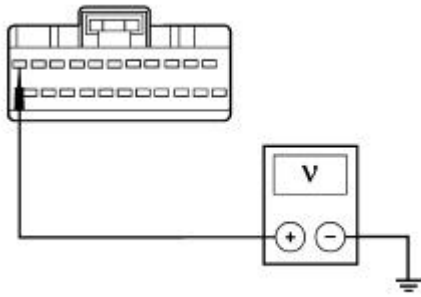
RF Side Marker C161

2



3

- 3 Measure the voltage between FEM C201b pin 11, circuit 31S-LF17 (BK/WH), harness side and ground.






A0003309

- Is any voltage indicated?

→ **Yes**
REPAIR the circuit. TEST the system for normal operation.

→ **No**
INSTALL a new FEM; REFER to [Section 419-10](#). CLEAR the DTCs. REPEAT the self-test.

PINPOINT TEST AG: ONE OR MORE PARKING, REAR OR LICENSE LAMPS ARE INOPERATIVE—LEFT REAR LAMPS

CONDITIONS	DETAILS/RESULTS/ACTIONS
NOTE: The ignition switch must be cycled from OFF to RUN to enable the SSP feature.	
AG1 CHECK REM OPERATION	
<p>1 </p> <p>Diagnostic Tool</p> <p>2 </p> <p>3 </p>	<p>3 Monitor REM PID L_TAIL.</p> <p>4 Place the headlamp switch in the parking lamp ON position.</p> <ul style="list-style-type: none"> ● Does the PID change when the headlamp switch is placed in the parking lamp position? <p>→ Yes GO to AG5.</p>

→ **No**
GO to [AG2](#).

AG2 CHECK REM OUTPUT

1



1

While observing the LR parking lamp, trigger the REM active command PARKLAMPS ON and then OFF.

● **Did the LR parking lamp illuminate?**

→ **Yes**

INSTALL a new REM; REFER to [Section 419-10](#). CLEAR the DTCs. REPEAT the self-test.

→ **No**

GO to [AG3](#).

AG3 CHECK POWER TO LR LAMP

1



2



LR Rear Lamp C412

3



LR Rear Lamp C419

4



LR Combination Lamp C414

5

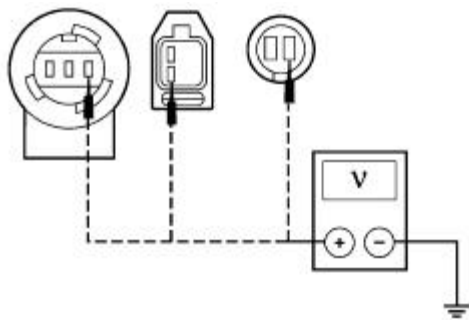


6

6

Measure the voltage between the following connector pins, harness side and ground:

Connector	Pin	Circuit
LR Combination Lamp C414	1	29S-LF23 (OG)



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LR Rear Lamp C412	1	29S-LF11 (OG/WH)
LR Rear Lamp C419	1	29S-LF11 (OG/WH)

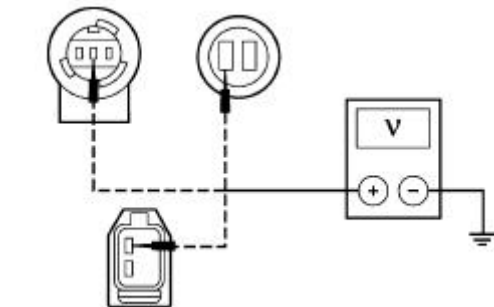
• Are the voltages greater than 10 volts?

→ **Yes**
GO to [AG4](#).

→ **No**
REPAIR the circuit. TEST the system for normal operation.

AG4 CHECK CIRCUIT(S) 31S-LF11 (BK/WH) FOR A SHORT TO POWER

1



A0003311

1

Measure the voltage between the following connector pins, harness side and ground:

Connector	Pin	Circuit
LR Combination Lamp C414	2	31S-LF11A (BK/WH)
LR Rear Lamp C412	2	31S-LF11 (BK/WH)
LR Rear Lamp C419	2	31S-LF11 (BK/WH)

• Is any voltage indicated?

→ **Yes**
GO to [AG5](#).

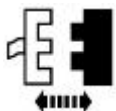
→ **No**
GO to [AG6](#).

AG5 CHECK REM FOR SHORT TO POWER

1



2

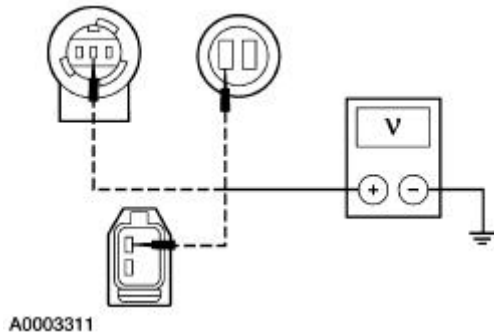


REM C420e

3



4



4 Measure the voltage between the following connector pins harness side and ground:

Connector	Pin	Circuit
LR Combination Lamp C414	2	31S-LF11A (BK/WH)
LR Rear Lamp C412	2	31S-LF11 (BK/WH)
LR Rear Lamp C419	2	31S-LF11 (BK/WH)

• Is any voltage indicated?

→ **Yes**
REPAIR the circuit. TEST the system for normal operation.

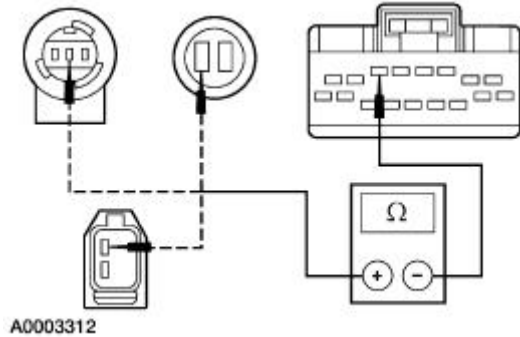
→ **No**
INSTALL a new REM; REFER to [Section 419-10](#). CLEAR the DTCs. REPEAT the self-test.

AG6 CHECK LH REAR LAMP CIRCUITS AN FOR OPEN

1



2



2 Measure the resistance between C420e pin 6, circuit 31S-LF2 (BK/BU), harness side and the following connector pins:

Connector	Pin	Circuit
LR Combination Lamp C414	2	31S-LF11A (BK/WH)
LR Rear Lamp C412	2	31S-LF11 (BK/WH)
LR Rear Lamp C419	2	31S-LF11 (BK/WH)





• Are the resistances less than 5 ohms?

→ **Yes**
INSTALL a new REM; REFER to [Section 419-10](#). CLEAR the DTCs. REPEAT the self-test.

→ **No**

REPAIR the circuit. TEST the system for normal operation.

PINPOINT TEST AH: ONE OR MORE PARKING, REAR OR LICENSE LAMP IS INOPERATIVE —RIGHT REAR LAMP

CONDITIONS	DETAILS/RESULTS/ACTIONS
AH1 CHECK REM OPERATION	
<p>1</p>  <p>Diagnostic Tool</p> <p>2</p>  <p>3</p> 	<p>3</p> Monitor the REM PID R_TAIL. <p>4</p> Turn the parking lamps on. <ul style="list-style-type: none">• Does the PID change when the parking lamps are turned on? <p>→ Yes GO to AH4.</p> <p>→ No GO to AH2.</p>
AH2 CHECK REM OUTPUT	
<p>1</p> 	<p>2</p> While observing the RR parking lamp, trigger the REM active command PARKLAMPS ON and then OFF. <ul style="list-style-type: none">• Does the RR lamp illuminate? <p>→ Yes INSTALL a new REM; REFER to Section 419-10. CLEAR the DTCs. REPEAT the self-test.</p> <p>→ No GO to AH3.</p>

AH3 CHECK POWER TO RR LAMPS

1



2



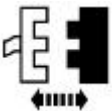
RH Combination Lamp C417

3



RH Rear Lamp C415

4

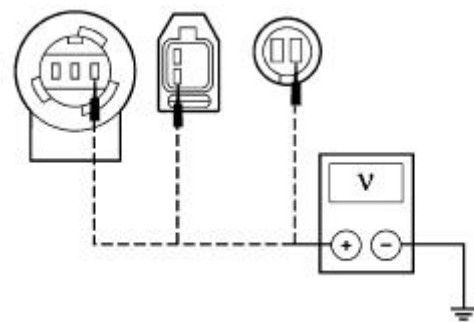


RH Rear Lamp C418

5



6



A0003298

6

Measure the voltage between the following connector pins, harness side and ground:

Connector	Pin	Circuit
RR Combination Lamp C417	1	29S-LF23 (OG)
RR Rear Lamp C415	1	29S-LF20 (OG)
RR Rear Lamp C418	1	29S-LF11 (OG/WH)

• Are the voltages greater than 10 volts?

→ **Yes**
GO to [AH4](#).

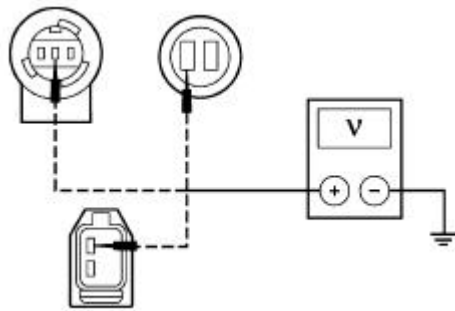
→ **No**
REPAIR the circuit. TEST the system for normal operation.

AH4 CHECK CIRCUIT(S) FOR SHORT TO POWER

1

1

Measure the voltage between the following connector pins, harness side and ground:



A0003311

Connector	Pin	Circuit
RR Combination Lamp C417	2	31S-LF11A (BK/WH)
RR Rear Lamp C415	1	31S-LF20 (BK/OG)
RR Rear Lamp C418	2	31S-LF11 (BK/WH)

● Is any voltage indicated?

→ **Yes**
GO to [AH5](#).

→ **No**
GO to [AH6](#).

AH5 CHECK REM FOR SHORT TO POWER

1



2

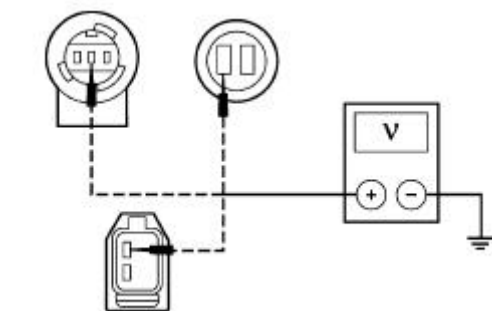


REM C420e

3



4



A0003311

4 Measure the voltage between the following connector pins, harness side and ground:

Connector	Pin	Circuit
RR Combination Lamp C417	2	31S-LF11A (BK/WH)
RR Rear Lamp C415	1	31S-LF20 (BK/OG)
RR Rear Lamp C418	2	31S-LF11 (BK/WH)

● Is any voltage indicated?

→ **Yes**
REPAIR the circuit. TEST the system for normal operation.

→ **No**

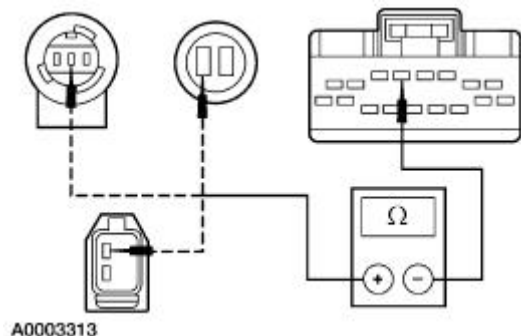
INSTALL a new REM; REFER to [Section 419-10](#). CLEAR the DTCs. REPEAT the self-test.

AH6 CHECK CIRCUIT(S) FOR OPEN

1



2



2

Measure the resistance between REM C420e pin 5, circuit 31S-LF4 (BK/BU), harness side and the following connector pins:

Connector	Pin	Circuit
RR Combination Lamp C417	2	31S-LF11A (BK/WH)
RR Rear Lamp C415	2	31S-LF20 (BK/OG)
RR Rear Lamp C418	2	31S-LF11 (BK/WH)

● Is the resistance less than 5 ohms?

→ Yes

INSTALL a new REM; REFER to [Section 419-10](#). CLEAR the DTCs. REPEAT the self-test.

→ No

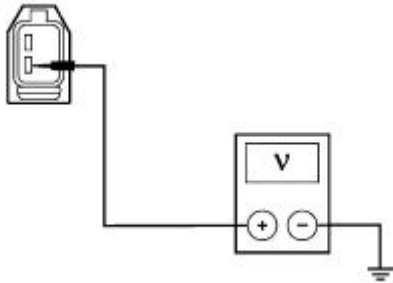
REPAIR the circuit. TEST the system for normal operation.

PINPOINT TEST AI: ONE OR MORE PARKING, REAR OR LICENSE LAMP IS INOPERATIVE — LICENSE LAMPS

CONDITIONS	DETAILS/RESULTS/ACTIONS
NOTE: The ignition switch must be cycled from OFF to RUN to enable the SSP feature.	
AI1 CHECK POWER TO LICENSE LAMPS	
1	<p>LH License Lamp C452</p>
2	<p>RH License Lamps C462</p>
3	



4



A0003314

4

Measure the voltage between LH license lamp C452 pin 1, circuit 29S-LF21 (OG/BK), harness side and ground; and between RH license lamp C462 pin 1, circuit 29S-LF22 (OG/BK), harness side and ground.

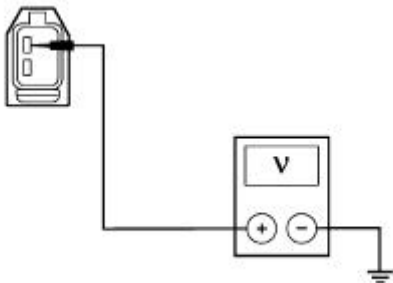
- Are the voltages greater than 10 volts?

→ **Yes**
GO to [AI2](#).

→ **No**
REPAIR the circuit. TEST the system for normal operation.

AI2 CHECK CIRCUITS 31S-LF21 (BK/GN) AND 31S-LF22 (BK/GN) FOR SHORT TO POWER

1



A0003303

1

Measure the voltage between LH license lamp C452 pin 2, circuit 31S-LF21 (BK/GN), harness side and ground; and between RH license lamp C462 pin 2, circuit 31S-LF22 (BK/GN), harness side and ground.

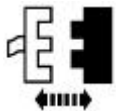
- Are any voltages indicated?

→ **Yes**
GO to [AI3](#).

→ **No**
GO to [AI4](#).

AI3 CHECK REM FOR A SHORT TO POWER

1

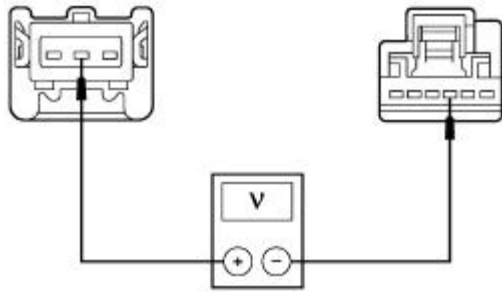


REM C420a

2

2

Measure the voltage between LH license lamp C452 pin 2, circuit 31S-LF21



A0030338

(BK/GN), harness side and ground; and between RH license lamp C462 pin 2, circuit 31S-LF22 (BK/GN), harness side and ground.

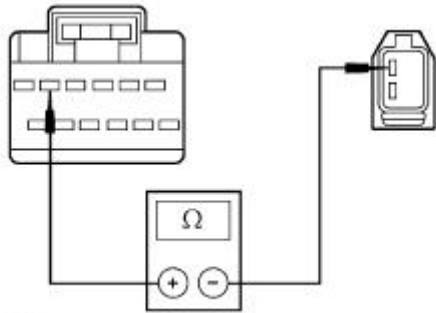
● **Is any voltage indicated?**

→ **Yes**
REPAIR the circuit. TEST the system for normal operation.

→ **No**
INSTALL a new REM; REFER to [Section 419-10](#). CLEAR the DTCs. REPEAT the self-test.

AI4 CHECK CIRCUITS 31S-LF21 (BK/GN) AND 31S-LF22 (BK/GN) FOR OPEN

1



A0003316

1

Measure the resistance between REM C420a pin 5, circuit 31S-LF12 (BK/GN), harness side and LH license lamp C452 pin 2, circuit 31S-LF21 (BK/GN), harness side; REM C420a pin 5, circuit 31S-LF12 (BK/GN), harness side and RH license lamp C462 pin 2, circuit 31S-LF22 (BK/GN), harness side.

● **Is the resistance less than 5 ohms?**

→ **Yes**
INSTALL a new REM; REFER to [Section 419-10](#). CLEAR the DTCs. REPEAT the self-test.

→ **No**
REPAIR the circuit. TEST the system for normal operation.

PINPOINT TEST AJ: THE EXTERIOR LAMP(S) ARE INOPERATIVE — LF OR RF PARKING AND TURN LAMPS

CONDITIONS	DETAILS/RESULTS/ACTIONS
AJ1 CHECK OPERATION OF FRONT PARKING AND TURN LAMPS	
1	



2 Turn the parking lamps on.

- **Do the front parking and turn lamps illuminate?**

→ **Yes**
The system is operating correctly.

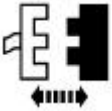
→ **No**
If the left side is inoperative, GO to [AJ2](#).
If the right side is inoperative, GO to [AJ3](#).

AJ2 CHECK CIRCUIT 29S-LF7 (OG/BU) FOR AN OPEN

1



2

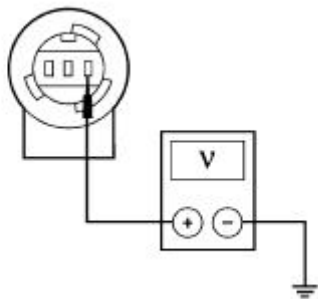


LF Parking/Turn Lamp C1022

3



4



A0003289

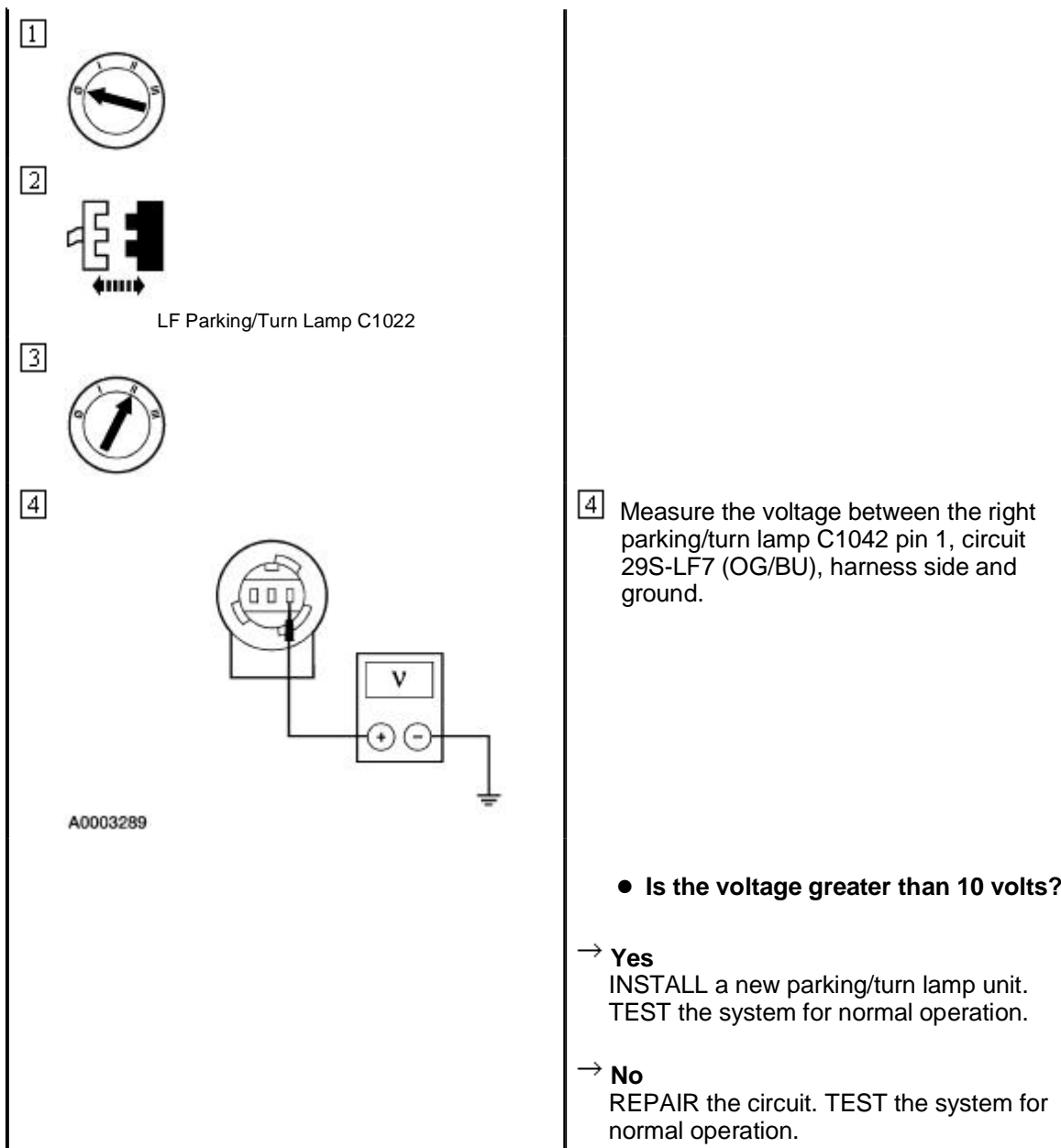
4 Measure the voltage between the left parking/turn lamp C1022 pin 1, circuit 29S-LF7 (OG/BU), harness side and ground.

- **Is the voltage greater than 10 volts?**


→ **Yes**
INSTALL a new parking/turn lamp unit.
TEST the system for normal operation.

→ **No**
REPAIR the circuit. TEST the system for normal operation.

AJ3 CHECK CIRCUIT 29S-LF7 (OG/BU) FOR AN OPEN



PINPOINT TEST AK: THE EXTERIOR LAMP(S) ARE INOPERATIVE — FRONT PARKING/TURN AND SIDE MARKER LAMPS

CONDITIONS	DETAILS/RESULTS/ACTIONS
AK1 CHECK OPERATION OF FRONT PARKING/TURN AND SIDE MARKER LAMPS	
<p>1</p> 	<p>2</p> <p>Turn the parking lamps on.</p> <ul style="list-style-type: none"> • Do the front parking/turn and side marker lamps illuminate?

- **Yes**
The system is operating correctly.
- **No**
If the left side is inoperative, GO to [AK2](#).
- If the right side is inoperative, GO to [AK3](#).

AK2 CHECK CJB FUSE 210 (5A) FOR POWER

1

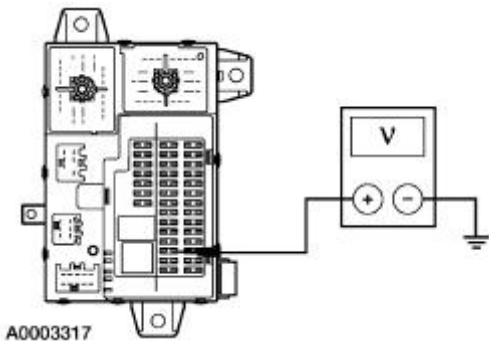


2



CJB Fuse 210 (5A)

3



3 Measure the voltage between CJB Fuse 210 (5A), input side and ground.

● **Is the voltage greater than 10 volts?**

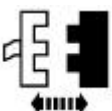
- **Yes**
REPAIR circuit 29S-LF3 (OG/YE). TEST the system for normal operation.
- **No**
REPAIR the CJB. TEST the system for normal operation.

AK3 CHECK CJB FUSE 208 (5A) FOR POWER

1



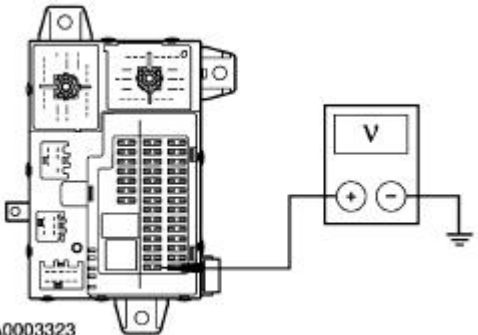
2



CJB Fuse 208 (5A)

3

3 Measure the voltage between CJB Fuse 208 (5A), input side and ground.



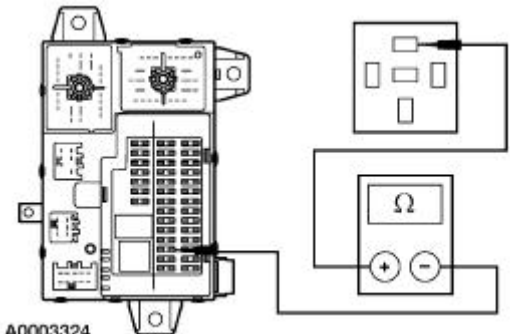


● Is the voltage greater than 10 volts?

→ **Yes**
REPAIR circuit 29S-LF3 (OG/YE). TEST the system for normal operation.



→ **No**
REPAIR the CJB. TEST the system for normal operation.

PINPOINT TEST AL: THE EXTERIOR LAMP(S) ARE INOPERATIVE — FRONT PARKING/TURN, SIDE MARKER, AND LOW BEAM LAMPS

CONDITIONS	DETAILS/RESULTS/ACTIONS
AL1 CHECK CIRCUIT 30-DD2 (RD) FOR AN OPEN	
<p>1</p>  <p>SSP2 relay</p> <p>2</p>  <p>CJB Fuse 210 (5A)</p> <p>3</p>  <p>A0003324</p>	<p>3 Measure the resistance between SSP2 relay pin 87, circuit 30-DD2 (RD), harness side and CJB Fuse 210 (5A), input side.</p> <p>● Is the resistance less than 5 ohms?</p> <p>→ Yes</p>

	REPAIR the CJB. TEST the system for normal operation. → No REPAIR the circuit. TEST the system for normal operation.
--	---

PINPOINT TEST AM: THE PARKING, REAR OR LICENSE LAMP IS ON CONTINUOUSLY — FRONT PARKING AND MARKER LAMPS

CONDITIONS	DETAILS/RESULTS/ACTIONS
NOTE: The ignition switch must be cycled from OFF to RUN to enable the SSP feature.	
AM1 CHECK OPERATION OF FRONT PARKING AND MARKER LAMP	
	<p>1 Turn the parking lamps off.</p> <ul style="list-style-type: none"> ● Are the front parking and marker lamps still illuminated? <p>→ Yes If the LF parking lamp is illuminated, GO to AM2. If the RF parking lamp is illuminated, GO to AM3. If the LF marker lamp is illuminated, GO to AM4. If the RF marker lamp is illuminated, GO to AM5.</p> <p>→ No The system is working correctly.</p>
AM2 CHECK CIRCUIT 31S-LF7 (BK/BU) FOR SHORT TO GROUND	
<p>1</p>  <p>FEM C201c</p> <p>2</p> 	<ul style="list-style-type: none"> ● Does the LF parking lamp turn off? <p>→ Yes INSTALL a new FEM; REFER to Section 419-10. CLEAR the DTCs. REPEAT the self-test.</p> <p>→ No REPAIR the circuit. TEST the system for normal operation.</p>
AM3 CHECK CIRCUIT 31S-LF16 (BK/RD) FOR SHORT TO GROUND	
1	



FEM C201c

2



● Does the RF parking lamp turn off?

→ Yes

INSTALL a new FEM; REFER to [Section 419-10](#). CLEAR the DTCs. REPEAT the self-test.

→ No

REPAIR the circuit. TEST the system for normal operation.

AM4 CHECK CIRCUIT 31S-LF8 (BK/OG) FOR SHORT TO GROUND

1



FEM C201b

2



● Does the LF marker lamp turn off?

→ Yes

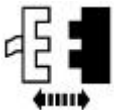
INSTALL a new FEM; REFER to [Section 419-10](#). CLEAR the DTCs. REPEAT the self-test.

→ No

REPAIR the circuit. TEST the system for normal operation.

AM5 CHECK CIRCUIT 31S-LF17 (BK/WH) FOR SHORT TO GROUND

1



FEM C201b

2






● Does the RF marker lamp turn off?

→ Yes


INSTALL a new FEM; REFER to [Section 419-10](#). CLEAR the DTCs.
REPEAT the self-test.

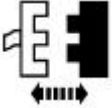

→ **No**
REPAIR the circuit. TEST the system for normal operation.

PINPOINT TEST AN: ONE OR MORE PARKING, REAR, OR LICENSE LAMP IS ON CONTINUOUSLY— LICENSE LAMPS


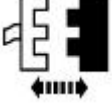

CONDITIONS	DETAILS/RESULTS/ACTIONS
NOTE: The ignition switch must be cycled from OFF to RUN to enable the SSP feature.	
AN1 CHECK CIRCUIT(S) FOR SHORT TO GROUND	
<p>1 Turn the parking lamps off.</p> <p>2 </p> <p>3  REM C420a</p> <p>4 </p> <p>● Do the license lamps turn off?</p> <p>→ Yes INSTALL a new REM; REFER to Section 419-10. CLEAR the DTCs. REPEAT the self-test.</p> <p>→ No REPAIR circuit 31S-LF12 (BK/GN), 31S-LF21 (BK/GN), and 31S-LF22 (BK/GN). TEST the system for normal operation.</p>	

PINPOINT TEST AO: ONE OR MORE PARKING, REAR, OR LICENSE LAMP IS ON CONTINUOUSLY — LR PARKING LAMPS

CONDITIONS	DETAILS/RESULTS/ACTIONS
AO1 CHECK CIRCUIT(S) FOR SHORT TO GROUND	
<p>1 Turn the parking lamps off.</p> <p>2 </p>	

<p>3</p>  <p>REM C420e</p>	
<p>4</p> 	
	<ul style="list-style-type: none"> • Does the LR parking lamp turn off? <p>→ Yes INSTALL a new REM; REFER to Section 419-10. CLEAR the DTCs. REPEAT the self-test.</p> <p>→ No REPAIR circuit 31S-LF (BK/WH) and 31S-LF11A (BK/WH). TEST the system for normal operation.</p>


PINPOINT TEST AP: ONE OR MORE PARKING, REAR, OR LICENSE LAMP IS ON CONTINUOUSLY — RR PARKING LAMPS

CONDITIONS	DETAILS/RESULTS/ACTIONS
<p>AP1 CHECK CIRCUIT(S) FOR SHORT TO GROUND</p>	
<p>1</p>	<p>1 Turn the parking lamps off.</p>
<p>2</p> 	
<p>3</p>  <p>REM C420e</p>	
<p>4</p> 	<ul style="list-style-type: none"> • Does the RR parking lamp turn off? <p>→ Yes INSTALL a new REM; REFER to Section 419-10. CLEAR the DTCs. REPEAT the self-test.</p> <p>→ No REPAIR circuit 31S-LF (BK/WH) and 31S-LF11A (BK/WH). TEST the system for normal operation.</p>

Fog Lamps

Refer to Wiring Diagrams Section [417-01](#), Exterior Lighting for schematic and connector information.

Special Tool(s)

 ST2332-A	Worldwide Diagnostic System (WDS) 418-F224, New Generation STAR (NGS) Tester 418-F052 or equivalent diagnostic tool
 ST1137-A	73III Automotive Meter 105-R0057 or equivalent

Principles of Operation

NOTE: The front electronic module (FEM), the rear electronic module (REM), and the instrument cluster module (ICM) must be reconfigured before installing a new module. Refer to [Section 418-01](#).

The vehicle electronic functions are divided into zones. The FEM controls the front portion of the vehicle and the REM controls the rear portion of the vehicle. These systems rely heavily on the standard corporate protocol (SCP) communication network in order to transmit and receive signals. As a technician it is very important to understand:

- where the input (command) originates from.
- all information (messages) necessary in order for a feature to operate.
- which module(s) receive(s) the input or command message.
- does the module which received the input (message) control the output of the feature, or does it output a message over the SCP communication network to another module.
- which module controls the output of the feature.

Exterior Lighting

The exterior lighting outputs are zone controlled by the FEM and REM. The front exterior lights are controlled by the FEM and the rear exterior lights are controlled by the REM. An additional function of the lighting system is a lamp outage function which indicates to the driver if certain exterior bulbs are not functioning. With a bulb inoperative, the FEM or REM will send a message to the instrument cluster and message center (if equipped with the message center), which will indicate to the driver that the lamp is inoperative with a lamp out indicator (with the message center a message will be displayed). To provide complete input and output functionality, each exterior lamp feature will be described individually. All exterior lighting is powered by the switched system power (SSP) feature (refer to Switched System Power [SSP]). A failure of all or any of the SSP features will cause inoperative

exterior lighting. When diagnosing exterior lighting, it is essential to determine if all related symptoms and DTCs are controlled by the SSP feature.

The vehicle's electronic functions are divided into zones. The FEM controls the front portion of the vehicle and the REM controls the rear portion of the vehicle. These systems rely heavily on the SCP communication network in order to transmit and receive signals. As a technician it is very important to understand:

- where the input (command) originates from.
- all information (messages) necessary in order for a feature to operate.
- which module(s) receive(s) the input or command message.
- does the module which received the input (message), control the output of the feature, or does it output a message over the SCP communication network to another module.
- which module controls the output of the feature.

Fog Lamps

The fog lamps are controlled by the headlamp switch. The switch toggles the fog lamps between on and off. When activated, the switch sends voltage to the instrument cluster. The instrument cluster sends a signal to the FEM which activates the fog lamp.

The vehicles electronic functions are divided into zones. The FEM controls the front portion of the vehicle and the REM controls the rear portion of the vehicle. These systems rely heavily on the SCP communication network in order to transmit and receive signals. As a technician it is very important to understand:

- where the input (command) originates from.
- all information (messages) necessary in order for a feature to operate.
- which module(s) receive(s) the input or command message.
- whether module which received the input (message) controls the output of the feature, or whether it outputs a message over the SCP communication network to another module.
- which module controls the output of the feature.

Switched System Power (SSP)

The SSP is invoked by both the FEM and REM. This function removes power from relays that provide power to the exterior lamps, interior lamps, and power door locks. This is only accomplished when both the FEM and the REM are in sleep mode. The sleep function of the FEM and REM places the modules in sleep mode when the ignition switch is in the OFF position, and no wake up (input) signals occur for 30 minutes. The module will not sleep if the parking lamps or the hazard lamps are active. The following relays are controlled by the SSP function: SSP1, SSP2, SSP3, and SSP4. When either the FEM or REM are not in sleep mode, all SSP relays will be energized. When energized, each relay will supply power to multiple features/functions. For additional information, go to the SSP Index for diagnosis and testing of SSP related issues. Refer to [Headlamps](#).

Inspection and Verification

1. Verify the customer concern by operating the fog lamps following these steps:
 1. Place the ignition switch (11572) in the ON position.
 2. Place the headlamp switch (11564) in the ON position.
 3. Place the fog lamp switch in the ON position.
 4. Verify the fog lamp operation.

5. Place the headlamps in the OFF position.
2. Visually inspect for obvious signs of mechanical and electrical damage.

Visual Inspection Chart

Mechanical	Electrical
<ul style="list-style-type: none"> ● Damaged FEM ● Damaged instrument cluster (10849) 	<ul style="list-style-type: none"> ● Battery junction box (BJB) Fuses: <ul style="list-style-type: none"> ■ 422 (20A) ■ 423 (30A) ■ 424 (30A) ■ 425 (40A) ■ 427 (30A) ■ 432 (30A) ● Central junction box (CJB) Fuse: <ul style="list-style-type: none"> ■ 213 (5A) ■ 220 (5A) ● Underhood auxiliary junction box UAJB Fuses: <ul style="list-style-type: none"> ■ 103 (15A) ● Damaged wiring harness ● Loose or corroded connections ● Damaged headlamp switch

3. If the concern remains after the inspection, connect the diagnostic tool to the data link connector (DLC) located beneath the instrument panel and select the vehicle to be tested from the diagnostic tool menu. If the diagnostic tool does not communicate with the vehicle:
 - check that the program card is correctly installed.
 - check the connections to the vehicle.
 - check the ignition switch position.
4. If the diagnostic tool still does not communicate with the vehicle, refer to the diagnostic tool manual.
5. Carry out the DATA LINK DIAGNOSTIC TEST. If the diagnostic tool responds with:
 - CKT914, CKT915 or CKT70 =ALL ECUS NO RESP/NOT EQUIP, refer to [Section 418-00](#).
 - NO RESP/NOT EQUIP for FEM, go to Pinpoint Test A.
 - NO RESP/NOT EQUIP for instrument cluster, go to Pinpoint Test C.
 - SYSTEM PASSED, retrieve and record the continuous diagnostic trouble codes (DTCs), erase the continuous DTCs and carry out self-test diagnostics for the FEM.
6. If the DTCs retrieved are related to the concern, go to FEM Diagnostic Trouble Code (DTC) Index, and Instrument Cluster Diagnostic Trouble Code (DTC) Index, or SSP Relay Index to continue diagnostics. Refer to [Headlamps](#).
7. If no DTCs related to the concern are retrieved, proceed to Symptom Chart to continue diagnostics.

Symptom Chart

Symptom Chart

Condition	Possible Sources	Action
<ul style="list-style-type: none"> No communication with the front electronic module 	<ul style="list-style-type: none"> BJB Fuses 425 (40A), 422 (20A). Circuitry. FEM. 	<ul style="list-style-type: none"> GO to Pinpoint Test A.
<ul style="list-style-type: none"> No communication with the instrument cluster module 	<ul style="list-style-type: none"> CJB Fuses 213 (5A), 220 (5A). Circuitry. Instrument cluster. 	<ul style="list-style-type: none"> GO to Pinpoint Test C.
<ul style="list-style-type: none"> The power supply relay is inoperative — all SSP features 	<ul style="list-style-type: none"> Circuitry. Relay. FEM. REM. 	<ul style="list-style-type: none"> GO to Pinpoint Test I.
<ul style="list-style-type: none"> The power supply relay is inoperative —SSP1 	<ul style="list-style-type: none"> BJB Fuse 427 (30A). Circuitry. Relay. FEM. 	<ul style="list-style-type: none"> GO to Pinpoint Test J.
<ul style="list-style-type: none"> The power supply relay is inoperative —SSP2 	<ul style="list-style-type: none"> BJB Fuse 432 (30A). Circuitry. Relay. FEM. 	<ul style="list-style-type: none"> GO to Pinpoint Test K.
<ul style="list-style-type: none"> The power supply relay is inoperative —SSP3 	<ul style="list-style-type: none"> BJB Fuse 424 (30A). Circuitry. Relay. REM. 	<ul style="list-style-type: none"> GO to Pinpoint Test L.
<ul style="list-style-type: none"> The power supply relay is inoperative —SSP4 	<ul style="list-style-type: none"> BJB Fuse 423 (30A). Circuitry. Relay. REM. 	<ul style="list-style-type: none"> GO to Pinpoint Test M.
<ul style="list-style-type: none"> The fog lamps are inoperative 	<ul style="list-style-type: none"> UAJB Fuse 103 (15A). Fog lamp relay. Circuitry. FEM. 	<ul style="list-style-type: none"> GO to pinpoint Test AQ.
<ul style="list-style-type: none"> The individual fog lamp is inoperative 	<ul style="list-style-type: none"> Bulb. Circuitry. 	<ul style="list-style-type: none"> GO to Pinpoint Test AR.
<ul style="list-style-type: none"> The fog lamps are on continuously 	<ul style="list-style-type: none"> Fog lamp relay. Bulbs. Circuitry. FEM. 	<ul style="list-style-type: none"> GO to Pinpoint Test AS.

Pinpoint Test

PINPOINT TEST AQ: THE FOG LAMPS ARE INOPERATIVE

CONDITIONS	DETAILS/RESULTS/ACTIONS
AQ1 CHECK UAJB FUSE 103 (15A) FOR POWER	

1

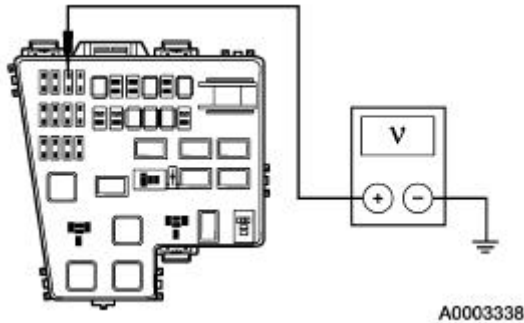


UAJB Fuse 103 (15A)

2



3



3

Measure the voltage between UAJB Fuse 103 (15A), input side and ground.

● Is the voltage greater than 10 volts?

→ Yes

REINSTALL the fuse;GO to [AQ2](#).

→ No

REPAIR the power source. TEST the system for normal operation.

AQ2 CHECK FRONT FOG LAMPS RELAY

1



Fog Lamp Relay C1007

2

Carry out the relay component test. Refer to Wiring Diagrams Section 700-09.

● Does the relay pass the component test?

→ Yes

GO to [AQ3](#).

→ No

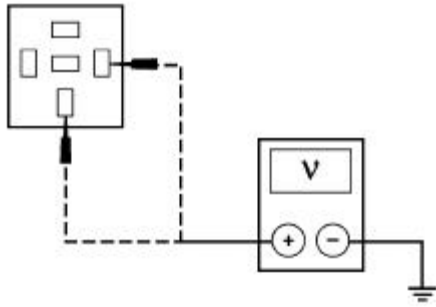
INSTALL a new relay. TEST the system for normal operation.

AQ3 CHECK CIRCUITS 30-LD8A (RD) AND 30-LD8 (RD) FOR AN OPEN

1

1

Measure the voltage between fog lamp relay C1007 pin 86, circuit 30-LD8A (RD), harness side and ground; and



A0003277

between fog lamp relay C1007 pin 30, circuit 30-LD8 (RD), harness side and ground.

- Are the voltages greater than 10 volts?

→ **Yes**
GO to [AQ4](#).

→ **No**
REPAIR the circuit. TEST the system for normal operation.

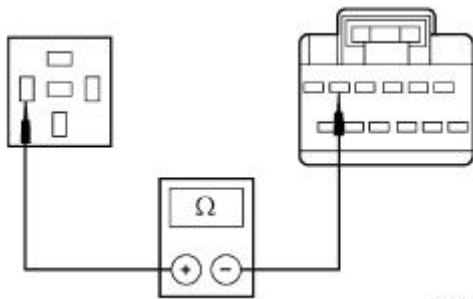
AQ4 CHECK CIRCUITS 31S-LD9 (BK/GN) FOR AN OPEN

1



FEM C201c

2



A0003339

2

Measure the resistance between fog lamp relay C1007 pin 85, circuit 31S-LD9 (BK/GN), harness side and FEM C201c pin 5, circuit 31S-LD9 (BK/GN), harness side.

- Is the resistance less than 5 ohms?

→ **Yes**
GO to [AQ5](#).

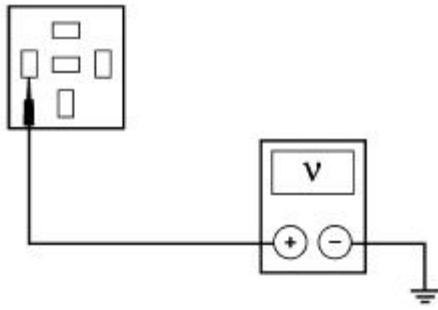
→ **No**
REPAIR the circuit. TEST the system for normal operation.

AQ5 CHECK CIRCUITS 31S-LD9 (BK/GN) FOR AN OPEN

1



2



A0003276

- 2 Measure the voltage between fog lamp relay C1007 pin 85, circuit 31S-LD9 (BK/GN), harness side and ground.

● Is the voltage greater than 10 volts?

→ **Yes**
REPAIR the circuit. TEST the system for normal operation.

→ **No**
REINSTALL the fog lamp relay; GO to [AQ6](#).

AQ6 CHECK CIRCUITS 30S-LD11 (RD/WH) AND 30S-LD17 (RD/WH) FOR AN OPEN

1

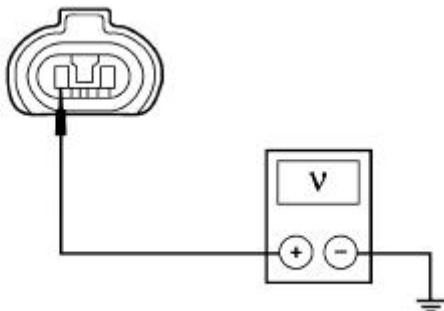


LF Fog Lamp C152

2



5



A0003266



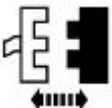
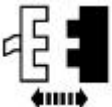
- 3 Turn the headlamps on.
4 Turn the fog lamps on.
5 Measure the voltage between LF fog lamp C152 pin 2, circuit 30S-LD11 (RD/WH), harness side and ground.

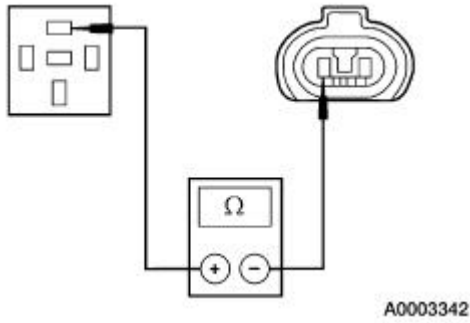
● Is the voltage greater than 10 volts?

→ **Yes**
INSTALL a new FEM; REFER to [Section 419-10](#). CLEAR the DTCs. REPEAT the self-test.

→ **No**
REPAIR the circuit. TEST the system for normal operation

PINPOINT TEST AR: THE INDIVIDUAL FOG LAMP IS INOPERATIVE

CONDITIONS	DETAILS/RESULTS/ACTIONS
AR1 CHECK THE FRONT FOG LAMP OPERATION	
<p>1</p> 	<p>2 Turn headlamps on.</p> <p>3 Turn fog lamps on.</p> <ul style="list-style-type: none"> ● Do the fog lamps illuminate? <p>→ Yes The system is operating correctly.</p> <p>→ No If the left side is inoperative, GO to AR5. If the right side is inoperative, GO to AR2.</p>
AR2 CHECK CIRCUIT 30S-LD11 (RD/WH) FOR AN OPEN	
<p>1</p>  <p>2</p>  <p>LF Fog Lamp C152</p> <p>3</p>  <p>Fog Lamp Relay C1007</p> <p>4</p>	<p>4 Measure the resistance between LF fog lamp C152 pin 2, circuit 30S-LD11 (RD/WH), harness side and front fog lamp relay C1007 pin 87, circuit 30S-LD11 (RD/WH), harness side.</p>



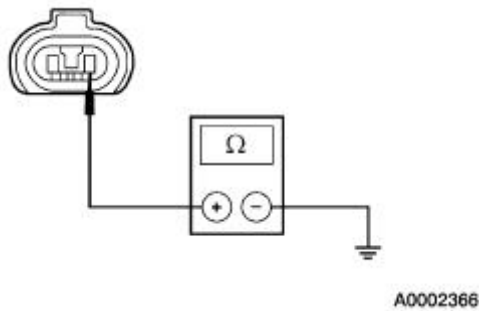
● Is the resistance less than 5 ohms?

→ **Yes**
REINSTALL the fog lamp relay;GO to [AR3](#).

→ **No**
REPAIR the circuit. TEST the system for normal operation.

AR3 CHECK CIRCUIT 31-LD11 (BK) FOR AN OPEN

1



1

Measure the resistance between LF fog lamp C152 pin 1, circuit 31-LD11 (BK), harness side and ground.

● Is the resistance less than 5 ohms?

→ **Yes**
GO to [AR4](#).

→ **No**
REPAIR the circuit. TEST the system for normal operation.

AR4 CHECK CIRCUIT 31-LD11 (BK) FOR A SHORT TO POWER

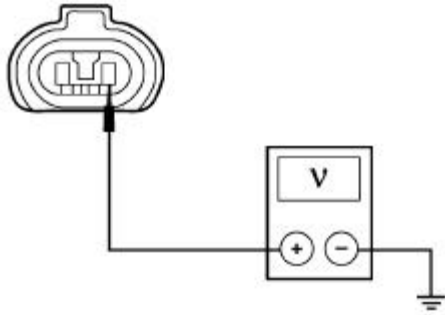
1



2

2

Measure the voltage between LF fog lamp C152 pin 1, circuit 31-LD11 (BK), harness side and ground.



A0003262

● Is any voltage indicated?

→ **Yes**
REPAIR the circuit. TEST the system for normal operation.

→ **No**
INSTALL a new FEM; REFER to [Section 419-10](#). CLEAR the DTCs. REPEAT the self-test.

AR5 CHECK CIRCUIT 30S-LD17 (RD/WH) FOR AN OPEN

1



2



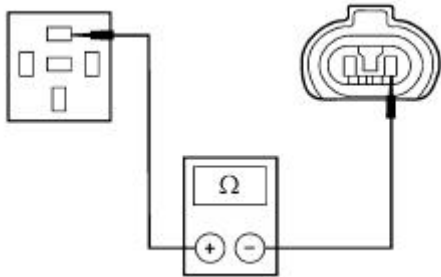
RF Fog Lamp C162

3



Fog Lamp Relay C1007

4



A0003340

4 Measure the resistance between RF fog lamp C162 pin 1, circuit 30S-LD17 (RD/WH), harness side and front fog lamp relay C1007 pin 87, circuit 30S-LD17 (RD/WH), harness side.

● Is the resistance less than 5 ohms?

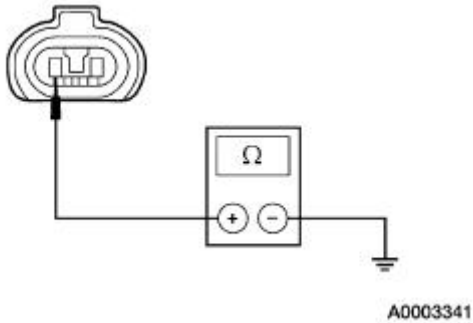
→ **Yes**

REINSTALL the front fog lamp relay. GO to [AR6](#).

→ **No**
REPAIR the circuit. TEST the system for normal operation.

AR6 CHECK CIRCUIT 31-LD17 (BK) FOR AN OPEN

1



1 Measure the resistance between RF fog lamp C162 pin 2, circuit 31-LD17 (BK), harness side and ground.

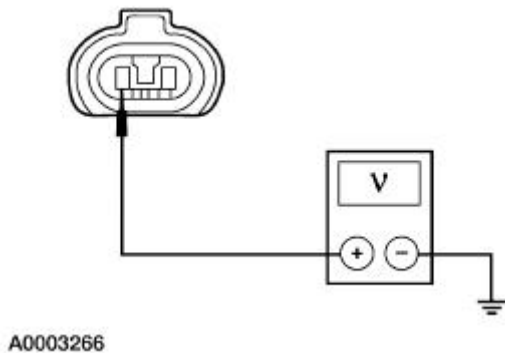
● **Is the resistance less than 5 ohms?**

→ **Yes**
GO to [AR7](#).

→ **No**
REPAIR the circuit. TEST the system for normal operation.

AR7 CHECK CIRCUIT 31-LD17 (BK) FOR A SHORT TO POWER

1





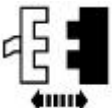
1 Measure the voltage between RF fog lamp C162 pin 2, circuit 31-LD17 (BK), harness side and ground.

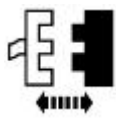
● **Is any voltage indicated?**

→ **Yes**
REPAIR the circuit. TEST the system for normal operation.

→ **No**
INSTALL a new FEM; REFER to [Section 419-10](#). CLEAR the DTCs. REPEAT the self-test.

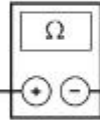
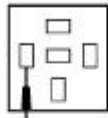
PINPOINT TEST AS: THE FOG LAMPS ARE ON CONTINUOUSLY

CONDITIONS	DETAILS/RESULTS/ACTIONS
AS1 CHECK THE OPERATION OF THE FRONT FOG LAMPS	
<p>1</p> 	<p>2 Turn the fog lamps off.</p> <ul style="list-style-type: none"> ● Do the fog lamps turn off? <p>→ Yes The system is operating correctly.</p> <p>→ No If both lamps are on continuously, GO to AS2.</p> <p>If the LF fog lamp is on continuously, REPAIR circuit 30S-LD11 (RD/WH) for a short to power. TEST the system for normal operation.</p> <p>If the RF fog lamp is on continuously, REPAIR circuit 30S-LD17 (RD/WH) for a short to power. TEST the system for normal operation.</p>
AS2 CHECK FRONT FOG LAMP RELAY	
<p>1</p>  <p>2</p>  <p>Front Fog Lamp Relay C1007</p>	<p>3 Carry out the relay component test. Refer to Wiring Diagrams Section 700-09.</p> <ul style="list-style-type: none"> ● Does the relay pass the component test? <p>→ Yes GO to AS3.</p> <p>→ No INSTALL a new relay. TEST the system for normal operation.</p>
AS3 CHECK CIRCUIT 31S-LD9 (BK/GN) FOR A SHORT TO GROUND	
<p>1</p>	



FEM C201c

2



A0030337

2

Measure the resistance between fog lamp relay C1007 pin 85, circuit 31S-LD9 (BK/GN), harness side and ground.

● Is the resistance less than 5 ohms?

→ **Yes**

INSTALL a new FEM. REFER to [Section 419-10](#). CLEAR the DTCs. REPEAT the self-test.

→ **No**

REPAIR the circuit. TEST the system for normal operation.

Reversing Lamps

Refer to Wiring Diagrams Section [417-01](#), Exterior Lighting for schematic and connector information.

Special Tool(s)

 ST2332-A	Worldwide Diagnostic System (WDS) 418-F224, New Generation STAR (NGS) Tester 418-F052 or equivalent diagnostic tool
 ST1137-A	73III Automotive Meter 105-R0057 or equivalent

Principles of Operation

NOTE: The front electronic module (FEM), the rear electronic module (REM) and the instrument cluster module (ICM) must be reconfigured before installing a new module. Refer to [Section 418-01](#).

The vehicle's electronic functions are divided into zones. The FEM controls the front portion of the vehicle and the REM controls the rear portion of the vehicle. These systems rely heavily on the standard corporate protocol (SCP) communication network in order to transmit and receive signals. As a technician it is very important to understand:

- where the input (command) originates from.
- all information (messages) necessary in order for a feature to operate.
- which module(s) receive(s) the input or command message.
- does the module which received the input (message), control the output of the feature, or does it output a message over the SCP communication network to another module.
- which module controls the output of the feature.

Exterior Lighting

The exterior lighting outputs are zone controlled by the FEM and REM. The front exterior lights are controlled by the FEM and the rear exterior lights are controlled by the REM. An additional function of the lighting system is a lamp outage function which indicates to the driver if certain exterior bulbs are not functioning. With a bulb inoperative, the FEM or REM will send a message to the instrument cluster and message center (if equipped with the message center), which will indicate to the driver that the lamp is inoperative with a lamp out indicator (with the message center a message will be displayed). To provide complete input and output functionality, each exterior lamp feature will be described individually. All exterior lighting is powered by the switched system power (SSP) feature (refer to Switched System Power [SSP]). A failure of all or any of the SSP features will cause inoperative

exterior lighting. When diagnosing exterior lighting, it is essential to determine if all related symptoms and DTCs are controlled by the SSP feature.

Reversing Lamps

The reversing lamps are controlled by the REM and PCM. The PCM sends a message through the SCP communication network to the REM indicating the transmission has been placed in REVERSE. The REM will process this information and output the command to the reversing lamps which are hardwired to the REM. Fault management of the reversing lamps will provide limited reversing lamp functionality. In the event of a transmission missing or invalid data, the reversing lamps will remain in the last state of operation prior to the failure for one key cycle. In the event of invalid or missing data for the ignition switch, the lamps will work in relation to PRNDL messages.

The vehicle's electronic functions are divided into zones. The FEM controls the front portion of the vehicle and the REM controls the rear portion of the vehicle. These systems rely heavily on the SCP communication network in order to transmit and receive signals. As a technician it is very important to understand:

- where the input (command) originates from.
- all information (messages) necessary in order for a feature to operate.
- which module(s) receive(s) the input or command message.
- does the module which received the input (message), control the output of the feature, or does it output a message over the SCP communication network to another module.
- which module controls the output of the feature.

Switched System Power (SSP)

The SSP is invoked by both the FEM and REM. This function removes power from relays that provide power to the exterior lamps, interior lamps, and power door locks. This is only accomplished when both the FEM and the REM are in sleep mode. The sleep function of the FEM and REM places the modules in sleep mode when the ignition switch is in the OFF position, and no wake up (input) signals occur for 30 minutes. The module will not sleep if the parking lamps or the hazard lamps are active. The following relays are controlled by the SSP function: SSP1, SSP2, SSP3, and SSP4. When either the FEM or REM are not in sleep mode, all SSP relays will be energized. When energized, each relay will supply power to multiple features/functions. For additional information, go to the SSP Index for diagnosis and testing of SSP related issues. Refer to [Headlamps](#).

Inspection and Verification

1. Verify the customer concern by operating the turn signal, cornering, and hazard lamps.
2. Visually inspect for obvious signs of mechanical and electrical damage.

Visual Inspection Chart

Mechanical	Electrical
<ul style="list-style-type: none">● Damaged REM	<ul style="list-style-type: none">● Battery junction box (BJB) Fuses:<ul style="list-style-type: none">■ 406 (10A)■ 423 (30A)■ 424 (30A)■ 425 (40A)

- 427 (30A)
- 432 (30A)
- Damaged wiring harness
- Loose or corroded connections
- Damaged bulbs

3. If the concern remains after the inspection, connect the diagnostic tool to the data link connector (DLC) located beneath the instrument panel and select the vehicle to be tested from the diagnostic tool menu. If the diagnostic tool does not communicate with the vehicle:
 - check that the program card is correctly installed.
 - check the connections to the vehicle.
 - check the ignition switch position.
4. If the diagnostic tool still does not communicate with the vehicle, refer to the diagnostic tool manual.
5. Carry out the DATA LINK DIAGNOSTIC TEST. If the diagnostic tool responds with:
 - CKT914, CKT915 or CKT70 =ALL ECUS NO RESP/NOT EQUIP, refer to [Section 418-00](#).
 - NO RESP/NOT EQUIP for REM, go to Pinpoint Test B.
 - SYSTEM PASSED, retrieve and record the continuous diagnostic trouble codes (DTCs), erase the continuous DTCs and carry out self-test diagnostics for the REM.
6. If the DTCs retrieved are related to the concern, go to REM Diagnostic Trouble Code (DTC) Index, or SSP Relay Index to continue diagnostics. Refer to [Headlamps](#).
7. If no DTCs related to the concern are retrieved, proceed to Symptom Chart to continue diagnostics.

Symptom Chart


Symptom Chart

Condition	Possible Sources	Action
<ul style="list-style-type: none"> ● No communication with the rear electronic module 	<ul style="list-style-type: none"> ● BJB Fuse 425 (40A). ● Circuitry. ● REM. 	<ul style="list-style-type: none"> ● GO to Pinpoint Test B.
<ul style="list-style-type: none"> ● The power supply relay is inoperative — all SSP features 	<ul style="list-style-type: none"> ● Circuitry. ● Relay. ● FEM. ● REM. 	<ul style="list-style-type: none"> ● GO to Pinpoint Test L.
<ul style="list-style-type: none"> ● The power supply relay is inoperative —SSP1 	<ul style="list-style-type: none"> ● BJB Fuse 427 (30A). ● Circuitry. ● Relay. ● FEM. 	<ul style="list-style-type: none"> ● GO to Pinpoint Test J.
<ul style="list-style-type: none"> ● The power supply relay is inoperative —SSP2 	<ul style="list-style-type: none"> ● BJB Fuse 432 (30A). ● Circuitry. ● Relay. ● REM. 	<ul style="list-style-type: none"> ● GO to Pinpoint Test K.
<ul style="list-style-type: none"> ● The power supply relay is inoperative —SSP3 	<ul style="list-style-type: none"> ● BJB Fuse 424 (30A). ● Circuitry. ● Relay. 	<ul style="list-style-type: none"> ● GO to Pinpoint Test L.

	<ul style="list-style-type: none"> ● FEM. ● REM. 	
<ul style="list-style-type: none"> ● The power supply relay is inoperative —SSP4 	<ul style="list-style-type: none"> ● BJB Fuse 423 (30A). ● Circuitry. ● Relay. ● REM. 	<ul style="list-style-type: none"> ● GO to Pinpoint Test M.
<ul style="list-style-type: none"> ● The reversing lamps are inoperative 	<ul style="list-style-type: none"> ● BJB Fuse 406 (10A). ● Bulbs. ● Circuitry. ● REM. ● Digital Transmission Range (TR) sensor. 	<ul style="list-style-type: none"> ● GO to Pinpoint Test AT.
<ul style="list-style-type: none"> ● The individual reversing lamp is inoperative — LH reversing lamp 	<ul style="list-style-type: none"> ● Circuitry. ● FEM. 	<ul style="list-style-type: none"> ● GO to Pinpoint Test AU.
<ul style="list-style-type: none"> ● The individual reversing lamp is inoperative — RH reversing lamp 	<ul style="list-style-type: none"> ● Bulb. ● Circuitry. ● FEM. 	<ul style="list-style-type: none"> ● GO to Pinpoint Test AV.
<ul style="list-style-type: none"> ● The reversing lamps are on continuously 	<ul style="list-style-type: none"> ● Circuitry. ● REM. ● Digital TR Sensor. 	<ul style="list-style-type: none"> ● GO to Pinpoint Test AW.

Pinpoint Tests

PINPOINT TEST AT: THE REVERSING LAMPS ARE INOPERATIVE

CONDITIONS	DETAILS/RESULTS/ACTIONS
NOTE: The ignition switch must be cycled from OFF to RUN to enable the SSP feature.	
AT1 CHECK THE DTCs	
	<p>1 Retrieve the recorded DTC results from the REM for the continuous and on-demand self-test.</p> <ul style="list-style-type: none"> ● Are any DTCs recorded? <p>→ Yes</p> <p>GO to REM Diagnostic Trouble Code (DTC) Index. REFER to Headlamps .</p> <p>→ No GO to AT2 .</p>
AT2 CHECK REM OUTPUT	
<p>1</p>  <p>Diagnostic Tool</p> <p>2</p>	



3



3

While observing the reversing lamps, trigger REM active command BACKUPLMP ON and then OFF.

• Do the reversing lamps operate correctly?

→ Yes

Check for digital transmission ranger (TR) sensor concerns. If no concerns exist INSTALL a new REM; REFER to [Section 419-10](#). CLEAR the DTCs. REPEAT the self-test.

→ No

GO to [AT3](#).

AT3 CHECK POWER TO THE REVERSING LAMPS

1



2



LH Reversing Lamp C451

3

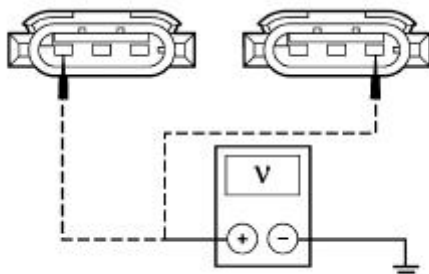


RH Reversing Lamp C461

4



5



5

Measure the voltage between LH reversing lamp C451 pin 1, circuit 29S-LG9 (OG/BK), harness side and ground; and between RH reversing lamp C461 pin 3, circuit 29S-LG16 (OG/GN), harness side and ground.

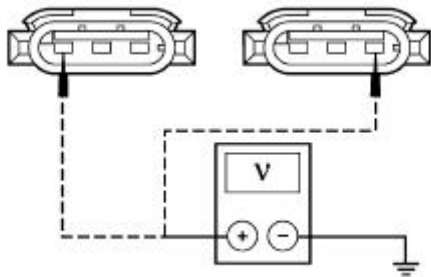
- Are the voltages greater than 10 volts?

→ **Yes**
GO to [AT4](#).

→ **No**
REPAIR the circuit. TEST the system for normal operation.

AT4 CHECK CIRCUIT 31S-LG16 (BK/RD) AND CIRCUIT 31S-LG9 (BK/GN) FOR A SHORT TO POWER

1



A0005097

1

Measure the voltage between LH reversing lamp C451 pin 3, circuit 31S-LG9 (BK/GN), harness side and ground; and between RH reversing lamp C461 pin 1, circuit 31S-LG16 (BK/RD), harness side and ground.

- Is any voltage indicated?

→ **Yes**
GO to [AT5](#).

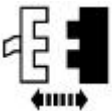
→ **No**
INSTALL a new REM; REFER to [Section 419-10](#). CLEAR the DTCs. REPEAT the self-test.

AT5 CHECK THE REM FOR A SHORT TO POWER

1



2



REM C420e

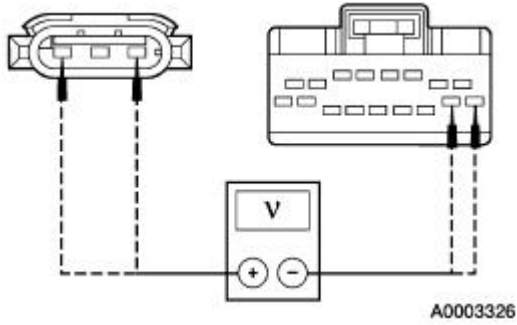
3



4

4

Measure the voltage between REM C420e pin 9, circuit 31S-LG9 (BK/GN), harness side and LH reversing lamp C451 pin 3, circuit 31S-LG9 (BK/GN), harness side; and between REM C420e pin 10, circuit 31S-LG16 (BK/RD), harness side and RH reversing lamp





C461 pin 1, circuit 31S-LG16 (BK/RD), harness side.

● **Is any voltage indicated?**

→ **Yes**
REPAIR the circuit. TEST the system for normal operation.

→ **No**
INSTALL a new REM; REFER to [Section 419-10](#). CLEAR the DTCs. REPEAT the self-test.

PINPOINT TEST AU: THE INDIVIDUAL REVERSING LAMP IS INOPERATIVE — LH REVERSING LAMP

CONDITIONS	DETAILS/RESULTS/ACTIONS
AU1 CHECK THE DTCs	<p>1 Retrieve the recorded DTC results from the REM for the continuous and on-demand self-test.</p> <p>● Are any DTCs recorded?</p> <p>→ Yes GO to REM Diagnostic Trouble Code (DTC) Index. REFER to Headlamps in this section.</p> <p>→ No GO to AU2.</p>
AU2 CHECK REM OUTPUT	
<p>1</p>  <p>Diagnostic Tool</p> <p>2</p>  <p>3</p>	



3 While observing the reversing lamps, trigger REM active command BACKUPLMP ON and then OFF.

• Do the reversing lamps operate correctly?

→ Yes
INSTALL a new REM; REFER to [Section 419-10](#). CLEAR the DTCs. REPEAT the self-test.

→ No
GO to [AU3](#).

AU3 CHECK POWER TO THE LH REVERSING LAMPS

1



2

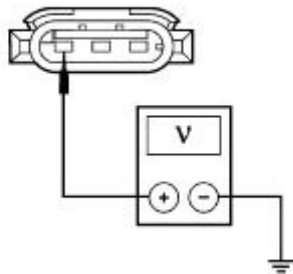


LH Reversing Lamp C451

3



4



A0003294

4 Measure the voltage between LH reversing lamp C451 pin 1, circuit 29S-LG9 (OG/BK), harness side and ground.

• Is the voltage greater than 10 volts?

→ Yes
GO to [AU4](#).

→ No
REPAIR the circuit. TEST the system for normal operation.

AU4 CHECK CIRCUIT 31S-LG9 (BK/GN) FOR AN OPEN

1

2

3

REM C420e

A0003327

3 Measure the resistance between LH reversing lamp C451 pin 3, circuit 31S-LG9 (BK/GN), harness side and REM C420e pin 9 circuit 31S-LG9 (BK/GN), harness side.

- Is the resistance less than 5 ohms?

→ **Yes**
INSTALL a new REM; REFER to [Section 419-10](#). CLEAR the DTCs. REPEAT the self-test.

→ **No**
REPAIR the circuit. TEST the system for normal operation.

PINPOINT TEST AV: THE INDIVIDUAL REVERSING LAMP IS INOPERATIVE — RH REVERSING LAMP

CONDITIONS	DETAILS/RESULTS/ACTIONS
AV1 CHECK THE DTCs	<p>1 Retrieve the recorded DTC results from the REM for the continuous and on-demand self-test.</p> <ul style="list-style-type: none"> ● Are any DTCs recorded? <p>→ Yes GO to REM Diagnostic Trouble Code (DTC) Index. REFER to Headlamps in this section.</p> <p>→ No GO to AV2.</p>
AV2 CHECK REM OUTPUT	
1	



Diagnostic Tool

2



3



3

While observing the reversing lamps, trigger REM active command BACKUPLMP ON and then OFF.

• Do the reversing lamps operate correctly?

→ Yes

INSTALL a new REM; REFER to [Section 419-10](#). CLEAR the DTCs. REPEAT the self-test.

→ No

GO to [AV3](#).

AV3 CHECK POWER TO THE RH REVERSING LAMPS

1



2

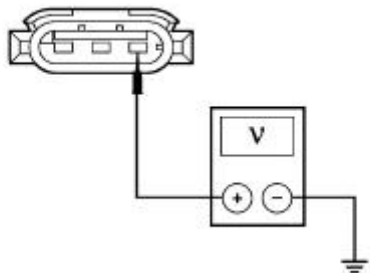


RH Reversing Lamp C461

3



4



A0003295

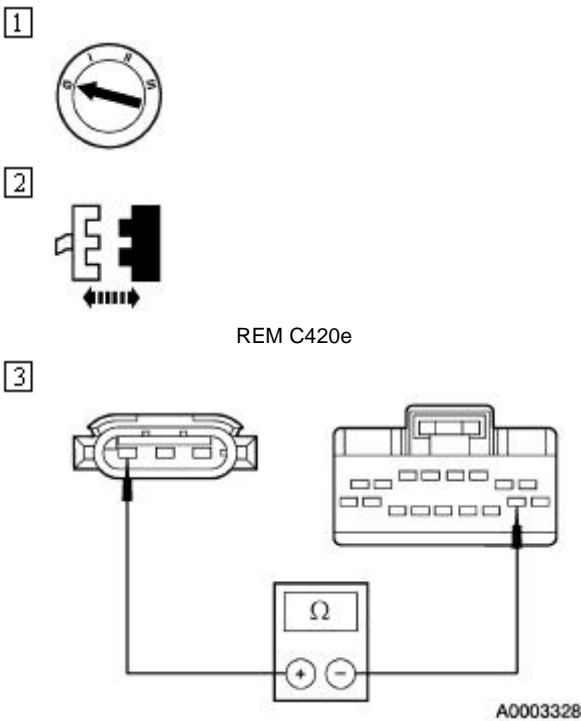
4

Measure the voltage between RH reversing lamp C461 pin 3, circuit 29S-LG16 (OG/GN), harness side and ground.

• Is the voltage greater than 10 volts?

- **Yes**
GO to [AV4](#).
- **No**
REPAIR the circuit. TEST the system for normal operation.

AV4 CHECK CIRCUIT 31S-LG16 (BK/RD) FOR AN OPEN



- 3** Measure the resistance between RH reverse lamp C461 pin 1, circuit 31S-LG16 (BK/RD), harness side and REM C420e pin 10, circuit 31S-LG16 (BK/RD), harness side.

● **Is the resistance less than 5 ohms?**

- **Yes**
INSTALL a new REM; REFER to [Section 419-10](#). CLEAR the DTCs. REPEAT the self-test.
- **No**
REPAIR the circuit. TEST the system for normal operation.

PINPOINT TEST AW: THE REVERSING LAMPS ARE ON CONTINUOUSLY

CONDITIONS	DETAILS/RESULTS/ACTIONS
NOTE: The ignition switch must be cycled from OFF to RUN to enable the SSP feature.	
AW1 CHECK THE DTCs	
	<ul style="list-style-type: none"> 1 Retrieve the recorded DTC results from the REM for the continuous and on-demand self-test. <p>● Are any DTCs recorded?</p>

→ **Yes**

GO to REM Diagnostic Trouble Code (DTC) Index. REFER to [Headlamps](#) .

→ **No**

GO to [AW2](#) .

AW2 CHECK CIRCUIT 31S-LG9 (BK/GN) AND CIRCUIT 31S-LG16 (BK/RD) FOR A SHORT TO GROUND

1



2



REM C420e

3



- **Do the reversing lamps turn off?**

→ **Yes**

Check for digital transmission range (TR) sensor concerns. If no concerns exist, INSTALL a new REM; REFER to [Section 419-10](#) . CLEAR the DTCs. REPEAT the self-test.


→ **Yes**

REPAIR the circuit in question. Clear the DTCs. REPEAT the self-test.

Trailer Lamps

Refer to Wiring Diagrams Section [417-01](#), Exterior Lighting for schematic and connector information.

Special Tool(s)

 ST2332-A	Worldwide Diagnostic System (WDS) 418-F224, New Generation STAR (NGS) Tester 418-F052 or equivalent diagnostic tool
 ST1137-A	73III Automotive Meter 105-R0057 or equivalent

Principles of Operation

NOTE: The front electronic module (FEM), the rear electronic module (REM), and the instrument cluster module (ICM) must be reconfigured before installing a new module. Refer to [Section 418-01](#).

The vehicle electronic functions are divided into zones. The FEM controls the front portion of the vehicle and the REM controls the rear portion of the vehicle. These systems rely heavily on the standard corporate protocol (SCP) communication network in order to transmit and receive signals. As a technician it is very important to understand:

- where the input (command) originates from.
- all information (messages) necessary in order for a feature to operate.
- which module(s) receive(s) the input or command message.
- does the module which received the input (message), control the output of the feature, or does it output a message over the SCP communication network to another module.
- which module controls the output of the feature.

Trailer Tow

The trailer lighting is controlled by the trailer tow module (TTM) (if equipped). The architecture of the vehicle lighting system requires the TTM to be used for correct trailer lighting operation. The TTM controls the park, turn, and stoplamps of the trailer lighting when connected. Trailer lighting is powered through the trailer tow relay and trailer tow auxiliary junction box (TTAJB). The TTM, which is hardwired to the rear electronics module (REM), senses the vehicle's rear exterior park, turn, and stoplamps. For turn lamp operation, when either turn lamp is activated, the TTM will apply power to the appropriate trailer turn lamp(s). For stoplamps operation, the TTM senses the vehicle right rear stoplamps only, and when activated, the TTM will apply power to both trailer stoplamps. For tail lamp operation, the TTM senses the vehicle right rear lamp only, and when activated, the TTM will apply

power to the trailer tail lamps.

Switched System Power (SSP)

The SSP is invoked by both the FEM and REM. This function removes power from relays that provide power to the exterior lamps, interior lamps, and power door locks. This is only accomplished when both the FEM and the REM are in sleep mode. The sleep function of the FEM and REM places the modules in sleep mode when the ignition switch is in the OFF position, and no wake up (input) signals occur for 30 minutes. The module will not sleep if the parking lamps or the hazard lamps are active. The following relays are controlled by the SSP function: SSP1, SSP2, SSP3, and SSP4. When either the FEM or REM are not in sleep mode, all SSP relays will be energized. When energized, each relay will supply power to multiple features/functions. For additional information, go to the SSP Index for diagnosis and testing of SSP related concerns. Refer to [Headlamps](#).

Inspection and Verification

1. Verify the customer concern by operating the vehicle stoplamps, turn signals and rear lamps. If the vehicle exterior lamps do not operate correctly, refer to [Stoplamps](#), [Turn Signal and Hazard Lamps](#), or [Parking, Rear and License Lamps](#) in this section.
2. Visually inspect for obvious signs of mechanical and electrical damage.
3. If the vehicle exterior lamps operate correctly, verify the operation of the trailer stoplamps, turn signals and tail lamps.

Visual Inspection Chart

Mechanical	Electrical
<ul style="list-style-type: none"> ● Damaged TTM ● Damaged bulbs ● Damaged trailer tow (TT) relay ● Damaged or corroded wiring 	<ul style="list-style-type: none"> ● Battery junction box (BJB) Fuses: <ul style="list-style-type: none"> ■ 423 (30A) ■ 424 (30A) ■ 427 (30A) ■ 432 (30A) ● TTAJB fuses 433 (15A), 434 (15A)

4. If the concern remains after the inspection, proceed to Symptom Chart to continue diagnostics.

Symptom Chart


Symptom Chart

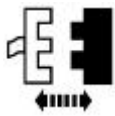
Condition	Possible Sources	Action
<ul style="list-style-type: none"> ● The power supply relay is inoperative — all SSP features 	<ul style="list-style-type: none"> ● Circuitry. ● Relay. ● FEM. ● REM. 	<ul style="list-style-type: none"> ● GO to Pinpoint Test I.
<ul style="list-style-type: none"> ● The power supply relay is inoperative — SSP1 	<ul style="list-style-type: none"> ● BJB Fuse 432 (30A). ● Circuitry. ● Relay. ● FEM. 	<ul style="list-style-type: none"> ● GO to Pinpoint Test J.

<ul style="list-style-type: none"> ● The power supply relay is inoperative — SSP2 	<ul style="list-style-type: none"> ● BJB Fuse 427 (30A). ● Circuitry. ● Relay. ● REM. 	<ul style="list-style-type: none"> ● GO to Pinpoint Test K.
<ul style="list-style-type: none"> ● The power supply relay is inoperative — SSP3 	<ul style="list-style-type: none"> ● BJB Fuse 424 (30A). ● Circuitry. ● Relay. ● FEM. ● REM. 	<ul style="list-style-type: none"> ● GO to Pinpoint Test L.
<ul style="list-style-type: none"> ● The power supply relay is inoperative — SSP4 	<ul style="list-style-type: none"> ● BJB Fuse 423 (30A). ● Circuitry. ● Relay. ● REM. 	<ul style="list-style-type: none"> ● GO to Pinpoint Test M.
<ul style="list-style-type: none"> ● The trailer lamps are inoperative—all 	<ul style="list-style-type: none"> ● TTAJB Fuses 433 (15A), 434 (15A). ● Bulbs. ● TT relay. ● Circuitry. ● TTM. 	<ul style="list-style-type: none"> ● GO to Pinpoint Test AX.
<ul style="list-style-type: none"> ● The trailer lamps are inoperative—rear lamps 	<ul style="list-style-type: none"> ● TTAJB Fuses 433 (15A), 434 (15A). ● Bulbs. ● Circuitry. ● TTM. 	<ul style="list-style-type: none"> ● GO to Pinpoint Test AY.
<ul style="list-style-type: none"> ● The trailer lamps are inoperative—any stop or turn lamp 	<ul style="list-style-type: none"> ● TTAJB Fuses 433 (15A), 434 (15A). ● Bulbs. ● Circuitry. ● TTM. 	<ul style="list-style-type: none"> ● GO to Pinpoint Test AZ.
<ul style="list-style-type: none"> ● The trailer lamps are always on—all 	<ul style="list-style-type: none"> ● Circuitry. ● TTM. 	<ul style="list-style-type: none"> ● GO to Pinpoint Test BA.

Pinpoint Tests

PINPOINT TEST AX: THE TRAILER LAMPS ARE INOPERATIVE — ALL

CONDITIONS	DETAILS/RESULTS/ACTIONS
<p>NOTE: It is necessary for the vehicle exterior lighting to be operating correctly. Repair any concerns with the vehicle rear exterior lighting before the diagnosis of the trailer tow module (TTM) and wiring is attempted.</p>	
<p>AX1 CHECK POWER TO THE TRAILER TOW RELAY</p>	
<p>1</p>  <p>2</p>	

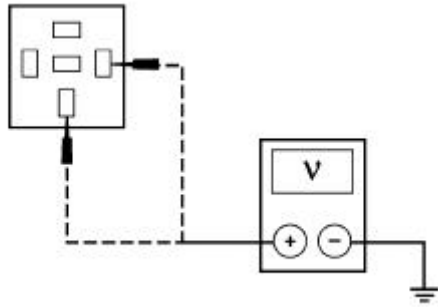


TT Relay C424

3



4



A0003277

4 Measure the voltage between TT relay C424 pin 86, circuit 29S-LF5A (OG/BU), harness side and ground; and between TT relay C424 pin 30, circuit 30-ND3 (RD), harness side and ground.

- Are the voltages greater than 10 volts?

→ Yes
GO to [AX2](#).

→ No
REPAIR the circuit in question. TEST the system for normal operation.

AX2 CHECK TRAILER TOW RELAY

1 Carry out the component test for TT relay. Refer to Wiring Diagrams Section 700-09.

- Does the relay pass the component test?

→ Yes
GO to [AX3](#).

→ No
INSTALL a new TT relay. TEST the system for normal operation.

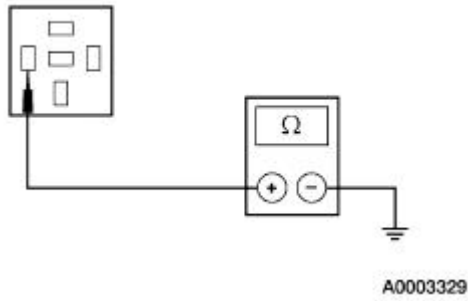
AX3 CHECK CIRCUIT 31-ND3 (BK)

1



2

2 Measure the resistance between TT relay C424 pin 85, circuit 31-ND3 (BK), harness side and ground.



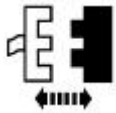
● **Is the resistance less than 5 ohms?**

→ **Yes**
REINSTALL the TT relay.GO to [AX4](#).

→ **No**
REPAIR the circuit. TEST the system for normal operation.

AX4 CHECK CIRCUIT 30S-DC1 (RD/BU) AND 30S-DC4 (RD/BU) FOR AN OPEN

1



TTAJB Fuse 433 (15A)

2



TTAJB Fuse 434 (15A)

3



4 Measure the voltage between TTAJB Fuse 433 (15A), circuit 30S-DC1 (RD/BU), input side and ground; and between TTAJB Fuse 434 (15A), circuit 30S-DC4 (RD/BU), input side and ground.

● **Are the voltages greater than 10 volts?**

→ **Yes**
REINSTALL the fuses.GO to [AX5](#).

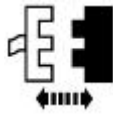
→ **No**
REPAIR the circuit in question. TEST the system for normal operation.

AX5 CHECK POWER TO THE TTM

1



2

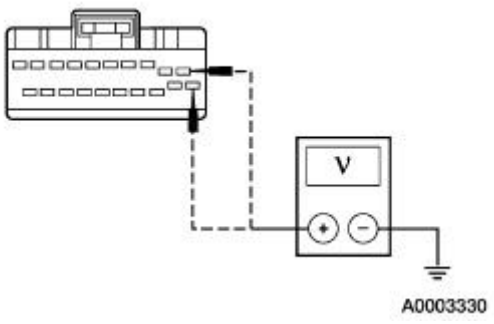


TTM C425

3



4



4 Measure the voltage between trailer tow module (TTM) C425 pin 11, circuit 30S-ND16B (RD/BU), harness side and ground; and between TTM C425 pin 1, circuit 30S-ND16A (RD/BU), harness side and ground.

• Are the voltages greater than 10 volts?

→ Yes
GO to [AX6](#).

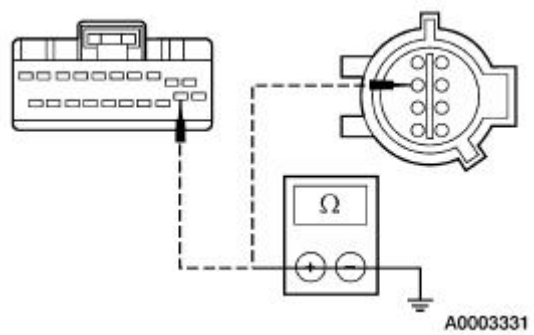
→ No
REPAIR the circuit in question. TEST the system for normal operation.

AX6 CHECK CIRCUIT 31-ND16 (BK) AND 99-ND9 (WH/BU) FOR AN OPEN

1



2

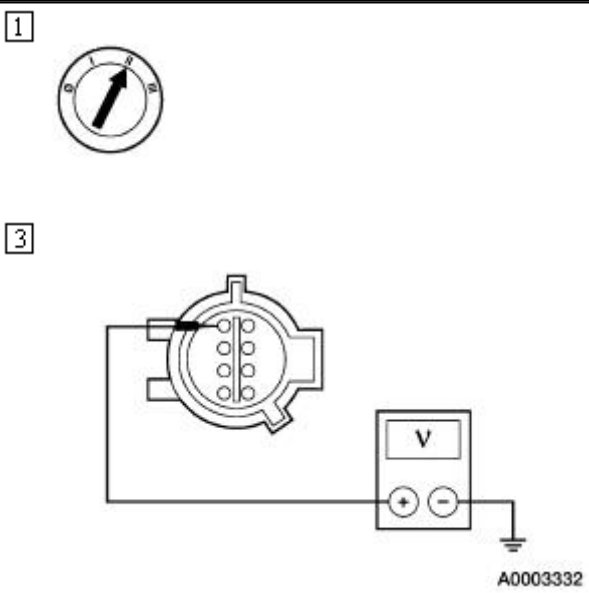



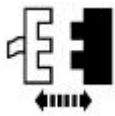
2 Measure the resistance between TTM C425 pin 12, circuit 31-ND16 (BK), harness side and ground; and between trailer harness C422 pin 7, circuit 99-ND9 (WH/BU), harness side and ground.

• Are the resistances less than 5 ohms?

	<p>→ Yes INSTALL a new TTM. TEST the system for normal operation.</p> <p>→ No REPAIR the circuit in question. TEST the system for normal operation.</p>
--	---

PINPOINT TEST AY: THE TRAILER LAMPS ARE INOPERATIVE — REAR LAMPS

CONDITIONS	DETAILS/RESULTS/ACTIONS
<p>NOTE: It is necessary for the vehicle exterior lighting to be operating correctly. Repair any concerns with the vehicle rear exterior lighting before the diagnosis of the trailer tow module (TTM) and wiring is attempted.</p>	
<p>AY1 CHECK TTM OUTPUT</p>	
<p>1</p>  <p>3</p>	<p>2 Turn the parking lamps on.</p> <p>3 Measure the voltage between trailer harness C422 pin 8, circuit 87-ND29 (BN/BU), harness side and ground.</p> <p>● Is the voltage greater than 10 volts?</p> <p>→ Yes The system is OK. REPAIR the trailer harness. TEST the system for normal operation.</p> <p>→ No GO to AY2.</p>
<p>AY2 CHECK POWER TO TRAILER TOW MODULE</p>	
<p>1</p>  <p>2</p>	



TTAJB Fuse 434 (15A)

3



4 Measure the voltage between TTAJB Fuse 434 (15A), circuit 30S-DC4 (RD/BU), input side and ground.

• Is the voltage greater than 10 volts?

→ Yes
REINSTALL the fuse.GO to [AY3](#).

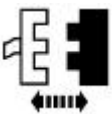
→ No
REPAIR the circuit. TEST the system for normal operation.

AY3 CHECK POWER TO TTM

1



2

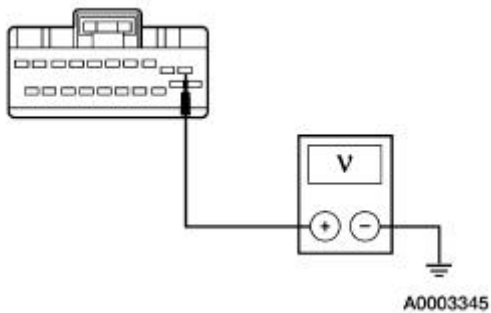


TTM C425

3



4



4 Measure the voltage between TTM C425 pin 1, circuit 30S-ND16A (RD/BU), harness side and ground.

• Is the voltage greater than 10 volts?

→ Yes
GO to [AY4](#).

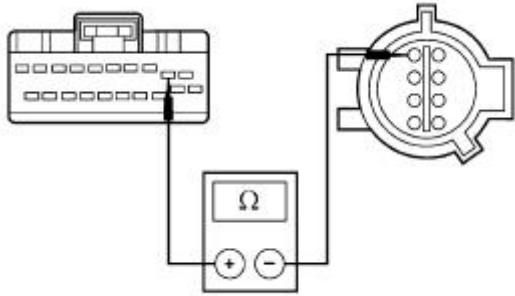
→ **No**
REPAIR the circuit. TEST the system for normal operation.

AY4 CHECK CIRCUIT 87-ND29 (BN/BU) FOR AN OPEN

1



2



A0003333

2 Measure the resistance between TTM C425 pin 2, circuit 87-ND29 (BN/BU), harness side and trailer harness C422 pin 8, circuit 87-ND29 (BN/BU), harness side.

● Is the resistance less than 5 ohms?

→ **Yes**
GO to [AY5](#).

→ **No**
REPAIR the circuit. TEST the system for normal operation.

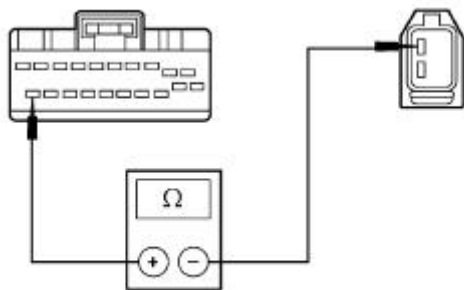
AY5 CHECK CIRCUIT 31S-ND22 (BK/WH) FOR AN OPEN

1



RR Lamp C415

2



A0003334





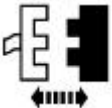
2 Measure the resistance between TTM C425 pin 19, circuit 31S-ND22 (BK/WH), harness side and RR lamp C415 pin 2, circuit 31S-LF20 (BK/OG), harness side.

● Is the resistance less than 5 ohms?

→ **Yes**
INSTALL a new TTM. TEST the system for normal operation.

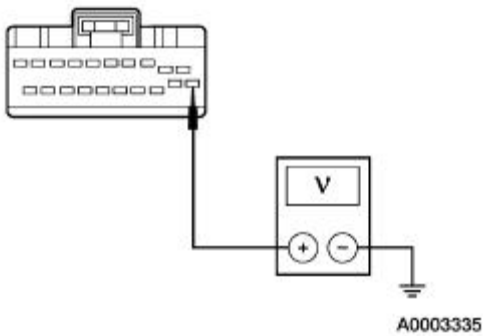
→ **No**
REPAIR the circuit. TEST the system for normal operation.

PINPOINT TEST AZ: THE TRAILER LAMPS ARE INOPERATIVE — ANY STOP OR TURN LAMP

CONDITIONS	DETAILS/RESULTS/ACTIONS
<p>NOTE: It is necessary for the vehicle exterior lighting to be operating correctly. Repair any concerns with the vehicle rear exterior lighting before the diagnosis of the trailer tow module (TTM) and wiring is attempted.</p>	
<p>AZ1 CHECK POWER TO TTAJB</p>	
<p>1 </p> <p>2  TTAJB Fuse 433 (15A)</p> <p>3 </p>	<p>4 Measure the voltage between TTAJB Fuse 433 (15A), circuit 30S-ND16B (RD/BU), input side and ground.</p> <ul style="list-style-type: none"> ● Is the voltage greater than 10 volts? <p>→ Yes REINSTALL the fuse.GO to AZ2.</p> <p>→ No REPAIR the circuit. TEST the system for normal operation.</p>
<p>AZ2 CHECK POWER TO TTM</p>	
<p>1 </p> <p>2  TTM C425</p> <p>3</p>	



4



4 Measure the voltage between TTM C425 pin 11, circuit 30S-ND16B (RD/BU), harness side and ground.

● Is the voltage greater than 10 volts?

→ **Yes**
GO to [AZ3](#).

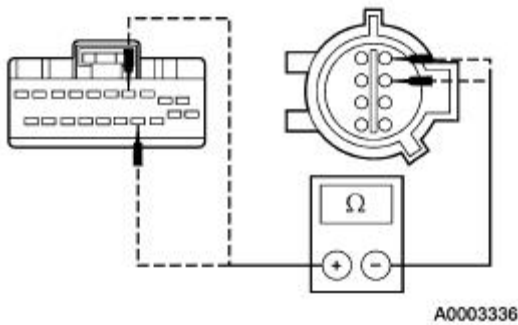
→ **No**
REPAIR the circuit. TEST the system for normal operation.

AZ3 CHECK CIRCUITS 96-ND31 (GN/BU) AND 88-ND28 (YE) FOR AN OPEN

1



2



2 Measure the resistance between TTM C425 pin 14, circuit 96-ND31 (GN/BU), harness side; and trailer harness C422 pin 4, circuit 96-ND31 (GN/BU), harness side and between TTM C425 pin 4, circuit 88-ND28 (YE), harness side and trailer harness C422 pin 3, circuit 88-ND28 (YE), harness side.

● Are the resistances less than 5 ohms?

→ **Yes**
GO to [AZ4](#).

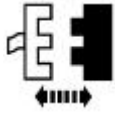
→ **No**
REPAIR the circuit in question. TEST the system for normal operation.

AZ4 CHECK CIRCUIT 31S-ND19 (BK/BU), 31S-ND18 (BK/YE), AND 31S-ND21 (BK/OG)

1

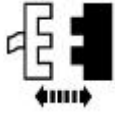


2



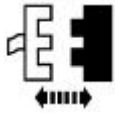
RR Turn Lamp C416

3



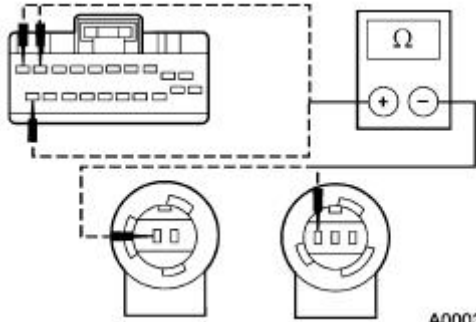
LR Turn Lamp C413

4



RR Stop/Rear Lamp C414

5



A0003337

5

Measure the resistance between TTM C425 pin 10, circuit 31S-ND19 (BK/BU), harness side and RR turn lamp C416 pin 1, circuit 31S-LG12 (BK/YE), harness side and between TTM C425 pin 9, circuit 31S-ND18 (BK/YE), harness side and LR turn lamp C413 pin 1, circuit 31S-LG12 (BK/YE), harness side and between TTM C425 pin 20, circuit 31S-ND21 (BK/OG), harness side and RR stop/rear lamp C414 pin 1, circuit 31S-LG14 (BK/OG), harness side.

- Are the resistances less than 5 ohms?

→ **Yes**
INSTALL a new TTM. TEST the system for normal operation.

→ **No**
REPAIR the circuit in question. TEST the system for normal operation.

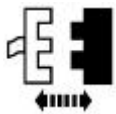
PINPOINT TEST BA: THE TRAILER LAMPS ARE ALWAYS ON — ALL

CONDITIONS	DETAILS/RESULTS/ACTIONS
<p>NOTE: It is necessary for the vehicle exterior lighting to be operating correctly. Repair any concerns with the vehicle rear exterior lighting before the diagnosis of the trailer tow module (TTM) and wiring is attempted.</p>	
<p>BA1 CHECK POWER TO TTM</p>	

1



2



TTM C425

● **Do the trailer lamps turn off?**

→ **Yes**

INSTALL a new TTM. TEST the system for normal operation.

→ **No**

The system is OK. REPAIR the trailer wiring harness. TEST the system for normal operation.

Headlamp Adjustment

Headlamp Aiming

1. The headlamp aiming procedure depends on the type of beam pattern the headlamp is equipped with. Vehicles may come equipped with visual optical right (VOR), visual optical left (VOL), or SAE only (includes sealed beam type) headlamps. To identify the headlamp beam pattern, look on the headlamp lens. Molded in small letters on the headlamp lens is one of the following:
 - SAE
 - VOR or SAE
 - VOL or SAE
2. Once the headlamp beam pattern is identified, aim the headlamps using one of the following methods as applicable.
 - Photometric aimers can aim SAE, VOR and VOL type headlamps. This is the preferred method of headlamp aiming.
 - Visual or screen method aiming can be used to aim SAE, VOR and VOL type headlamps.
 - Mechanical aimers can be used only with SAE type headlamps. Lamps that can be aimed mechanically will have three nibs molded into the lens of the lamp.

Photometric Aiming

1. For the photometric aiming procedure, refer to the appropriate photometric headlamp aimer instruction manual.

Screen Method Aiming

All headlamp types

NOTE: Horizontal aim is not necessary for VOR or VOL headlamps.

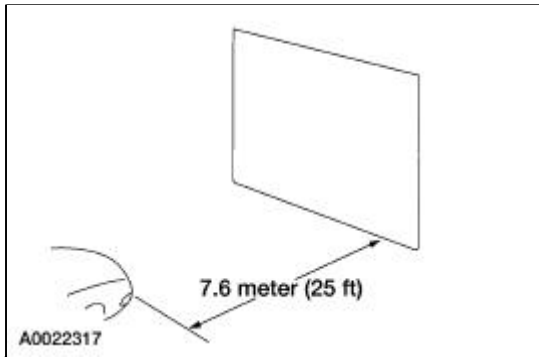
NOTE: Consult your state vehicle inspection manual for recommended tolerance ranges for visual aiming.

NOTE: The sight shield may need to be positioned or removed for access to the adjusters.

1. Before starting headlamp adjustment:
 - Check the tire inflation.
 - Check that no other load is in the vehicle other than a half tank of fuel.
 - Check that the headlamps are clean.
 - Check for correct headlamp operation.

- Check that the vehicle is on level ground.
 - If the vehicle is equipped with air suspension, make sure that the switch is on.
2. **NOTE:** The vertical wall or screen must be a minimum of 2.4 meters (8 feet) wide.

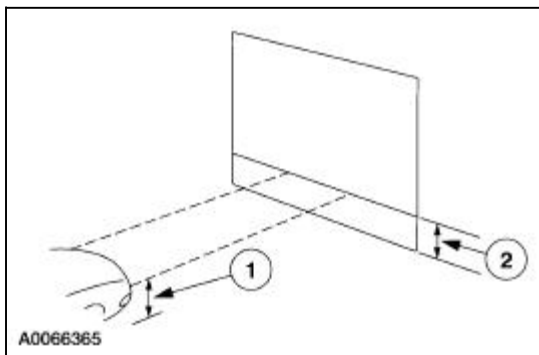
Park the vehicle on a level surface approximately 7.6 meters (25 feet) from the vertical wall or screen directly in front of it.



3. **NOTE:** The center of the lamp is marked by a 3 mm (0.12 in) circle on the headlamp lens.

Mark a horizontal reference line on the vertical wall or screen.

1. Measure the center of the headlamp height to ground and record.
2. Make a 2.4 meter (8 foot) horizontal mark (masking tape) on the vertical wall or screen at the same distance from the ground as previously recorded.



4. **NOTE:** This procedure should be done in a dark environment to effectively see the headlamp beam pattern.

Turn on the low beam headlamps to illuminate the wall or screen and open the hood.

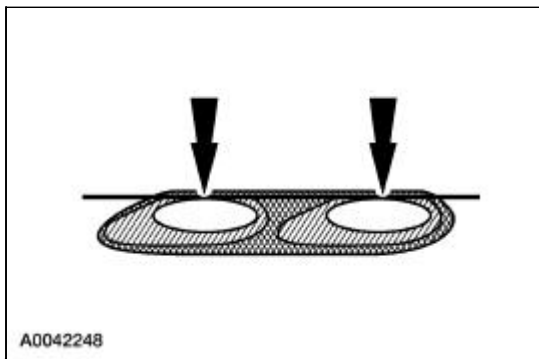
5. **NOTE:** For SAE type headlamps, the appearance of the beam pattern may vary between vehicles.

On the wall or screen, locate the high intensity area of the beam pattern. Place the top edge of the high intensity zone even with the horizontal reference line.

VOR type headlamps

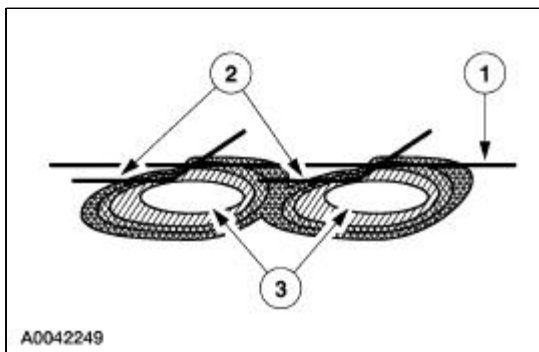
6. **NOTE:** The appearance of the VOR beam pattern may vary between vehicles.

Identify at the top edge of this high intensity area a distinct horizontal cutoff in the beam pattern. If the top edge of this cutoff is not even with the horizontal reference line, the headlamp beam will need to be adjusted.



VOL type headlamps

7. For VOL type headlamps, there will be a distinct cutoff in the left portion of the beam pattern.
The edge of this cutoff should be positioned 50.2 mm (2 in) below the horizontal reference line.
 1. Horizontal reference line.
 2. Top edge of the beam pattern.
 3. High intensity zone.




Mechanical Aiming

1. For the mechanical aiming procedure, refer to the appropriate mechanical headlamp aimer instruction manual.
-

Bulb —Headlamp

Removal and Installation

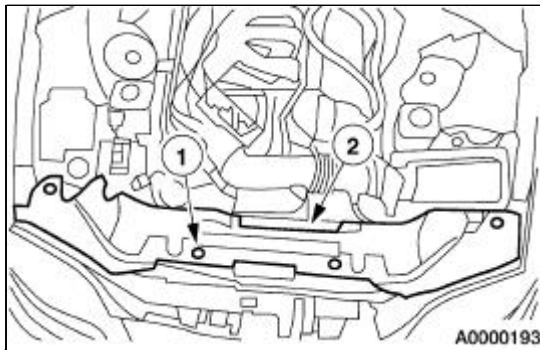
1.  **WARNING:** The halogen bulb contains gas under pressure. The bulb may shatter if the glass envelope is scratched or if the bulb is dropped. Handle the bulb only by its base. Avoid touching the glass envelope.

NOTE: The headlamp bulb should not be removed from the headlamp assembly until just before a replacement bulb is installed. Removing the bulb for an extended period of time may affect headlamp bulb performance. Contaminants may enter the headlamp assembly where they can settle on the lens and reflector. Never turn on the headlamps with the bulb removed.

NOTE: Make sure that the headlamp switch and the ignition switch are in the OFF position.

Remove the radiator upper sight shield.

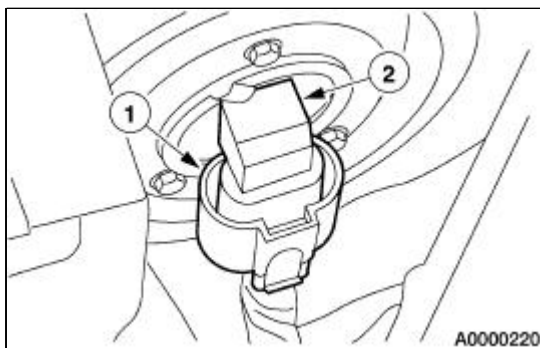
1. Remove the pin-type retainers.
2. Remove the radiator upper sight shield.



2. **NOTE:** Remove both the high and low beam headlamp bulbs in the same way.

Remove the headlamp bulb.


1. Disconnect the electrical connector.
2. Remove the headlamp bulb.



3. To install, reverse the removal procedure.

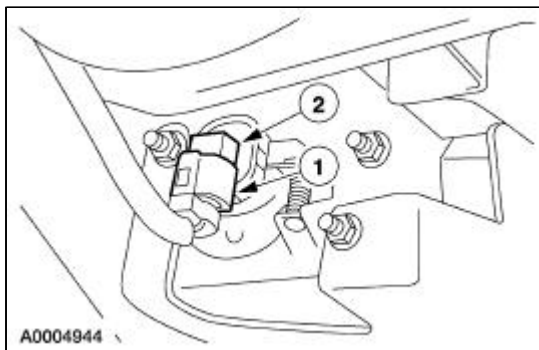
Bulb —Fog Lamp

Removal and Installation

1.  **WARNING:** The halogen fog lamp bulb contains gas under pressure. The bulb may shatter if the glass envelope is scratched or if the bulb is dropped. Handle the bulb only by its base. Avoid touching the glass envelope.

Raise and support the vehicle. For additional information, refer to [Section 100-02](#).

2. Remove the fog lamp bulb.
 1. Disconnect the electrical connector.
 2. Remove the fog lamp bulb.



3. To install, reverse the removal procedure.
-

Lamp Assembly —Headlamp

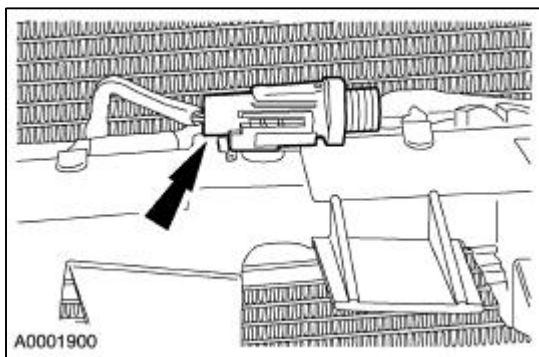
Removal and Installation

⚠ WARNING: The halogen fog lamp bulb contains gas under pressure. The bulb may shatter if the glass envelope is scratched or if the bulb is dropped. Handle the bulb only by its base. Avoid touching the glass envelope.

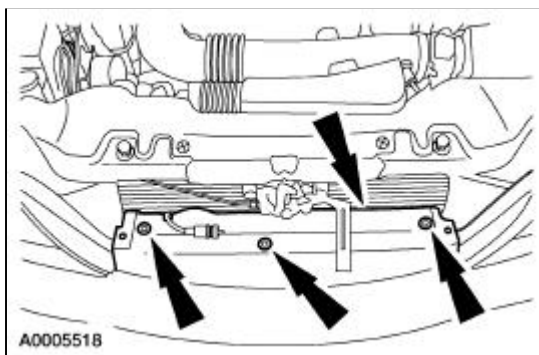
NOTE: The headlamp bulb should not be removed from the headlamp assembly until just before a replacement bulb is installed. Removing the bolt for an extended period of time may affect headlamp bulb performance. Contaminants may enter the headlamp assembly where they can settle on the lens and reflector. Never turn on the headlamps with the bulb removed.

1. **NOTE:** Make sure that the headlamp switch and the ignition switch are in the OFF position.

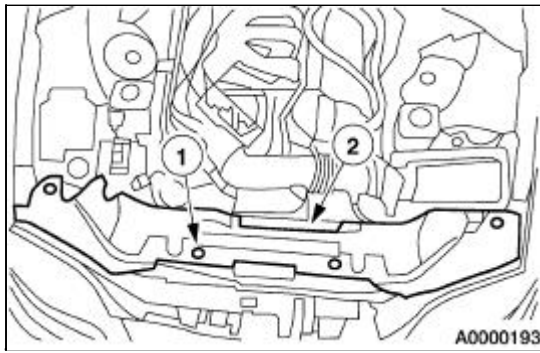
Release the ambient air temperature sensor.



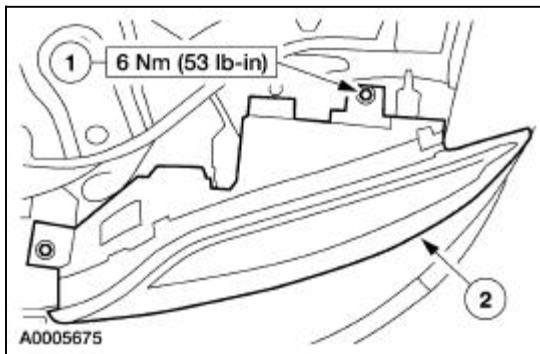
2. Remove the radiator grille opening cover at the top shelf of the bumper.



3. Remove the radiator upper sight shield.
 1. Remove the pin-type retainers.
 2. Remove the radiator upper sight shield.




4. Position the headlamp assembly for removal.
 1. Remove the three bolts.
 2. Position the headlamp assembly for removal.
 - Disconnect the electrical connectors and remove the headlamp assembly.



5. To install, reverse the removal procedure.
 - If necessary, install new bulbs.
 - If necessary, adjust the headlamps. For additional information, refer to [Headlamp Adjustment](#) in this section.
-

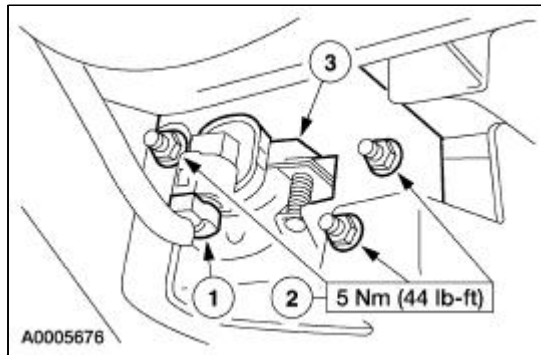
Lamp Assembly —Fog Lamp

Removal and Installation

1.  **WARNING:** The halogen fog lamp bulb contains gas under pressure. The bulb may shatter if the glass envelope is scratched or if the bulb is dropped. Handle the bulb only by its base. Avoid touching the glass envelope.

Raise and support the vehicle. For additional information, refer to [Section 100-02](#).

2. Remove the fog lamp assembly.
 1. Disconnect the electrical connector.
 2. Remove the nuts.
 3. Remove the fog lamp assembly.
 - If necessary, install a new bulb.

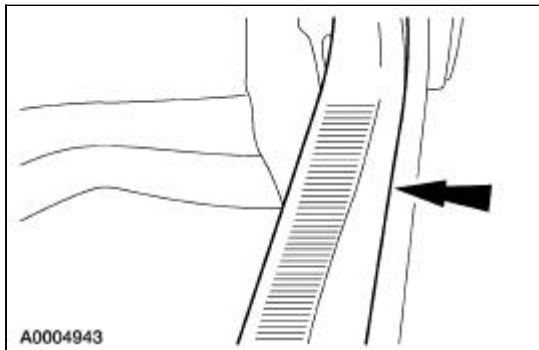


3. To install, reverse the removal procedure.

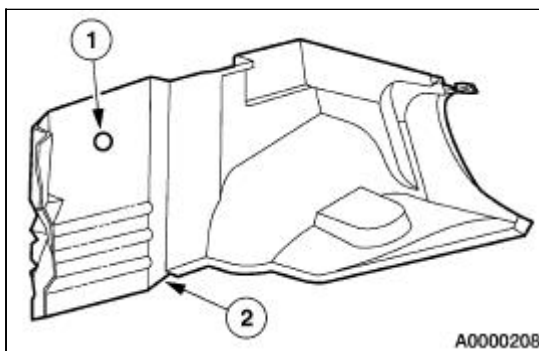
Lamp Assembly —Stoplamp

Removal and Installation

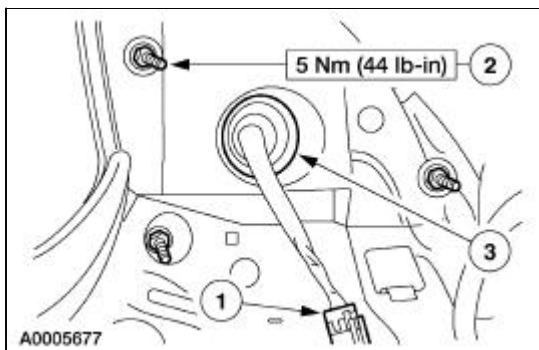
1. Remove the luggage compartment scuff plate.
 - Pull to unsnap.



2. Position the luggage compartment side trim panel aside.
 1. Remove the pin-type retainers.
 2. Position the luggage compartment side trim panel aside.



3. Remove the stoplamp assembly.
 1. Disconnect the electrical connector.
 2. Remove the three nuts.
 3. Push the rubber grommet through the sheet metal and remove the stoplamp assembly.
 - If necessary, install new bulbs.

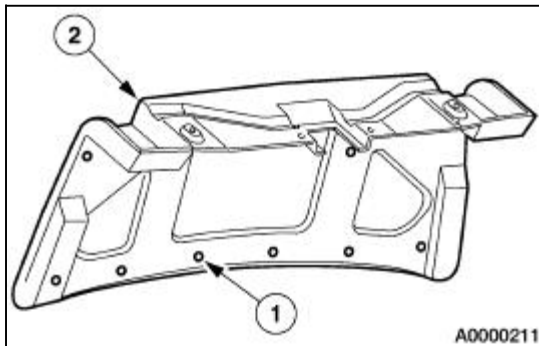


4. To install, reverse the removal procedure.

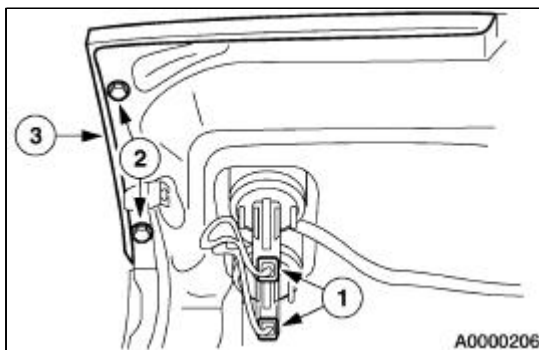
Lamp Assembly —Rear

Removal and Installation

1. Remove the luggage compartment door trim panel.
 1. Remove the 13 pin-type retainers.
 2. Remove the luggage compartment door trim panel.




2. Remove the rear lamp assembly.
 1. Disconnect the electrical connectors.
 2. Remove the nuts.
 3. Remove the rear lamp assembly.
 - If necessary, install new bulbs.



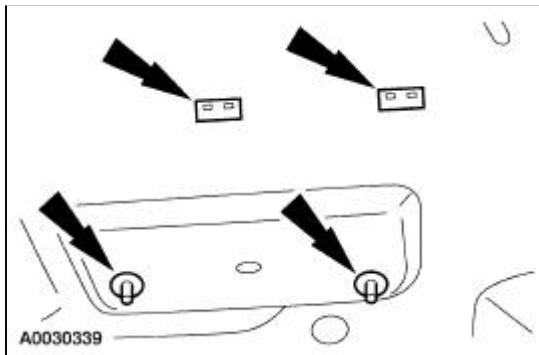
3. To install, reverse the removal procedure.

Lamp Assembly —High Mounted Stoplamp

Removal and Installation

1. Remove the carpeted package tray trim panel. For additional information, refer to [Section 501-05](#).
2. If equipped, remove the subwoofer enclosure. For additional information, refer to [Section 415-03](#).
3.  **CAUTION: Exercise care not to break the locator pins, which are positioned on the high mounted stoplamp assembly at the rear of the vehicle.**

Depress the two retaining tabs from the inside of the luggage compartment.

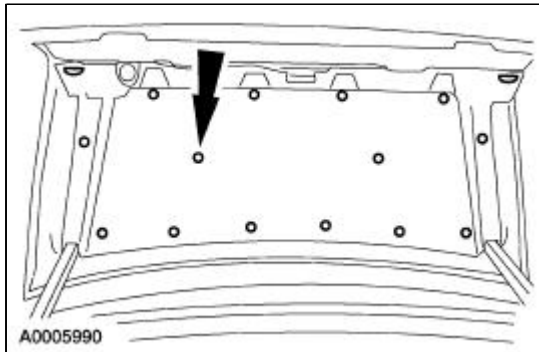


4. Lift the high mounted stoplamp up to clear the locator pins and remove the stoplamp assembly.
5. To install, reverse the removal procedure.

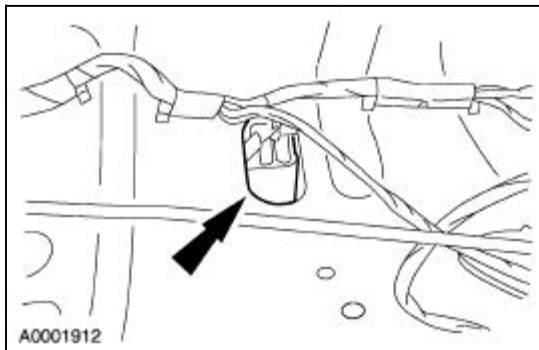
License Plate Lamp

Removal and Installation

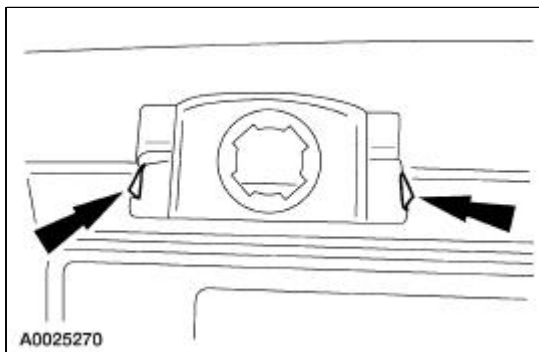
1. If necessary, remove the license plate.
2. Remove the pin-type retainers and the luggage compartment lid trim panel.



3. Disconnect the license plate lamp electrical connector.



4. Remove the lamp socket from the license plate lamp.
5. Using a suitable tool, through the access hole, release the clips and remove the license plate lamp.

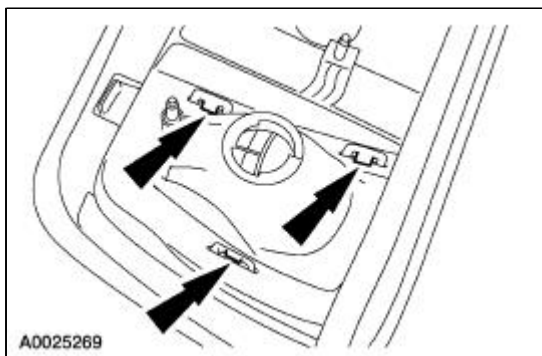


6. To install, reverse the removal procedure.

Reversing Lamp

Removal and Installation

1. Remove the license plate housing. For additional information, refer to section [Section 501-08](#).
2. Release the clips and remove the reversing lamp.

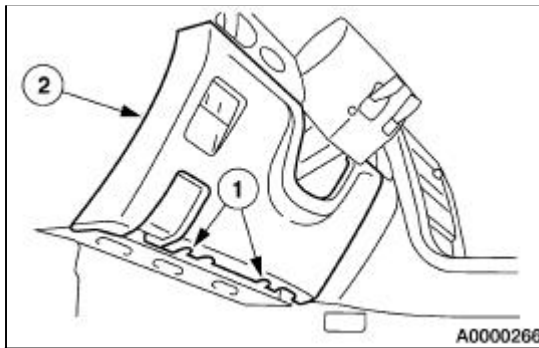


3. To install, reverse the removal procedure.
-

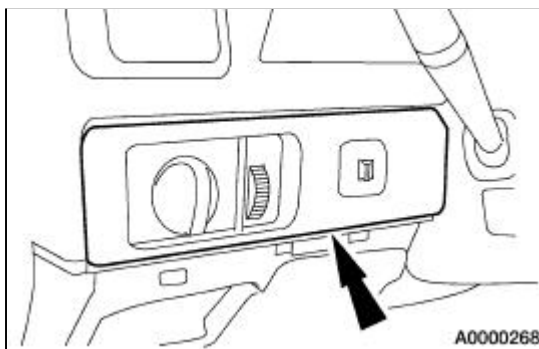
Lamp Switch —Headlamp

Removal and Installation

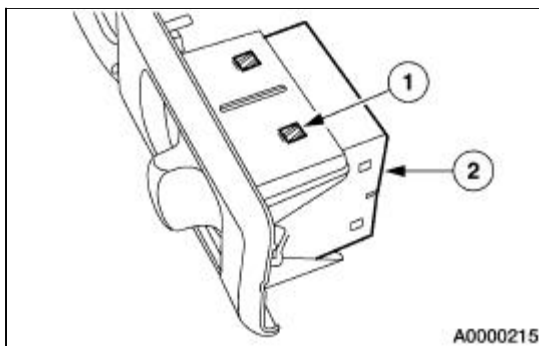
1. Disconnect the battery ground cable. Refer to [Section 414-01](#).
2. Remove the instrument panel steering column cover.
 1. Remove the screws.
 2. Remove the instrument panel steering column cover.
 - Disconnect the electrical connectors.



3. Remove the outer instrument panel finish panel.
 - Disconnect the electrical connector.



4. Remove the headlamp switch.
 1. Release the four retaining clips.
 2. Remove the headlamp switch.

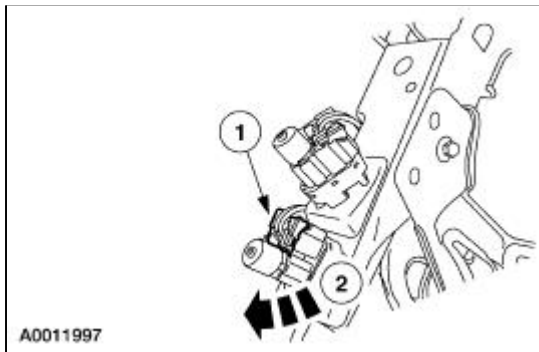


5. To install, reverse the removal procedure.

Lamp Switch —Brake Pedal Position (BPP)

Removal

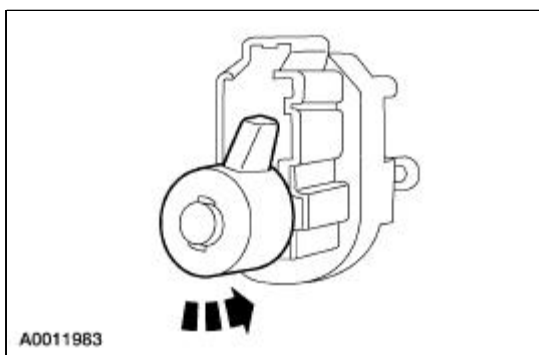
1. Remove the instrument panel insulator.
 - Disconnect electrical connector.
2. Remove the brake pedal position (BPP) switch.
 1. Disconnect the electrical connector.
 2. Remove the BPP switch.



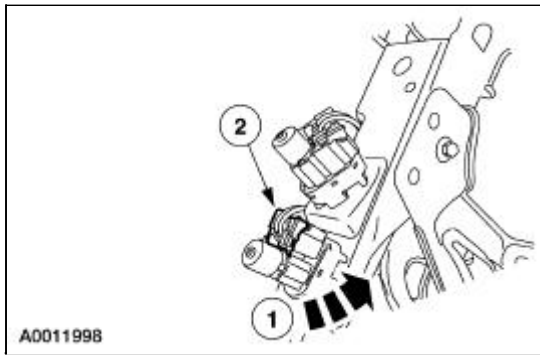
Installation

⚠ CAUTION: Initial installation of a brake pedal position (BPP) switch allows for one adjustment. If additional adjustments are required, install a new switch.

1. Rotate the lock knob counterclockwise to the stop to unlock.



2. With the engine running, fully depress and hold the brake pedal.
3. Install the BPP switch.
 1. Position the BPP switch in the bracket and rotate counterclockwise.
 2. Connect the electrical connector.

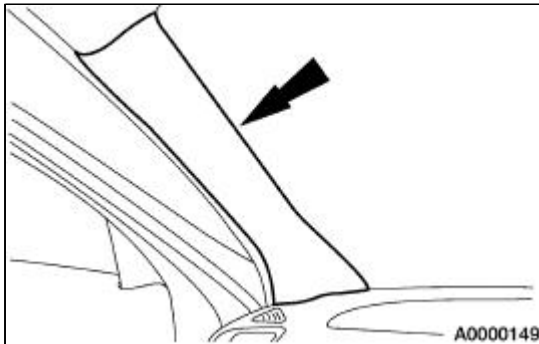


4. Slowly release the brake pedal.
-

Photocell and Amplifier —Light Sensor

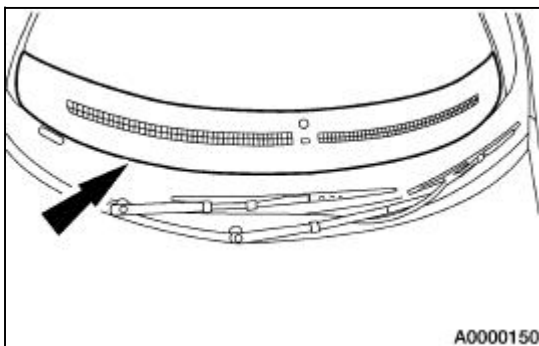
Removal and Installation

1. Disconnect the battery ground cable. Refer to [Section 414-01](#).
2. Remove the RH and LH windshield side garnish mouldings.

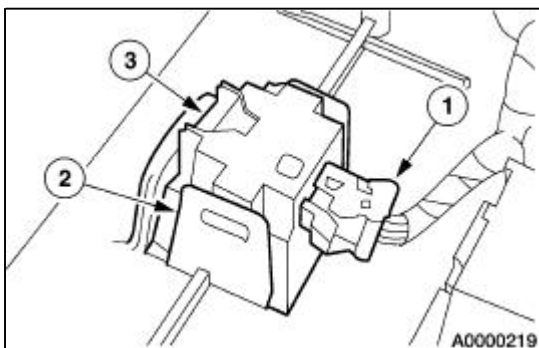


3.  **CAUTION:** To avoid damaging the photocell and amplifier electrical connector, lift the instrument panel defroster opening grille assembly only enough to expose the connector.

Remove the instrument panel defroster opening grille assembly.



4. Remove the photocell and amplifier.
 1. Disconnect the electrical connector.
 2. Release the two retaining clips.
 3. Remove the photocell and amplifier.



5. To install, reverse the removal procedure.

Interior Lighting



The interior lighting system consists of:

- driver and passenger front door lamp (integral to the door trim panel)
 - left and right instrument panel lamps
 - rear dome lamp (integral to the headliner)
 - left and right front map lamps (integral to the headliner)
 - rear map lamps
 - deck lid lamp
 - glove box lamp
 - inside console lamp
 - driver and passenger vanity lamp
-

Interior Lighting

Refer to Wiring Diagrams Section [417-02](#) for schematic and connector information.

Special Tool(s)

 ST1137-A	73III Automotive Meter 105-R0057
 ST1217-A	New Generation STAR (NGS) Tester or equivalent 418-F048 (007-00500)

Principles of Operation

NOTE: The front electronic module (FEM), rear electronic module (REM), and driver door module (DDM) must all be reconfigured before installing a new module. REFER to [Section 418-01](#).

The vehicle's electronic functions are divided into zones. The FEM controls the front portion of the vehicle and the REM controls the rear portion of the vehicle. These systems rely heavily on the standard corporate protocol (SCP) communication network in order to transmit and receive signals. As a technician, it is very important to understand:

- where the input (command) originates from.
- all information (messages) necessary in order for a feature to operate.
- which module(s) receive(s) the input or command message.
- whether the module which received the input (message) controls the output of the feature, or whether it outputs a message over the SCP communication network to another module.
- which module controls the output of the feature.

FEM Operation

This system is unique in that many of the inputs the FEM receives are delivered via the SCP communication network. These input messages come from other modules connected to the network, such as the REM, DDM, and instrument cluster. The FEM will interpret the inputs and, in turn, command the correct output. The FEM also receives inputs which come directly from components which are hardwired to the module, such as the passenger door ajar switch.

Interior Lighting

The FEM controls the outputs to all interior lighting. The interior lamps include: courtesy lamps, dome lamps, and map lamps. The lamps will be illuminated if the driver or front passenger door is ajar. The

switches are hardwired to the FEM. When any of the two doors are opened, the FEM will command the interior lamps through the SCP network to the FEM. The right and left rear ajar switches are hardwired to the REM. When any of these doors are ajar, the REM will send a command through the SCP network, to the FEM. The FEM will command the appropriate interior lamps on.

The FEM also handles the grounds for the glove box and the visor lamps. Fault management of the interior lamps will provide limited functionality in the event of certain dome or lighting mode inputs, vehicle speed or ignition switch failures. All interior lighting is powered by the switched system power (SSP) feature (refer to Switched System Power). A failure of any or all of the SSP feature(s) could cause inoperative interior lighting. When diagnosing the interior lighting, it is essential to determine if all relative symptoms and DTCs are controlled by the SSP feature.

Switched System Power (SSP)

The SSP is invoked by both the FEM and REM. This function removes power from relays that provide power to the exterior lamps, interior lamps, and power door locks. This is only accomplished when both the FEM and the REM are in sleep mode. The sleep function of the FEM and REM places the modules in sleep mode when the ignition switch is in the OFF position, and no wake up (inputs) signals occur for 30 minutes. The module will not sleep if the parking lamps or the hazard lamps are active. The following relays are controlled by the SSP function: SSP1, SSP2, SSP3, and SSP4. When either the FEM or REM are not in sleep mode, all SSP relays will be energized. Each relay, when energized, will supply power to multiple features/functions. For additional information, refer to the SSP Relay Index for diagnosis and testing of SSP-related issues.

Inspection and Verification

1. Verify the customer concern by operating the system.
2. Visually inspect for obvious signs of mechanical and electrical damage.

Visual Inspection Chart

Electrical
<ul style="list-style-type: none">● Wiring harness● Loose or corroded connections● Battery junction box (BJB) Fuses:<ul style="list-style-type: none">■ 404 (10A)■ 405 (10A)■ 422 (20A)■ 425 (40A)■ 423 (30A)■ 424 (30A)■ 430 (30A)■ 431 (30A)● Central junction box (CJB) Fuses:<ul style="list-style-type: none">■ 207 (5A)■ 220 (10A)■ 222 (10A)■ 235 (5A)● Lamp(s)● Relay(s)● Headlamp switch● Instrument cluster● Dimmer switch● FEM● REM● DDM

3. If the concern remains after the inspection, connect the New Generation STAR (NGS) Tester to the data link connector (DLC) located beneath the instrument panel and select the vehicle to be tested from the NGS Tester menu. If the NGS Tester does not communicate with the vehicle:
 - Check that the program card is correctly installed.
 - Check the connections to the vehicle.
 - Check the ignition switch position.
4. If the NGS Tester still does not communicate with the vehicle, refer to the New Generation STAR Tester manual.
5. Carry out the DATA LINK DIAGNOSTICS test. If the NGS Tester responds with:
 - CKT914, CKT915 or CKT70 =ALL ECUS NO RESP/NOT EQUIP, refer to [Section 418-00](#).
 - NO RESP/NOT EQUIP for FEM, go to Pinpoint Test A.
 - NO RESP/NOT EQUIP for REM, go to Pinpoint Test B.
 - NO RESP/NOT EQUIP for DDM, go to Pinpoint Test C.
 - SYSTEM PASSED, retrieve and record the continuous diagnostic trouble codes (DTCs), erase the continuous DTCs and carry out self-test diagnostics for the FEM.
6. If the DTCs retrieved are related to the concern, go to FEM Diagnostic Trouble Code (DTC) Index or REM Diagnostic Trouble Code (DTC) Index.
7. If no DTCs related to the concern are retrieved, proceed to Symptom Chart to continue diagnostics.

FEM Diagnostic Trouble Code (DTC) Index

DTC	Description	Source	Action
B1319	Driver Door Ajar Circuit Failure	FEM	GO to Pinpoint Test F .
B1327	Passenger Door Ajar Circuit Failure	FEM	GO to Pinpoint Test F .
B1342	ECU Is Defective	FEM	CLEAR the DTC. REPEAT the FEM self-test. If DTC B1342 is retrieved, INSTALL a new FEM. REFER to Section 419-10 .
B1438	Wiper Mode Select Switch Circuit Failure	FEM	REFER to Section 501-16 .
B1446	Wiper Park Sense Circuit Failure	FEM	REFER to Section 501-16 .
B1479	Wiper Washer Fluid Level Sensor Circuit Failure	FEM	REFER to Section 413-01 .
B1499	Lamp Turn Signal Left Circuit Failure	FEM	REFER to Section 417-01 .
B1501	Lamp Turn Signal Left Circuit Short to Battery	FEM	REFER to Section 417-01 .
B1503	Lamp Turn Signal Right Circuit Failure	FEM	REFER to Section 417-01 .
B1505	Lamp Turn Signal Right Circuit Short to Battery	FEM	REFER to Section 417-01 .

B1519	Hood Switch Circuit Failure	FEM	REFER to Section 419-01A .
B1567	Lamp Headlamp High Beam Circuit Failure	FEM	REFER to Section 417-01 .
B1676	Battery Pack Voltage Out of Range	FEM	REFER to Section 414-00 .
B1794	Lamp Headlamp Low Beam Circuit Failure	FEM	REFER to Section 417-01 .
B2214	Window Passenger Front Up Switch Short to Battery	FEM	REFER to Section 501-11 .
B2215	Window Passenger Front Down Switch Short to Battery	FEM	REFER to Section 501-11 .
B2312	Mirror Passenger Horizontal Feedback Potentiometer Circuit Failure	FEM	REFER to Section 501-09 .
B2316	Mirror Passenger Vertical Feedback Potentiometer Circuit Failure	FEM	REFER to Section 501-09 .
B2477	Module Configuration Failure	FEM	REFER to Section 418-01 .
C1284	Oil Pressure Switch Failure	FEM	REFER to Section 413-01 .
C1446	Brake Switch Circuit Failure	FEM	REFER to Section 413-01 .
C1924	VAPS Solenoid Actuator Output Circuit Short to Ground	FEM	REFER to Section 211-00 .
C1925	VAPS Solenoid Actuator Return Circuit Failure	FEM	REFER to Section 211-00 .
U1027	SCP (J1850) Invalid or Missing Data for Engine RPM	PCM	CARRY OUT the PCM self-test. REFER to Powertrain Control/Emissions Diagnosis (PC/ED) manual.
U1041	SCP (J1850) Invalid or Missing Data for Vehicle Speed	ABS	CARRY OUT the ABS self-test. REFER to Section 206-09A , Section 206-09B , or Section 206-09C .
U1059	SCP (J1850) Invalid or Missing Data for Transmission / Transaxle / PRNDL	PCM	CARRY OUT the PCM self-test. REFER to Powertrain Control/Emissions Diagnosis (PC/ED) manual..
U1218	SCP (J1850) Invalid or Missing Data for External Lamps	ICM	CARRY OUT the ICM self-test. REFER to Section 413-01 .
U1222	SCP (J1850) Invalid or Missing Data for Interior Lamps	ICM	CARRY OUT the ICM self-test. REFER to Section 413-01 .
U1227	SCP (J1850) Invalid or Missing Data for Body Status Request	ICM	CARRY OUT the ICM self-test. REFER to Section 413-01 .

FEM Parameter Identification (PID) Index

PID	Description	Expected Value
AL_EVT1	Last 8 Alarm Events	DROPEN, HOODTR, IGNTAM, PANIC, T_AJAR, RR_SD, LR_SD, P_DOOR, D_DOOR, RADIO, WINDO, ULTRS, NOEVNT, BB_SND
AL_EVT2	Last 8 Alarm Events	DROPEN, HOODTR, IGNTAM, PANIC, T_AJAR, RR_SD, LR_SD, P_DOOR, D_DOOR, RADIO, WINDO, ULTRS, NOEVNT, BB_SND

AL_EVT3	Last 8 Alarm Events	DROPEN, HOODTR, IGNTAM, PANIC, T_AJAR, RR_SD, LR_SD, P_DOOR, D_DOOR, RADIO, WINDO, ULTRS, NOEVNT, BB_SND
AL_EVT4	Last 8 Alarm Events	DROPEN, HOODTR, IGNTAM, PANIC, T_AJAR, RR_SD, LR_SD, P_DOOR, D_DOOR, RADIO, WINDO, ULTRS, NOEVNT, BB_SND
AL_EVT5	Last 8 Alarm Events	DROPEN, HOODTR, IGNTAM, PANIC, T_AJAR, RR_SD, LR_SD, P_DOOR, D_DOOR, RADIO, WINDO, ULTRS, NOEVNT, BB_SND
AL_EVT6	Last 8 Alarm Events	DROPEN, HOODTR, IGNTAM, PANIC, T_AJAR, RR_SD, LR_SD, P_DOOR, D_DOOR, RADIO, WINDO, ULTRS, NOEVNT, BB_SND
AL_EVT7	Last 8 Alarm Events	DROPEN, HOODTR, IGNTAM, PANIC, T_AJAR, RR_SD, LR_SD, P_DOOR, D_DOOR, RADIO, WINDO, ULTRS, NOEVNT, BB_SND
AL_EVT8	Last 8 Alarm Events	DROPEN, HOODTR, IGNTAM, PANIC, T_AJAR, RR_SD, LR_SD, P_DOOR, D_DOOR, RADIO, WINDO, ULTRS, NOEVNT, BB_SND
CCNT	Number Of Continuous DTCs In Module	one count per bit
D_DOOR	Left Front Door Ajar Switch	CLOSED, AJAR
FLUID_1	Brake Fluid Level Switch #1	OFF, ON
HOOD_SW	Hood Ajar Switch	CLOSED, AJAR
IGN_R	Ignition Switch -RUN Position	NO, YES
L_HIGH	Left High Beam Lamp Driver	Off---, Off-B-, On---, On-B-
L_LOW	Left Low Beam Lamp	Off---, Off-B-, On---, On-B-
LF_TURN	Left Front Turn Lamp	Off---, Off-B-, On---, On-B-
LMRKOUT	Left Front Marker Lamp	Off---, Off-B-, On---, On-B-
OILWRN	Oil Level Warning Lamp	Off---, On---
P_DN_SW	Passenger Down Activated	OFF, DOWN
P_DOOR	Passenger Door Ajar Switch	CLOSED, AJAR
P_UP_SW	Passenger Up Activated	OFF, UP
PRK_BRK	Parking Brake Switch Input	OFF, ON
PSMRPSH	Passenger Mirror Position Sensor (Left/Right)	#####
PSMRPSV	Passenger Mirror Position	#####
PSPWAMP	Power Window Passenger's Peak Motor Current	#####
PWM_DC1	PWM Duty Cycle #1	%
R_HIGH	Right High Beam Lamp Driver	Off---, Off-B-, On---, On-B-
R_LOW	Right Low Beam Lamp	Off---, Off-B-, On---, On-B-

RADIOSW	Security Input Switch Status	OFF, ON
RF_TURN	Right Front Turn Lamp	Off---, Off-B-, On---, On-B-
RMRKSTB	Right Front Marker Lamp	Off---, Off-B-, On---, On-B-
STLKOUT	Steering Column Lock Ground Output	OFF, ON
VBAT	Battery Voltage	Volts
WFLUID	Washer Fluid Level	LOW, OK
WPMODE	Wiper Control Mode Select	WASH, OPEN, INVLD, OFF, INTVL1, INTVL2, INTVL3, INTVL4, INTVL5, INTVL6, INTVL7, LOW, HIGH
WPPRKS	Windshield Wiper Park Sense	notPRK, PARKED

FEM Active Command Index

Active Command	Display	Action
BACKLIGHTING INTENSITY CONTROL COMMAND	ILLUM	%
BRAKE SYSTEM CONTROL COMMAND	SHFT LOCK	OFF, ON
EXTERIOR LAMP CONTROL	PARKLAMPS	OFF, ON
FRONT WINDOW CONTROL	RR UP	OFF, ON
FRONT WINDOW CONTROL	PR DOWN	OFF, ON
FRONT WINDSHIELD WIPER/WASHER	SPEED RLY	OFF, ON
FRONT WINDSHIELD WIPER/WASHER	WASH RLY	OFF, ON
FRONT WINDSHIELD WIPER/WASHER	WIPER RLY	OFF, ON
HEAD/CORNERING LAMP CONTROL	HIGH BEAM	OFF, ON
HEAD/CORNERING LAMP CONTROL	LOW BEAM	OFF, ON
INDICATOR LAMP CONTROL	NON MIL	OFF, ON
LAMP CONTROL COMMAND	HDLMPWSH	OFF, ON
POWER MIRROR CONTROL	PR DOWN	OFF, ON
POWER MIRROR CONTROL	PR LEFT	OFF, ON
POWER MIRROR CONTROL	PR RIGHT	OFF, ON
POWER MIRROR CONTROL	PR UP	OFF, ON
STEERING COLUMN CONTROL COMMAND	LOCK_GND	OFF, ON
TURN SIGNAL AND MARKER LAMPS	HAZARD	OFF, ON
VAPS II OUTPUT PULSE CONTROL	VAPSIIOUT	%

REM Diagnostic Trouble Code (DTC) Index

DTC	Description	Source	Action
B1201	Fuel Sender Circuit Failure	REM	REFER to Section 413-01 .

B1300	Power Door Lock Circuit Failure	REM	REFER to Section 501-14B .
B1310	Power Door Unlock Circuit Failure	REM	REFER to Section 501-14B .
B1331	Decklid Ajar Rear Door Circuit Failure	REM	GO to Pinpoint Test J .
B1335	Door Ajar RR Circuit Failure	REM	GO to Pinpoint Test F .
B1342	ECU Is Defective	REM	CLEAR the DTC. RETRIEVE the DTCs. If DTC B1342 is retrieved, INSTALL a new REM. REFER to Section 419-10 .
B1483	Brake Pedal Input Circuit Failure	REM	REFER to Section 417-01 .
B1499	Lamp Turn Signal Left Circuit Failure	REM	REFER to Section 417-01 .
B1501	Lamp Turn Signal Left Circuit Short to Battery	REM	REFER to Section 417-01 .
B1503	Lamp Turn Signal Right Circuit Failure	REM	REFER to Section 417-01 .
B1505	Lamp Turn Signal Right Circuit Short to Battery	REM	REFER to Section 417-01 .
B1551	Decklid Release Circuit Failure	REM	REFER to Section 501-14B .
B1571	Door Ajar LR Circuit Failure	REM	GO to Pinpoint Test F .
B1676	Battery Pack Voltage Out of Range	REM	REFER to Section 414-00 .
B2172	Inertia Switch input Circuit Open	REM	REFER to Powertrain Control/Emissions Diagnosis (PC/ED) manual.
B2174	Window Driver Rear Remote Up Switch Short to Battery	REM	REFER to Section 501-16 .
B2178	Window Driver Rear Remote Down Switch Short to Battery	REM	REFER to Section 501-16 .
B2190	Window Passenger Rear Remote Up Switch Short to Battery	REM	REFER to Section 501-16 .
B2194	Window Passenger Rear Remote Down Switch Short to Battery	REM	REFER to Section 501-16 .
B2477	Module Configuration Failure	REM	REFER to Section 418-01 .
U1059	SCP (J1850) Invalid or missing Data for Transmission/Transaxle/ PRNDL	PCM	CARRY OUT the PCM self-test. REFER to Powertrain Control/Emissions Diagnosis (PC/ED) manual.
U1041	SCP (J1850) Invalid or Missing Data for Vehicle Speed	ABS	CARRY OUT the ABS self-test.
U1218	SCP (J1850) Invalid or Missing Data for External Lamps	ICM	CARRY OUT the ICM self-test.

REM Parameter Identification (PID) Index

PID	Description	Expected Value
BOO	Brake Switch Input	OFF, ON
DECKLID	Decklid/Hatch Ajar	CLOSED, AJAR
DL_DSARM	Decklid/Hatch Unlock Disarm Switch	NO, YES
DLIDOUT	Decklid Driver	Off---, Off--G, Off-B-, Off-BG, OffO--, OffO-G, OffOB-, OffOBG, On---, On--G, On-B-, On-BG, OnO--, OnO-G,

		OnOB-, OnOBG
DLIDRLS	Deck Lid Release	OFF, ON
L_TAIL	Left and Right Tail Lamp	Off---, Off--G, Off-B-, Off-BG, OffO--, OffO-G, OffOB-, OffOBG, On---, On--G, On-B-, On-BG, OnO--, OnO-G, OnOB-, OnOBG
LMRKOUT	Left Marker Lamp Driver Output State	OFF, ON
LMRKSTB	Left Marker Lamp Driver Short To Battery	NO, YES
LR_TURN	Left and Right Rear Turn Lamp	Off---, Off--G, Off-B-, Off-BG, OffO--, OffO-G, OffOB-, OffOBG, On---, On--G, On-B-, On-BG, OnO--, OnO-G, OnOB-, OnOBG
LRDN_SW	Left Rear Down Activated	OFF, UP
LRDR_SW	Left Rear Door Ajar Switch	CLOSED, AJAR
LRUP_SW	Left Rear Up Activated	OFF, DOWN
PD_LOCK	Passenger Door Lock	NO, YES
PD_UNLK	Passenger Door Unlock	NOTLOC, LOCK
R_TAIL	Left and Right Tail Lamp	Off---, Off--G, Off-B-, Off-BG, OffO--, OffO-G, OffOB-, OffOBG, On---, On--G, On-B-, On-BG, OnO--, OnO-G, OnOB-, OnOBG
RR_TURN	Left and Right Rear Turn Lamp	Off---, Off--G, Off-B-, Off-BG, OffO--, OffO-G, OffOB-, OffOBG, On---, On--G, On-B-, On-BG, OnO--, OnO-G, OnOB-, OnOBG
RRDN_SW	Right Rear Down Activated	OFF, UP
RRDR_SW	Right Rear Door Ajar Switch	CLOSED, AJAR
RRUP_SW	Right Rear Up Activated	OFF, DOWN

REM Active Command Index

Active Command	Display	Action
EXTERIOR LAMP CONTROL	BACKUPLMP	OFF, ON
EXTERIOR LAMP CONTROL	H MNT STP	OFF, ON
EXTERIOR LAMP CONTROL	L STOP	OFF, ON
EXTERIOR LAMP CONTROL	PARKLAMPS	OFF, ON
EXTERIOR LAMP CONTROL	R DEF RLY	OFF, ON
EXTERIOR LAMP CONTROL	R FOG LMP	OFF, ON
EXTERIOR LAMP CONTROL	R STOP	OFF, ON
POWER WINDOW ENABLE COMMAND	PSGR RLY	OFF, ON
REAR DOOR LOCK CONTROL	LR LOCK	OFF, ON
REAR DOOR LOCK CONTROL	LR UNLOCK	OFF, ON
REAR DOOR LOCK CONTROL	RELEASE	OFF, ON
REAR WINDOW CONTROL	LR DOWN	OFF, ON

REAR WINDOW CONTROL	RR DOWN	OFF, ON
TURN SIGNAL AND MARKER LAMPS	HAZARD	OFF, ON

DDM Diagnostic Trouble Code (DTC) Index

DTC	Description	Source	Action
B1309	Power Door Lock Circuit Short to Ground	DDM	REFER to Section 501-14B .
B1341	Power Door Unlock Circuit Short to Ground	DDM	REFER to Section 501-14B .
B1342	ECU Is Defective	DDM	CLEAR the DTC. REPEAT the DDM self-test. If DTC B1342 is retrieved, INSTALL a new DDM. REFER to Section 419-10 .
B1400	Driver Power Window One Touch Window Relay Circuit Short to Battery	DDM	REFER to Section 501-11 .
B1405	Driver Power Window Down Circuit Short to Battery	DDM	REFER to Section 501-11 .
B1408	Driver Power Window Up Circuit Short to Battery	DDM	REFER to Section 501-11 .
B1416	Power Window LR Motor Circuit Short to Battery	DDM	REFER to Section 501-11 .
B1420	Passenger Power Window Motor Circuit Short to Battery	DDM	REFER to Section 501-11 .
B1424	Power Window RR Motor Circuit Short to Battery	DDM	REFER to Section 501-11 .
B1530	Memory Set Switch Circuit Short to Ground	DDM	REFER to Section 501-10 .
B1534	Memory 1 Switch Circuit Short to Ground	DDM	REFER to Section 501-10 .
B1538	Memory 2 Switch Circuit Short to Ground	DDM	REFER to Section 501-10 .
B1676	Battery Pack Voltage Out of Range	DDM	REFER to Section 414-00 .
B2112	Door Driver Set Switch Stuck Failure	DDM	REFER to Section 501-14B .
B2116	Door Driver Reset Switch Stuck Failure	DDM	REFER to Section 501-14B .
B2320	Mirror Driver Horizontal Feedback Potentiometer Circuit Failure	DDM	REFER to Section 501-09 .
B2324	Mirror Driver Vertical Feedback Potentiometer Circuit Failure	DDM	REFER to Section 501-09 .
B2336	Mirror Switch Assembly Circuit Failure	DDM	REFER to Section 501-09 .
B2425	Remote Keyless Entry Out of Synchronization	DDM	REFER to Section 501-14B .
B2477	Module Configuration Failure	DDM	REFER to Section 418-01 .

DDM Parameter Identification (PID) Index

PID	Description	Expected Value
D_DN_SW	Driver Window Down Switch	OFF, DOWN
D_PWPK	Driver Power Window Peak Current	AMP
D_UP_SW	Driver Window Up Switch	OFF, UP
DMIR_H	Driver Side Mirror Horizontal Motor	notSEN, SENSED
DMIR_V	Driver Mirror Vertical	notSEN, SENSED
DR_LOCK	Driver Door Lock Output State	NO, YES
DR_UNLK	All Doors Unlock Output State	NO, YES
DRLKCYL	Door Lock Cylinder	notACT, ACTIVE
MEM1_SW	Memory Recall Switch #1	notACT, ACTIVE
MEM2_SW	Memory Recall Switch #2	notACT, ACTIVE
MEMS_SW	Memory Set Switch	notACT, ACTIVE
MIR_SEL	Power Mirror Select Switch	DRVMIR, PSGMIR, OFF
MIRH_SW	Pow Mir Position Switch - Horizontal	SHORT, RIGHT, LEFT, OFF
OTD_SW	One Touch Down Switch	OFF, DOWN
VBAT	Battery Voltage	Volts

DDM Active Command Index

Active Command	Display	Action
DOOR LOCK CONTROL	DD LOCK	OFF, ON
DOOR LOCK CONTROL	DD UNLOCK	OFF, ON
DOUBLE LOCK COMMAND	DOUBLE LK	UNLOCK, LOCK
FRONT WINDOW CONTROL	DR DOWN	OFF, ON
FRONT WINDOW CONTROL	DR UP	OFF, ON
ONE TOUCH WINDOW DOWN & ACCY DELAY	ONE TOUCH	OFF, ON
POWER MIRROR CONTROL	DR DOWN	OFF, ON
POWER MIRROR CONTROL	DR LEFT	OFF, ON
POWER MIRROR CONTROL	DR RIGHT	OFF, ON
POWER MIRROR CONTROL	DR UP	OFF, ON

SSP Relay Index

Relay	Fuse	Controlled System(s)
SSP1	BJB Fuse 427 (30A)	.

		<ul style="list-style-type: none"> ● Driver power door lock (FEM) ● LH high beam headlamps (FEM) ● RF park/turn/side marker lamps (FEM) ● RH low beam headlamp ● Driver exterior rear view mirror ● LF park/turn/side marker lamps (FEM)
SSP2	BJB Fuse 432 (30A)	<ul style="list-style-type: none"> ● LH low beam headlamp (FEM) ● RH high beam headlamps (FEM) ● Passenger exterior rear view mirror (FEM) ● Switch illumination backlighting
SSP3	BJB Fuse 424 (30A)	<ul style="list-style-type: none"> ● High mounted stoplamp (REM) ● RR park/stoplamps (REM) ● Reversing lamps (REM) ● LR turn signals (REM) ● Interior courtesy and demand lighting (FEM)
SSP4	BJB Fuse 423 (30A)	<ul style="list-style-type: none"> ● LR park/stoplamps (REM) ● RR turn signals (REM) ● All passenger door locks (REM) ● License lamps ● Luggage compartment release solenoid/switch ● Fuel door release solenoid/switch ● Luggage compartment lamp

When diagnosing an SSP relay, check that all systems for that relay are inoperative. Refer to [Section 417-01](#).

Symptom Chart


Symptom Chart

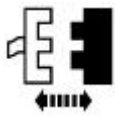
Condition	Possible Sources	Action
<ul style="list-style-type: none"> ● No communication with the front electronic module (FEM) 	<ul style="list-style-type: none"> ● BJB Fuses: <ul style="list-style-type: none"> ■ 425 (40A). ■ 422 (20A). ● Circuitry. ● FEM. 	<ul style="list-style-type: none"> ● GO to Pinpoint Test A.
<ul style="list-style-type: none"> ● No communication with the rear electronic module (REM) 	<ul style="list-style-type: none"> ● CJB Fuse: <ul style="list-style-type: none"> ■ 235 (5A). ● Circuitry. ● REM. 	<ul style="list-style-type: none"> ● GO to Pinpoint Test B.
<ul style="list-style-type: none"> ● No communication with the driver door module (DDM) 	<ul style="list-style-type: none"> ● CJB Fuse: <ul style="list-style-type: none"> ■ 207 (5A). ■ 222 (10A). ● Circuitry. ● DDM. 	<ul style="list-style-type: none"> ● GO to Pinpoint Test C.
<ul style="list-style-type: none"> ● The courtesy lamps are inoperative — all courtesy and interior lamps 	<ul style="list-style-type: none"> ● BJB Fuse 405 (10A). ● CJB. ● Circuits. 	<ul style="list-style-type: none"> ● GO to Pinpoint Test D.

	<ul style="list-style-type: none"> ● FEM. 	
<ul style="list-style-type: none"> ● An individual courtesy lamp is inoperative — individual and multiple lamps 	<ul style="list-style-type: none"> ● BJB. ● Interior AJB. ● Lamps. ● Switch(es). ● Circuitry. 	<ul style="list-style-type: none"> ● GO to Pinpoint Test E.
<ul style="list-style-type: none"> ● The courtesy lamps stay on continuously — all courtesy and interior lamps 	<ul style="list-style-type: none"> ● Door ajar switches. ● Interior AJB. ● Circuits. ● Map/rear dome lamp switches. ● FEM. ● REM. 	<ul style="list-style-type: none"> ● GO to Pinpoint Test F.
<ul style="list-style-type: none"> ● The demand lamps stay on continuously — left map, right map or rear dome lamp 	<ul style="list-style-type: none"> ● Switches. ● Circuits. 	<ul style="list-style-type: none"> ● GO to Pinpoint Test G.
<ul style="list-style-type: none"> ● The courtesy lamps do not turn on with one door open 	<ul style="list-style-type: none"> ● Door ajar switches. ● Circuits. ● FEM. ● REM. 	<ul style="list-style-type: none"> ● GO to Pinpoint Test H.
<ul style="list-style-type: none"> ● Individual demand lamp is inoperative — glove compartment, vanity mirror (s), map or rear dome lamp 	<ul style="list-style-type: none"> ● Circuitry. ● Lamps. ● Switches. 	<ul style="list-style-type: none"> ● GO to Pinpoint Test I.
<ul style="list-style-type: none"> ● The courtesy lamp stays on continuously — luggage compartment lid lamp only 	<ul style="list-style-type: none"> ● Circuitry. ● Luggage compartment lid ajar switch. ● Circuitry. ● REM. 	<ul style="list-style-type: none"> ● GO to Pinpoint Test J.
<ul style="list-style-type: none"> ● The courtesy lamps do not turn on with one door open — luggage compartment lid lamp inoperative with luggage compartment open 	<ul style="list-style-type: none"> ● Circuitry. ● Lamp. ● Luggage compartment lid ajar switch. ● REM. 	<ul style="list-style-type: none"> ● GO to Pinpoint Test K.

Pinpoint Tests

PINPOINT TEST A: NO COMMUNICATION WITH THE FRONT ELECTRONIC MODULE (FEM)

CONDITIONS	DETAILS/RESULTS/ACTIONS
A1 CHECK CIRCUITS 29-DK20 (OG/GN) AND 29S-DK22 (OG/YE) FOR VOLTAGE	
NOTE: Cycle ignition switch from OFF to RUN to enable the switched system power feature.	
<p>1</p>  <p>2</p>	



FEM C201c

3

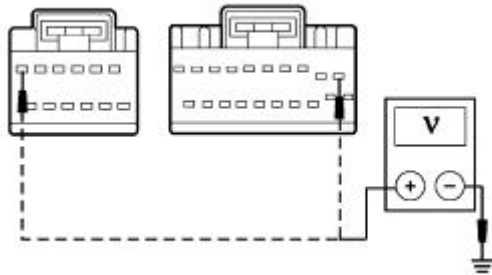


FEM C201f

4



5



A0006297

5 Measure the voltage between FEM C201c pin 6, circuit 29-DK20 (OG/GN), harness side and ground; and between FEM C201f pin 1, circuit 29S-DK22 (OG/YE) harness side and ground.

• Are the voltages greater than 10 volts?

→ Yes
GO to [A2](#).

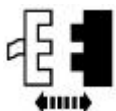
→ No
REPAIR the circuit(s) in question. TEST the system for normal operation.

A2 CHECK CIRCUITS 31-DK20 (BK/RD), 31-DK20A (BK/RD), 31-DK20B (BK/RD), 31-DK20C (BK/RD) AND 31-DK20D (BK/RD) FOR OPENS

1



2

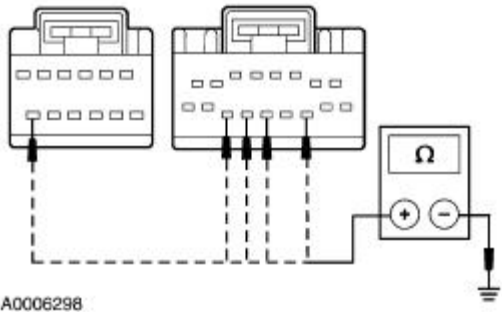


FEM C201a

3

3 Using the following table, measure the resistance between FEM connectors, harness side and ground:

FEM	Pin	Circuit



A0006298

C201c	12	31-DK20 (BK/RD)
C201a	11	31-DK20A (BK/RD)
C201a	13	31-DK20B (BK/RD)
C201a	14	31-DK20C (BK/RD)
C201a	15	31-DK20D (BK/RD)

- Are the resistances less than 5 ohms?

→ Yes

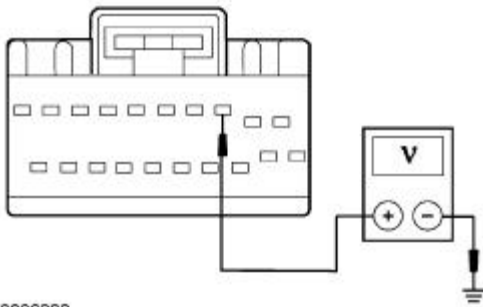
REFER to [Section 418-00](#).

→ No

REPAIR the circuit(s) in question. TEST the system for normal operation.

PINPOINT TEST B: NO COMMUNICATION WITH THE REAR ELECTRONIC MODULE (REM)

CONDITIONS	DETAILS/RESULTS/ACTIONS
B1 CHECK CIRCUIT 29-DK31 (OG/BK) FOR VOLTAGE	
NOTE: Cycle ignition switch from OFF to RUN to enable the switched system power feature.	
<p>1</p>	
<p>2</p> <p>REM C420d</p>	
<p>3</p> <p>REM C420c</p>	
<p>4</p>	
<p>5</p>	<p>5</p> Measure the voltage between REM C420d pin 3, circuit 29-DK31 (OG/BK), harness side and ground.



A0006299

- Is the voltage greater than 10 volts?

→ **Yes**
GO to [B2](#).

→ **No**
REPAIR the circuit. TEST the system for normal operation.

B2 CHECK CIRCUITS 29S-DK31 (OG), 31-DK30D (BK), 31-DK30E (BK), 31-DK30F (BK), 31-DK30G (BK) AND 31-DK30H (BK/OG), FOR OPENS

1

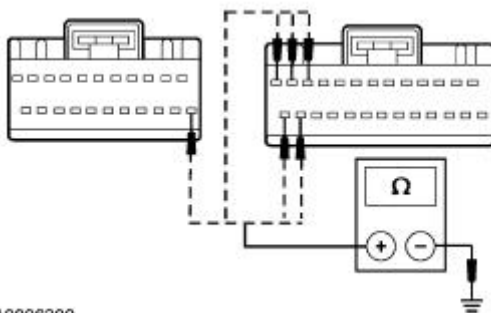


2



REM C420b

3



A0006300

3 Using the following table, measure the resistance between REM connectors, harness side and ground:

REM	Pin	Circuit
C420c	13	29S-DK31 (OG/BK)
C420c	12	31-DK30E (BK)
C420c	11	31-DK30D (BK)
C420c	26	31-DK30G (BK)
C420c	25	31-DK30F (BK)
C420b	12	31-DK30H (BK/OG)


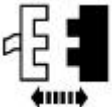

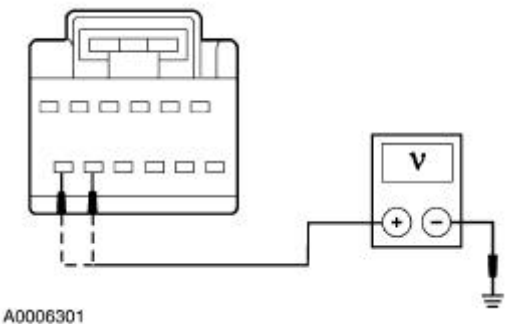

- Are the resistances less than 5 ohms?

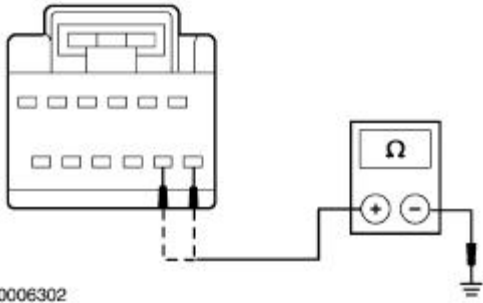
→ **Yes**
REFER to [Section 418-00](#).

→ **No**
REPAIR the circuit(s) in question. TEST

the system for normal operation.

PINPOINT TEST C: NO COMMUNICATION WITH THE DRIVER DOOR MODULE (DDM)

CONDITIONS	DETAILS/RESULTS/ACTIONS
C1 CHECK CIRCUITS 29-AJ80 (OG) AND 29S-AJ86 (OG/BU) FOR VOLTAGE	
NOTE: Cycle ignition switch from OFF to RUN to enable the switched system power feature.	
<p>1 </p> <p>2  DDM C501a</p> <p>3 </p> <p>4  A0006301</p>	<p>4 Measure the voltage between DDM C501a pin 11, circuit 29-AJ80 (OG), harness side and ground; and between DDM C501a pin 12, circuit 29S-AJ86 (OG/BU), harness side and ground.</p> <p>● Is the voltage greater than 10 volts?</p> <p>→ Yes GO to C2.</p> <p>→ No REPAIR the circuit(s) in question. TEST the system for normal operation.</p>
C2 CHECK CIRCUITS 31-AJ80B (BK/OG) AND 91-AJ80 (BN/BU) FOR OPENS	
<p>1 </p> <p>2</p>	<p>2 Measure the resistance between DDM C501a pin 7, circuit 91-AJ80 (BN/BU),</p>



A0006302

harness side and ground; and between DDM C501a pin 8, circuit 31-AJ80B (BK/OG), harness side and ground.

- Is the resistance less than 5 ohms?

→ **Yes**
REFER to [Section 418-00](#).

→ **No**
REPAIR the circuit(s) in question. TEST the system for normal operation.

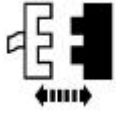
PINPOINT TEST D: THE COURTESY LAMPS ARE INOPERATIVE — ALL COURTESY AND INTERIOR LAMPS

CONDITIONS	DETAILS/RESULTS/ACTIONS
<p>D1 CHECK CIRCUIT 30-DD2 (RD) FOR OPEN</p>	
<p>NOTE: The ignition switch must be cycled from OFF to RUN to enable the switched system power feature. The switched system power will remain active for one half-hour after ignition is turned OFF. Refer to Principles of Operation for Switched System Power operation.</p>	
<p>1</p> <p>BJB Fuse 405 (10A)</p> <p>2</p> <p>A0004308</p>	<p>2</p> <p>Measure the voltage between BJB Fuse 405 (10A) pin 1, circuit 30-DD2 (RD), and ground.</p> <ul style="list-style-type: none"> ● Is the voltage greater than 10 volts? <p>→ Yes INSTALL Fuse 405 (10A).GO to D2.</p>

→ **No**
REPAIR the circuit. REPEAT the self-test. CLEAR the DTCs.

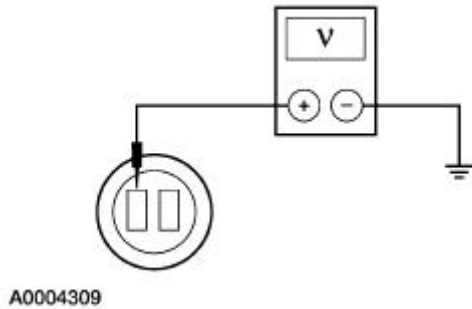
D2 CHECK CIRCUIT 29S-LC36 (OG/YE) FOR AN OPEN

1



RF Door Courtesy Lamp C606

2



2 Measure the voltage between the right front door courtesy lamp C606 pin 1, circuit 29S-LC36 (OG/YE), harness side and ground.

● **Is the voltage greater than 10 volts?**

→ **Yes**
RECONNECT C606 and GO to [D3](#).

→ **No**
REPAIR the circuit. REPEAT the self-test. CLEAR the DTCs.

D3 CHECK CIRCUIT 29S-LC3 (OG/BU) FOR SHORT TO POWER

1



3

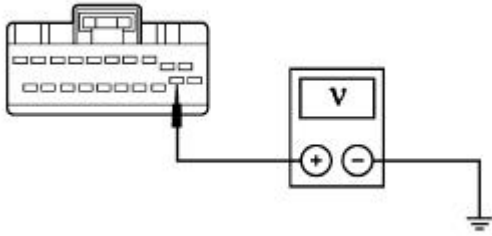


FEM C201f

4

2 Remove BJB Fuse 405 (10A).

4 Measure the voltage between FEM C201f pin 12, circuit 29S-LC3 (OG/BU), harness side and ground.



A0005552

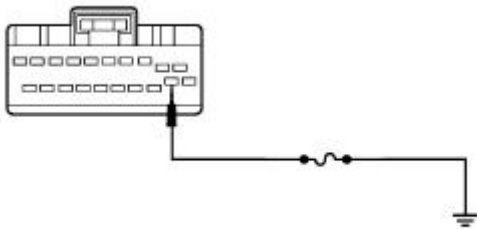
- Is the voltage greater than 10 volts?

→ **Yes**
REPAIR the circuit. REPEAT the self-test. CLEAR the DTCs.

→ **No**
GO to [D4](#).

D4 CHECK FEM FOR OPENS

1



A0004310

1

Connect a 30A fused jumper between FEM C201f pin 12, circuit 29S-LC3 (OG), harness side and ground.

- Did the courtesy lamps illuminate?

→ **Yes**
INSTALL a new FEM. REFER to [Section 419-10](#). REPEAT the self-test. CLEAR the DTCs.

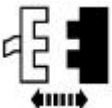
→ **No**
GO to [D5](#).

D5 CHECK CIRCUIT 29S-LC3 (OG) FOR AN OPEN

1



2

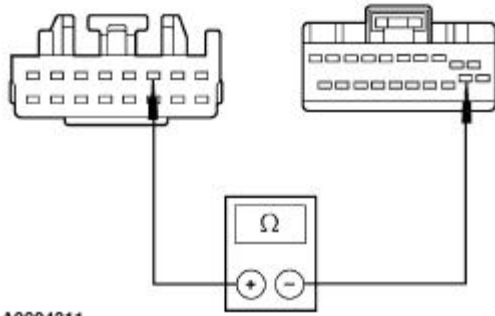


Interior AJB C283b

3

3

Measure the resistance between the



A0004311

interior AJB C283b pin 3, circuit 29S-LC3 (OG), harness side and FEM C201f pin 12, circuit 29S-LC3 (OG) harness side.

- Is the resistance less than 5 ohms?

→ **Yes**
REPAIR the interior AJB. REPEAT the self-test. CLEAR the DTCs.

→ **No**
REPAIR the circuit. REPEAT the self-test. CLEAR the DTCs.

PINPOINT TEST E: AN INDIVIDUAL COURTESY LAMP IS INOPERATIVE — INDIVIDUAL AND MULTIPLE LAMPS

CONDITIONS	DETAILS/RESULTS/ACTIONS
E1 VERIFY COURTESY LAMP SYMPTOM	<p>1 Verify the courtesy lamp symptom.</p> <ul style="list-style-type: none"> ● Is more than one lamp inoperative? <p>→ Yes GO to E26.</p> <p>→ No If a front door courtesy lamp is inoperative,GO to E2.</p> <p>If a map lamp is inoperative,GO to E9.</p> <p>If the dome lamp is inoperative,GO to E16.</p> <p>If a footwell lamp is inoperative,GO to E19.</p>
E2 VERIFY FRONT DOOR COURTESY LAMP SYMPTOM	<p>1 Verify the area of the front door courtesy lamp symptom.</p> <ul style="list-style-type: none"> ● Which front door courtesy lamp is inoperative?

→ **Yes**
Driver door GO to [E3](#).

→ **No**
Front passenger door GO to [E6](#).

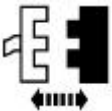
E3 CHECK CIRCUIT 29S-LC34 (OG/YE) FOR VOLTAGE

NOTE: The ignition switch must be cycled from OFF to RUN to enable the switched system power feature. The switched system power will remain active for one half-hour after ignition is turned OFF. Refer to Principles of Operation for Switched System Power operation.

1

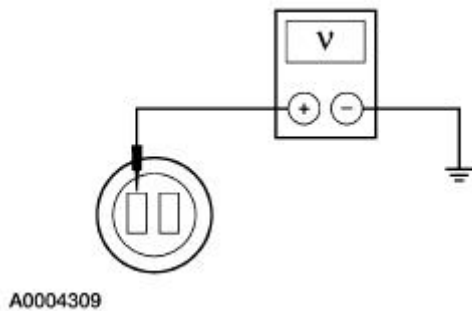


2



Driver Door Courtesy Lamp C506

3



3 Measure the voltage between the driver door courtesy lamp C506, circuit 29S-LC34 (OG/YE), harness side and ground.

● Is the voltage greater than 10 volts?

→ **Yes**
GO to [E5](#).

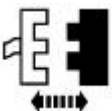
→ **No**
GO to [E4](#).

E4 CHECK CIRCUIT 29S-L34 (OG/YE) FOR AN OPEN

1



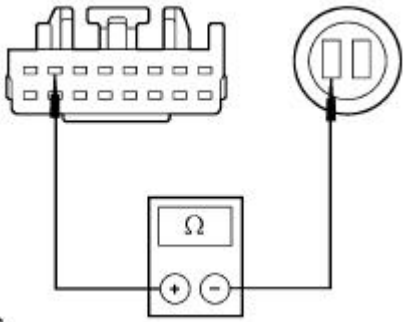
2



Interior AJB C283b

3

3 Measure the resistance between interior AJB C283b pin 7, circuit 29S-L34



A0004312

(OG/YE), harness side and driver door courtesy lamp C506, circuit 29S-LC34 (OG/YE) harness side.

● **Is the resistance less than 5 ohms?**

→ **Yes**
INSTALL a new interior AJB. REPEAT the self-test. CLEAR the DTCs.

→ **No**
REPAIR the circuit. REPEAT the self-test. CLEAR the DTCs.

E5 CHECK CIRCUIT 9-LC34 (BN) FOR AN OPEN

1

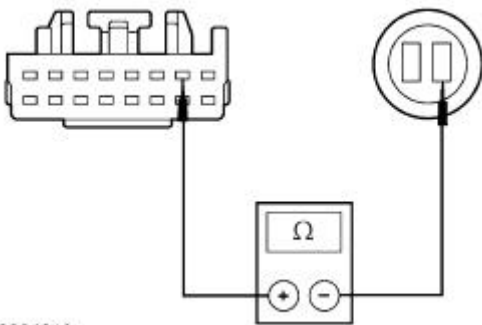


2



Interior AJB C283b

3



A0004313

3 Measure the resistance between interior AJB C283b pin 2, circuit 9-LC34 (BN), harness side and driver door courtesy lamp C506, circuit 9-LC34 (BN) harness side.

● **Is the resistance less than 5 ohms?**

→ **Yes**
INSTALL a new interior AJB. REPEAT the self-test. CLEAR the DTCs.

→ **No**
REPAIR the circuit. REPEAT the self-test. CLEAR the DTCs.

E6 CHECK CIRCUIT 29S-LC36 (OG/YE) FOR VOLTAGE

NOTE: The ignition switch must be cycled from OFF to RUN to enable the switched system power feature. The switched system power will remain active for one half-hour after ignition is turned OFF. Refer to Principles of Operation for Switched System Power operation.

1

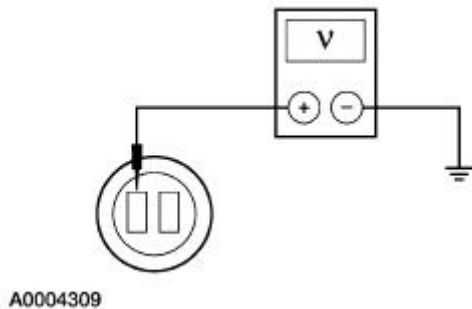


2



Front Passenger Door Courtesy Lamp C606

3



3

Measure the voltage between the front passenger door courtesy lamp C606, circuit 29S-LC36 (OG/YE), harness side and ground.

● Is the voltage greater than 10 volts?

→ **Yes**
GO to [E8](#).

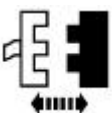
→ **No**
GO to [E7](#).

E7 CHECK CIRCUIT 29S-LC36 (OG/YE) FOR AN OPEN

1



2

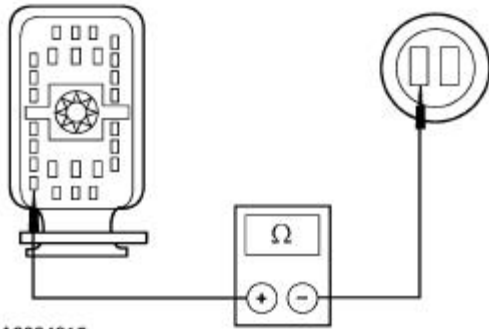


BJB C270d

3

3

Measure the resistance between BJB C270d pin 20, circuit 29S-LC36 (OG/YE), harness side and front passenger door courtesy lamp C606, circuit 29S-LC36 (OG/YE) harness side.



A0004315

● Is the resistance less than 5 ohms?

→ **Yes**
INSTALL a new BJB. REPEAT the self-test. CLEAR the DTCs.

→ **No**
REPAIR the circuit. REPEAT the self-test. CLEAR the DTCs.

E8 CHECK CIRCUIT 9-LC36 (BN) FOR AN OPEN

1

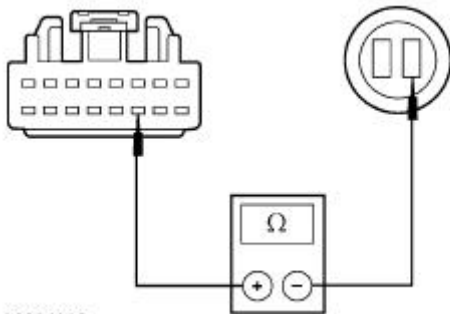


2



Interior AJB C283a

3



A0004316

3 Measure the resistance between interior AJB C283a pin 11, circuit 9-LC36 (BN), harness side and front passenger door courtesy lamp C606, circuit 9-LC36 (BN), harness side.

● Is the resistance less than 5 ohms?

→ **Yes**
INSTALL a new interior AJB. REPEAT the self-test. CLEAR the DTCs.

→ **No**
REPAIR the circuit. REPEAT the self-test. CLEAR the DTCs.

E9 VERIFY COURTESY MAP LAMP SYMPTOM

1 Verify the area of the courtesy map lamp symptom.

● Is the left map lamp inoperative?

→ Yes
GO to [E10](#).

→ No
GO to [E13](#).

E10 CHECK LEFT MAP LAMP SWITCH FOR VOLTAGE

NOTE: The ignition switch must be cycled from OFF to RUN to enable the switched system power feature. The switched system power will remain active for one half-hour after ignition is turned OFF. Refer to Principles of Operation for Switched System Power operation.

1

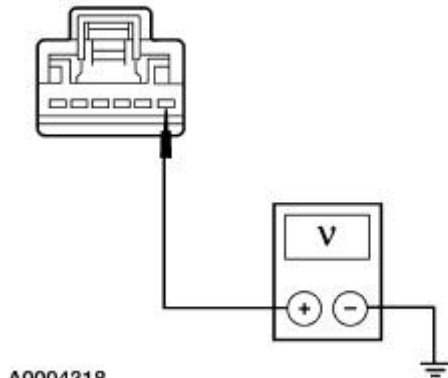


2



LF Map Reading Lamp Switch C910

3



A0004318

3 Measure the voltage between the left front map reading lamp switch C910 pin 1, circuit 31S-LB12 (BK/YE), harness side and ground.

● Is the voltage greater than 10 volts?

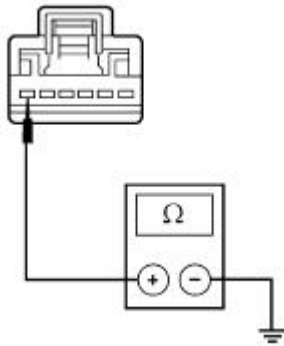
→ Yes
GO to [E11](#).

→ No
GO to [E12](#).

E11 CHECK CIRCUIT 9-LB13 (BN/RD) FOR AN OPEN

1

1 Measure the resistance between left map lamp switch C910 pin 6, circuit 9-LB13 (BN/RD), harness side and ground.



A0004317

2 Open the driver door.

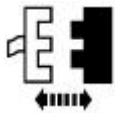
- When the driver door is opened, does resistance drop to less than 5 ohms?

→ **Yes**
 INSTALL a new front map lamp assembly. REFER to [Lamp Assembly—Front Map](#) in this section. REPEAT the self-test. CLEAR the DTCs.

→ **No**
 REPAIR the circuit. REPEAT the self-test. CLEAR the DTCs.

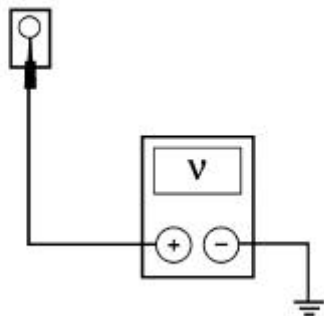
E12 CHECK CIRCUITS 29S-LB12 (OG/YE) AND 31S-LB12 (BK/YE) FOR AN OPEN

1



LF Map Lamp Bulb C908

2



A0004319

2 Measure the voltage between LF map lamp bulb C908a, circuit 29S-LB12 (OG/YE), harness side and ground.

- Is the voltage greater than 10 volts?

→ **Yes**
 REPAIR circuit 31S-LB12 (BK/YE). REPEAT the self-test. CLEAR the DTCs.

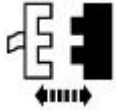
→ **No**

REPAIR circuit 29S-LB12 (OG/YE).
REPEAT the self-test. CLEAR the DTCs.

E13 CHECK THE RIGHT MAP LAMP SWITCH FOR VOLTAGE

NOTE: The ignition switch must be cycled from OFF to RUN to enable the switched system power feature. The switched system power will remain active for one half-hour after ignition is turned OFF. Refer to Principles of Operation for Switched System Power operation.

1

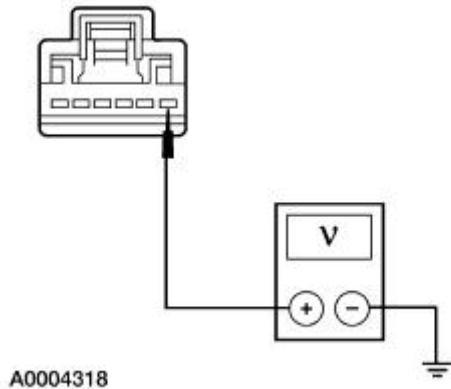


RF Map Reading Lamp Switch C905

2



3



3 Measure the voltage between the RF map reading lamp switch C905 pin 1, circuit 31S-LB19 (BK/BU), harness side and ground.

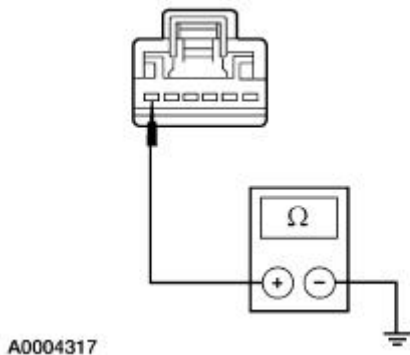
• Is the voltage greater than 10 volts?

→ **Yes**
GO to [E14](#).

→ **No**
GO to [E15](#).

E14 CHECK CIRCUIT 9-LB20 (BN/BU) FOR AN OPEN

1



1 Measure the resistance between RF map reading lamp switch C905 pin 6, circuit 9-LB20 (BN/BU), harness side and ground.

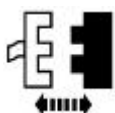
2 Open the driver door.

- **When the driver door is opened, does resistance drop to less than 5 ohms?**

- **Yes**
 INSTALL a new front map lamp assembly. For additional information, REFER to [Lamp Assembly—Front Map](#) in this section. REPEAT the self-test. CLEAR the DTCs.
- **No**
 REPAIR the circuit. REPEAT the self-test. CLEAR the DTCs.

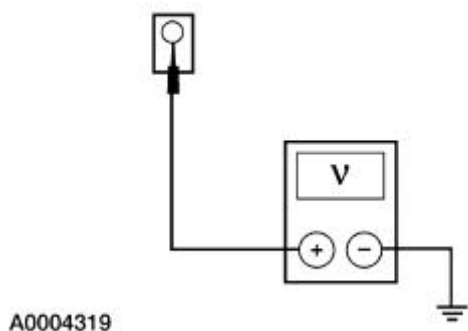
E15 CHECK CIRCUITS 29S-LB19 (OG/BU) AND 31S-LB19 (BK/BU) FOR AN OPEN

1



RF Map Lamp Bulb C903

2



A0004319

- 2 Measure the voltage between RF map lamp bulb C903, circuit 29S-LB19 (OG/BU), harness side and ground.

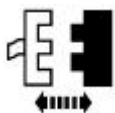
- **Is the voltage greater than 10 volts?**

- **Yes**
 REPAIR circuit 31S-LB19 (BK/BU). REPEAT the self-test. CLEAR the DTCs.
- **No**
 REPAIR circuit 29S-LB19 (OG/BU). REPEAT the self-test. CLEAR the DTCs.

E16 CHECK REAR DOME LAMP SWITCH FOR VOLTAGE

NOTE: The ignition switch must be cycled from OFF to RUN to enable the switched system power feature. The switched system power will remain active for one half-hour after ignition is turned OFF. Refer to Principles of Operation for Switched System Power operation.

1

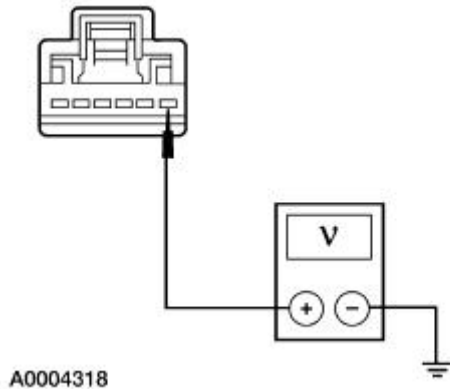


Rear Dome Lamp Switch C900

2



3



A0004318

3

Measure the voltage between the rear dome lamp switch C900 pin 1, circuit 31S-LB29 (BK/OG), harness side and ground.

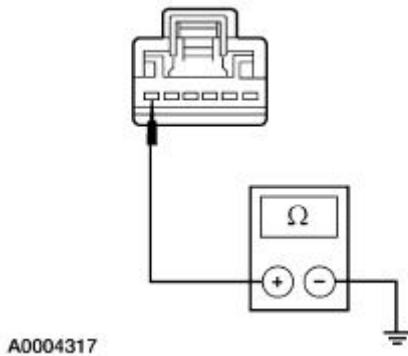
• Is the voltage greater than 10 volts?

→ **Yes**
GO to [E17](#).

→ **No**
GO to [E18](#).

E17 CHECK CIRCUIT 9-LB32 (BN/WH) FOR AN OPEN

1



A0004317

1

Measure the resistance between rear dome lamp switch C900 pin 6, circuit 9-LB20 (BN/BU), harness side and ground.

2 Open the driver door.

• **When the driver door is opened, does resistance drop to less than 5 ohms?**

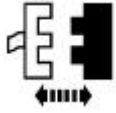
→ **Yes**
INSTALL a new rear dome lamp assembly. REFER to [Lamp Assembly—Rear Reading](#) in this section. REPEAT the self-test. CLEAR the DTCs.

→ **No**
REPAIR the circuit. REPEAT the self-

test. CLEAR the DTCs.

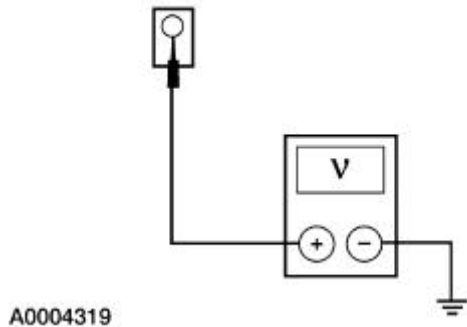
E18 CHECK CIRCUITS 29S-LB29 (OG) AND 31S-LB29 (BK/OG) FOR AN OPEN

1



Rear Dome Lamp Bulb C901

2



2

Measure the voltage between rear dome lamp bulb C901, circuit 29S-LB29 (OG/BU), harness side and ground.

● **Is the voltage greater than 10 volts?**

→ **Yes**
REPAIR circuit 31S-LB29 (BK/OG).
REPEAT the self-test. CLEAR the DTCs.

→ **No**
REPAIR circuit 29S-LB29 (OG). REPEAT the self-test. CLEAR the DTCs.

E19 VERIFY COURTESY FRONT FOOTWELL LAMP SYMPTOM

1

Verify the area of the front footwell courtesy lamp symptom.

● **Are both front footwell lamps inoperative?**

→ **Yes**
GO to [E26](#).

→ **No**
If the left footwell lamp is inoperative, GO to [E20](#).

If the right footwell lamp is inoperative, GO to [E23](#).

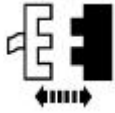
E20 CHECK CIRCUIT 29S-LC11 (OG/WH) FOR VOLTAGE

NOTE: The ignition switch must be cycled from OFF to RUN to enable the switched system power feature. The switched system power will remain active for one half-hour after ignition is turned OFF. Refer to Principles of Operation for Switched System Power operation.

1

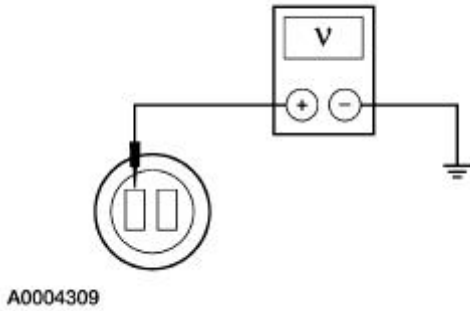


2



LF Footwell Lamp Bulb C209

3



3 Measure the voltage between the LF footwell lamp C209, circuit 29S-LC11 (OG/WH), harness side and ground.

• Is the voltage greater than 10 volts?

→ Yes
GO to [E22](#).

→ No
GO to [E21](#).

E21 CHECK CIRCUIT 29S-LC11 (OG/WH) FOR AN OPEN

1

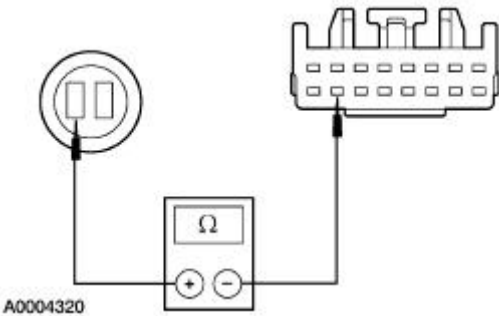


2



Interior AJB C283d

3



3 Measure the resistance between the LF footwell lamp C209, circuit 29S-LC11 (OG/WH), harness side and interior AJB C283d pin 15, circuit 29S-LC11 (OG/WH), harness side.

• Is the resistance less than 5 ohms?

- **Yes**
INSTALL a new interior AJB. REPEAT the self-test. CLEAR the DTCs.
- **No**
REPAIR the circuit. REPEAT the self-test. CLEAR the DTCs.

E22 CHECK CIRCUIT 31S-LC11 (BK/WH) FOR AN OPEN

1

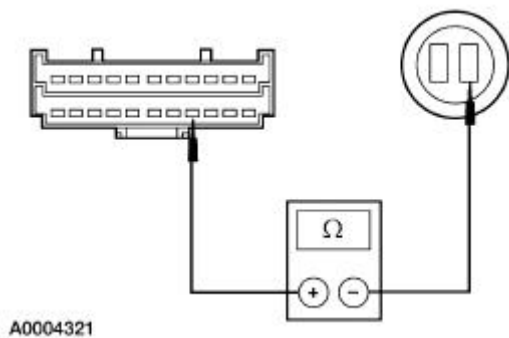


2



Joint Connector No. 3, C224

3



A0004321

- 3 Measure the resistance between joint connector No. 3, C224 pin 19, circuit 31S-LC11 (BK/WH), harness side and left front footwell lamp C209, circuit 31S-LC11 (BK/WH), harness side.

- Is the resistance more than 5 ohms?

- **Yes**
REPAIR joint connector No. 3, C224. REPEAT the self-test. CLEAR the DTCs.
- **No**
REPAIR the circuit. REPEAT the self-test. CLEAR the DTCs.

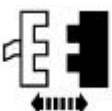
E23 CHECK CIRCUIT 29S-LC23 (OG/WH) FOR VOLTAGE

NOTE: The ignition switch must be cycled from OFF to RUN to enable the switched system power feature. The switched system power will remain active for one half-hour after ignition is turned OFF. Refer to Principles of Operation for Switched System Power operation.

1

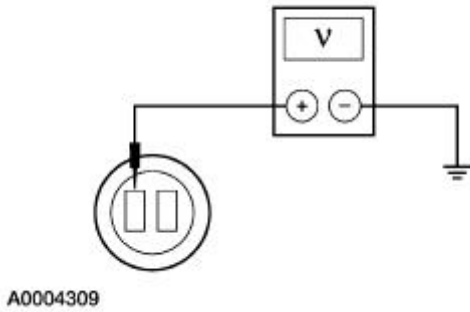


2



RF Footwell Lamp Bulb C266

3



3

Measure the voltage between the right front footwell lamp C266, circuit 29S-LC23 (OG/WH), harness side and ground.

● Is the voltage greater than 10 volts?

→ **Yes**
GO to [E25](#).

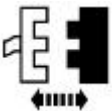
→ **No**
GO to [E24](#).

E24 CHECK CIRCUIT 29S-LC23 (OG/WH) FOR AN OPEN

1

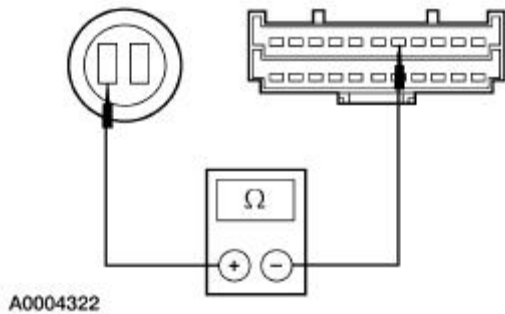


2



Joint Connector No. 1, C261

3



3

Measure the resistance between the RF footwell lamp C266, circuit 29S-LC23 (OG/WH), harness side and joint connector No. 1, C261 pin 7, circuit 29S-LC23 (OG/WH) harness side.

● Is the resistance less than 5 ohms?

→ **Yes**
Verify if the glove box lamp is operating correctly. If it is OK, REPAIR junction connector No. 1 C261. REPEAT the self-test. CLEAR the DTCs.

If the glove box lamp is not operating correctly, GO to [E26](#).

→ **No**
REPAIR the circuit. REPEAT the self-test. CLEAR the DTCs.

E25 CHECK CIRCUIT 31S-LC23 (BK/WH) FOR AN OPEN

1

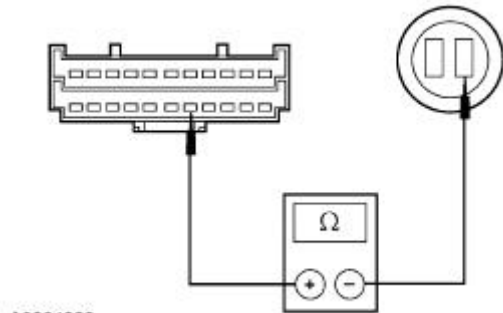


2



Joint Connector No. 3, C224

3



A0004323

3 Measure the resistance between the joint connector No. 3, C224 pin 18, circuit 31S-LC23 (BK/WH), harness side and right front footwell lamp C266, circuit 31S-LC23 (BK/WH), harness side.

● **Is the resistance more than 5 ohms?**

→ **Yes**
REPAIR joint connector No. 3, C224.
REPEAT the self-test. CLEAR the DTCs.

→ **No**
REPAIR the circuit. REPEAT the self-test. CLEAR the DTCs.

E26 CHECK LEFT AND RIGHT FRONT FOOTWELL LAMPS

1 Verify the symptom.

● **Are both door courtesy lamps inoperative only?**

→ **Yes**
INSTALL a new interior AJB. REPEAT the self-test. CLEAR the DTCs.

→ **No**
GO to [E27](#).

E27 CHECK LEFT AND RIGHT FRONT FOOTWELL LAMPS

1 Verify the symptom.

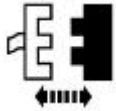
- Are both front footwell courtesy lamps inoperative only?

→ **Yes**
GO to [E28](#).

→ **No**
GO to [E30](#).

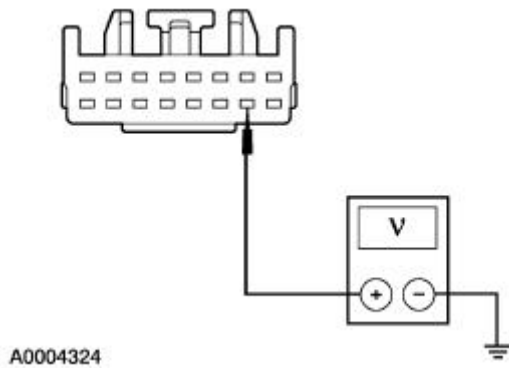
E28 CHECK VOLTAGE TO INTERIOR AJB

1



Interior AJB C283d

2



A0004324

2 Measure the voltage between the interior AJB C283d pin 10, circuit 31S-LC4 (BK/GN), harness side and ground.

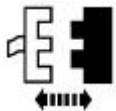
- Is the voltage greater than 10 volts?

→ **Yes**
INSTALL a new interior AJB. REPEAT the self-test. CLEAR the DTCs.

→ **No**
GO to [E29](#).

E29 CHECK CIRCUIT 31S-LC4 (BK/GN) FOR AN OPEN

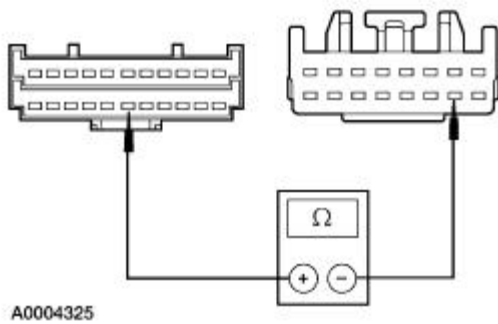
1



Joint Connector No. 3, C224

2

2 Measure the resistance between the joint connector No. 3, C224 pin 17, circuit 31S-LC4 (BK/GN), harness side and interior AJB C283d pin 10, circuit 31S-LC4 (BK/GN), harness side.



- Is the resistance less than 5 ohms?

- **Yes**
REPAIR joint connector No. 3, C224.
REPEAT the self-test. CLEAR the DTCs.
- **No**
REPAIR the circuit. REPEAT the self-test. CLEAR the DTCs.

E30 CHECK RIGHT FRONT FOOTWELL LAMP AND GLOVE BOX LAMP

- 1 Verify the symptom.

- Are the right front footwell and glove box lamps the only lamps that are inoperative?

- **Yes**
GO to [E31](#).
- **No**
GO to [E32](#).

E31 CHECK FOR VOLTAGE TO JOINT CONNECTOR No. 1, C261

1



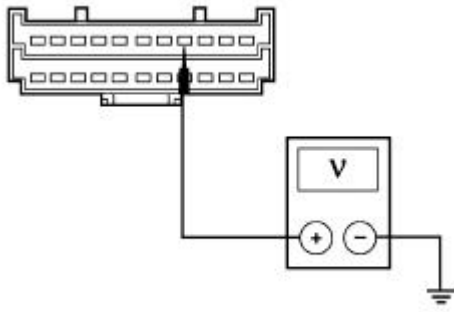
Joint Connector No. 1, C261

2



3

- 3 Measure the voltage between joint connector No. 1, C261 pin 15, circuit 29S-LC1 (OG/YE), harness side and ground.



A0004326

- Is the voltage greater than 10 volts?

- **Yes**
REPAIR joint connector No. 1, C261.
REPEAT the self-test. CLEAR the DTCs.
- **No**
REPAIR circuit 29S-LC1 (OG/YE).
REPEAT the self-test. CLEAR the DTCs.

E32 CHECK LEFT FRONT FOOTWELL LAMP AND GLOVE BOX LAMP

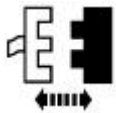
- 1 Verify the symptom.

- Are the left front footwell and left door courtesy lamps the only lamps that are inoperative?

- **Yes**
GO to [E33](#).
- **No**
GO to [E34](#).

E33 CHECK FOR VOLTAGE TO THE INTERIOR AJB

1



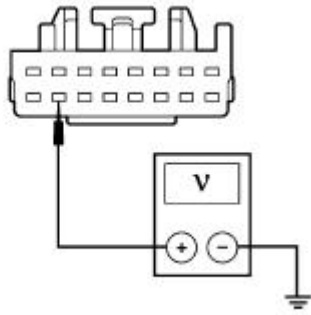
Interior AJB C283b

2



3

- 3 Measure the voltage between the interior AJB C283b pin 15, circuit 29S-LC5 (OG/GN), harness side and ground.



A0004327

- Is the voltage greater than 10 volts?

- **Yes**
INSTALL a new interior AJB. REPEAT the self-test. CLEAR the DTCs.
- **No**
REPAIR the circuit. REPEAT the self-test. CLEAR the DTCs.

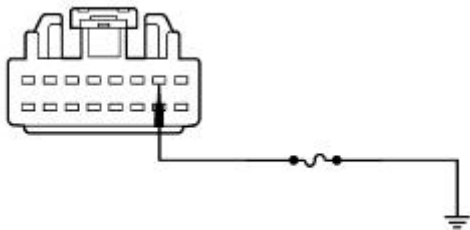
E34 CHECK BOTH MAP AND DOME LAMPS OPERATION AT THE INTERIOR AJB

1



Interior AJB C283a

2



A0004328

- 2 Connect a 10A fused jumper between interior AJB C283a pin 2, circuit 9-LB1 (BN), harness side and ground.

- Do both map and dome lamps illuminate?

- **Yes**
INSTALL a new interior AJB. REPEAT the self-test. CLEAR the DTCs.
- **No**
GO to [E35](#).

E35 CHECK CIRCUIT 9-LB1 (BN) FOR AN OPEN

1

2

Rear Dome Lamp C900

3

A0004329

3 Measure the resistance between the rear dome lamp C900 pin 6, circuit 9-LB32 (BN/WH), harness side and interior AJB C283a pin 2, circuit 9-LB1 (BN), harness side.

- Is the resistance less than 5 ohms?

→ **Yes**
REPAIR circuit 29S-LB2 (OG/BU) between BJB, map and dome lamps. REPEAT the self-test. CLEAR the DTCs.

→ **No**
REPAIR circuit 9-LB1 (BN). REPEAT the self-test. CLEAR the DTCs.

PINPOINT TEST F: THE COURTESY LAMPS STAY ON CONTINUOUSLY — ALL COURTESY AND INTERIOR LAMPS

CONDITIONS	DETAILS/RESULTS/ACTIONS
F1 USE THE RECORDED RESULTS FROM FEM SELF-TESTS	<p>1 Use the recorded FEM continuous and self-test DTCs.</p> <ul style="list-style-type: none"> • Are any DTCs recorded? <p>→ Yes If DTC B1319, GO to F3. If DTC B1327, GO to F6.</p> <p>→ No GO to F2.</p>
F2 USE THE RECORDED RESULTS FROM REM SELF-TESTS	<p>1 Use the recorded REM continuous and</p>

self-test DTCs.

- Are any DTCs recorded?

→ Yes

If DTC B1335, GO to [F20](#).

If DTC B1571, GO to [F23](#).

→ No

GO to [F9](#).

F3 CHECK THE DRIVER DOOR AJAR SWITCH

1

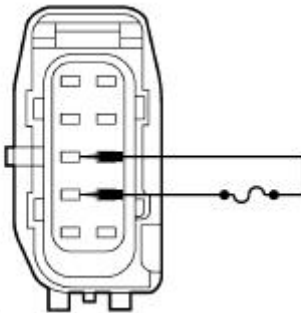


2



Driver Door Lock Actuator C525

3



A0005553

3

Connect a fused jumper wire between driver door lock actuator C525 pin 6, circuit 31-AA58 (BK), harness side and pin 8, circuit 31S-GL46 (BK/YE), harness side.

- After 20-30 seconds did the interior lamps turn OFF?

→ Yes

INSTALL a new driver door lock actuator/ajar switch. REFER to [Section 501-14B](#).

→ No

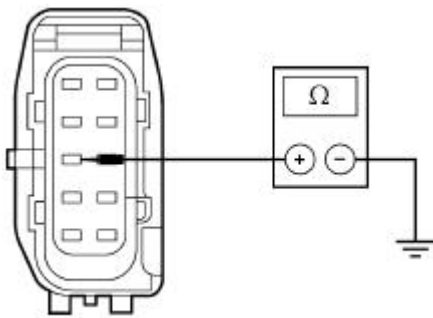
GO to [F4](#).

F4 CHECK CIRCUIT 31-AA58 (BK) FOR AN OPEN

1

1

Measure the resistance between driver door lock actuator C525 pin 6, circuit 31-AA58 (BK), harness side and ground.



A0005554

● Is the resistance less than 5 ohms?

→ **Yes**
GO to [F5](#).

→ **No**
REPAIR the circuit. REPEAT the self-test.
CLEAR the DTCs.

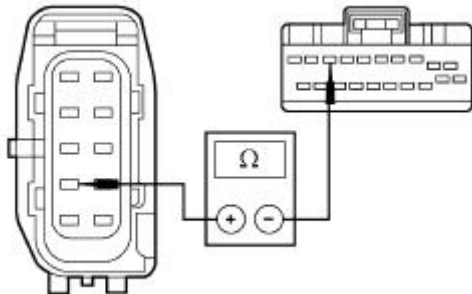
F5 CHECK CIRCUIT 31S-GL46 (BK/YE) FOR AN OPEN

1



FEM C201f

2



A0004332

2 Measure the resistance between driver door lock actuator C525 pin 8, circuit 31S-GL46 (BK/YE), harness side and FEM C201f pin 8, circuit 31S-GL46 (BK/YE), harness side.

● Is the resistance less than 5 ohms?

→ **Yes**
INSTALL a new FEM. REFER to [Section 419-10](#). REPEAT the self-test. CLEAR the DTCs.

→ **No**
REPAIR the circuit. REPEAT the self-test.
CLEAR the DTCs.

F6 CHECK THE FRONT PASSENGER DOOR AJAR SWITCH

1

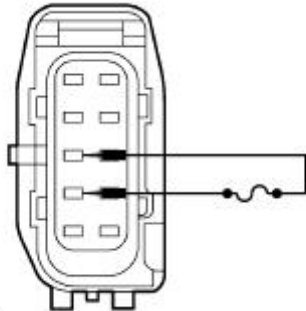


2



Front Passenger Door Lock Actuator C609

3



A0005553

3

Connect a fused jumper wire between front passenger door lock actuator C609 pin 6, circuit 31-AA5BB (BK), harness side and pin 8, circuit 31S-GL47 (BK/BU), harness side.

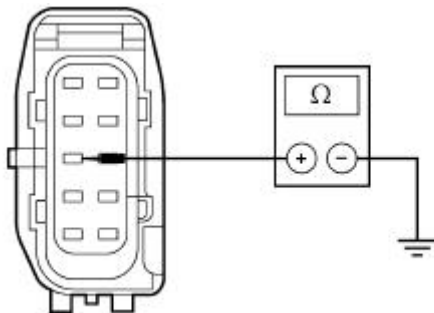
- After 20-30 seconds did the interior lamps turn OFF?

→ **Yes**
INSTALL a new passenger door lock actuator/ajar switch. REFER to [Section 501-14B](#).

→ **No**
GO to [F7](#).

F7 CHECK CIRCUIT 31-AA5BB (BK) FOR AN OPEN

1



A0005554

1

Measure the resistance between front passenger door lock actuator C609 pin 6, circuit 31-AA5BB (BK), harness side and ground.

- Is the resistance less than 5 ohms?

→ **Yes**
GO to [F8](#).

→ **No**
REPAIR the circuit. REPEAT the self-test. CLEAR the DTCs.

F8 CHECK CIRCUIT 31S-GL47 (BK/BU) FOR AN OPEN

1

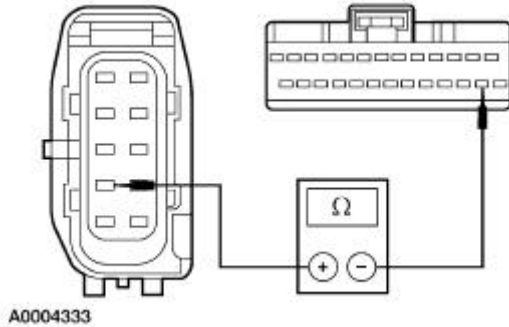


2



FEM C201e

3



3

Measure the resistance between front passenger door lock actuator C609 pin 8, circuit 31S-GL47 (BK/BU), harness side and FEM C201e pin 15, circuit 31S-GL47 (BK/BU), harness side.

● Is the resistance less than 5 ohms?

→ Yes

INSTALL a new FEM. REFER to [Section 419-10](#). REPEAT the self-test. CLEAR the DTCs.

→ No

REPAIR the circuit. REPEAT the self-test. CLEAR the DTCs.

F9 CHECK LEFT FRONT MAP READING LAMP OPERATION

1



2

Activate the left front map reading lamp demand switch.

● Do ALL other courtesy lamps turn OFF?

→ Yes

GO to [F12](#).

→ No

GO to [F10](#).

F10 CHECK RIGHT FRONT MAP READING LAMP OPERATION

1

Activate the right front map lamp switch.

● Do ALL other courtesy lamps turn OFF?

→ Yes

GO to [F13](#).

→ **No**
GO to [F11](#).

F11 CHECK REAR DOME LAMP OPERATION

- 1 Activate the rear dome lamp switch.
- **Do ALL other courtesy lamps turn OFF?**
- **Yes**
GO to [F14](#).
- **No**
GO to [F15](#).

F12 CHECK CIRCUIT 31S-LB12 (BK) FOR SHORT TO GROUND

1

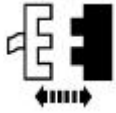


LF Map Reading Lamp Switch C910

- **Does the LF map lamp stay ON?**
- **Yes**
REPAIR the circuit. TEST the system for normal operation.
- **No**
INSTALL a new front map lamp assembly. REFER to [Lamp Assembly—Front Map](#) in this section. REPEAT the self-test. CLEAR the DTCs.

F13 CHECK FRONT MAP LAMP

1

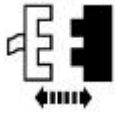


RF Map Reading Lamp Switch C905

- **Does the RF map lamp stay ON?**
- **Yes**
REPAIR the circuit. TEST the system for normal operation.
- **No**
INSTALL a new front map lamp assembly. REFER to [Lamp Assembly—Front Map](#) in this section. REPEAT the self-test. CLEAR the DTCs.

F14 CHECK CIRCUIT 31S-LB29 (BK) FOR SHORT TO GROUND

1



Rear Dome Lamp Switch C900

- Does the rear dome lamp stay ON?

→ **Yes**
REPAIR the circuit. TEST the system for normal operation.

→ **No**
INSTALL a new rear dome lamp assembly. REFER to [Lamp Assembly—Rear Reading](#) in this section . REPEAT the self-test. CLEAR the DTCs.

F15 ISOLATE CIRCUIT 29S-LC3 (OG/BU) AND FEM FOR SHORT TO GROUND

1

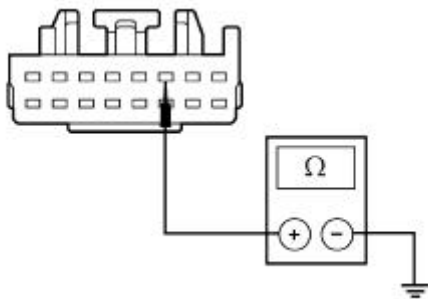


2



Interior AJB C283b

3



3 Measure the resistance between interior AJB C283b pin 3, circuit 29S-LC3 (OG), harness side and ground.

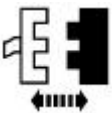
- Is resistance greater than 10,000 ohms?

→ **Yes**
GO to [F17](#).

→ **No**
GO to [F16](#).

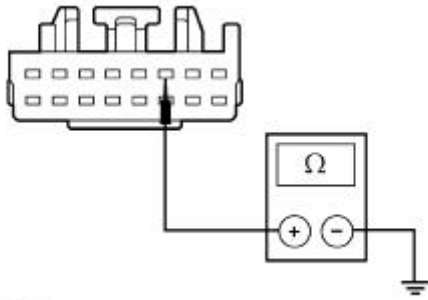
F16 CHECK CIRCUIT 29S-LC3 (OG/BU) FOR SHORT TO GROUND

1



FEM C201f

2



A0004334

2

Measure the resistance between interior AJB C283b pin 3, circuit 29S-LC3 (OG), harness side and ground.

- Is the resistance greater than 10,000 ohms?

→ **Yes**
INSTALL a new FEM. REFER to [Section 419-10](#) . REPEAT the self-test. CLEAR the DTCs.

→ **No**
REPAIR the circuit. REPEAT the self-test. CLEAR the DTCs.

F17 CHECK CIRCUIT 9-LC34 (BN) FOR SHORT TO GROUND

1

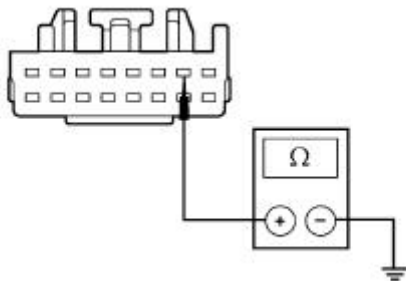


2



Interior AJB C283b

3



A0005600

3

Measure the resistance between interior AJB C283b pin 2, circuit 9-LC34 (BN), harness side and ground.

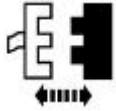
- Is the resistance greater than 10,000 ohms?

→ **Yes**
REPAIR the circuit. REPEAT the self-test. CLEAR the DTCs.

→ **No**
GO to [F18](#).

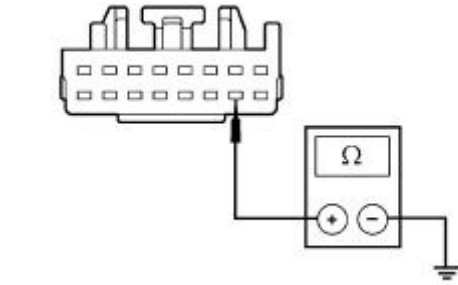
F18 ISOLATE THE INSTRUMENT PANEL LAMP CIRCUITS FOR SHORT TO GROUND

1



Interior AJB C283d

2



A0005601

2 Measure the resistance between interior AJB C283d pin 10, circuit 31S-LC4 (BK/GN), harness side and ground.

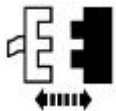
- Is the resistance greater than 10,000 ohms?

→ **Yes**
REPAIR the circuit. TEST system for normal operation.

→ **No**
GO to [F19](#).

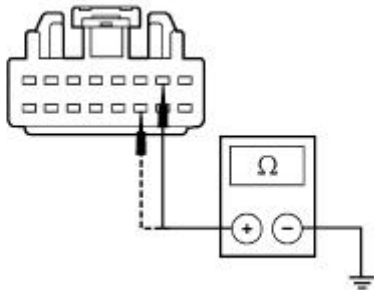
F19 CHECK CIRCUITS 9-LB1 (BN) AND 9-LC36 (BN) FOR SHORT TO GROUND

1



Interior AJB C283a

2



A0005602

2 Measure the resistance between interior AJB C283a pin 2, circuit 9-LB1 (BN), harness side and ground; and between AJB C283a pin 11, circuit 9-LC36 (BN), harness side and ground.

- Is the resistance greater than 10,000 ohms?

→ **Yes**

INSTALL a new AJB. TEST system for normal operation.

→ **No**
REPAIR the circuit in question. TEST system for normal operation.

F20 CHECK THE RIGHT REAR PASSENGER DOOR AJAR SWITCH

1

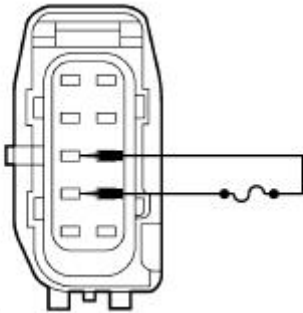


2



RR Passenger Door Lock Actuator C804

3



A0005553

3 Connect a fused jumper wire between RR passenger door lock actuator C804 pin 6, circuit 31-AA58C (BK), harness side and pin 8, circuit 31S-GL19 (BK/GN), harness side.

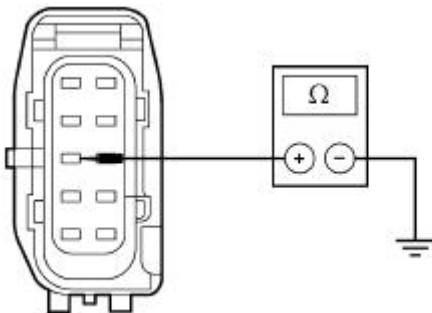
● After 20-30 seconds did the interior lamps turn OFF?

→ **Yes**
INSTALL a new RR passenger door lock actuator/ajar switch. REFER to [Section 501-14B](#). REPEAT the self-test. CLEAR the DTCs.

→ **No**
GO to [F21](#).

F21 CHECK CIRCUIT 31-AA58C (BK) FOR AN OPEN

1



A0005554

1 Measure the resistance between RR passenger door lock actuator C804 pin 6, circuit 31-AA58C (BK), harness side and ground.

● Is the resistance less than 5 ohms?

- **Yes**
GO to [F22](#).
- **No**
REPAIR the circuit. REPEAT the self-test.
CLEAR the DTCs.

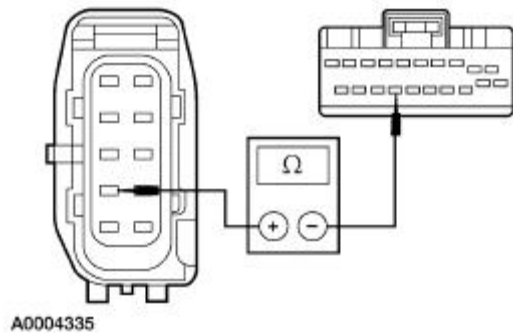
F22 CHECK CIRCUIT 31S-GL19 (BK/GN) FOR AN OPEN

1



REM C420d

2



- 2 Measure the resistance between RR passenger door lock actuator C804 pin 8, circuit 31S-GL19 (BK/GN), harness side and REM C420d pin 17, circuit 31S-GL19 (BK/GN), harness side.

● **Is the resistance less than 5 ohms?**

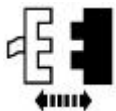
- **Yes**
INSTALL a new REM. REFER to [Section 419-10](#). REPEAT the self-test. CLEAR the DTCs.
- **No**
REPAIR the circuit. REPEAT the self-test.
CLEAR the DTCs.

F23 CHECK THE LEFT REAR PASSENGER DOOR AJAR SWITCH

1



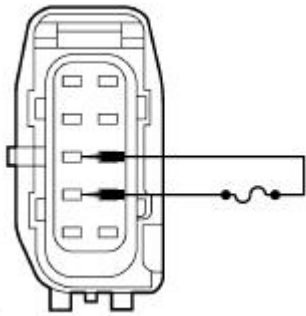
2



LR Passenger Door Lock Actuator C704

3

- 3 Connect a fused jumper wire between LR passenger door lock actuator C704 pin 6, circuit 31-AA58D (BK), harness side and pin 8, circuit 31S-GL12 (BK/OG), harness side.



A0005553

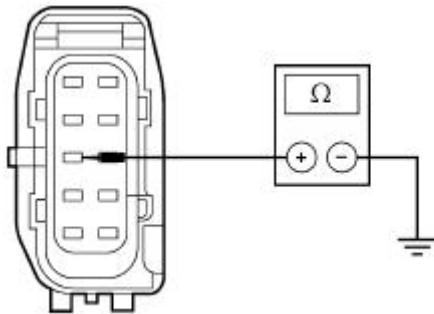
- After 20-30 seconds did the interior lamps turn OFF?

→ **Yes**
 INSTALL a new LR passenger door lock actuator/ajar switch. REFER to [Section 501-14B](#). REPEAT the self-test. CLEAR the DTCs.

→ **No**
 GO to [F24](#).

F24 CHECK CIRCUIT 31-AA58D (BK) FOR AN OPEN

1



A0005554

1 Measure the resistance between left rear passenger door lock actuator C704 pin 6, circuit 31-AA58D (BK), harness side and ground.

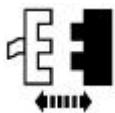
- Is the resistance less than 5 ohms?

→ **Yes**
 GO to [F25](#).

→ **No**
 REPAIR circuit 31-AA58D (BK). REPEAT the self-test. CLEAR the DTCs.

F25 CHECK CIRCUIT 31S-GL12 (BU/OG) FOR AN OPEN

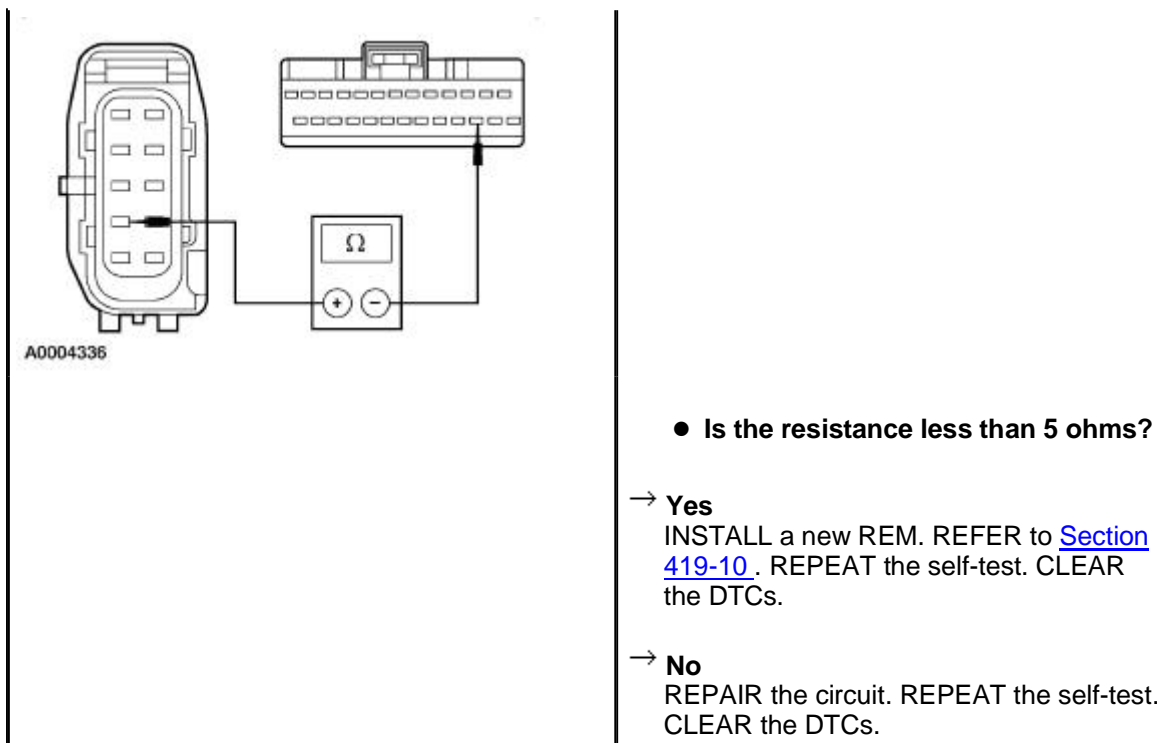
1



REM C420c

2

2 Measure the resistance between LR passenger door lock actuator C704 pin 8, circuit 31S-GL12 (BK/OG), harness side and REM C420c pin 16, circuit 31S-GL12 (BU/OG), harness side.



PINPOINT TEST G: THE DEMAND LAMPS STAY ON CONTINUOUSLY — LEFT MAP, RIGHT MAP OR REAR DOME LAMP

CONDITIONS	DETAILS/RESULTS/ACTIONS
G1 VERIFY DEMAND LIGHTING	
	<ol style="list-style-type: none"> 1 Close all doors. 2 Toggle demand switch in question to the courtesy and demand positions. <p>● Does the lamp in question turn OFF?</p> <p>→ Yes System OK.</p> <p>→ No INSTALL a new switch. TEST system for normal operation.</p>

PINPOINT TEST H: THE COURTESY LAMPS DO NOT TURN ON WITH ONE DOOR OPEN

CONDITIONS	DETAILS/RESULTS/ACTIONS
H1 VERIFY COURTESY LAMP SYMPTOM	
	<ol style="list-style-type: none"> 1 Open and close all the doors one at a time and observe the courtesy lamps. <p>● Are the courtesy lamps inoperative from the driver door?</p>

→ **Yes**
GO to [H2](#).

→ **No**
If the courtesy lamps are inoperative from the front passenger door, GO to [H5](#).

If the courtesy lamps are inoperative from the left rear door, GO to [H8](#).

If the courtesy lamps are inoperative from the right rear door, GO to [H11](#).

H2 CHECK DRIVER DOOR INPUT TO THE FEM

NOTE: The ignition switch must be cycled from OFF to RUN to enable the switched system power feature. The switched system power will remain active for one half-hour after ignition is turned OFF. Refer to Principles of Operation for Switched System Power operation.

1



2



NGS

3



4



4 Monitor the FEM PID D_DOOR.

5 Open the driver door.

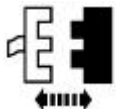
● **Does the FEM PID D_DOOR read AJAR?**

→ **Yes**
INSTALL a new FEM. REFER to [Section 419-10](#). REPEAT the self-test. CLEAR the DTCs.

→ **No**
GO to [H3](#).

H3 CHECK DRIVER DOOR AJAR SWITCH

1



Driver Door Lock Actuator C525

- Are the courtesy lamps illuminated?

- **Yes**
INSTALL a new driver door lock actuator/ajar switch. REFER to [Section 501-14B](#). REPEAT the self-test. CLEAR the DTCs.
- **No**
GO to [H4](#).

H4 CHECK CIRCUIT 31S-GL46 (BK/YE) FOR SHORT TO GROUND

1

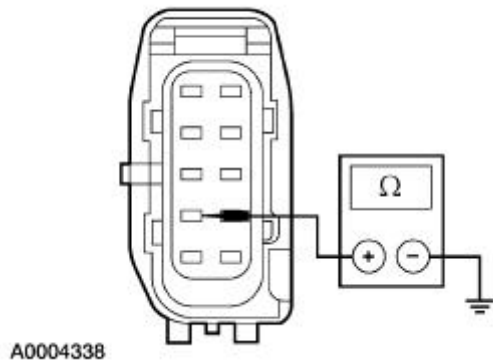


2



FEM 201f

3



- 3 Measure the resistance between driver door lock actuator C525 pin 8, circuit 31S-GL46 (BK/YE), harness side and ground.

- Is the resistance greater than 10,000 ohms?

- **Yes**
INSTALL a new FEM. REFER to [Section 419-10](#). REPEAT the self-test. CLEAR the DTCs.
- **No**
REPAIR the circuit. REPEAT the self-test. CLEAR the DTCs.

H5 CHECK FRONT PASSENGER DOOR INPUT TO THE FEM

NOTE: The ignition switch must be cycled from OFF to RUN to enable the switched system power feature. The switched system power will remain active for one half-hour after ignition is turned OFF. Refer to Principles of Operation for Switched System Power operation.

1



2



NGS

3



4



4 Monitor the FEM PID P_DOOR.

5 Open the front passenger door.

• Does the FEM PID P_DOOR read AJAR?

→ Yes
INSTALL a new FEM. REFER to [Section 419-10](#). REPEAT the self-test. CLEAR the DTCs.

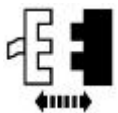
→ No
GO to [H6](#).

H6 CHECK FRONT PASSENGER DOOR AJAR SWITCH

1



2



Front Passenger Door Lock Actuator C609

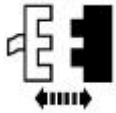
• Are the courtesy lamps illuminated?

→ Yes
INSTALL a new front passenger door lock actuator/ajar switch. REFER to [Section 501-14B](#). REPEAT the self-test. CLEAR the DTCs.

→ No
GO to [H7](#).

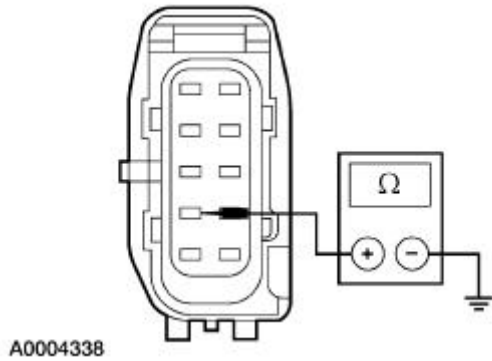
H7 CHECK CIRCUIT 31S-GL47 (BK/BU) FOR SHORT TO GROUND

1



FEM 201e

2



2

Measure the resistance between passenger door lock actuator C609 pin 8, circuit 31S-GL47 (BK/BU), harness side and ground.

● Is the resistance greater than 10,000 ohms?

→ **Yes**

INSTALL a new FEM. REFER to [Section 419-10](#). REPEAT the self-test. CLEAR the DTCs.

→ **No**

REPAIR the circuit. REPEAT the self-test. CLEAR the DTCs.

H8 CHECK LR DOOR INPUT TO THE REM

NOTE: The ignition switch must be cycled from OFF to RUN to enable the switched system power feature. The switched system power will remain active for one half-hour after ignition is turned OFF. Refer to Principles of Operation for Switched System Power operation.

1



2



NGS

3



4

4

Monitor the REM PID LRDR_SW.



5 Open the left rear door.

- Does the REM PID LRDR_SW read AJAR?

→ **Yes**
INSTALL a new REM. REFER to [Section 419-10](#). REPEAT the self-test. CLEAR the DTCs.

→ **No**
GO to [H9](#).

H9 CHECK LR DOOR AJAR SWITCH

1



2



LR Door Lock Actuator C704

- Are the courtesy lamps illuminated?

→ **Yes**
INSTALL a new LR door lock actuator/ajar switch. REFER to [Section 501-14B](#). REPEAT the self-test. CLEAR the DTCs.

→ **No**
GO to [H10](#).

H10 CHECK CIRCUIT 31S-GL12 (BK/OG) FOR SHORT TO GROUND

1



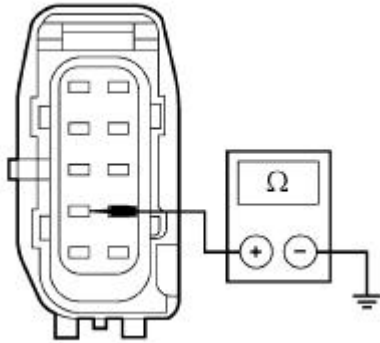
2



REM 420c

3

3 Measure the resistance between LR door lock actuator C704 pin 8, circuit 31S-GL12 (BK/OG), harness side and ground.



A0004338

- Is the resistance greater than 10,000 ohms?

- **Yes**
 INSTALL a new REM. REFER to [Section 419-10](#). REPEAT the self-test. CLEAR the DTCs.
- **No**
 REPAIR the circuit. REPEAT the self-test. CLEAR the DTCs.

H11 CHECK RR DOOR INPUT TO THE REM

NOTE: The ignition switch must be cycled from OFF to RUN to enable the switched system power feature. The switched system power will remain active for one half-hour after ignition is turned OFF. Refer to Principles of Operation for Switched System Power operation.

1



2



NGS

3



4



- 4 Monitor the REM PID RRDR_SW.

- 5 Open the RR door.

- Does the REM PID RRDR_SW read AJAR?

- **Yes**
 INSTALL a new REM. REFER to

[Section 419-10](#). REPEAT the self-test.
CLEAR the DTCs.

→ **No**
GO to [H12](#).

H12 CHECK RIGHT REAR DOOR AJAR SWITCH

1



RR Door Lock Actuator C804

● **Are the courtesy lamps illuminated?**

→ **Yes**
INSTALL a new RR door lock actuator/ajar switch. REFER to [Section 501-14B](#). REPEAT the self-test.
CLEAR the DTCs.

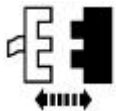
→ **No**
GO to [H13](#).

H13 CHECK CIRCUIT 31S-GL19 (BK/GN) FOR SHORT TO GROUND

1

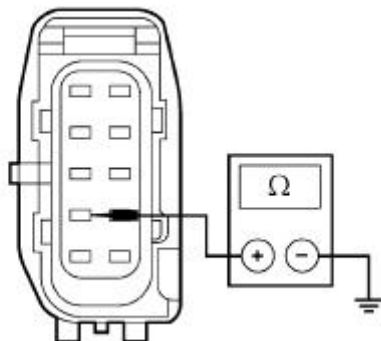


2



REM 420d

3



A0004338


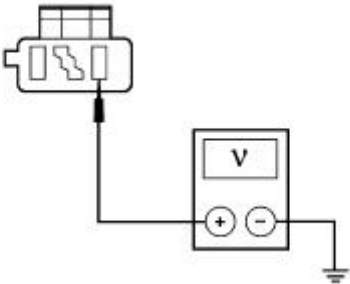
3 Measure the resistance between RR door lock actuator C804 pin 8, circuit 31S-GL19 (BK/GN), harness side and ground.

● **Is the resistance greater than 10,000 ohms?**

→ **Yes**
INSTALL a new REM. REFER to [Section 419-10](#). REPEAT the self-test.

	<p>CLEAR the DTCs.</p> <p>→ No REPAIR the circuit. REPEAT the self-test. CLEAR the DTCs.</p>
--	---

PINPOINT TEST I: INDIVIDUAL DEMAND LAMP IS INOPERATIVE — GLOVE COMPARTMENT, VANITY MIRROR(S), MAP OR REAR DOME LAMP

CONDITIONS	DETAILS/RESULTS/ACTIONS
I1 VERIFY LAMP SYMPTOM	
NOTE: If any of the courtesy lamps are also inoperative, refer to symptom chart. If multiple lamps are inoperative, refer to Pinpoint Test E.	
	<p>1 Verify the inoperative lamp.</p> <ul style="list-style-type: none"> ● Is the glove box lamp inoperative? <p>→ Yes GO to 12.</p> <p>→ No If the left hand visor lamp is inoperative, GO to 14.</p> <p>If the right hand visor lamp is inoperative, GO to 16.</p> <p>If a map lamp is inoperative, GO to 18.</p> <p>If the rear dome lamp is inoperative, GO to 19.</p>
I2 CHECK CIRCUIT 29S-LB8 (OG) FOR AN OPEN	
NOTE: The ignition switch must be cycled from OFF to RUN to enable the switched system power feature. The switched system power will remain active for one half-hour after ignition is turned OFF. Refer to Principles of Operation for Switched System Power operation.	
<p>1</p>  <p>Glove Box Lamp and Switch C254</p> <p>2</p>  <p style="text-align: right;">A0005603</p>	<p>2 Measure the voltage between glove box lamp and switch C254 pin 3, circuit 29S-LB8 (OG), harness side and ground.</p>

● Is the voltage greater than 10 volts?

→ **Yes**
GO to [13](#).

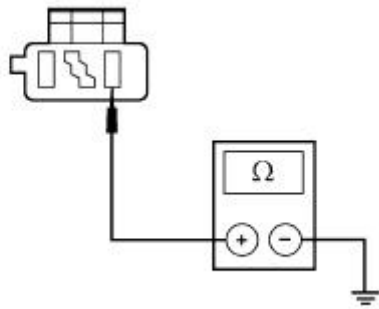
→ **No**
REPAIR the circuit. REPEAT the self-test.
CLEAR the DTCs.

13 CHECK CIRCUIT 31-LB8 (OG) FOR AN OPEN

1



2



A0004340

2 Measure the resistance between glove box lamp and switch C254, circuit 31-LB8 (OG), harness side and ground.

● Is the resistance less than 5 ohms?

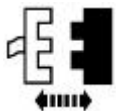
→ **Yes**
INSTALL a new glove box lamp and switch. REPEAT the self-test. CLEAR the DTCs.

→ **No**
REPAIR the circuit. REPEAT the self-test.
CLEAR the DTCs.

14 CHECK CIRCUIT 29S-LB16 (OG/GN) FOR OPEN

NOTE: The ignition switch must be cycled from OFF to RUN to enable the switched system power feature. The switched system power will remain active for one half-hour after ignition is turned OFF. Refer to Principles of Operation for Switched System Power operation.

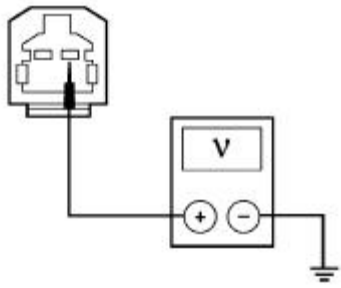
1



Left Vanity Mirror Lamp and Switch C907

2

2 Measure the voltage between left vanity mirror lamp and switch C907 pin 2, circuit 29S-LB16 (OG/GN), harness side and ground.



A0004342

- Is the voltage greater than 10 volts?

→ **Yes**
GO to [15](#).

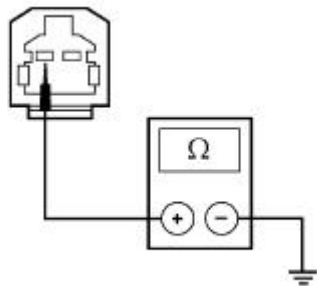
→ **No**
REPAIR the circuit. REPEAT the self-test.
CLEAR the DTCs.

15 CHECK CIRCUIT 31-LB16 (BK) FOR AN OPEN

1



2



A0004341

2 Measure the resistance between left vanity mirror lamp and switch C907 pin 1, circuit 31-LB16 (BK), harness side and ground.

- Is the resistance less than 5 ohms?

→ **Yes**
INSTALL a new left vanity mirror lamp and switch. REPEAT the self-test. CLEAR the DTCs.

→ **No**
REPAIR the circuit. REPEAT the self-test.
CLEAR the DTCs.

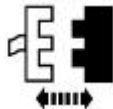
16 CHECK CIRCUIT 29S-LB23 (OG/WH) FOR AN OPEN

NOTE: The ignition switch must be cycled from OFF to RUN to enable the switched system power feature. The switched system power will remain active for one half-hour after ignition is turned OFF. Refer to Principles of Operation for Switched System Power operation.

1



2

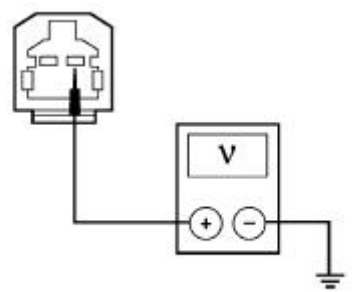


Right Vanity Mirror Lamp and Switch C906

3



4



A0004342

4 Measure the voltage between right vanity mirror lamp and switch C906 pin 2, circuit 29S-LB23 (OG/WH), harness side and ground.

• Is the voltage greater than 10 volts?

→ Yes
GO to [17](#).

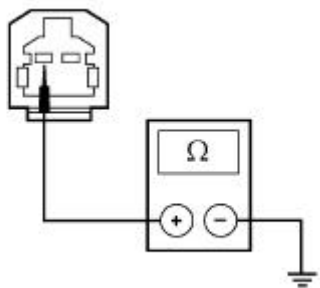
→ No
REPAIR the circuit. REPEAT the self-test.
CLEAR the DTCs.

17 CHECK CIRCUIT 31-LB23 (BK) FOR AN OPEN

1



2



A0004341

2 Measure the resistance between right vanity mirror lamp and switch C906 pin 1, circuit 31-LB23 (BK), harness side and ground.

• Is the resistance less than 5 ohms?

→ **Yes**
INSTALL a new right vanity mirror lamp and switch. REPEAT the self-test. CLEAR the DTCs.

→ **No**
REPAIR the circuit. REPEAT the self-test. CLEAR the DTCs.

18 CHECK GROUND CIRCUIT TO MAP SWITCH

1

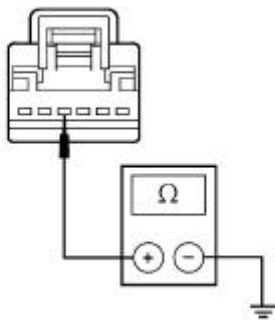


2



Front Map Reading Lamp Switch C905 or C910

3



A0005604

3 For the LF map reading lamp switch measure the resistance between C910 pin 4, circuit 31-LB13 (BK), harness side and ground. For the RF map reading lamp switch measure the resistance between C905 pin 4, circuit 31-LB20 (BK), harness side and ground.

● **Are the resistance less than 5 ohms?**

→ **Yes**
INSTALL a new front map lamp assembly. REFER to [Lamp Assembly—Front Map](#) in this section. REPEAT the self-test. CLEAR the DTCs.

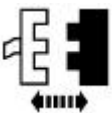
→ **No**
REPAIR the circuit. REPEAT the self-test. CLEAR the DTCs.

19 CHECK GROUND CIRCUIT TO REAR DOME LAMP SWITCH

1

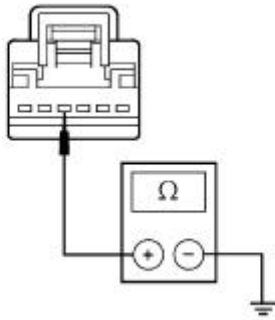


2



Rear Dome Lamp Switch C900

3



A0005604

3

Measure the resistance between the rear dome lamp switch C900 pin 4, circuit 31-LB32 (BK), harness side and ground.

● Is the resistance less than 5 ohms?



→ Yes

INSTALL a new rear dome lamp assembly. REFER to [Lamp Assembly—Rear Reading](#) in this section. REPEAT the self-test. CLEAR the DTCs.

→ No

REPAIR the circuit. REPEAT the self-test. CLEAR the DTCs.

PINPOINT TEST J: THE COURTESY LAMP STAYS ON CONTINUOUSLY — LUGGAGE COMPARTMENT LAMP ONLY

CONDITIONS	DETAILS/RESULTS/ACTIONS
J1 RETRIEVE DIAGNOSTIC TROUBLE CODES	
<p>1</p> 	<p>1 Use recorded results from REM self-test.</p> <p>● Are any DTCs recorded?</p> <p>→ Yes If B1331GO to J4.</p> <p>For all other DTCs REFER to the REM Diagnostic Trouble Code (DTC) Index.</p> <p>→ No GO to J2.</p>
J2 CHECK THE LUGGAGE COMPARTMENT LID AJAR SWITCH INPUT TO THE REM	
<p>NOTE: The ignition switch must be cycled from OFF to RUN to enable the switched system power feature. The switched system power will remain active for one half-hour after ignition is turned OFF. Refer to Principles of Operation for Switched System Power operation.</p>	
<p>1</p> 	<p>1 While opening and closing the luggage compartment lid, monitor the REM PID DECKLID.</p>

- Do the REM PID values agree with the luggage compartment lid positions?

→ **Yes**
GO to [J3](#).

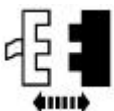
→ **No**
GO to [J4](#).

J3 CHECK CIRCUIT 31S-LB25 (BK/BU) FOR SHORT TO GROUND

1

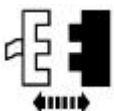


2



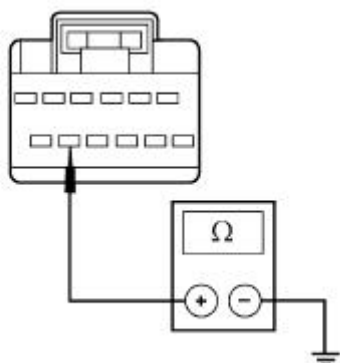
REM C420a

3



Luggage Compartment Lid Lamp C428

4



A0004343

- 4 Measure the resistance between the REM C420a pin 11, circuit 31S-LB25 (BK/BU), harness side and ground.

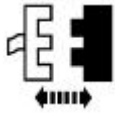
- Is the resistance greater than 10,000 ohms?

→ **Yes**
INSTALL a new REM. REFER to [Section 419-10](#). REPEAT the self-test. CLEAR the DTCs.

→ **No**
REPAIR the circuit. REPEAT the self-test. CLEAR the DTCs.

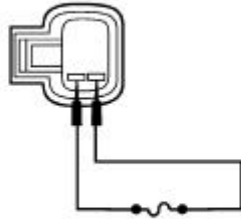
J4 CHECK THE LUGGAGE COMPARTMENT LID AJAR SWITCH

1



Luggage Compartment Lid Ajar Switch C429

2



A0004345

2

Connect a fused (10A) jumper wire between the luggage compartment lid ajar switch C429 pins 1 and 2, harness side.

• Does the luggage compartment lid lamp go OFF?

→ **Yes**
INSTALL a new luggage compartment lid ajar switch. REFER to [Section 501-14A](#).

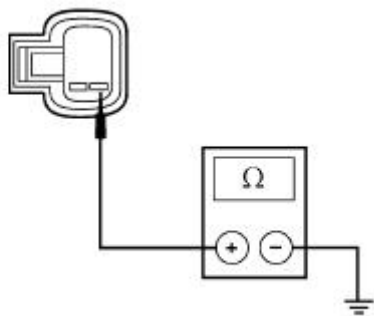
→ **No**
GO to [J5](#).

J5 CHECK CIRCUIT 31-GL20 (BK/RD) FOR AN OPEN

1



2



A0004346

2

Measure the resistance between the luggage compartment lid ajar switch C429 pin 2, circuit 31-GL20 (BK/RD), harness side and ground.


• Is the resistance less than 5 ohms?

→ **Yes**
GO to [J6](#).

→ **No**
REPAIR the circuit. REPEAT the self-test. CLEAR the DTCs.

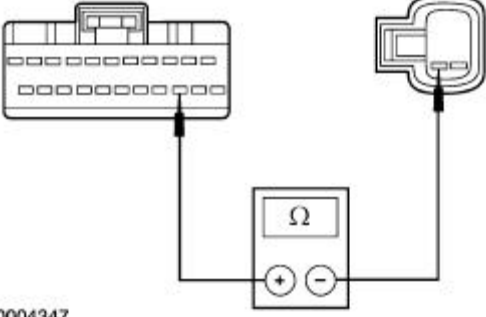
J6 CHECK CIRCUIT 8-GL20 (WH/BK) FOR AN OPEN

1



REM C420b

2



A0004347


2 Measure the resistance between the REM C420b pin 14, circuit 8-GL20 (WH/BK) , harness side and luggage compartment lid ajar switch C429 pin 1, circuit 8-GL20 (WH/BK), harness side.

- Is the resistance less than 5 ohms?

→ **Yes**
INSTALL a new REM. REFER to [Section 419-10](#). REPEAT the self-test. CLEAR the DTCs.

→ **No**
REPAIR the circuit. REPEAT the self-test. CLEAR the DTCs.

PINPOINT TEST K: THE COURTESY LAMPS DO NOT TURN ON WITH ONE DOOR OPEN — LUGGAGE COMPARTMENT LID LAMP INOPERATIVE WITH LUGGAGE COMPARTMENT LID OPEN

CONDITIONS	DETAILS/RESULTS/ACTIONS
K1 RETRIEVE REM DIAGNOSTIC TROUBLE CODES	
<p>1</p> 	<p>1 Use recorded results from REM self-test.</p> <ul style="list-style-type: none"> ● Are any REM DTCs recorded? <p>→ Yes REFER to REM Diagnostic Trouble Code (DTC) Index.</p> <p>→ No GO to K2.</p>
K2 CHECK THE LUGGAGE COMPARTMENT LID AJAR SWITCH INPUT TO THE REM	
<p>NOTE: The ignition switch must be cycled from OFF to RUN to enable the switched system power feature. The switched system power will remain active for one half-hour after ignition is</p>	

turned OFF. Refer to Principles of Operation for Switched System Power operation.

1



1

While opening and closing the luggage compartment lid, monitor the REM PID DECKLID.

- Does the REM PID values DECKLID agree with the luggage compartment lid position?

→ Yes
GO to [K3](#).

→ No
GO to [K8](#).

K3 CHECK POWER TO THE BJB FUSE 404 (10A)

1

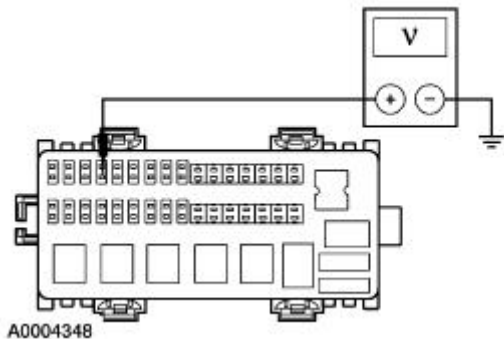


BJB Fuse 404 (10A)

2



3



3

Measure the voltage between the BJB Fuse 404 (10A) input side and ground.

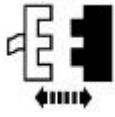
- Is the voltage greater than 10 volts?

→ Yes
INSTALL BJB fuse 404 (10A) and GO to [K4](#).

→ No
REPAIR supply circuit to the BJB.
REPEAT the self-test. CLEAR the DTCs.

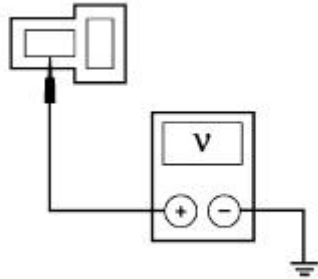
K4 CHECK CIRCUIT 29S-LB25 (OG/BU) FOR AN OPEN

1



Luggage Compartment Lid Lamp C428

2



A0004349

2

Measure the voltage between luggage compartment lid lamp C428, circuit 29S-LB25 (OG/BU), harness side and ground.

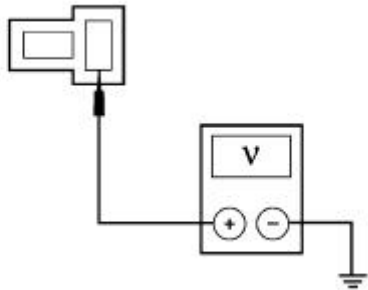
● Is the voltage greater than 10 volts?

→ **Yes**
GO to [K5](#).

→ **No**
REPAIR the circuit. REPEAT the self-test. CLEAR the DTCs.

K5 CHECK CIRCUIT 31S-LB25 (BK/BU) FOR VOLTAGE

1



A0004350

1

Measure the voltage between luggage compartment lid lamp C428, circuit 31S-LB25 (BK/BU), harness side and ground.

● Is the voltage greater than 10 volts?

→ **Yes**
GO to [K7](#).

→ **No**
GO to [K6](#).

K6 CHECK CIRCUIT 31S-LB25 (BK/BU) FOR AN OPEN

1

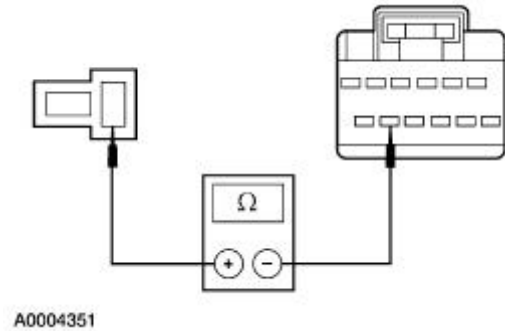


2



REM C420a

3



3

Measure the resistance between the REM C420a pin 11, circuit 31S-LB25 (BK/BU), harness side and luggage compartment lid lamp C429, circuit 31S-LB25 (BK/BU), harness side.

● Is the resistance less than 5 ohms?

→ Yes

INSTALL a new REM. REFER to [Section 419-10](#). REPEAT the self-test. CLEAR the DTCs.

→ No

REPAIR the circuit. REPEAT the self-test. CLEAR the DTCs.

K7 CHECK CIRCUIT 31S-LB25 (BK/BU) FOR SHORT TO BATTERY

1



2



REM C420b

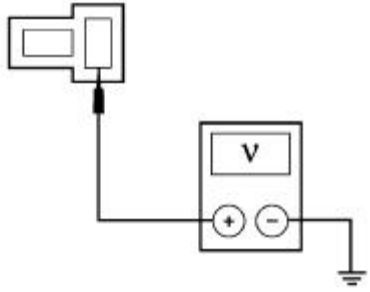
3



4

4

Measure the voltage between the luggage compartment lid lamp C428, circuit 31S-LB25 (BK/BU) harness side and ground.



A0004350

- **Is the voltage greater than 10 volts?**

- **Yes**
REPAIR the circuit. REPEAT the self-test. CLEAR the DTCs.
- **No**
INSTALL a new REM. REFER to [Section 419-10](#). REPEAT the self-test. CLEAR the DTCs.

K8 CHECK FOR A STUCK OR STICKING LUGGAGE COMPARTMENT AJAR SWITCH

1



2



Luggage Compartment Lid Ajar Switch C429

- 3 While disconnecting the luggage compartment lid ajar switch observe luggage compartment lamp.

- **Does the luggage compartment lid lamp go ON?**

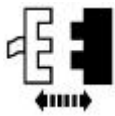
- **Yes**
INSTALL a new luggage compartment lid ajar switch. REFER to [Section 501-14A](#).
- **No**
GO to [K9](#).

K9 CHECK CIRCUIT 8-GL20 (WH/BK) FOR SHORT TO GROUND

1

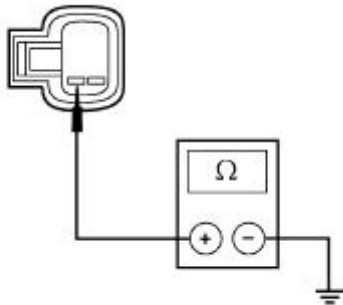


2



REM C420b

3



A0004352

- 3 Measure resistance between the luggage compartment lid ajar switch C429 pin 1, circuit 8-GL20 (WH/BK), harness side and ground.

- Is the resistance greater than 10,000 ohms?

→ **Yes**
INSTALL a new REM. REFER to [Section 419-10](#). REPEAT the self-test. CLEAR the DTCs.

→ **No**
REPAIR the circuit. REPEAT the self-test. CLEAR the DTCs.

Lamp Assembly —Rear Reading

Removal and Installation

NOTE: The rear reading lamp assembly is an integral part of the headliner. This does not include the reading lamp lens and the bulbs.

For additional information, refer to [Section 501-05](#).

Lamp Assembly —Front Map

Removal and Installation

NOTE: The front map lamp assembly is an integral part of the headliner. This does not include the front map lamp lens and bulbs.

For additional information, refer to [Section 501-05](#).

Daytime Running Lamps (DRL)

Refer to Wiring Diagrams Section [417-01](#) for schematic and connector information.

Principles of Operation

The daytime running lamps (DRL) feature will illuminate the high beam headlamps, pulse width modulated at a 40% duty cycle when the following conditions exist:

- The ignition switch (11572) is in the RUN position.
- The headlamp switch (11654) is in the OFF or PARK position.
- The autolamps feature has not illuminated the parking lamps and the headlamps.

The headlamps are controlled by the front electronic module (FEM) and the instrument cluster (10849) in all phases of operation. The headlamp switch is hardwired to the instrument cluster, which sends a command through the standard corporate protocol (SCP) network to the FEM, which outputs the appropriate voltage to the headlamps. For additional information, refer to [Section 417-01](#).

Inspection and Verification

NOTE: The FEM must be reconfigured upon replacement. Refer to [Section 418-01](#).

1. Verify the customer concern by operating the DRL following these steps:
 1. Place the ignition switch in the RUN position.
 2. Place the autolamp switch in the OFF position.
 3. Place the headlamp switch in the OFF or PARK position.
 2. Verify the parking lamp operation.
 1. Place the headlamp switch in the PARK position.
If at least one of the parking lamps operates correctly, proceed to the next step.
If none of the parking lamps operate, refer to [Section 417-01](#).
 3. Verify the high beam headlamp operation.
 1. Place the headlamp switch in the ON position.
 2. Place the multifunction switch in the high beam headlamp position.
If the high beam headlamp operation is correct and the DRL operation is incorrect, install a new FEM; refer to [Section 419-10](#).
If the high beam operation is incorrect, refer to [Section 417-01](#).
-

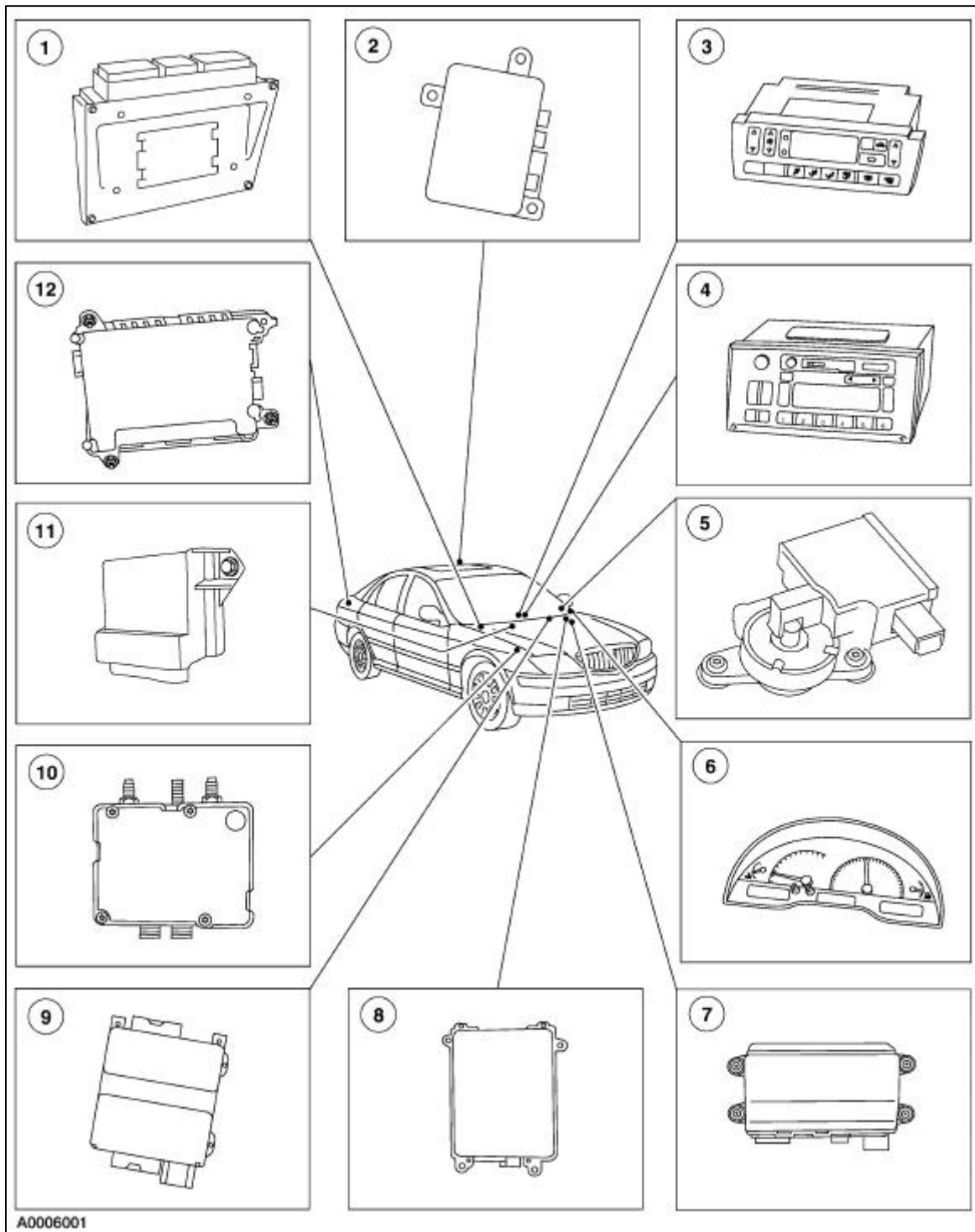
General Specifications

Item	Specification
Heat shrink tube overlap mm (inch)	12.7 (0.5)
Wire insulation removal length (twist side) mm (inch)	37.2 (1.5)
Wire insulation removal length (receiving side) mm (inch)	19.5 (0.75)
Raychem SCT® heat shrink tubing, Motorcraft part number WT-5627	ESB-M99056-AZ

Torque Specifications

Description	Nm	lb-in
Battery ground cable	10	89

Communications Network





Item	Part Number	Description
1	12A650	Powertrain control module (PCM)
2	—	Remote emergency satellite cellular unit (RESCU) module

3	18C612	Dual automatic temperature control (DATC) module
4	—	Audio control module (ACM)
5	—	Steering column lock module (SCLM)
6	—	Instrument cluster
7	—	Driver door module (DDM)
8	13B525	Front electronic module (FEM)
9	—	Driver seat module (DSM)
10	—	Anti-lock brake system (ABS)/traction control (TC) module/stability assist module
11	—	Restraint control module (RCM)
12	13B520	Rear electronic module (REM)

Communications Network

Refer to Wiring Diagrams Section [418-00](#), Multiplex Communication Network for schematic and connector information.

Special Tool(s)

 ST1137-A	73III Automotive Meter or equivalent 105-R0057
 ST1217-A	New Generation STAR (NGS) Tester or equivalent 418-F048 (007-00500)

Principles of Operation

The vehicle has two module communication networks. The standard corporate protocol (SCP), which is an unshielded twisted pair cable: data bus plus and data bus minus, and the International Standards Organization (ISO) 9141 communications network, which is a single wire network. Both networks can be connected to the New Generation STAR (NGS) Tester by one connector called the data link connector (DLC). This makes troubleshooting these systems easier by allowing one smart tester to be able to diagnose and control any module on the two networks from one connector. The DLC can be found under the instrument panel, between the steering column and the radio.

The ISO 9141 communication network does not permit inter-module communication. When the NGS Tester communicates to modules on the ISO 9141 communication network, the NGS Tester must ask for all information; the modules cannot initiate communications.

The SCP communication network will remain operational even with the severing of one of the bus wires. Communications will also continue if one of the bus wires is shorted to ground or voltage, or if some, but not all, termination resistors are lost.

Unlike the SCP communication network, the ISO 9141 communication network will not function if the wire is shorted to ground or voltage. Also, if one of the modules on the ISO 9141 communication network loses power or shorts internally, communications to that module will fail.

The anti-lock brake control module is connected to the SCP communication network. The module comes in three types. The first type is the standard equipped anti-lock brake system (ABS). It controls the brake pressure to the four wheels to keep the vehicle under control while braking. For additional information, refer to [Section 206-09A](#). The second type of ABS, if fitted, adds traction control to the anti-lock brake control module. For additional information, refer to [Section 206-09B](#). The third type of ABS, if fitted, is called the stability assist module. This module adds yaw rate sensors, lateral accelerometer, and a steering angle rate sensor to the package to help in sensing a loss of vehicle control. For additional information, refer to [Section 206-09C](#). All three types use the SCP communication network for diagnosis and communication between other SCP networked modules.

The audio control module (ACM) is connected to the SCP communication network and also to the audio control protocol (ACP) communication network. The ACM communicates with the compact disc player/changer and the cellular phone transceiver. For additional information on the compact disc player/changer, refer to [Section 415-00](#). For additional information on the cellular phone, refer to [Section 419-08](#).

The driver door module (DDM) is connected to the SCP communication network. The module controls many functions including power windows, power locks, and remote keyless entry. The DDM also communicates with the driver seat module (DSM) to control power seat and mirror memory. For additional information, refer to [Section 501-14B](#).

The DSM is connected to the SCP communication network. The DSM controls the driver power seat. The module also communicates with the DDM to control the driver seat memory functions. For additional information, refer to [Section 501-10](#).

The dual automatic temperature control (DATC) module is connected to the SCP communication network. The DATC module controls automatic climate functions that maintain the vehicle at a constant temperature setting. For additional information, refer to [Section 412-00](#).

The instrument cluster (also known as an instrument cluster module [ICM]) is connected to the SCP communication network. The instrument cluster displays information received on the SCP including speedometer, odometer, fuel, and message center warnings. The instrument cluster also controls the passive anti-theft system (PATS). For additional information, refer to [Section 413-00](#) for instrument cluster operation and [Section 419-01B](#) for PATS.

The front electronic module (FEM) and rear electronic module (REM) are connected to the SCP communication network. The FEM and REM controls both interior and exterior lighting and active anti-theft functions. For additional information on interior lamps, refer to [Section 417-02](#). For additional information on exterior lighting, refer to [Section 417-01](#). For additional information on active anti-theft, refer to [Section 419-01A](#).

The powertrain control module (PCM) is connected to the SCP communication network. The PCM controls the engine performance, electronic ignition, emission controls, speed control, and on board diagnostics. For additional information, refer to Powertrain Control/Emissions Diagnosis (PC/ED) manual.

The remote emergency satellite cellular unit (RESCU) module is connected to the SCP communication network. The module allows a user to request emergency assistance (police, ambulance, fire, wrecker) or directions to a desired location at the touch of a button. Also, if any of the vehicle's airbags are deployed while the RESCU System is powered ON, the system automatically issues a call for emergency assistance. For additional information, refer to [Section 419-05](#).

The steering column lock module (SCLM) is connected to the SCP communication network. The module controls locking of the steering column and is only equipped on vehicles with manual transmissions. For additional information, refer to [Section 211-05](#).

The restraint control module (RCM) is connected to the ISO 9141 communication network. The RCM controls the deployment of the air bags and safety belt pretensioners based on sensor input. For additional information, refer to [Section 501-20B](#).

Inspection and Verification

1. Verify the customer concern by operating the system in question.
2. Visually inspect for obvious signs of electrical damage.

Visual Inspection Chart

Electrical
<ul style="list-style-type: none"> ● Central junction box (CJB) Fuses 206 (10A) and 232 (20A) ● Wiring harness ● Loose or corroded connections

3. If the concern remains after the inspection, connect New Generation STAR (NGS) Tester to the data link connector (DLC) located beneath the instrument panel and select the vehicle to be tested from NGS Tester menu. If NGS Tester does not communicate with the vehicle:
 - check that the program card is correctly installed.
 - check that the correct version of the program card is installed.
 - check the connections to the vehicle.
 - check the ignition switch position.

If the NGS Tester still does not communicate with the vehicle, go to Pinpoint Test O.

4. Go to Pinpoint Test PC.

System Precheck

PINPOINT TEST PC: DATA LINK DIAGNOSTICS NETWORK TEST

CONDITIONS	DETAILS/RESULTS/ACTIONS
PC1 DATA LINK DIAGNOSTICS NETWORK TEST	
	<p>1 Run the DATA LINK DIAGNOSTICS network test.</p> <ul style="list-style-type: none"> ● Is SYSTEM PASSED obtained? <p>→ Yes Test PASSED. RETURN to the Symptom Chart of the section for the module in question.</p> <p>→ No If CKT70 = ALL ECUS NO RESP / NOT EQUIP, GO to Pinpoint Test C . If CKT914 = ALL ECUS NO RESP / NOT EQUIP, GO to Pinpoint Test N . If CKT915 = ALL ECUS NO RESP/NOT EQUIP, GO to Pinpoint Test N . If no response from the NGS Tester, GO to Pinpoint Test O . If CKT70, CKT914, or CKT915 = SOME ECUS NO RESP/NOT EQUIP, REFER to Symptom Chart. If the module in question is NO RESPONSE ON CKT914 (BUS+), REFER to Symptom Chart. If the module in question is NO RESPONSE ON CKT915 (BUS-), REFER to</p>

Symptom Chart.

If the module in question is NO RESPONSE/NOT EQUIPPED, REFER to Symptom Chart.

Symptom Chart

Symptom Chart

Condition	Possible Sources	Action
<ul style="list-style-type: none"> The anti-lock brake control module does not respond to the NGS Tester 	<ul style="list-style-type: none"> Wire or connection in standard corporate protocol (SCP) network. Anti-lock brake control module. Anti-lock brake control module with traction control (if fitted). Stability assist module (if fitted). 	<ul style="list-style-type: none"> GO to Pinpoint Test A.
<ul style="list-style-type: none"> The front electronic module (FEM) does not respond to the NGS Tester 	<ul style="list-style-type: none"> Wire or connection in SCP network. FEM. 	<ul style="list-style-type: none"> GO to Pinpoint Test B.
<ul style="list-style-type: none"> The restraint control module (RCM) does not respond to the NGS Tester 	<ul style="list-style-type: none"> Wire or connection in International Standards Organization (ISO) 9141 network. RCM. 	<ul style="list-style-type: none"> GO to Pinpoint Test C.
<ul style="list-style-type: none"> The instrument cluster module does not respond to the NGS Tester 	<ul style="list-style-type: none"> Wire or connection in SCP network. Instrument cluster. 	<ul style="list-style-type: none"> GO to Pinpoint Test D.
<ul style="list-style-type: none"> The powertrain control module (PCM) does not respond to the NGS Tester 	<ul style="list-style-type: none"> Wire or connection in SCP network. PCM. 	<ul style="list-style-type: none"> GO to Pinpoint Test E.
<ul style="list-style-type: none"> The dual automatic temperature control (DATC) module does not respond to the NGS Tester 	<ul style="list-style-type: none"> Wire or connection in SCP network. DATC module. 	<ul style="list-style-type: none"> GO to Pinpoint Test F.
<ul style="list-style-type: none"> The audio control module (ACM) does not respond to the NGS Tester 	<ul style="list-style-type: none"> Wire or connection in SCP network. ACM. 	<ul style="list-style-type: none"> GO to Pinpoint Test G.
<ul style="list-style-type: none"> The steering column lock module (SCLM) does not respond to the NGS Tester 	<ul style="list-style-type: none"> Wire or connection in SCP network. SCLM. 	<ul style="list-style-type: none"> GO to Pinpoint Test H.
<ul style="list-style-type: none"> The remote emergency satellite cellular unit (RESCU) module (optional) does not respond to the NGS Tester 	<ul style="list-style-type: none"> Wire or connection in SCP network. RESCU module. 	<ul style="list-style-type: none"> GO to Pinpoint Test I.
<ul style="list-style-type: none"> The driver seat module (DSM) does not respond to the NGS tester 	<ul style="list-style-type: none"> Wire or connection in SCP network. DSM (if fitted). 	<ul style="list-style-type: none"> GO to Pinpoint Test J.
<ul style="list-style-type: none"> The driver door module (DDM) does not respond to the NGS tester 	<ul style="list-style-type: none"> Wire or connection in SCP network. DDM. 	<ul style="list-style-type: none"> GO to Pinpoint Test K.
<ul style="list-style-type: none"> The rear electronic module (REM) does not respond to the 	<ul style="list-style-type: none"> Wire or connection in SCP network. 	<ul style="list-style-type: none"> GO to Pinpoint


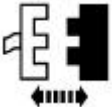

NGS Tester	<ul style="list-style-type: none"> ● REM. 	Test L.
<ul style="list-style-type: none"> ● No ISO 9141 network communication 	<ul style="list-style-type: none"> ● Wire or connection in ISO 9141 network. ● RCM. ● Anti-lock brake control module. ● Anti-lock brake control module with traction control (if fitted). ● Stability assist module (if fitted). 	<ul style="list-style-type: none"> ● GO to Pinpoint Test M.
<ul style="list-style-type: none"> ● No SCP network communication 	<ul style="list-style-type: none"> ● Wire or connection in SCP network. ● SCP networked modules. 	<ul style="list-style-type: none"> ● GO to Pinpoint Test N.
<ul style="list-style-type: none"> ● No module/network communication — no power to the NGS Tester 	<ul style="list-style-type: none"> ● CJB Fuses: 206 (10A) and 232 (20A). ● DLC pins. ● NGS Tester. ● Circuitry. 	<ul style="list-style-type: none"> ● GO to Pinpoint Test O.

Pinpoint Tests



CAUTION: Electronic modules are sensitive to static electrical charges. If exposed to these charges, damage may result.

PINPOINT TEST A: THE ANTI-LOCK BRAKE CONTROL MODULE DOES NOT RESPOND TO THE NGS TESTER

CONDITIONS	DETAILS/RESULTS/ACTIONS
A1 CHECK ANTI-LOCK BRAKE CONTROL MODULE FOR DAMAGE	
<p>1</p> 	
<p>2</p> 	<p>2</p> <p>Disconnect the anti-lock brake control module with or without traction control C135 or the stability assist module C155.</p>
<p>4</p> 	<p>3</p> <p>Inspect anti-lock brake control module C135 or stability assist module C155 for damage; repair as necessary.</p>
<p>5</p>	<p>4</p> <p>Reconnect the anti-lock brake control module with or without traction control C135 or the stability assist module C155.</p>



NGS

6



7



DATA LINK DIAGNOSTICS

- Was the result received ABS: NO RESPONSE ON CKT914 (BUS+)?

→ Yes
GO to [A2](#).

→ No
GO to [A7](#).

A2 CHECK FOR OPEN BETWEEN DLC C251 AND ANTI-LOCK BRAKE CONTROL MODULE C135 OR C155 — SCP (+)

1

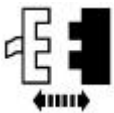


2

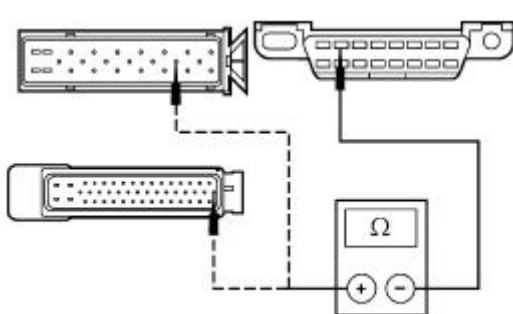


NGS

3



4



A0004353

3 Disconnect the anti-lock brake control module with or without traction control C135 or the stability assist module C155.

4 Measure the resistance between anti-lock brake control module C135 pin 11 or stability assist module C155 pin 17, circuit 4-CF6 (GY), harness side and DLC C251 pin 2, circuit 4-EG7 (GY/RD), harness side.

- Is the resistance less than 5 ohms?

→ **Yes**
INSTALL a new anti-lock brake control module or stability assist module. REFER to [Section 206-09A](#) , [Section 206-09B](#) , or [Section 206-09C](#) .

→ **No**
GO to [A3](#) .

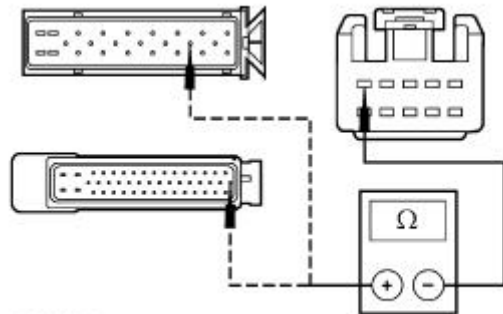
A3 CHECK FOR OPEN BETWEEN INTERIOR AJB C283c AND ANTI-LOCK BRAKE CONTROL MODULE C135 OR C155 — SCP (+)

1



Interior AJB C283c

2



A0004354

2 Measure the resistance between anti-lock brake control module C135 pin 11 or stability assist module C155 pin 17, circuit 4-CF6 (GY), harness side and interior AJB C283c pin 5, circuit 4-CF6 (GY), harness side.

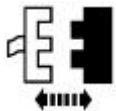
● **Is the resistance less than 5 ohms?**

→ **Yes**
GO to [A4](#) .

→ **No**
REPAIR circuit 4-CF6 (GY). For additional information, REFER to [Communication Circuit Wiring Repair](#) in this section. TEST the system for normal operation.

A4 CHECK FOR OPEN BETWEEN INTERIOR AJB C283c AND INTERIOR AJB C283d — SCP (+)

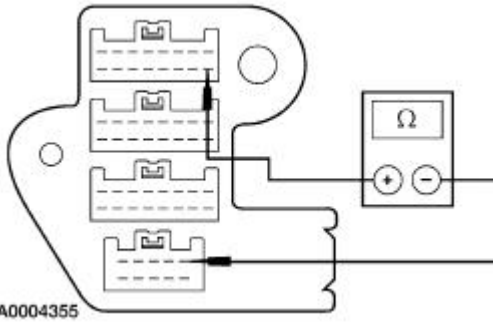
1



Interior AJB C283d

2

2 Measure the resistance between interior AJB C283d pin 16 and interior AJB C283c pin 5, component side.



● Is the resistance less than 5 ohms?

→ **Yes**
GO to [A5](#).

→ **No**
INSTALL a new AJB. TEST the system for normal operation.

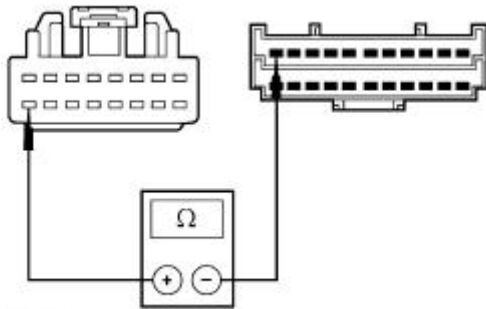
A5 CHECK FOR OPEN BETWEEN INTERIOR AJB C283d AND JOINT CONNECTOR #4 C223 — SCP (+)

1



Joint Connector #4 C223

2



2

Measure the resistance between interior AJB C283d pin 16, circuit 4-EG1 (GY), harness side and joint connector #4 C223 pin 22, circuit 4-EG1 (GY), harness side.

● Is the resistance less than 5 ohms?

→ **Yes**
GO to [A6](#).

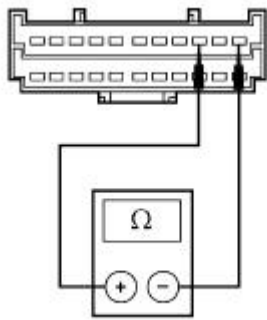
→ **No**
REPAIR circuit 4-EG1 (GY). REFER to [Communication Circuit Wiring Repair](#) in this section. TEST the system for normal operation.

A6 CHECK FOR OPEN BETWEEN JOINT CONNECTOR #4 C223 PINS — SCP (+)

1

1

Measure the resistance between joint connector #4 C223 pin 22 and pin 20, component side.



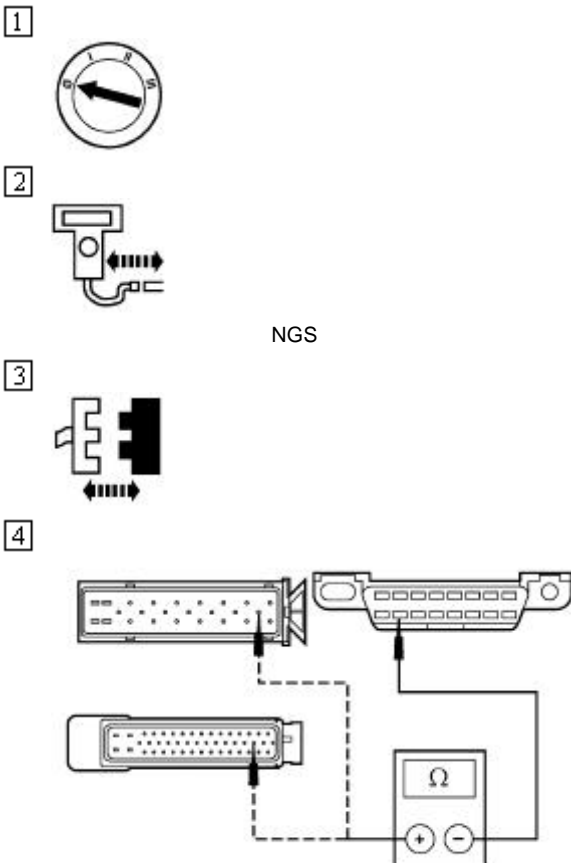
A0004357

- Is the resistance less than 5 ohms?

→ **Yes**
 REPAIR circuit 4-EG7 (GY/RD). REFER to [Communication Circuit Wiring Repair](#) in this section. TEST the system for normal operation.

→ **No**
 REPAIR joint connector #4 C223. TEST the system for normal operation.

A7 CHECK FOR OPEN BETWEEN DLC C251 AND ANTI-LOCK BRAKE CONTROL MODULE C135 OR C155 — SCP (-)



A0004358

- 3 Disconnect the anti-lock brake control module with or without traction control C135 or the stability assist module C155.
- 4 Measure the resistance between anti-lock brake control module C135 pin 10 or stability assist module C155 pin 19, circuit 5-CF6 (BU), harness side and DLC C251 pin 10, circuit 5-EG7 (BU/RD), harness side.

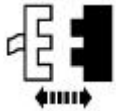
- Is the resistance less than 5 ohms?

→ **Yes**
INSTALL a new anti-lock brake control module or stability assist module. REFER to [Section 206-09A](#) , [Section 206-09B](#) , or [Section 206-09C](#) .

→ **No**
GO to [A8](#) .

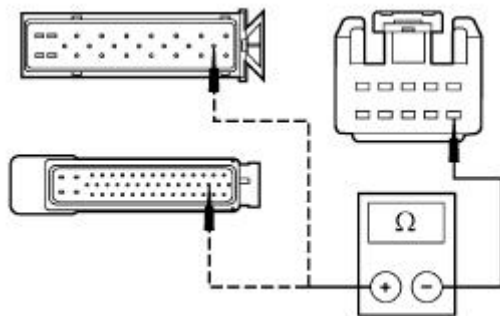
A8 CHECK FOR OPEN BETWEEN INTERIOR AJB C283c AND ANTI-LOCK BRAKE CONTROL MODULE C135 OR C155 — SCP (-)

1



Interior AJB C283c

2



A0004359

2 Measure the resistance between anti-lock brake control module C135 pin 10 or stability assist module C155 pin 19, circuit 5-CF6 (BU), harness side and interior AJB C283c pin 6, circuit 5-CF6 (BU), harness side.

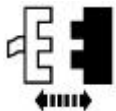
● **Is the resistance less than 5 ohms?**

→ **Yes**
GO to [A9](#) .

→ **No**
REPAIR circuit 5-CF6 (BU). REFER to [Communication Circuit Wiring Repair](#) in this section. TEST the system for normal operation.

A9 CHECK FOR OPEN BETWEEN INTERIOR AJB C283c AND INTERIOR AJB C283d — SCP (-)

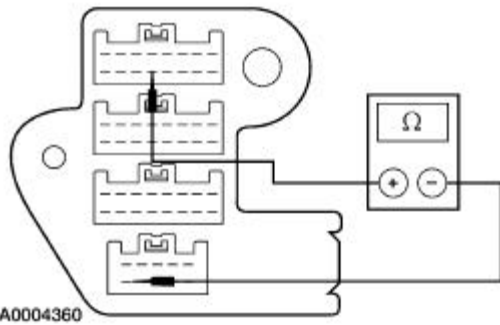
1



Interior AJB C283d

2

2 Measure the resistance between interior AJB C283d pin 12 and interior AJB C283c pin 6, component side.



● Is the resistance less than 5 ohms?

→ **Yes**
GO to [A10](#).

→ **No**
INSTALL a new AJB. TEST the system for normal operation.

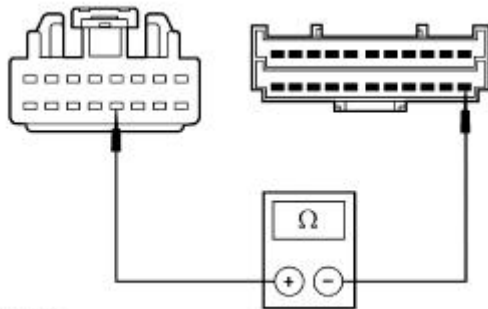
A10 CHECK FOR OPEN BETWEEN INTERIOR AJB C283d AND JOINT CONNECTOR #4 C223 — SCP (-)

1



Joint Connector #4 C223

2



2

Measure the resistance between interior AJB C283d pin 12, circuit 5-EG1 (BU), harness side and joint connector #4 C223 pin 1, circuit 5-EG1 (BU), harness side.

● Is the resistance less than 5 ohms?

→ **Yes**
GO to [A11](#).

→ **No**
REPAIR circuit 5-EG1 (BU). For additional information, REFER to [Communication Circuit Wiring Repair](#) in this section. TEST the system for normal operation.

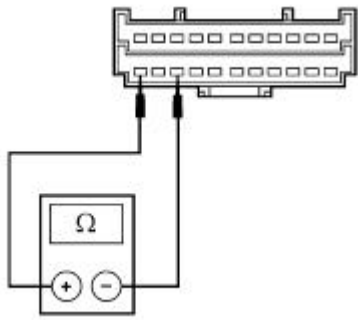
A11 CHECK FOR OPEN BETWEEN JOINT CONNECTOR #4 C223 PINS — SCP (-)

1

1

Measure the resistance between joint connector #4 C223 pin 1 and pin 3, component side.

A0004362


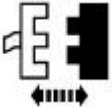




● Is the resistance less than 5 ohms?

→ **Yes**
REPAIR circuit 5-EG7 (BU/RD). REFER to [Communication Circuit Wiring Repair](#) in this section. TEST the system for normal operation.

→ **No**
REPAIR joint connector #4 C223. TEST the system for normal operation.

PINPOINT TEST B: THE FRONT ELECTRONIC MODULE (FEM) DOES NOT RESPOND TO THE NGS TESTER

CONDITIONS	DETAILS/RESULTS/ACTIONS
B1 CHECK FEM C201c FOR DAMAGE	
<p>1 </p> <p>2  FEM C201c</p> <p>4  FEM C201c</p> <p>5  NGS</p>	<p>3 Inspect FEM C201c for damage; repair as necessary.</p>

6



7



DATA LINK DIAGNOSTICS

- Was the result received GEM: NO RESPONSE ON CKT914 (BUS+)?

→ Yes
GO to [B2](#).

→ No
GO to [B7](#).

B2 CHECK FOR OPEN BETWEEN DLC C251 AND FEM C201c — SCP (+)

1

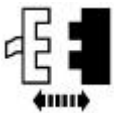


2



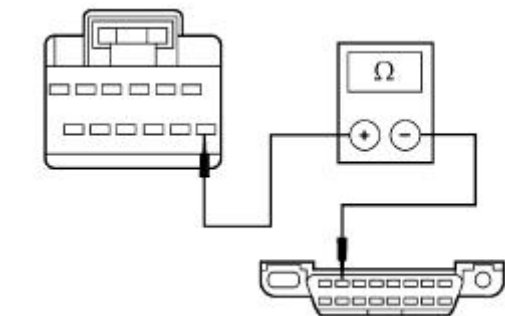
NGS

3



FEM C201c

4



A0004363

- 4 Measure the resistance between FEM C201c pin 7, circuit 4-EG11 (GY), harness side and DLC C251 pin 2, circuit 4-EG7 (GY/RD), harness side.

- Is the resistance less than 5 ohms?

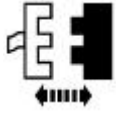
→ Yes
INSTALL a new FEM. REFER to [Section 419-10](#). TEST the system for normal

operation.

→ **No**
GO to [B3](#).

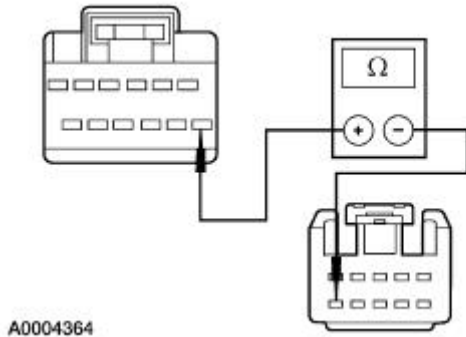
B3 CHECK FOR OPEN BETWEEN INTERIOR AJB C283c AND FEM C201c — SCP (+)

1



Interior AJB C283c

2



2

Measure the resistance between FEM C201c pin 7, circuit 4-EG11 (GY), harness side and interior AJB C283c pin 10, circuit 4-EG11 (GY), harness side.

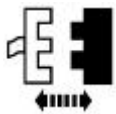
● Is the resistance less than 5 ohms?

→ **Yes**
GO to [B4](#).

→ **No**
REPAIR circuit 4-EG11 (GY). REFER to [Communication Circuit Wiring Repair](#) in this section. TEST the system for normal operation.

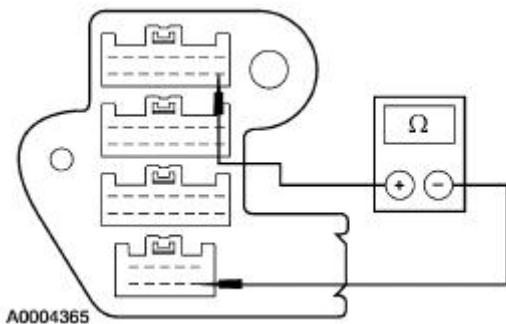
B4 CHECK FOR OPEN BETWEEN INTERIOR AJB C283c AND INTERIOR AJB C283d — SCP (+)

1



Interior AJB C283d

2



2

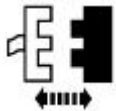
Measure the resistance between interior AJB C283d pin 16 and interior AJB C283c pin 10, component side.

● Is the resistance less than 5 ohms?

- **Yes**
GO to [B5](#).
- **No**
INSTALL a new AJB. TEST the system for normal operation.

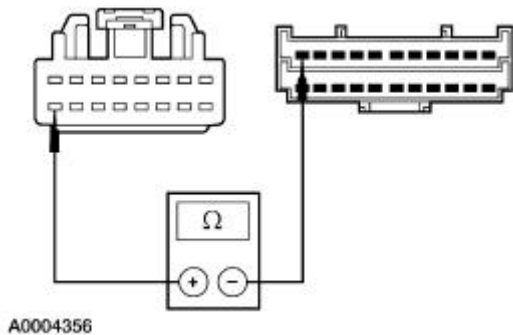
B5 CHECK FOR OPEN BETWEEN INTERIOR AJB C283d AND JOINT CONNECTOR #4 C223 — SCP (+)

1



Joint Connector #4 C223

2



2

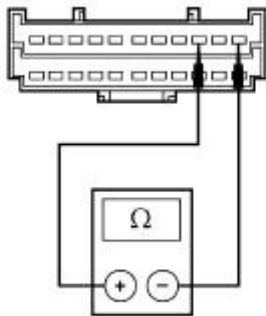
Measure the resistance between interior AJB C283d pin 16, circuit 4-EG1 (GY), harness side and joint connector #4 C223 pin 22, circuit 4-EG1 (GY), harness side.

- Is the resistance less than 5 ohms?

- **Yes**
GO to [B6](#).
- **No**
REPAIR circuit 4-EG1 (GY). REFER to [Communication Circuit Wiring Repair](#) in this section. TEST the system for normal operation.

B6 CHECK FOR OPEN BETWEEN JOINT CONNECTOR #4 C223 PINS — SCP (+)

1



A0004357

1

Measure the resistance between joint connector #4 C223 pin 22 and pin 20, component side.

- Is the resistance less than 5 ohms?

- **Yes**

REPAIR circuit 4-EG7 (GY/RD). REFER to [Communication Circuit Wiring Repair](#) in this section. TEST the system for normal operation.

→ **No**
REPAIR joint connector #4 C223. TEST the system for normal operation.

B7 CHECK FOR OPEN BETWEEN DLC C251 AND FEM C201c — SCP (-)

1



2



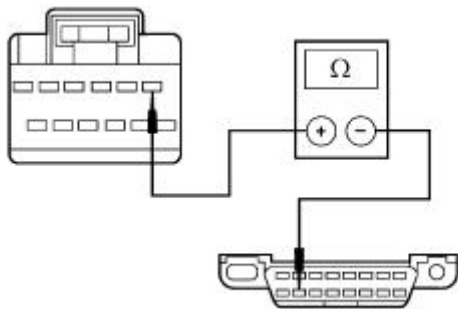
NGS

3



FEM C201c

4



A0004366

4 Measure the resistance between FEM C201c pin 1, circuit 5-EG11 (BU), harness side and DLC C251 pin 10, circuit 5-EG7 (BU/RD), harness side.

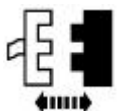
● **Is the resistance less than 5 ohms?**

→ **Yes**
INSTALL a new FEM. REFER to [Section 419-10](#). TEST the system for normal operation.

→ **No**
GO to [B8](#).

B8 CHECK FOR OPEN BETWEEN INTERIOR AJB C283c AND FEM C201c — SCP (-)

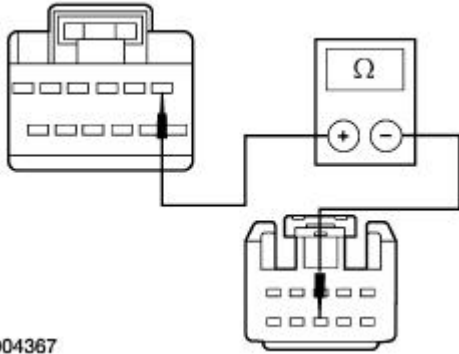
1



Interior AJB C283c

2

2 Measure the resistance between FEM



A0004367

C201c pin 1, circuit 5-EG11 (BU), harness side and interior AJB C283c pin 8, circuit 5-EG11 (BU), harness side.

● Is the resistance less than 5 ohms?

→ **Yes**
GO to [B9](#).

→ **No**
REPAIR circuit 5-EG11 (BU). REFER to [Communication Circuit Wiring Repair](#) in this section. TEST the system for normal operation.

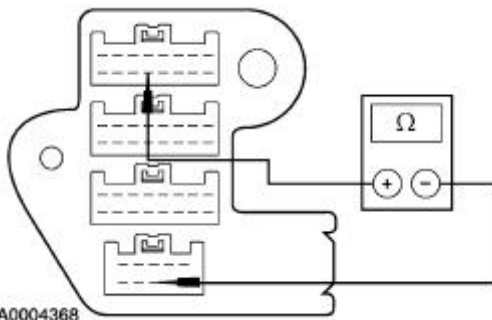
B9 CHECK FOR OPEN BETWEEN INTERIOR AJB C283c AND INTERIOR AJB C283d — SCP (-)

1



Interior AJB C283d

2



A0004368

2 Measure the resistance between interior AJB C283d pin 12 and interior AJB C283c pin 8, component side.

● Is the resistance less than 5 ohms?

→ **Yes**
GO to [B10](#).

→ **No**
INSTALL a new AJB. TEST the system for normal operation.

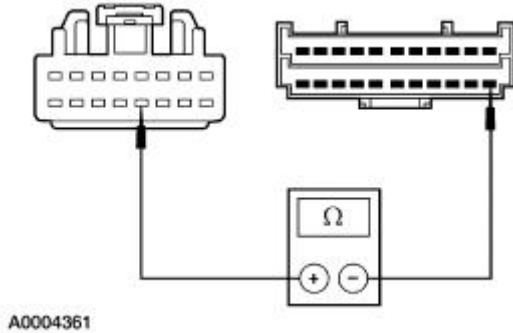
B10 CHECK FOR OPEN BETWEEN INTERIOR AJB C283d AND JOINT CONNECTOR #4 C223 — SCP (-)

1



Joint Connector #4 C223

2



2

Measure the resistance between interior AJB C283d pin 12, circuit 5-EG1 (BU), harness side and joint connector #4 C223 pin 1, circuit 5-EG1 (BU), harness side.

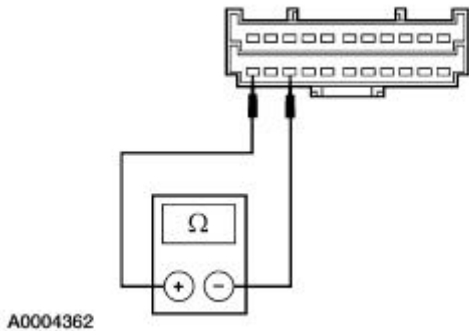
● Is the resistance less than 5 ohms?

→ **Yes**
GO to [B11](#).

→ **No**
REPAIR circuit 5-EG1 (BU). REFER to [Communication Circuit Wiring Repair](#) in this section. TEST the system for normal operation.

B11 CHECK FOR OPEN BETWEEN JOINT CONNECTOR #4 C223 PINS — SCP (-)

1



1

Measure the resistance between joint connector #4 C223 pin 1 and pin 3, component side.


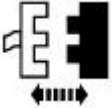
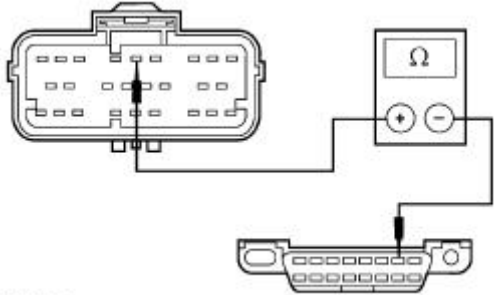
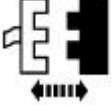
● Is the resistance less than 5 ohms?

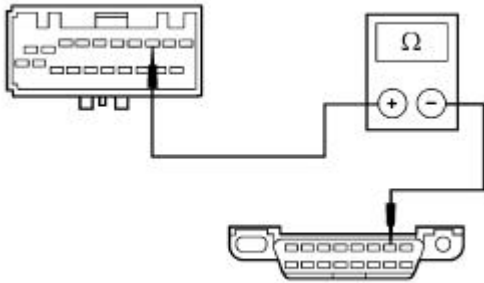
→ **Yes**
REPAIR circuit 5-EG7 (BU/RD). REFER to [Communication Circuit Wiring Repair](#) in this section. TEST the system for normal operation.

→ **No**
REPAIR joint connector #4 C223. TEST the system for normal operation.

PINPOINT TEST C: THE RESTRAINT CONTROL MODULE (RCM)

DOES NOT RESPOND TO THE NGS TESTER

CONDITIONS	DETAILS/RESULTS/ACTIONS
<p>C1 CHECK FOR AN OPEN CIRCUIT BETWEEN RCM C310a AND DLC C251</p> <p>1</p>  <p>4</p>  <p>RCM C310a</p> <p>6</p>  <p>A0004369</p>	<p>2 Inspect the DLC C251 and NGS Tester terminal for damage; repair as necessary.</p> <p>3 Deactivate the air bag system. Refer to Section 501-20B.</p> <p>5 Inspect RCM C310a for damage, repair as necessary.</p> <p>6 Measure the resistance between DLC C251 pin 7, circuit 4-EE10 (GY/BK), harness side and RCM C310a pin 5, circuit 4-EE1 (GY), harness side.</p> <p>● Is the resistance less than 5 ohms?</p> <p>→ Yes GO to Pinpoint Test M.</p> <p>→ No GO to C2.</p>
<p>C2 CHECK FOR AN OPEN CIRCUIT BETWEEN DLC C251 AND IN-LINE C212M</p> <p>1</p>  <p>In-Line C212</p> <p>2</p>	<p>2 Measure the resistance between DLC C251 pin 7, circuit 4-EE10 (GY/BK), harness side and in-line C212m pin 8, circuit 4-EE10 (GY/BK), harness side.</p>



A0004370

● Is the resistance less than 5 ohms?


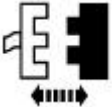


→ Yes

REPAIR circuit 4-EE1 (GY) and circuit 4-EE10 (GY/BK) between the RCM C310a and in-line C212F. TEST the system for normal operation.

→ No

REPAIR circuit 4-EE10 (GY/BK) between the DLC C251 and in-line C212m. TEST the system for normal operation.

PINPOINT TEST D: THE INSTRUMENT CLUSTER MODULE DOES NOT RESPOND TO THE NGS TESTER

CONDITIONS	DETAILS/RESULTS/ACTIONS
D1 CHECK INSTRUMENT CLUSTER C220b FOR DAMAGE	
<p>1 </p> <p>2  Instrument Cluster C220b</p> <p>4  Instrument Cluster C220b</p> <p>5  NGS</p>	<p>3 Inspect instrument cluster C220b for damage; repair as necessary.</p>

6



7



DATA LINK DIAGNOSTICS

- Was the result received ICM: NO RESPONSE ON CKT914 (BUS+)?

→ Yes
GO to [D2](#).

→ No
GO to [D5](#).

D2 CHECK FOR OPEN BETWEEN DLC C251 AND INSTRUMENT CLUSTER C220b — SCP (+)

1



2



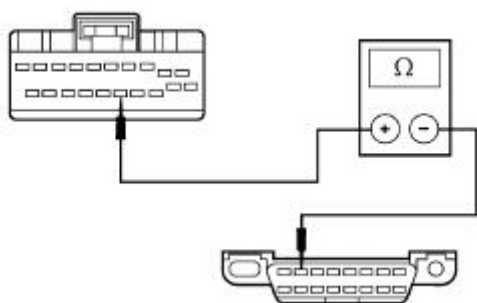
NGS

3



Instrument Cluster C220b

4



A0004371

- 4 Measure the resistance between instrument cluster C220b pin 15, circuit 4-EG8 (GY/VT), harness side and DLC C251 pin 2, circuit 4-EG7 (GY/RD), harness side.

- Is the resistance less than 5 ohms?

→ Yes
INSTALL a new instrument cluster.
REFER to [Section 413-01](#) . TEST the

system for normal operation.

→ **No**
GO to [D3](#).

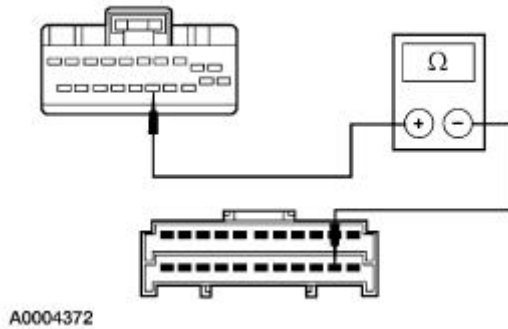
D3 CHECK FOR OPEN BETWEEN INSTRUMENT CLUSTER C220b AND JOINT CONNECTOR #4 C223 — SCP (+)

1



Joint Connector #4 C223

2



2

Measure the resistance between instrument cluster C220b pin 15, circuit 4-EG8 (GY/VT), harness side and joint connector #4 C223 pin 21, circuit 4-EG8 (GY/VT), harness side.

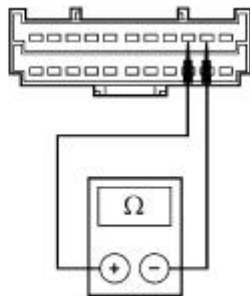
● **Is the resistance less than 5 ohms?**

→ **Yes**
GO to [D4](#).

→ **No**
REPAIR circuit 4-EG8 (GY/VT). REFER to [Communication Circuit Wiring Repair](#) in this section. TEST the system for normal operation.

D4 CHECK FOR OPEN BETWEEN JOINT CONNECTOR #4 C223 PINS — SCP (+)

1



A0004373

1

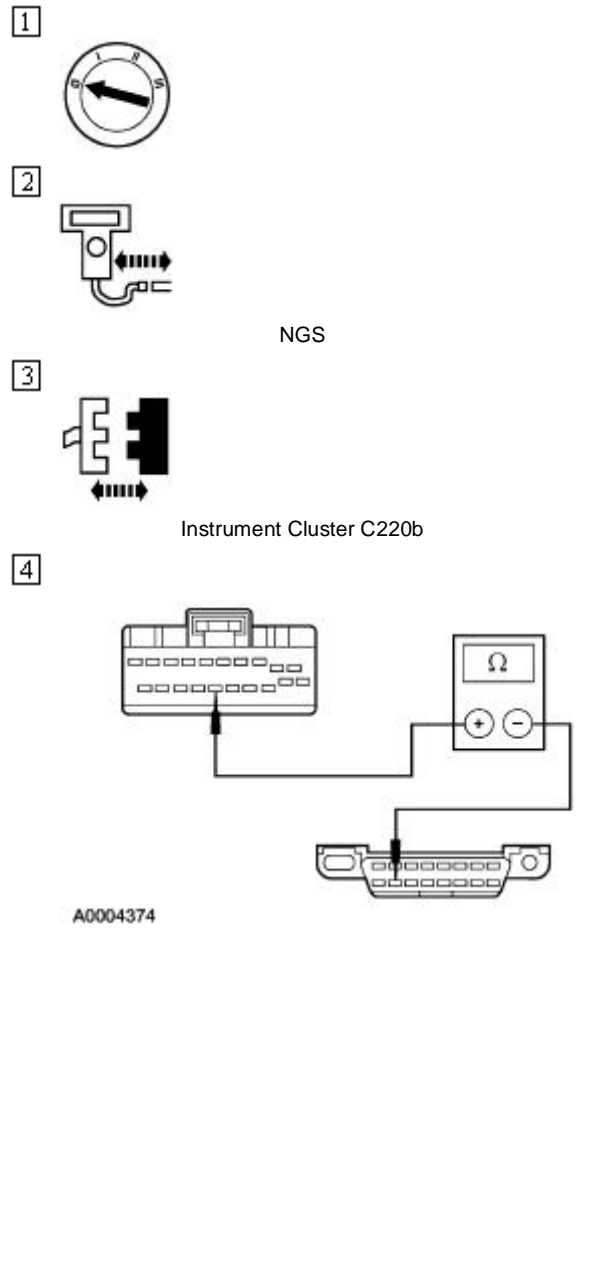
Measure the resistance between joint connector #4 C223 pin 21 and pin 20, component side.

● **Is the resistance less than 5 ohms?**

→ **Yes**
REPAIR circuit 4-EG7 (GY/RD). REFER to [Communication Circuit Wiring Repair](#) in this section. TEST the system for normal operation.

→ **No**
REPAIR joint connector #4 C223. TEST the system for normal operation.

D5 CHECK FOR OPEN BETWEEN DLC C251 AND INSTRUMENT CLUSTER C220b — SCP (-)



4 Measure the resistance between instrument cluster C220b pin 16, circuit 5-EG8 (BU/WH), harness side and DLC C251 pin 10, circuit 5-EG7 (BU/RD), harness side.

● Is the resistance less than 5 ohms?

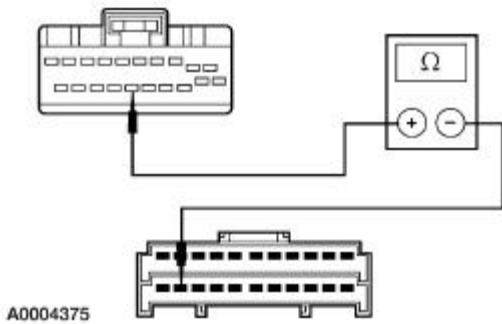
→ **Yes**
INSTALL a new instrument cluster. REFER to [Section 413-01](#). TEST the system for normal operation.

→ **No**
GO to [D6](#).

D6 CHECK FOR OPEN BETWEEN INSTRUMENT CLUSTER C220b AND JOINT CONNECTOR #4 C223 — SCP (-)



2 Measure the resistance between instrument cluster C220b pin 16, circuit 5-EG8 (BU/WH), harness side and joint



connector #4 C223 pin 1, circuit 5-EG1 (BU), harness side.

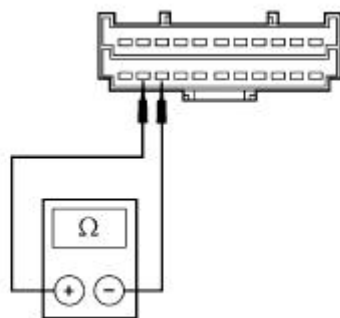
● Is the resistance less than 5 ohms?

→ **Yes**
GO to [D7](#).

→ **No**
REPAIR circuit 5-EG8 (BU/WH). REFER to [Communication Circuit Wiring Repair](#). TEST the system for normal operation.

D7 CHECK FOR OPEN BETWEEN JOINT CONNECTOR #4 C223 PINS — SCP (-)

1



1

Measure the resistance between joint connector #4 C223 pin 2 and pin 3, component side.

● Is the resistance less than 5 ohms?

→ **Yes**
REPAIR circuit 5-EG7 (BU/RD). REFER to [Communication Circuit Wiring Repair](#) in this section. TEST the system for normal operation.

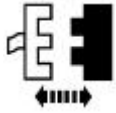
→ **No**
REPAIR joint connector #4 C223. TEST the system for normal operation.

PINPOINT TEST E: THE POWERTRAIN CONTROL MODULE (PCM) DOES NOT RESPOND TO THE NGS TESTER

CONDITIONS	DETAILS/RESULTS/ACTIONS
E1 CHECK PCM C175a FOR DAMAGE	
1	



2



PCM C175a

4



PCM C175a

5



NGS

6



7



DATA LINK DIAGNOSTICS

3 Inspect PCM C175a for damage; repair as necessary.

• Was the result received PCM: NO RESPONSE ON CKT914 (BUS+)?

→ Yes
GO to E2.

→ No
GO to E7.

E2 CHECK FOR OPEN BETWEEN DLC C251 AND PCM C175a — SCP (+)

1

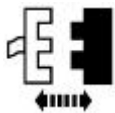


2



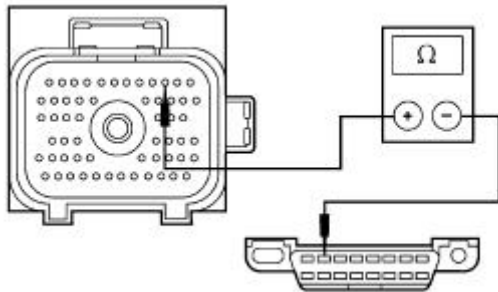
NGS

3



PCM C175a

4



A0004377

4

Measure the resistance between PCM C175a pin 3, circuit 4-RE8 (GY), harness side and DLC C251 pin 2, circuit 4-EG7 (GY/RD), harness side.

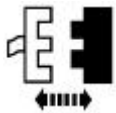
• Is the resistance less than 5 ohms?

→ **Yes**
REFER to Powertrain Control/Emissions Diagnosis (PC/ED) manual.

→ **No**
GO to [E3](#).

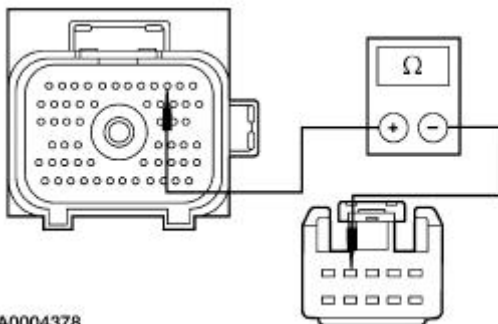
E3 CHECK FOR OPEN BETWEEN INTERIOR AJB C283c AND PCM C175a — SCP (+)

1



Interior AJB C283c

2



A0004378

2

Measure the resistance between PCM C175a pin 3, circuit 4-RE8 (GY), harness side and interior AJB C283c pin 4, circuit 4-RE8 (GY), harness side.

• Is the resistance less than 5 ohms?

→ **Yes**
GO to [E4](#).

→ **No**
REPAIR circuit 4-RE8 (GY). REFER to [Communication Circuit Wiring Repair](#) in this section. TEST the system for normal operation.

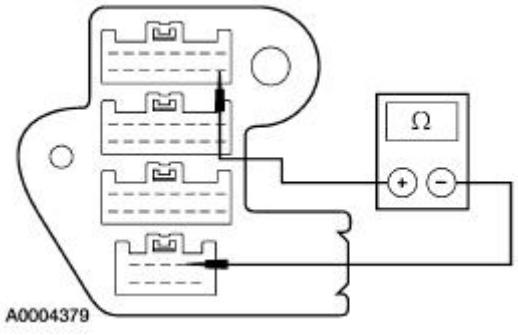
E4 CHECK FOR OPEN BETWEEN INTERIOR AJB C283c AND INTERIOR AJB C283d — SCP (+)

1



Interior AJB C283d

2



2

Measure the resistance between interior AJB C283d pin 16 and interior AJB C283c pin 4, component side.

● Is the resistance less than 5 ohms?

→ **Yes**
GO to [E5](#).

→ **No**
INSTALL a new AJB. TEST the system for normal operation.

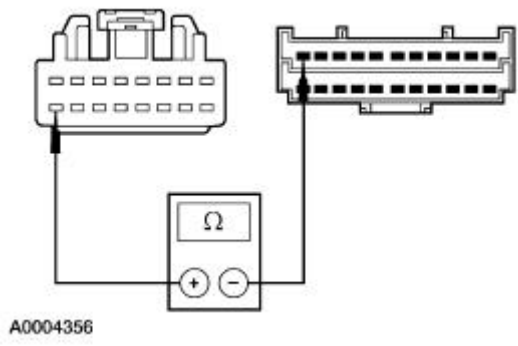
E5 CHECK FOR OPEN BETWEEN INTERIOR AJB C283d AND JOINT CONNECTOR #4 C223 — SCP (+)

1



Joint Connector #4 C223

2



2

Measure the resistance between interior AJB C283d pin 16, circuit 4-EG1 (GY), harness side and joint connector #4 C223 pin 22, circuit 4-EG1 (GY), harness side.

● Is the resistance less than 5 ohms?

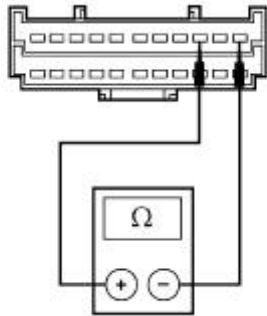
→ **Yes**
GO to [E6](#).

→ **No**

REPAIR circuit 4-EG1 (GY). REFER to [Communication Circuit Wiring Repair](#) in this section. TEST the system for normal operation.

E6 CHECK FOR OPEN BETWEEN JOINT CONNECTOR #4 C223 PINS — SCP (+)

1



A0004357

1

Measure the resistance between joint connector #4 C223 pin 22 and pin 20, component side.

● **Is the resistance less than 5 ohms?**

→ **Yes**

REPAIR circuit 4-EG7 (GY/RD). REFER to [Communication Circuit Wiring Repair](#) in this section. TEST the system for normal operation.

→ **No**

REPAIR joint connector #4 C223. TEST the system for normal operation.

E7 CHECK FOR OPEN BETWEEN DLC C251 AND PCM C175a — SCP (-)

1



2



NGS

3

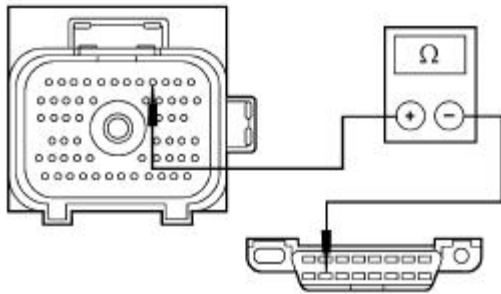


PCM C175a

4

4

Measure the resistance between PCM C175a pin 4, circuit 5-RE8 (BU), harness side and DLC C251 pin 10, circuit 5-EG7 (BU/RD), harness side.



A0004380

● Is the resistance less than 5 ohms?

→ **Yes**
REFER to Powertrain Control/Emissions Diagnosis (PC/ED) manual.

→ **No**
GO to [E8](#).

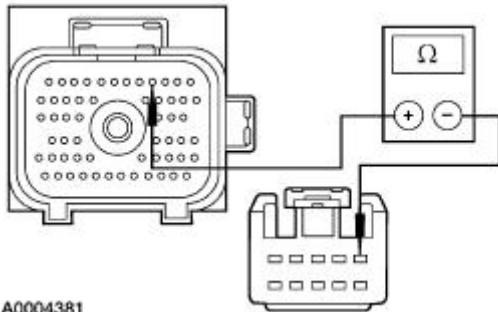
E8 CHECK FOR OPEN BETWEEN INTERIOR AJB C283c AND PCM C175a — SCP (-)

1



Interior AJB C283c

2



A0004381

2 Measure the resistance between PCM C175a pin 4, circuit 5-RE8 (BU), harness side and interior AJB C283c pin 1, circuit 5-RE8 (BU), harness side.

● Is the resistance less than 5 ohms?

→ **Yes**
GO to [E9](#).

→ **No**
REPAIR circuit 5-RE8 (BU). REFER to [Communication Circuit Wiring Repair](#) in this section. TEST the system for normal operation.

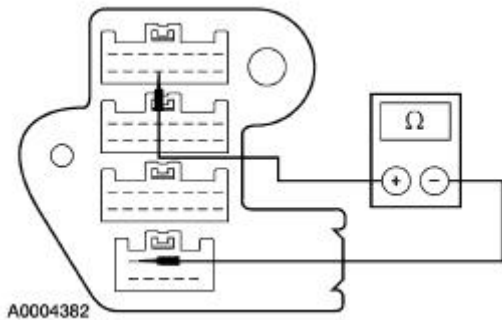
E9 CHECK FOR OPEN BETWEEN INTERIOR AJB C283c AND INTERIOR AJB C283d — SCP (-)

1



Interior AJB C283d

2



2

Measure the resistance between interior AJB C283d pin 12 and interior AJB C283c pin 1, component side.

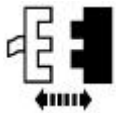
● Is the resistance less than 5 ohms?

→ **Yes**
GO to [E10](#).

→ **No**
INSTALL a new AJB. TEST the system for normal operation.

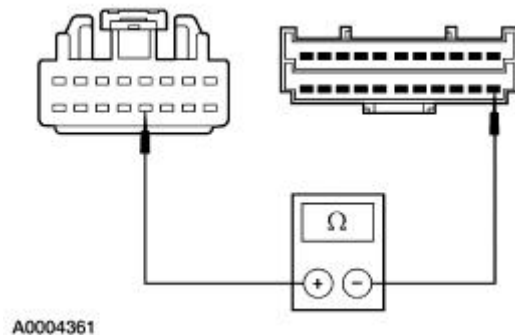
E10 CHECK FOR OPEN BETWEEN INTERIOR AJB C283d AND JOINT CONNECTOR #4 C223 — SCP (-)

1



Joint Connector #4 C223

2



2

Measure the resistance between interior AJB C283d pin 12, circuit 5-EG1 (BU), harness side and joint connector #4 C223 pin 1, circuit 5-EG1 (BU), harness side.

● Is the resistance less than 5 ohms?

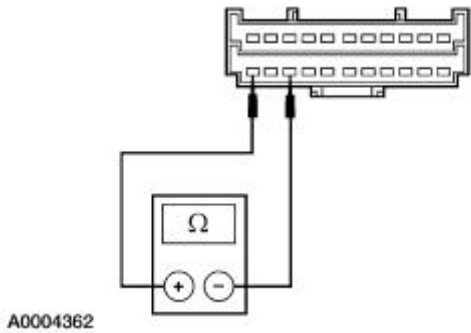
→ **Yes**
GO to [E11](#).

→ **No**
REPAIR circuit 5-EG1 (BU). REFER to [Communication Circuit Wiring Repair](#) in this section. TEST the system for normal

operation.

E11 CHECK FOR OPEN BETWEEN JOINT CONNECTOR #4 C223 PINS — SCP (-)

1



1

Measure the resistance between joint connector #4 C223 pin 1 and pin 3, component side.

● Is the resistance less than 5 ohms?


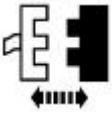

→ Yes

REPAIR circuit 5-EG7 (BU/RD). REFER to [Communication Circuit Wiring Repair](#) in this section. TEST the system for normal operation.

→ No

REPAIR joint connector #4 C223. TEST the system for normal operation.

PINPOINT TEST F: THE DUAL AUTOMATIC TEMPERATURE CONTROL (DATC) MODULE DOES NOT RESPOND TO THE NGS TESTER

CONDITIONS	DETAILS/RESULTS/ACTIONS
F1 CHECK DATC MODULE C228 FOR DAMAGE	
<p>1</p>  <p>2</p>  <p>DATC Module C228</p> <p>4</p>  <p>DATC Module C228</p> <p>5</p>	<p>3</p> <p>Inspect DATC module C228 for damage; repair as necessary.</p>



NGS

6



7



DATA LINK DIAGNOSTICS

- Was the result received DATC: NO RESPONSE ON CKT914 (BUS+)?

→ Yes
GO to [F2](#).

→ No
GO to [F5](#).

F2 CHECK FOR OPEN BETWEEN DLC C251 AND DATC MODULE C228a — SCP (+)

1

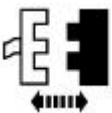


2



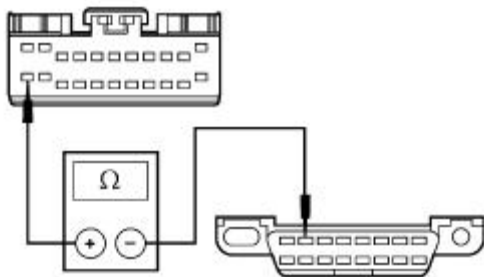
NGS

3



DATC Module C228a

4



A0004383

- 4 Measure the resistance between DATC module C228a pin 12, circuit 4-FA10 (GY/BK), harness side and DLC C251 pin 2, circuit 4-EG7 (GY/RD), harness side.

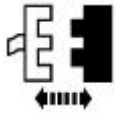
- Is the resistance less than 5 ohms?

→ **Yes**
INSTALL a new DATC module. REFER to [Section 412-00](#). TEST the system for normal operation.

→ **No**
GO to [F3](#).

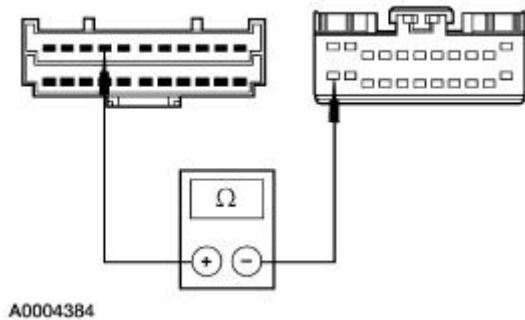
F3 CHECK FOR OPEN BETWEEN DATC MODULE C228a AND JOINT CONNECTOR #4 C223 — SCP (+)

1



Joint Connector #4 C223

2



2

Measure the resistance between DATC module C228a pin 12, circuit 4-FA10 (GY/BK), harness side and joint connector #4 C223 pin 19, circuit 4-FA10 (GY/BK), harness side.

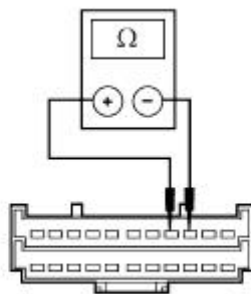
● **Is the resistance less than 5 ohms?**

→ **Yes**
GO to [F4](#).

→ **No**
REPAIR circuit 4-FA10 (GY/BK). REFER to [Communication Circuit Wiring Repair](#) in this section. TEST the system for normal operation.

F4 CHECK FOR OPEN BETWEEN JOINT CONNECTOR #4 C223 PINS — SCP (+)

1



A0004385

1

Measure the resistance between joint connector #4 C223 pin 19 and pin 20, component side.

● **Is the resistance less than 5 ohms?**

→ **Yes**
REPAIR circuit 4-EG7 (GY/RD). REFER

to [Communication Circuit Wiring Repair](#) in this section. TEST the system for normal operation.

→ **No**
REPAIR joint connector #4 C223. TEST the system for normal operation.

F5 CHECK FOR OPEN BETWEEN DLC C251 AND DATC MODULE C228a — SCP (-)

1



2



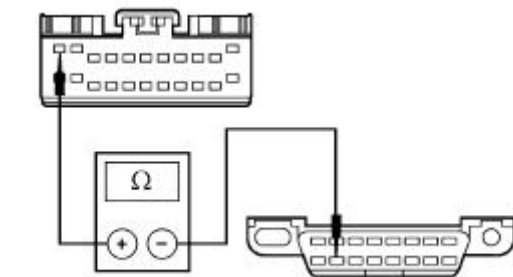
NGS

3



DATC Module C228a

4



A0004386

4 Measure the resistance between DATC module C228a pin 1, circuit 5-FA10 (BU/YE), harness side and DLC C251 pin 10, circuit 5-EG7 (BU/RD), harness side.

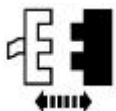
● **Is the resistance less than 5 ohms?**

→ **Yes**
INSTALL a new DATC module. REFER to [Section 412-00](#). TEST the system for normal operation.

→ **No**
GO to [F6](#).

F6 CHECK FOR OPEN BETWEEN DATC MODULE C228a AND JOINT CONNECTOR #4 C223 — SCP (-)

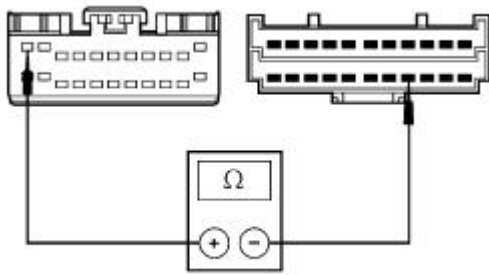
1



Joint Connector #4 C223

2

2 Measure the resistance between DATC module C228a pin 1, circuit 5-FA10



A0004387

(BU/YE), harness side and joint connector #4 C223 pin 4, circuit 5-FA10 (BU/YE), harness side.

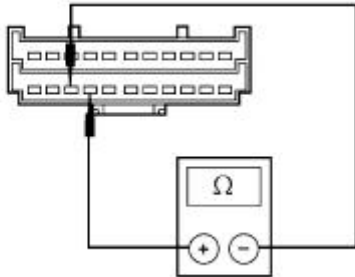
● Is the resistance less than 5 ohms?

→ **Yes**
GO to [F7](#).

→ **No**
REPAIR circuit 5-FA10 (BU/YE). REFER to [Communication Circuit Wiring Repair](#) in this section. TEST the system for normal operation.

F7 CHECK FOR OPEN BETWEEN JOINT CONNECTOR #4 C223 PINS — SCP (-)

1



A0004388

1

Measure the resistance between joint connector #4 C223 pin 4 and pin 3, component side.

● Is the resistance less than 5 ohms?

→ **Yes**
REPAIR circuit 5-EG7 (BU/RD). REFER to [Communication Circuit Wiring Repair](#) in this section. TEST the system for normal operation.

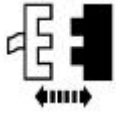
→ **No**
REPAIR joint connector #4 C223. TEST the system for normal operation.

PINPOINT TEST G: THE AUDIO CONTROL MODULE (ACM) DOES NOT RESPOND TO THE NGS TESTER

CONDITIONS	DETAILS/RESULTS/ACTIONS
G1 CHECK ACM C240a FOR DAMAGE	
1	



2



ACM C240a

3 Inspect ACM C240a for damage; repair as necessary.

4



ACM C240a

5



NGS

6



7



DATA LINK DIAGNOSTICS

• Was the result received ACM: NO RESPONSE ON CKT914 (BUS+)?

→ Yes
GO to [G2](#).

→ No
GO to [G5](#).

G2 CHECK FOR OPEN BETWEEN DLC C251 AND ACM C240a — SCP (+)

1

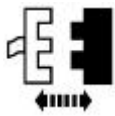


2



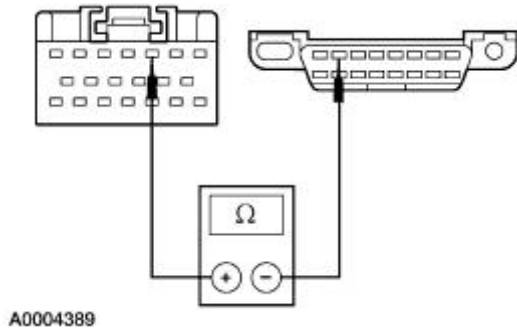
NGS

3



ACM C240a

4



4

Measure the resistance between ACM C240a pin 3, circuit 4-EG10 (GY/BK), harness side and DLC C251 pin 2, circuit 4-EG7 (GY/RD), harness side.

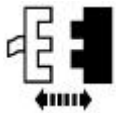
● Is the resistance less than 5 ohms?

→ **Yes**
INSTALL a new ACM. REFER to [Section 415-01](#). TEST the system for normal operation.

→ **No**
GO to [G3](#).

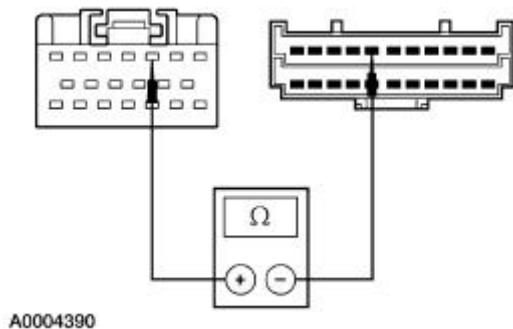
G3 CHECK FOR OPEN BETWEEN ACM C240a AND JOINT CONNECTOR #4 C223 — SCP (+)

1



Joint Connector #4 C223

2



2

Measure the resistance between ACM C240a pin 3, circuit 4-EG10 (GY/BK), harness side and joint connector #4 C223 pin 18, circuit 4-EG10 (GY/BK), harness side.

● Is the resistance less than 5 ohms?

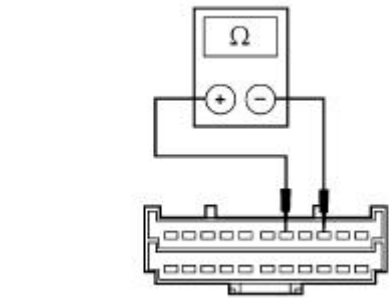
→ **Yes**
GO to [G4](#).

→ **No**
REPAIR circuit 4-EG10 (GY/BK). REFER to [Communication Circuit Wiring Repair](#) in this section. TEST the system for normal

operation.

G4 CHECK FOR OPEN BETWEEN JOINT CONNECTOR #4 C223 PINS — SCP (+)

1



A0004391

1

Measure the resistance between joint connector #4 C223 pin 18 and pin 20, component side.

● **Is the resistance less than 5 ohms?**

→ **Yes**

REPAIR circuit 4-EG7 (GY/RD). REFER to [Communication Circuit Wiring Repair](#) in this section. TEST the system for normal operation.

→ **No**

REPAIR joint connector #4 C223. TEST the system for normal operation.

G5 CHECK FOR OPEN BETWEEN DLC C251 AND ACM C240a — SCP (-)

1



2



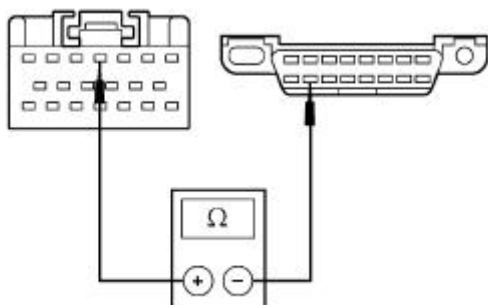
NGS

3



ACM C240a

4



A0004392

4

Measure the resistance between ACM C240a pin 4, circuit 5-EG10 (BU/YE), harness side and DLC C251 pin 10, circuit 5-EG7 (BU/RD), harness side.

● Is the resistance less than 5 ohms?

→ **Yes**
INSTALL a new ACM. REFER to [Section 415-01](#). TEST the system for normal operation.

→ **No**
GO to [G6](#).

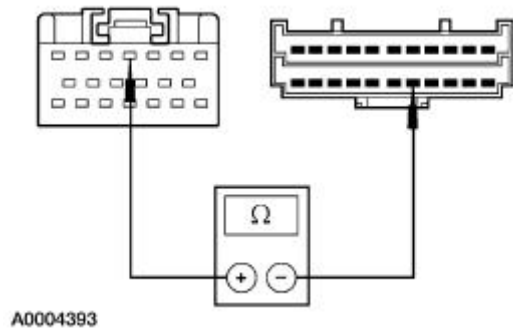
G6 CHECK FOR OPEN BETWEEN ACM C240a AND JOINT CONNECTOR #4 C223 — SCP (-)

1



Joint Connector #4 C223

2



2

Measure the resistance between ACM C240a pin 4, circuit 5-EG10 (BU/YE), harness side and joint connector #4 C223 pin 5, circuit 5-EG10 (BU/YE), harness side.

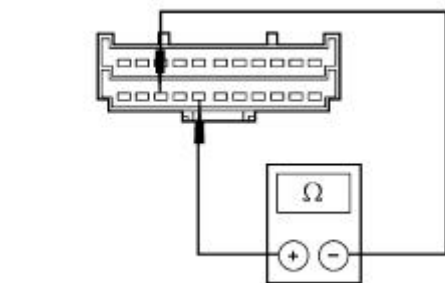
● Is the resistance less than 5 ohms?

→ **Yes**
GO to [G7](#).

→ **No**
REPAIR circuit 5-EG10 (BU/YE). REFER to [Communication Circuit Wiring Repair](#) in this section. TEST the system for normal operation.

G7 CHECK FOR OPEN BETWEEN JOINT CONNECTOR #4 C223 PINS — SCP (-)

1









1

Measure the resistance between joint connector #4 C223 pin 5 and pin 3, component side.

● Is the resistance less than 5 ohms?

- **Yes**
REPAIR circuit 5-EG7 (BU/RD). REFER to [Communication Circuit Wiring Repair](#) in this section. TEST the system for normal operation.
- **No**
REPAIR joint connector #4 C223. TEST the system for normal operation.

PINPOINT TEST H: THE STEERING COLUMN LOCK MODULE (SCLM) DOES NOT RESPOND TO THE NGS TESTER

CONDITIONS	DETAILS/RESULTS/ACTIONS
H1 CHECK SCLM C267 FOR DAMAGE	
<p>1</p> 	
<p>2</p>  <p>SCLM C267</p>	<p>3 Inspect SCLM C267 for damage; repair as necessary.</p>
<p>4</p>  <p>SCLM C267</p>	
<p>5</p>  <p>NGS</p>	
<p>6</p> 	
<p>7</p>  <p>DATA LINK DIAGNOSTICS</p>	<ul style="list-style-type: none"> ● Was the result received SCLU: NO RESPONSE ON CKT914 (BUS+)?

→ **Yes**
GO to [H2](#).

→ **No**
GO to [H6](#).

H2 CHECK FOR OPEN BETWEEN DLC C251 AND SCLM C267 — SCP (+)

1

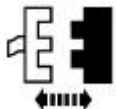


2



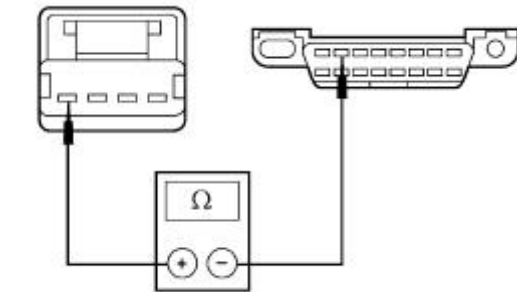
NGS

3



SCLM C267

4



A0004395

4 Measure the resistance between SCLM C267 pin 4, circuit 4-GL58 (GY/OG), harness side and DLC C251 pin 2, circuit 4-EG7 (GY/RD), harness side.

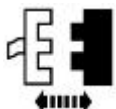
● **Is the resistance less than 5 ohms?**

→ **Yes**
INSTALL a new SCLM. REFER to [Section 211-05](#). TEST the system for normal operation.

→ **No**
GO to [H3](#).

H3 CHECK FOR OPEN BETWEEN SCLM C267 AND JOINT CONNECTOR #4 C223 — SCP (+)

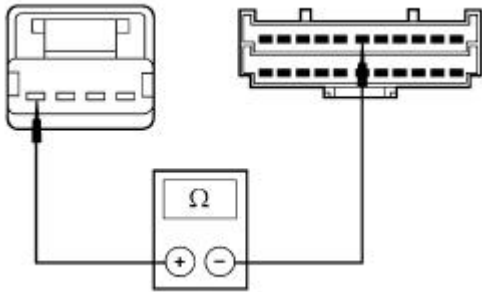
1



Joint Connector #4 C223

2

2 Measure the resistance between SCLM C267 pin 4, circuit 4-GL58 (GY/OG), harness side and joint connector #4



A0004396

C223 pin 17, circuit 4-GL58 (GY/OG), harness side.

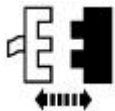
● Is the resistance less than 5 ohms?

→ **Yes**
GO to [H5](#).

→ **No**
GO to [H4](#).

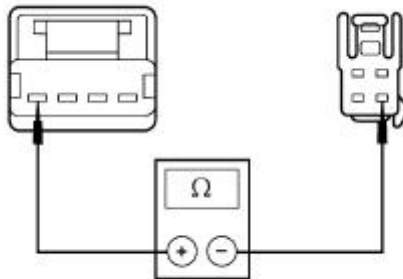
H4 CHECK FOR OPEN BETWEEN SCLM C267 AND IN-LINE C248F — SCP (+)

1



In-Line C248

2



A0004397

2

Measure the resistance between SCLM C267 pin 4, circuit 4-GL58 (GY/OG), harness side and in-line C248F pin 3, circuit 4-GL58 (GY/OG), harness side.

● Is the resistance less than 5 ohms?

→ **Yes**
REPAIR circuit 4-GL58 (GY/OG) between in-line C248M and joint connector #4 C223. REFER to [Communication Circuit Wiring Repair](#) in this section. TEST the system for normal operation.

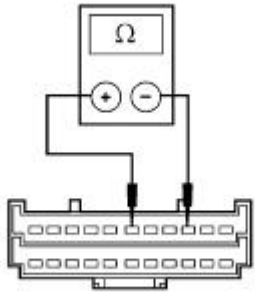
→ **No**
REPAIR circuit 4-GL58 (GY/OG) between in-line C248F and SCLU C267. REFER to [Communication Circuit Wiring Repair](#) in this section. TEST the system for normal operation.

H5 CHECK FOR OPEN BETWEEN JOINT CONNECTOR #4 C223 PINS — SCP (+)

1

1

Measure the resistance between joint



A0004398

connector #4 C223 pin 17 and pin 20, component side.

- Is the resistance less than 5 ohms?

→ **Yes**
REPAIR circuit 4-EG7 (GY/RD). REFER to [Communication Circuit Wiring Repair](#) in this section. TEST the system for normal operation.

→ **No**
REPAIR joint connector #4 C223. TEST the system for normal operation.

H6 CHECK FOR OPEN BETWEEN DLC C251 AND SCLM C267 — SCP (-)

1

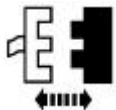


2



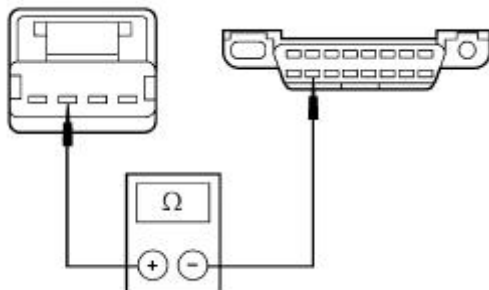
NGS

3



SCLM C267

4



A0004399

4 Measure the resistance between SCLM C267 pin 3, circuit 5-GL58 (BU/BK), harness side and DLC C251 pin 10, circuit 5-EG7 (BU/RD), harness side.

- Is the resistance less than 5 ohms?

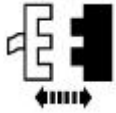
→ **Yes**

INSTALL a new SCLM. REFER to [Section 211-05](#). TEST the system for normal operation.

→ **No**
GO to [H7](#).

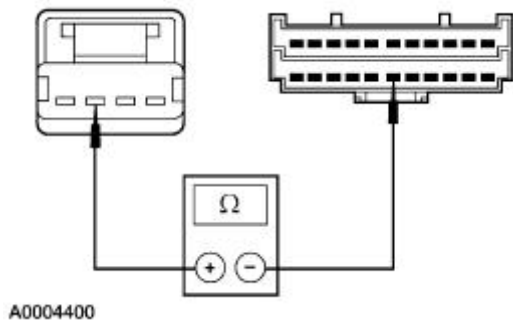
H7 CHECK FOR OPEN BETWEEN SCLM C267 AND JOINT CONNECTOR #4 C223 — SCP (-)

1



Joint Connector #4 C223

2



2

Measure the resistance between SCLM C267 pin 3, circuit 5-GL58 (BU/BK), harness side and joint connector #4 C223 pin 6, circuit 5-GL58 (BU/BK), harness side.

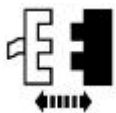
● Is the resistance less than 5 ohms?

→ **Yes**
GO to [H9](#).

→ **No**
GO to [H8](#).

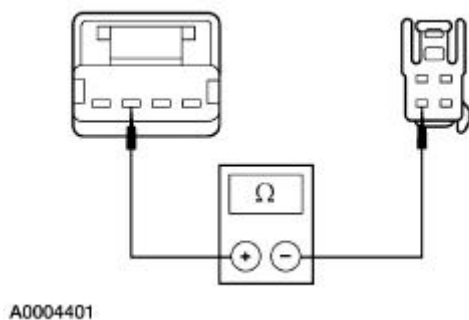
H8 CHECK FOR OPEN BETWEEN SCLM C267 AND IN-LINE C248F — SCP (+)

1



In-Line C248

2



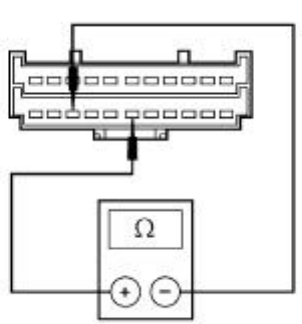
2

Measure the resistance between SCLM C267 pin 3, circuit 5-GL58 (BU/BK), harness side and in-line C248F pin 4, circuit 5-GL58 (BU/BK), harness side.


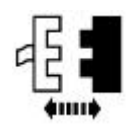
● Is the resistance less than 5 ohms?

	<p>→ Yes REPAIR circuit 5-GL58 (BU/BK) between in-line C248M and joint connector #4 C223. REFER to Communication Circuit Wiring Repair in this section. TEST the system for normal operation.</p> <p>→ No REPAIR circuit 5-GL58 (BU/BK) between in-line C248F and SCLM C267. REFER to Communication Circuit Wiring Repair in this section. TEST the system for normal operation.</p>
--	--

H9 CHECK FOR OPEN BETWEEN JOINT CONNECTOR #4 C223 PINS — SCP (-)

<p>1</p>  <p>A0004402</p>	<p>1 Measure the resistance between joint connector #4 C223 pin 6 and pin 3, component side.</p> <p>● Is the resistance less than 5 ohms?</p> <p>→ Yes REPAIR circuit 5-EG7 (BU/RD). REFER to Communication Circuit Wiring Repair in this section. TEST the system for normal operation.</p> <p>→ No REPAIR joint connector #4 C223. TEST the system for normal operation.</p>
--	---

PINPOINT TEST I: THE REMOTE EMERGENCY SATELLITE CELLULAR UNIT (RESCU) MODULE DOES NOT RESPOND TO THE NGS TESTER

CONDITIONS	DETAILS/RESULTS/ACTIONS
I1 CHECK RESCU MODULE C401a FOR DAMAGE	
<p>1</p>  <p>2</p> 	

RESCU Module C401a

4



RESCU Module C401a

5



NGS

6



7



DATA LINK DIAGNOSTICS

3 Inspect RESCU module C401a for damage; repair as necessary.

• Was the result received RESCU: NO RESPONSE ON CKT914 (BUS+)?

→ Yes
GO to 12.

→ No
GO to 17.

12 CHECK FOR OPEN BETWEEN DLC C251 AND RESCU MODULE C401a — SCP (+)

1



2



NGS

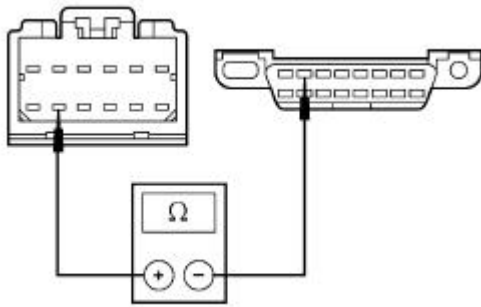
3



RESCU Module C401a

4

4 Measure the resistance between RESCU module C401a pin 8, circuit 4-GP8 (GY/BK), harness side and DLC



A0004403

C251 pin 2, circuit 4-EG7 (GY/RD), harness side.

- Is the resistance less than 5 ohms?

→ **Yes**
 INSTALL a new RESCU module. REFER to [Section 419-05](#). TEST the system for normal operation.

→ **No**
 GO to [I3](#).

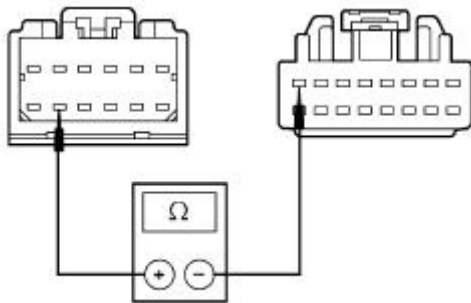
I3 CHECK FOR OPEN BETWEEN INTERIOR AJB C283b AND RESCU MODULE C401a — SCP (+)

1



Interior AJB C283b

2



A0004404

2

Measure the resistance between RESCU module C401a pin 8, circuit 4-GP8 (GY/BK), harness side and interior AJB C283b pin 8, circuit 4-GP8 (GY/BK), harness side.

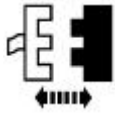
- Is the resistance less than 5 ohms?

→ **Yes**
 GO to [I4](#).

→ **No**
 REPAIR circuit 4-GP8 (GY/BK). REFER to [Communication Circuit Wiring Repair](#) in this section. TEST the system for normal operation.

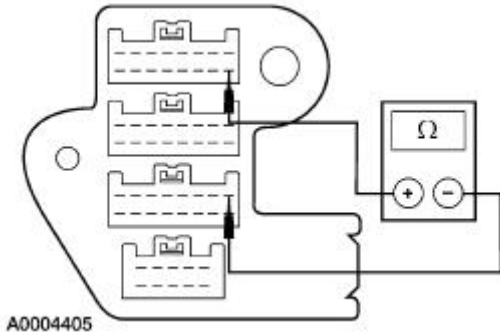
I4 CHECK FOR OPEN BETWEEN INTERIOR AJB C283b AND INTERIOR AJB C283d — SCP (+)

1



Interior AJB C283d

2



2

Measure the resistance between interior AJB C283d pin 16 and interior AJB C283b pin 8, component side.

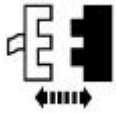
● Is the resistance less than 5 ohms?

→ **Yes**
GO to [15](#).

→ **No**
INSTALL a new AJB. TEST the system for normal operation.

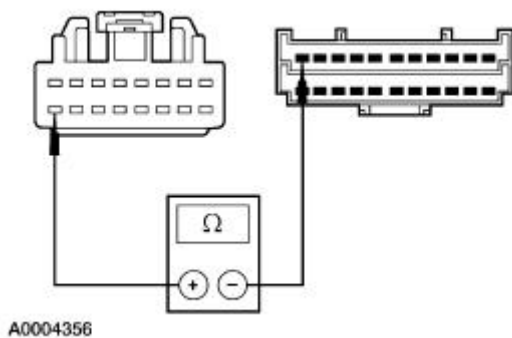
15 CHECK FOR OPEN BETWEEN INTERIOR AJB C283d AND JOINT CONNECTOR #4 C223 — SCP (+)

1



Joint Connector #4 C223

2



2

Measure the resistance between interior AJB C283d pin 16, circuit 4-EG1 (GY), harness side and joint connector #4 C223 pin 22, circuit 4-EG1 (GY), harness side.

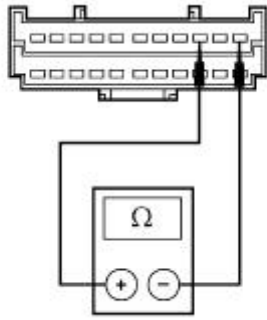
● Is the resistance less than 5 ohms?

→ **Yes**
GO to [16](#).

→ **No**
REPAIR circuit 4-EG1 (GY). REFER to [Communication Circuit Wiring Repair](#) in this section. TEST the system for normal operation.

I6 CHECK FOR OPEN BETWEEN JOINT CONNECTOR #4 C223 PINS — SCP (+)

1



A0004357

1

Measure the resistance between joint connector #4 C223 pin 22 and pin 20, component side.

● **Is the resistance less than 5 ohms?**

→ **Yes**
REPAIR circuit 4-EG7 (GY/RD). REFER to [Communication Circuit Wiring Repair](#) in this section. TEST the system for normal operation.

→ **No**
REPAIR joint connector #4 C223. TEST the system for normal operation.

I7 CHECK FOR OPEN BETWEEN DLC C251 AND RESCU MODULE C401a — SCP (-)

1

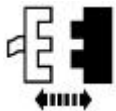


2



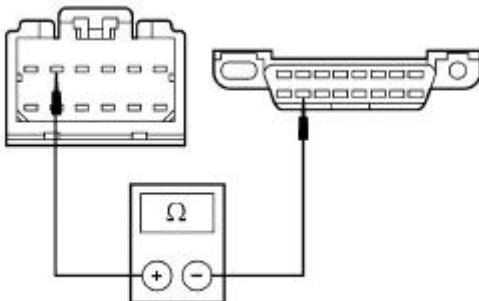
NGS

3



RESCU Module C401a

4



A0004406

4

Measure the resistance between RESCU module C401a pin 2, circuit 5-GP8 (BU/YE), harness side and DLC C251 pin 10, circuit 5-EG7 (BU/RD), harness side.

● Is the resistance less than 5 ohms?

→ **Yes**
INSTALL a new RESCU module. REFER to [Section 419-05](#). TEST the system for normal operation.

→ **No**
GO to [18](#).

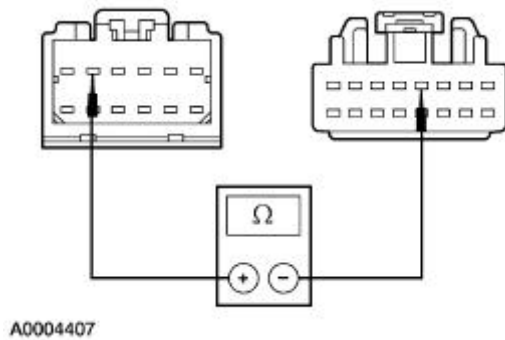
18 CHECK FOR OPEN BETWEEN INTERIOR AJB C283b AND RESCU MODULE C401a — SCP (-)

1



Interior AJB C283b

2



2 Measure the resistance between RESCU module C401a pin 2, circuit 5-GP8 (BU/YE), harness side and interior AJB C283b pin 4, circuit 5-GP8 (BU/YE), harness side.

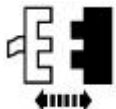
● Is the resistance less than 5 ohms?

→ **Yes**
GO to [19](#).

→ **No**
REPAIR circuit 5-GP8 (BU/YE). REFER to [Communication Circuit Wiring Repair](#) in this section. TEST the system for normal operation.

19 CHECK FOR OPEN BETWEEN INTERIOR AJB C283b AND INTERIOR AJB C283d — SCP (-)

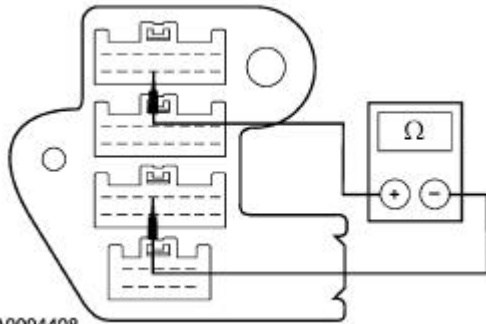
1



Interior AJB C283d

2

2 Measure the resistance between interior AJB C283d pin 12 and interior AJB C283b pin 4, component side.



A0004408

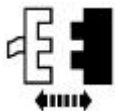
● Is the resistance less than 5 ohms?

→ **Yes**
GO to [I10](#).

→ **No**
INSTALL a new AJB. TEST the system for normal operation.

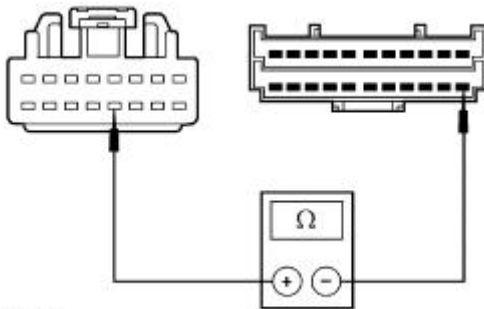
I10 CHECK FOR OPEN BETWEEN INTERIOR AJB C283d AND JOINT CONNECTOR #4 C223 — SCP (-)

1



Joint Connector #4 C223

2



A0004361

2

Measure the resistance between interior AJB C283d pin 12, circuit 5-EG1 (BU), harness side and joint connector #4 C223 pin 1, circuit 5-EG1 (BU), harness side.

● Is the resistance less than 5 ohms?

→ **Yes**
GO to [I11](#).

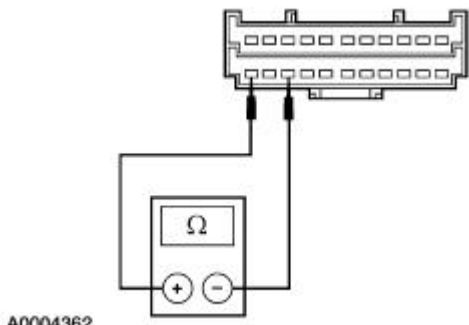
→ **No**
REPAIR circuit 5-EG1 (BU). REFER to [Communication Circuit Wiring Repair](#) in this section. TEST the system for normal operation.

I11 CHECK FOR OPEN BETWEEN JOINT CONNECTOR #4 C223 PINS — SCP (-)

1

1

Measure the resistance between joint connector #4 C223 pin 1 and pin 3, component side.







A0004362

● Is the resistance less than 5 ohms?

→ **Yes**
 REPAIR circuit 5-EG7 (BU/RD). REFER to [Communication Circuit Wiring Repair](#) in this section. TEST the system for normal operation.

→ **No**
 REPAIR joint connector #4 C223. TEST the system for normal operation.

PINPOINT TEST J: THE DRIVER SEAT MODULE (DSM) DOES NOT RESPOND TO THE NGS TESTER

CONDITIONS	DETAILS/RESULTS/ACTIONS
J1 CHECK DSM 341c FOR DAMAGE	
<p>1 </p> <p>2  DSM 341c</p> <p>4  DSM 341c</p> <p>5  NGS</p>	<p>3 Inspect DSM 341c for damage; repair as necessary.</p>

6



7



DATA LINK DIAGNOSTICS

- Was the result received DSM: NO RESPONSE ON CKT914 (BUS+)?

→ Yes
GO to [J2](#).

→ No
GO to [J8](#).

J2 CHECK FOR OPEN BETWEEN DLC C251 AND DSM 341c — SCP (+)

1



2



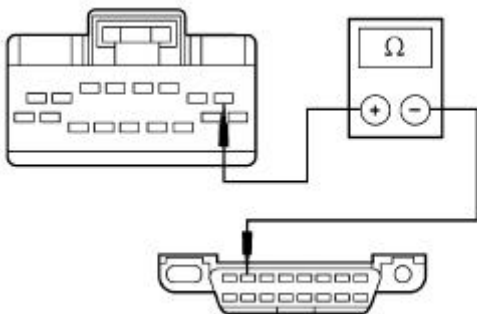
NGS

3



DSM 341c

4



A0004409

- 4 Measure the resistance between DSM 341c pin 1, circuit 4-AH80 (GY/WH), harness side and DLC C251 pin 2, circuit 4-EG7 (GY/RD), harness side.

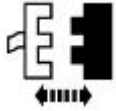
- Is the resistance less than 5 ohms?

→ Yes
INSTALL a new DSM. REFER to [Section 419-10](#). TEST the system for normal operation.

→ **No**
GO to [J3](#).

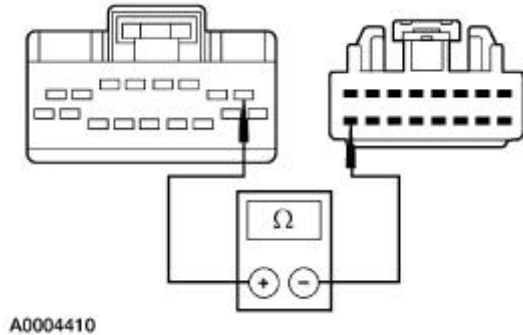
J3 CHECK FOR OPEN BETWEEN INTERIOR AJB C283a AND DSM 341c — SCP (+)

1



Interior AJB C283a

2



A0004410

2 Measure the resistance between DSM 341c pin 1, circuit 4-AH80 (GY/WH), harness side and interior AJB C283a pin 16, circuit 4-AH80 (GY/WH), harness side.

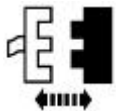
● Is the resistance less than 5 ohms?

→ **Yes**
GO to [J5](#).

→ **No**
GO to [J4](#).

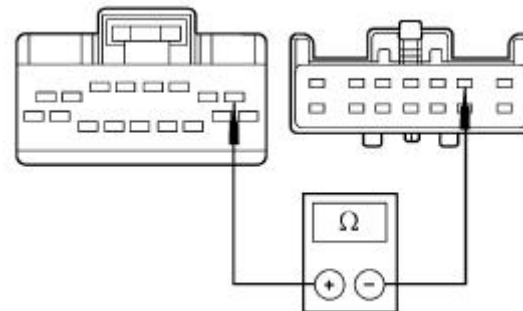
J4 CHECK FOR OPEN BETWEEN IN-LINE C315M AND DSM 341c — SCP (+)

1



In-Line C315

2



A0004411

2 Measure the resistance between DSM 341c pin 1, circuit 4-AH80 (GY/WH), harness side and in-line C315M pin 6, circuit 4-AH80 (GY/WH), harness side.

● Is the resistance less than 5 ohms?

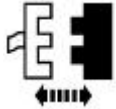
→ **Yes**
REPAIR circuit 4-AH80 (GY/WH) between in-line C315F and interior AJB C283a. REFER to [Communication Circuit](#)

[Wiring Repair](#) in this section. TEST the system for normal operation.

→ **No**
REPAIR circuit 4-AH80 (GY/WH) between in-line C315M and DSM C341c. REFER to [Communication Circuit Wiring Repair](#) in this section. TEST the system for normal operation.

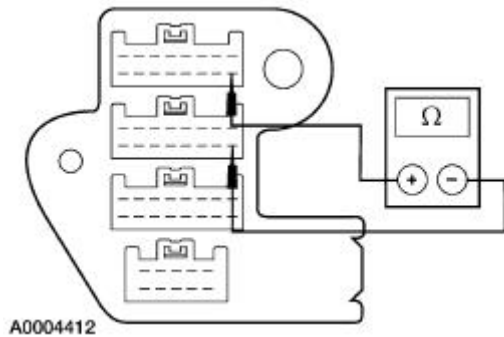
J5 CHECK FOR OPEN BETWEEN INTERIOR AJB C283a AND INTERIOR AJB C283d — SCP (+)

1



Interior AJB C283d

2



2 Measure the resistance between interior AJB C283d pin 16 and interior AJB C283a pin 16, component side.

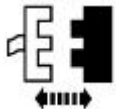
● **Is the resistance less than 5 ohms?**

→ **Yes**
GO to [J6](#).

→ **No**
INSTALL a new AJB. TEST the system for normal operation.

J6 CHECK FOR OPEN BETWEEN INTERIOR AJB C283d AND JOINT CONNECTOR #4 C223 — SCP (+)

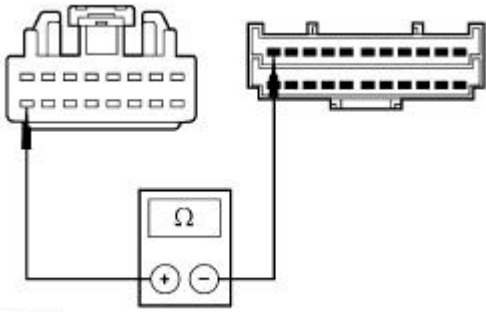
1



Joint Connector #4 C223

2

2 Measure the resistance between interior AJB C283d pin 16, circuit 4-EG1 (GY), harness side and joint connector #4 C223 pin 22, circuit 4-EG1 (GY), harness side.



A0004356

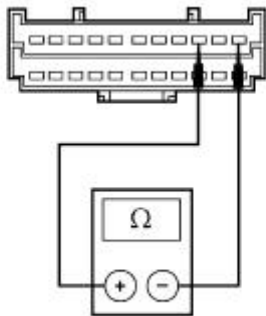
● Is the resistance less than 5 ohms?

→ **Yes**
GO to [J7](#).

→ **No**
REPAIR circuit 4-EG1 (GY). REFER to [Communication Circuit Wiring Repair](#) in this section. TEST the system for normal operation.

J7 CHECK FOR OPEN BETWEEN JOINT CONNECTOR #4 C223 PINS — SCP (+)

1



A0004357

1 Measure the resistance between joint connector #4 C223 pin 22 and pin 20, component side.

● Is the resistance less than 5 ohms?

→ **Yes**
REPAIR circuit 4-EG7 (GY/RD). REFER to [Communication Circuit Wiring Repair](#) in this section. TEST the system for normal operation.

→ **No**
REPAIR joint connector #4 C223. TEST the system for normal operation.

J8 CHECK FOR OPEN BETWEEN DLC C251 AND DSM 341c — SCP (-)

1



2



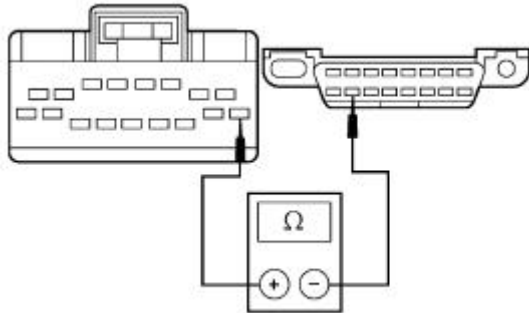
NGS

3



DSM 341c

4



A0004413

4

Measure the resistance between DSM 341c pin 9, circuit 5-AH80 (BU/OG), harness side and DLC C251 pin 10, circuit 5-EG7 (BU/RD), harness side.

● Is the resistance less than 5 ohms?

→ Yes

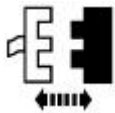
INSTALL a new DSM. REFER to [Section 419-10](#). TEST the system for normal operation.

→ No

GO to [J9](#).

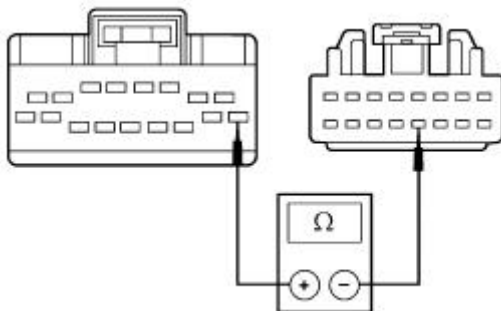
J9 CHECK FOR OPEN BETWEEN INTERIOR AJB C283a AND DSM 341c — SCP (-)

1



Interior AJB C283a

2



A0004414

2

Measure the resistance between DSM 341c pin 9, circuit 5-AH80 (BU/OG), harness side and interior AJB C283a pin 12, circuit 5-AH80 (BU/OG), harness side.

● Is the resistance less than 5 ohms?

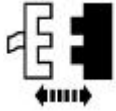
→ Yes

GO to [J11](#).

→ **No**
GO to [J10](#).

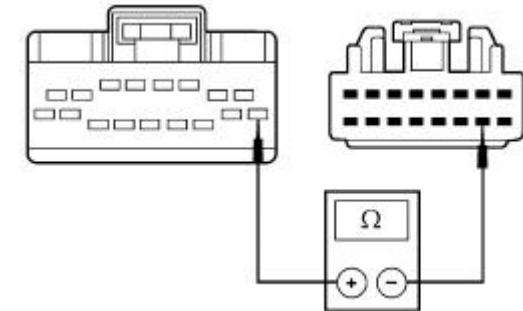
J10 CHECK FOR OPEN BETWEEN IN-LINE C315M AND DSM 341c — SCP (+)

1



In-Line C315

2



A0004415

2

Measure the resistance between DSM 341c pin 9, circuit 5-AH80 (BU/OG), harness side and in-line C315M pin 13, circuit 5-AH80 (BU/OG), harness side.

● **Is the resistance less than 5 ohms?**

→ **Yes**

REPAIR circuit 5-AH80 (BU/OG) between in-line C351F and interior AJB C283a. REFER to [Communication Circuit Wiring Repair](#) in this section. TEST the system for normal operation.

→ **No**

REPAIR circuit 5-AH80 (BU/OG) between in-line C351M and DSM C341c. REFER to [Communication Circuit Wiring Repair](#) in this section. TEST the system for normal operation.

J11 CHECK FOR OPEN BETWEEN INTERIOR AJB C283a AND INTERIOR AJB C283d — SCP (-)

1

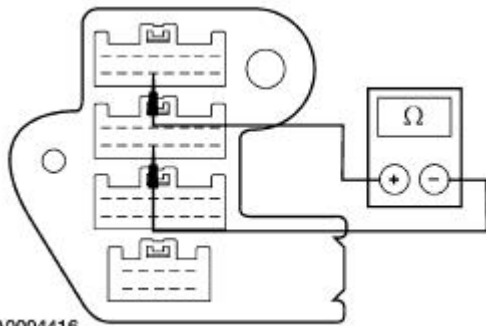


Interior AJB C283d

2

2

Measure the resistance between interior AJB C283d pin 12 and interior AJB C283a pin 12, component side.



A0004416

● Is the resistance less than 5 ohms?

→ **Yes**
GO to [J12](#).

→ **No**
INSTALL a new AJB. TEST the system for normal operation.

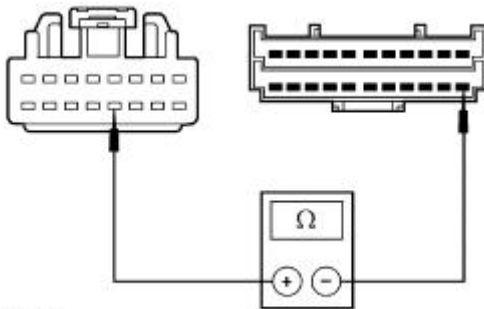
J12 CHECK FOR OPEN BETWEEN INTERIOR AJB C283d AND JOINT CONNECTOR #4 C223 — SCP (-)

1



Joint Connector #4 C223

2



A0004361

2

Measure the resistance between interior AJB C283d pin 12, circuit 5-EG1 (BU), harness side and joint connector #4 C223 pin 1, circuit 5-EG1 (BU), harness side.

● Is the resistance less than 5 ohms?

→ **Yes**
GO to [J13](#).

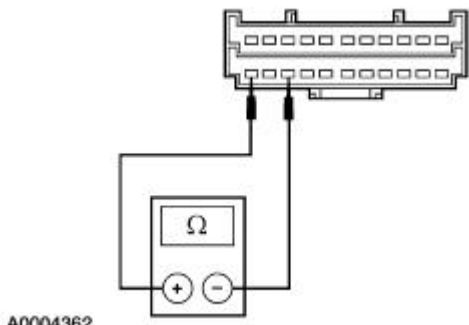
→ **No**
REPAIR circuit 5-EG1 (BU). REFER to [Communication Circuit Wiring Repair](#) in this section. TEST the system for normal operation.

J13 CHECK FOR OPEN BETWEEN JOINT CONNECTOR #4 C223 PINS — SCP (-)

1

1

Measure the resistance between joint connector #4 C223 pin 1 and pin 3, component side.







A0004362

● Is the resistance less than 5 ohms?

→ **Yes**
REPAIR circuit 5-EG7 (BU/RD). REFER to [Communication Circuit Wiring Repair](#) in this section. TEST the system for normal operation.

→ **No**
REPAIR joint connector #4 C223. TEST the system for normal operation.

PINPOINT TEST K: THE DRIVER DOOR MODULE (DDM) DOES NOT RESPOND TO THE NGS TESTER

CONDITIONS	DETAILS/RESULTS/ACTIONS
K1 CHECK DDM C501a FOR DAMAGE	
<p>1</p> 	
<p>2</p>  <p>DDM C501a</p>	<p>3 Inspect DDM C501a for damage; repair as necessary.</p>
<p>4</p>  <p>DDM C501a</p>	
<p>5</p>  <p>NGS</p>	

6



7



DATA LINK DIAGNOSTICS

- Was the result received DDM: NO RESPONSE ON CKT914 (BUS+)?

→ Yes
GO to [K2](#).

→ No
GO to [K7](#).

K2 CHECK FOR OPEN BETWEEN DLC C251 AND DDM C501a — SCP (+)

1



2



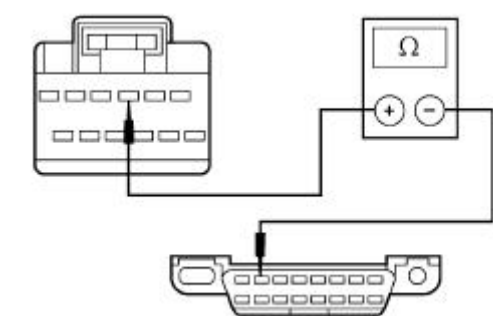
NGS

3



DDM C501a

4



Δ0004417

- 4 Measure the resistance between DDM C501a pin 3, circuit 4-EG13 (GY/OG), harness side and DLC C251 pin 2, circuit 4-EG7 (GY/RD), harness side.

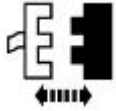
- Is the resistance less than 5 ohms?

→ Yes
INSTALL a new DDM. REFER to [Section 419-10](#). TEST the system for normal operation.

→ **No**
GO to [K3](#).

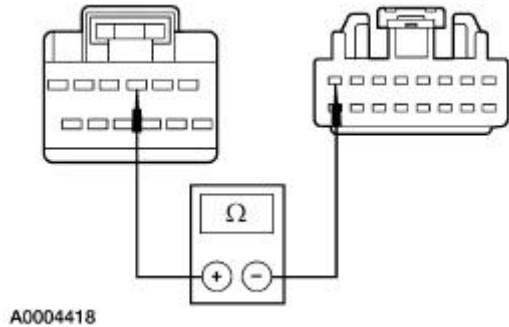
K3 CHECK FOR OPEN BETWEEN INTERIOR AJB C283a AND DDM C501a — SCP (+)

1



Interior AJB C283a

2



2

Measure the resistance between DDM C501a pin 3, circuit 4-EG13 (GY/OG), harness side and interior AJB C283a pin 8, circuit 4-EG13 (GY/OG), harness side.

● Is the resistance less than 5 ohms?

→ **Yes**
GO to [K4](#).

→ **No**
REPAIR circuit 4-EG13 (GY/OG). REFER to [Communication Circuit Wiring Repair](#) in this section. TEST the system for normal operation.

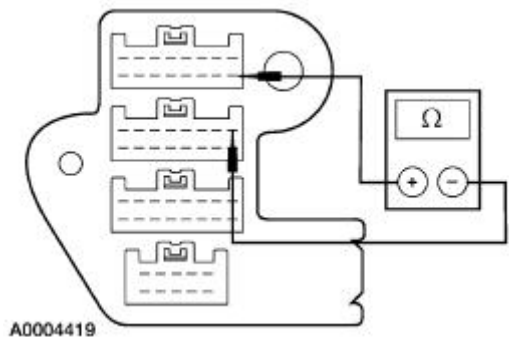
K4 CHECK FOR OPEN BETWEEN INTERIOR AJB C283a AND INTERIOR AJB C283d — SCP (+)

1



Interior AJB C283d

2



2

Measure the resistance between interior AJB C283d pin 16 and interior AJB C283a pin 8, component side.

● Is the resistance less than 5 ohms?

- **Yes**
GO to [K5](#).
- **No**
INSTALL a new AJB. TEST the system for normal operation.

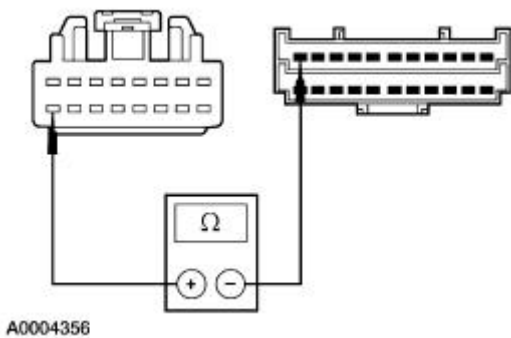
K5 CHECK FOR OPEN BETWEEN INTERIOR AJB C283d AND JOINT CONNECTOR #4 C223 — SCP (+)

1



Joint Connector #4 C223

2



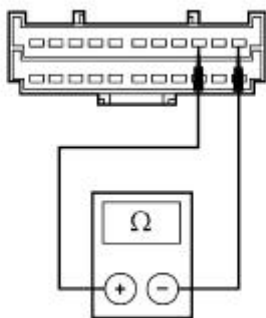
- 2 Measure the resistance between interior AJB C283d pin 16, circuit 4-EG1 (GY), harness side and joint connector #4 C223 pin 22, circuit 4-EG1 (GY), harness side.

● Is the resistance less than 5 ohms?

- **Yes**
GO to [K6](#).
- **No**
REPAIR circuit 4-EG1 (GY). REFER to [Communication Circuit Wiring Repair](#) in this section. TEST the system for normal operation.

K6 CHECK FOR OPEN BETWEEN JOINT CONNECTOR #4 C223 PINS — SCP (+)

1



A0004357

- 1 Measure the resistance between joint connector #4 C223 pin 22 and pin 20, component side.

● Is the resistance less than 5 ohms?

- **Yes**
REPAIR circuit 4-EG7 (GY/RD). REFER

to [Communication Circuit Wiring Repair](#) in this section. TEST the system for normal operation.

→ **No**
REPAIR joint connector #4 C223. TEST the system for normal operation.

K7 CHECK FOR OPEN BETWEEN DLC C251 AND DDM C501a — SCP (-)

1



2



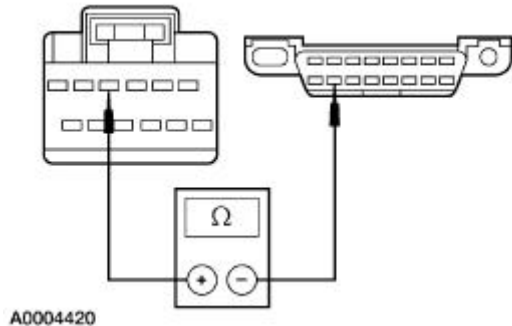
NGS

3



DDM C501a

4



4 Measure the resistance between DDM C501a pin 4, circuit 5-EG13 (BU/BK), harness side and DLC C251 pin 10, circuit 5-EG7 (BU/RD), harness side.

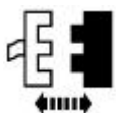
● **Is the resistance less than 5 ohms?**

→ **Yes**
INSTALL a new DDM. REFER to [Section 419-10](#). TEST the system for normal operation.

→ **No**
GO to [K8](#).

K8 CHECK FOR OPEN BETWEEN INTERIOR AJB C283a AND DDM C501a — SCP (-)

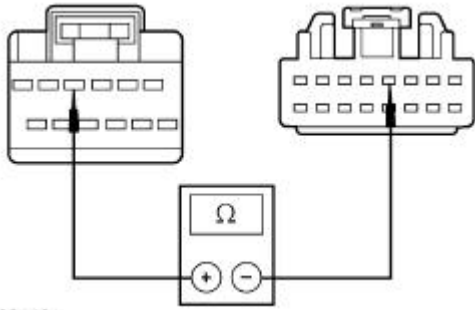
1



Interior AJB C283a

2

2 Measure the resistance between DDM C501a pin 4, circuit 5-EG13 (BU/BK), harness side and interior AJB C283a pin



A0004421

4, circuit 5-EG13 (BU/BK), harness side.

● Is the resistance less than 5 ohms?

→ **Yes**
GO to [K9](#).

→ **No**
REPAIR circuit 5-EG13 (BU/BK). REFER to [Communication Circuit Wiring Repair](#) in this section. TEST the system for normal operation.

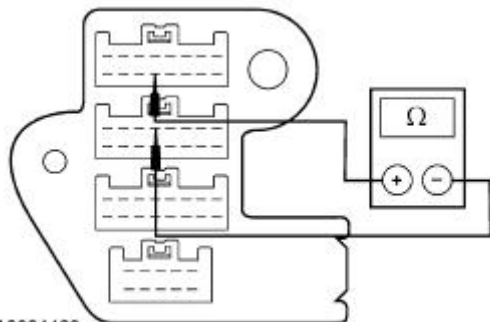
K9 CHECK FOR OPEN BETWEEN INTERIOR AJB C283a AND INTERIOR AJB C283d — SCP (-)

1



Interior AJB C283d

2



A0004422

2 Measure the resistance between interior AJB C283d pin 12 and interior AJB C283a pin 4, component side.

● Is the resistance less than 5 ohms?

→ **Yes**
GO to [K10](#).

→ **No**
INSTALL a new AJB. TEST the system for normal operation.

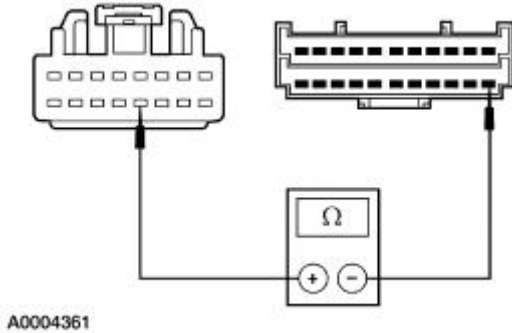
K10 CHECK FOR OPEN BETWEEN INTERIOR AJB C283d AND JOINT CONNECTOR #4 C223 — SCP (-)

1



Joint Connector #4 C223

2



2

Measure the resistance between interior AJB C283d pin 12, circuit 5-EG1 (BU), harness side and joint connector #4 C223 pin 1, circuit 5-EG1 (BU), harness side.

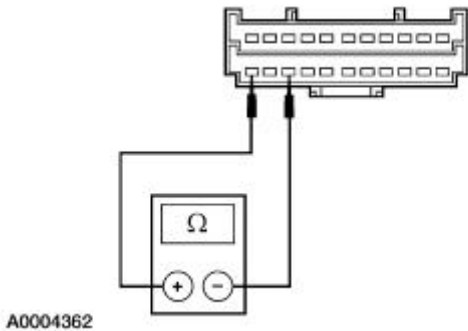
● Is the resistance less than 5 ohms?

→ **Yes**
GO to [K11](#).

→ **No**
REPAIR circuit 5-EG1 (BU). REFER to [Communication Circuit Wiring Repair](#) in this section. TEST the system for normal operation.

K11 CHECK FOR OPEN BETWEEN JOINT CONNECTOR #4 C223 PINS — SCP (-)

1



1

Measure the resistance between joint connector #4 C223 pin 1 and pin 3, component side.


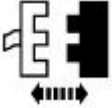





● Is the resistance less than 5 ohms?

→ **Yes**
REPAIR circuit 5-EG7 (BU/RD). REFER to [Communication Circuit Wiring Repair](#) in this section. TEST the system for normal operation.

→ **No**
REPAIR joint connector #4 C223. TEST the system for normal operation.

PINPOINT TEST L: THE REAR ELECTRONIC MODULE (REM) DOES

NOT RESPOND TO THE NGS TESTER

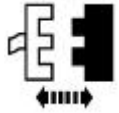
CONDITIONS	DETAILS/RESULTS/ACTIONS
L1 CHECK REM C420b FOR DAMAGE	
<p>1 </p> <p>2  REM C420b</p> <p>4  REM C420b</p> <p>5  NGS</p> <p>6 </p> <p>7  DATA LINK DIAGNOSTICS</p>	<p>3 Inspect REM C420b for damage; repair as necessary.</p> <p>● Was the result received REM: NO RESPONSE ON CKT914 (BUS+)?</p> <p>→ Yes GO to L2.</p> <p>→ No GO to L7.</p>
L2 CHECK FOR OPEN BETWEEN DLC C251 AND REM C420b — SCP (+)	
<p>1 </p>	

2



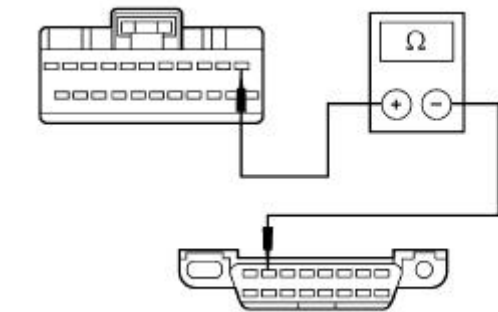
NGS

3



REM C420b

4



A0004423

4

Measure the resistance between REM C420b pin 1, circuit 4-EG12 (GY/WH), harness side and DLC C251 pin 2, circuit 4-EG7 (GY/RD), harness side.

● Is the resistance less than 5 ohms?

→ Yes

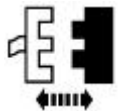
INSTALL a new REM. REFER to [Section 419-10](#). TEST the system for normal operation.

→ No

GO to [L3](#).

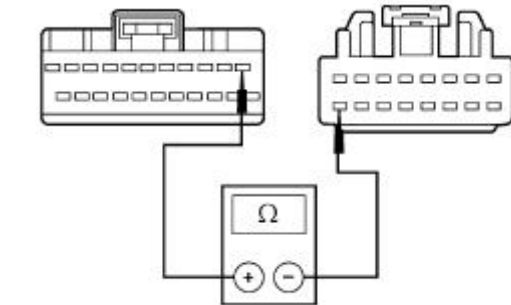
L3 CHECK FOR OPEN BETWEEN INTERIOR AJB C283b AND REM C420b — SCP (+)

1



Interior AJB C283b

2



A0004424

2

Measure the resistance between REM C420b pin 1, circuit 4-EG12 (GY/WH), harness side and interior AJB C283b pin 16, circuit 4-EG12 (GY/WH), harness side.

● Is the resistance less than 5 ohms?

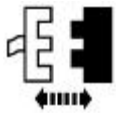
→ Yes

GO to [L4](#).

→ **No**
REPAIR circuit 4-EG12 (GY/WH). REFER to [Communication Circuit Wiring Repair](#) in this section. TEST the system for normal operation.

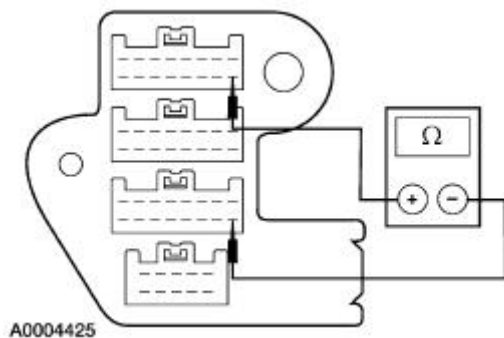
L4 CHECK FOR OPEN BETWEEN INTERIOR AJB C283b AND INTERIOR AJB C283d — SCP (+)

1



Interior AJB C283d

2



A0004425

2 Measure the resistance between interior AJB C283d pin 16 and interior AJB C283b pin 16, component side.

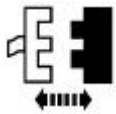
● **Is the resistance less than 5 ohms?**

→ **Yes**
GO to [L5](#).

→ **No**
INSTALL a new AJB. TEST the system for normal operation.

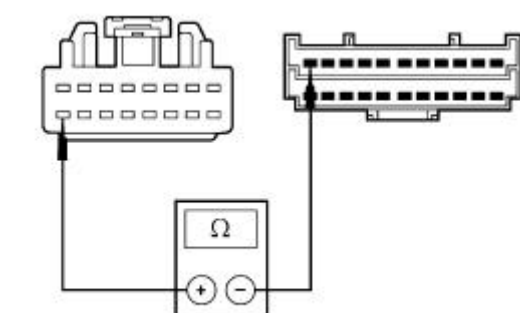
L5 CHECK FOR OPEN BETWEEN INTERIOR AJB C283d AND JOINT CONNECTOR #4 C223 — SCP (+)

1



Joint Connector #4 C223

2



A0004356

2 Measure the resistance between interior AJB C283d pin 16, circuit 4-EG1 (GY), harness side and joint connector #4 C223 pin 22, circuit 4-EG1 (GY), harness side.

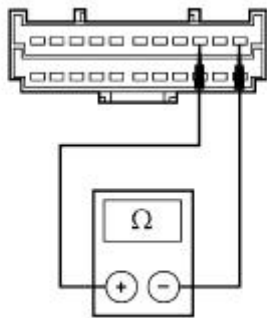
● Is the resistance less than 5 ohms?

→ **Yes**
GO to [L6](#).

→ **No**
REPAIR circuit 4-EG1 (GY). REFER to [Communication Circuit Wiring Repair](#) in this section. TEST the system for normal operation.

L6 CHECK FOR OPEN BETWEEN JOINT CONNECTOR #4 C223 PINS — SCP (+)

1



A0004357

1 Measure the resistance between joint connector #4 C223 pin 22 and pin 20, component side.

● Is the resistance less than 5 ohms?

→ **Yes**
REPAIR circuit 4-EG7 (GY/RD). REFER to [Communication Circuit Wiring Repair](#) in this section. TEST the system for normal operation.

→ **No**
REPAIR joint connector #4 C223. TEST the system for normal operation.

L7 CHECK FOR OPEN BETWEEN DLC C251 AND REM C420b — SCP (-)

1

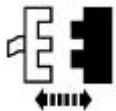


2



NGS

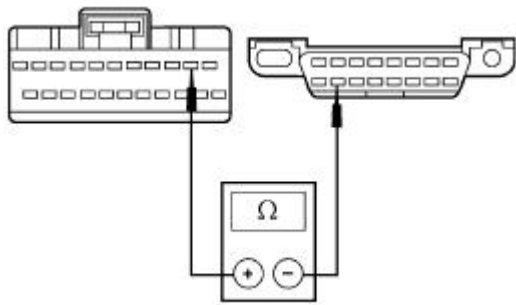
3



REM C420b

4

4 Measure the resistance between REM



A0004426

C420b pin 2, circuit 5-EG12 (BU/OG), harness side and DLC C251 pin 10, circuit 5-EG7 (BU/RD), harness side.

● Is the resistance less than 5 ohms?

→ **Yes**
 INSTALL a new REM. REFER to [Section 419-10](#). TEST the system for normal operation..

→ **No**
 GO to [L8](#).

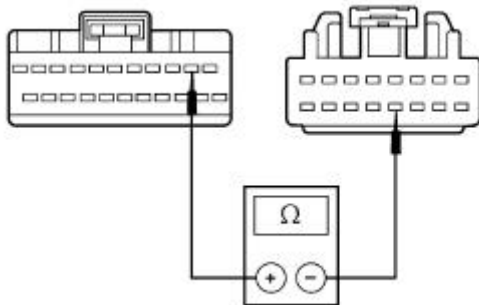
L8 CHECK FOR OPEN BETWEEN INTERIOR AJB C283b AND REM C420b — SCP (-)

1



Interior AJB C283b

2



A0004427

2

Measure the resistance between REM C420b pin 2, circuit 5-EG12 (BU/OG), harness side and interior AJB C283b pin 12, circuit 5-EG12 (BU/OG), harness side.

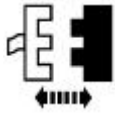
● Is the resistance less than 5 ohms?

→ **Yes**
 GO to [L9](#).

→ **No**
 REPAIR circuit 5-EG12 (BU/OG). REFER to [Communication Circuit Wiring Repair](#) in this section. TEST the system for normal operation.

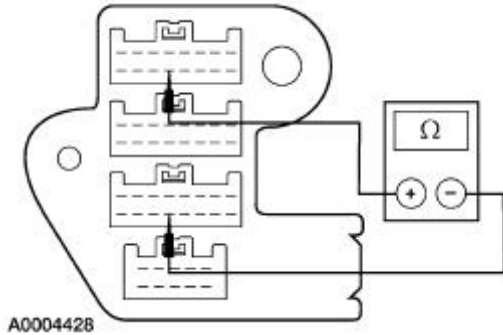
L9 CHECK FOR OPEN BETWEEN INTERIOR AJB C283b AND INTERIOR AJB C283d — SCP (-)

1



Interior AJB C283d

2



2

Measure the resistance between interior AJB C283d pin 12 and interior AJB C283b pin 12, component side.

● Is the resistance less than 5 ohms?

→ **Yes**
GO to [L10](#).

→ **No**
INSTALL a new AJB. TEST the system for normal operation.

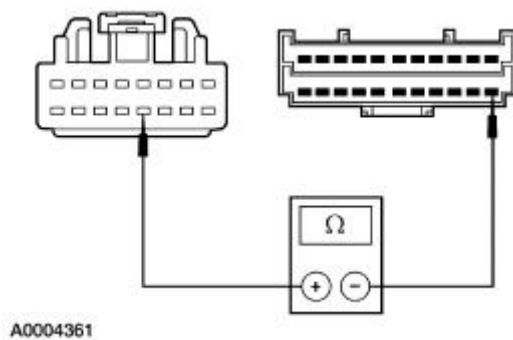
L10 CHECK FOR OPEN BETWEEN INTERIOR AJB C283d AND JOINT CONNECTOR #4 C223 — SCP (-)

1



Joint Connector #4 C223

2



2

Measure the resistance between interior AJB C283d pin 12, circuit 5-EG1 (BU), harness side and joint connector #4 C223 pin 1, circuit 5-EG1 (BU), harness side.

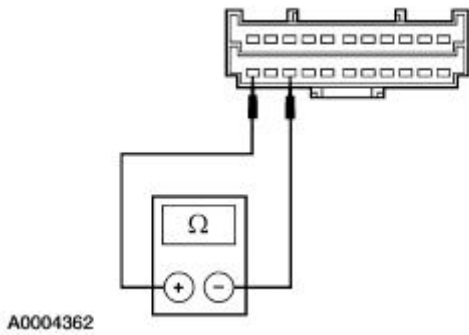
● Is the resistance less than 5 ohms?

→ **Yes**
GO to [L11](#).

→ **No**
REPAIR circuit 5-EG1 (BU). REFER to [Communication Circuit Wiring Repair](#) in this section. TEST the system for normal operation.

L11 CHECK FOR OPEN BETWEEN JOINT CONNECTOR #4 C223 PINS — SCP (-)

1



1

Measure the resistance between joint connector #4 C223 pin 1 and pin 3, component side.

● **Is the resistance less than 5 ohms?**

→ **Yes**
REPAIR circuit 5-EG7 (BU/RD). REFER to [Communication Circuit Wiring Repair](#) in this section. TEST the system for normal operation.

→ **No**
REPAIR joint connector #4 C223. TEST the system for normal operation.

PINPOINT TEST M: NO ISO 9141 NETWORK COMMUNICATION

CONDITIONS	DETAILS/RESULTS/ACTIONS
M1 CHECK CIRCUIT 4-EE10 (GY/BK) FOR SHORT TO VOLTAGE AND GROUND	
<p>1</p> <p>2</p>	<p>2</p> <p>Measure the voltage between DLC C251 pin 7, circuit 4-EE10 (GY/BK), harness side and DLC C251 pin 4, circuit 31-ED6 (BK), harness side; and between DLC C251 pin 7, circuit 4-EE10 (GY/BK), harness side and DLC C251 pin 16, circuit 29-ED6 (OG/YE), harness side.</p> <p>● Is the voltage zero volts in either measurement?</p> <p>→ Yes GO to M2.</p>

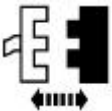
→ **No**
INSTALL a new RCM. REFER to [Section 501-20B](#). TEST the system for normal operation.

M2 CHECK CIRCUIT ANTI-LOCK BRAKE CONTROL MODULE FOR THE SOURCE OF THE CONCERN

1



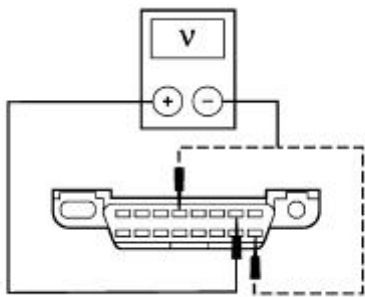
2



3



4



A0004429

2 Disconnect the anti-lock brake control module with or without traction control C135 or the stability assist module C155.

4 Measure the voltage between DLC C251 pin 7, circuit 4-EE10 (GY/BK), harness side and DLC C251 pin 4, circuit 31-ED6 (BK), harness side; and between DLC C251 pin 7, circuit 4-EE10 (GY/BK), harness side and DLC C251 pin 16, circuit 29-ED6 (OG/YE), harness side.

● Is the voltage zero volts in either measurement?

→ **Yes**
GO to [M3](#).

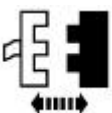
→ **No**
INSTALL a new anti-lock brake control module or stability assist module. REFER to [Section 206-09A](#), [Section 206-09B](#), or [Section 206-09C](#).

M3 CHECK CIRCUITS 4-EE10 (GY/BK), 4-EE6 (GY), AND 4-EE1 (GY) FOR SHORT TO VOLTAGE AND GROUND

1



2

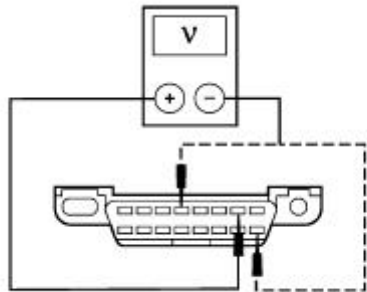


In-Line C211

3



4



A0004429

4

Measure the voltage between DLC C251 pin 7, circuit 4-EE10 (GY/BK), harness side and DLC C251 pin 4, circuit 31-ED6 (BK), harness side; and between DLC C251 pin 7, circuit 4-EE10 (GY/BK), harness side and DLC C251 pin 16, circuit 29-ED6 (OG/YE), harness side.

● Is the voltage greater than 10 volts in either measurement?

→ **Yes**
GO to [M4](#).

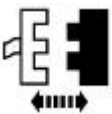
→ **No**
REPAIR circuit 4-EE6 (GY) between the in-line C211F and anti-lock brake control module with or without traction control C135 or the stability assist module C155. TEST the system for normal operation.

M4 CHECK CIRCUITS 4-EE10 (GY/BK), 4-EE6 (GY), AND 4-EE1 (GY) FOR SHORT TO VOLTAGE AND GROUND

1



2



In-Line C212

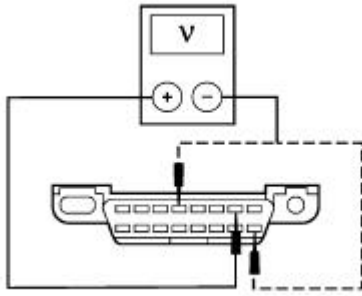
3



4

4

Measure the voltage between DLC C251 pin 7, circuit 4-EE10 (GY/BK), harness side and DLC C251 pin 4, circuit 31-ED6 (BK), harness side; and between DLC C251 pin 7, circuit 4-EE10 (GY/BK), harness side and DLC C251 pin 16, circuit 29-ED6 (OG/YE), harness side.



A0004429

- Is the voltage greater than 10 volts in either measurement?


→ **Yes**

REPAIR circuit 4-EE10 (GY/BK) between in-line C212M and DLC C251. TEST the system for normal operation.

→ **No**

REPAIR Circuits 4-EE10 (GY/BK), 4-EE1 (GY), and 4-EE6 (GY) between the RCM C310a, in-line C211M, and in-line C212F. TEST the system for normal operation.

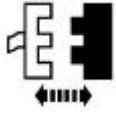
PINPOINT TEST N: NO SCP NETWORK COMMUNICATION

CONDITIONS	DETAILS/RESULTS/ACTIONS
N1 CHECK NGS TESTER PINS FOR DAMAGE	
	<p>1 Inspect NGS Tester pins for damage.</p> <ul style="list-style-type: none"> ● Are the NGS Tester pins OK? <p>→ Yes GO to N2.</p> <p>→ No REPAIR the NGS Tester terminals. TEST the system for normal operation.</p>
N2 CHECK DLC C251 PINS 2 AND 10 FOR DAMAGE	
<p>1</p> 	<p>2 Inspect the DLC C251 pins for damage.</p> <ul style="list-style-type: none"> ● Are the pins OK? <p>→ Yes GO to N3.</p>

→ **No**
REPAIR the DLC C251. TEST the system for normal operation.

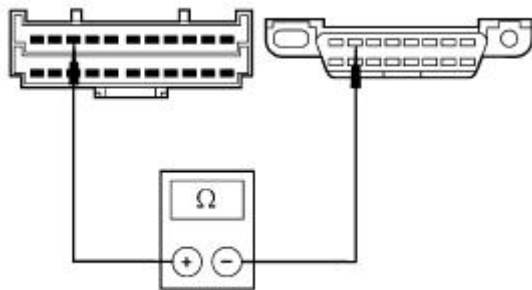
N3 CHECK CIRCUIT 4-EG7 (GY/RD) AND CIRCUIT 5-EG7 (BU/RD) FOR OPEN — JOINT CONNECTOR #4 C223 DISCONNECTED

1



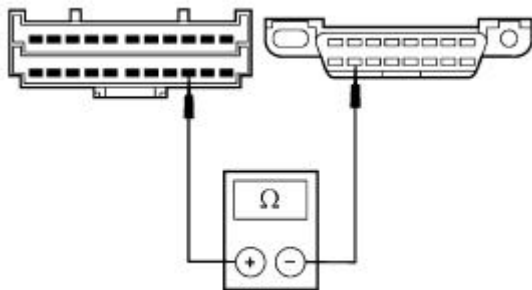
Joint Connector #4 C223

2



A0004430

3



A0004431

2 Measure the resistance between joint connector #4 C223 pin 20, circuit 4-EG7 (GY/RD), harness side and DLC C251 pin 2, circuit 4-EG7 (GY/RD), harness side.

3 Measure the resistance between joint connector #4 C223 pin 3, circuit 5-EG7 (BU/RD), harness side and DLC C251 pin 10, circuit 5-EG7 (BU/RD), harness side.

- Are the resistances less than 5 ohms?

→ **Yes**
GO to [N4](#).

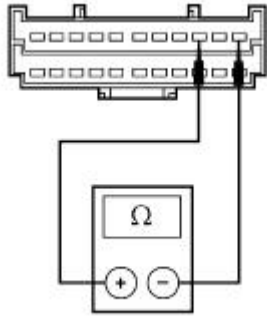
→ **No**
REPAIR the circuit(s) in question between joint connector #4 C223 and DLC C251. REFER to [Communication Circuit Wiring Repair](#) in this section. TEST the system for normal operation.

N4 CHECK FOR OPENS IN JOINT CONNECTOR #4 C223

1

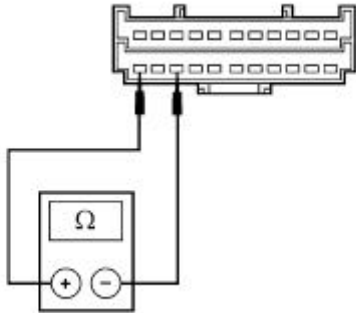
1

Measure the resistance between joint connector #4 C223 pin 20 and pin 22, component side.



A0004357

2



A0004362

2 Measure the resistance between joint connector #4 C223 pin 3 and pin 1, component side.

• Are the resistances less than 5 ohms?

→ Yes
GO to [N5](#).

→ No
REPAIR joint connector #4 C223. TEST the system for normal operation.

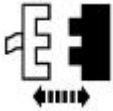
N5 CHECK SCP COMMUNICATIONS WITH INTERIOR AJB C283d DISCONNECTED

1



Joint Connector #4 C223

2



Interior AJB C283d

3



4



DATA LINK DIAGNOSTICS

- Did only the ACM, ICM, DATC, and the SCLM (if equipped with manual transmission) pass the DATA LINK DIAGNOSTICS test?

→ **Yes**
GO to [N12](#).

→ **No**
GO to [N6](#).

N6 CHECK SCP COMMUNICATIONS WITH ACM C240a DISCONNECTED

1



2



ACM C240a

3



4



DATA LINK DIAGNOSTICS

- Did only the ICM, DATC, and the SCLM (if equipped with manual transmission) pass the DATA LINK DIAGNOSTICS test?

→ **Yes**
INSTALL a new ACM. REFER to [Section 415-01](#). TEST the system for normal operation.

→ **No**
If equipped with the SCLM, GO to [N7](#).

If not equipped with the SCLM, GO to [N9](#).

N7 CHECK SCP COMMUNICATIONS WITH SCLU C267 DISCONNECTED

1



2



SCLM C267

3



4



DATA LINK DIAGNOSTICS

- Did only the ICM and DATC pass the DATA LINK DIAGNOSTICS test?

→ **Yes**
 INSTALL a new SCLM. For additional information, REFER to [Section 211-05](#). TEST the system for normal operation.

→ **No**
 GO to [N8](#).

N8 CHECK SCP COMMUNICATIONS WITH IN-LINE C248 DISCONNECTED

1



2



In-Line C248

3



4



DATA LINK DIAGNOSTICS

- Did only the ICM and DATC pass the DATA LINK DIAGNOSTICS test?

→ **Yes**
 REPAIR the circuits in question between

in-line C248F and SCLM C267. REFER to [Communication Circuit Wiring Repair](#) in the section. TEST the system for normal operation.

→ **No**
GO to [N9](#).

N9 CHECK SCP COMMUNICATIONS WITH DATC C228 DISCONNECTED

1



2



DATC C228

3



4



DATA LINK DIAGNOSTICS

- Did only the ICM pass the DATA LINK DIAGNOSTICS test?

→ **Yes**
INSTALL a new DATC. REFER to [Section 412-00](#). TEST the system for normal operation.

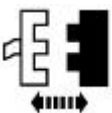
→ **No**
GO to [N10](#).

N10 CHECK INSTRUMENT CLUSTER FOR THE SOURCE OF THE CONCERN

1



2

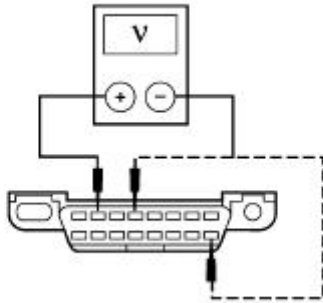


Instrument Cluster C220b

3

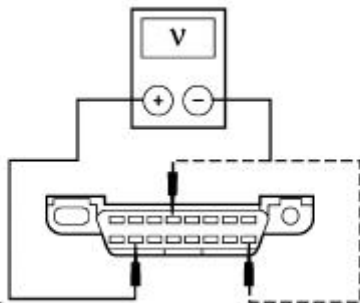


4



A0004789

5



A0004790

4

Measure the voltage between DLC C251 pin 2, circuit 4-EG7 (GY/RD), harness side and DLC C251 pin 4, circuit 31-ED6 (BK), harness side; and between DLC C251 pin 2, circuit 4-EG7 (GY/RD), harness side and DLC C251 pin 16, circuit 29-ED6 (OG/YE).

5

Measure the voltage between DLC C251 pin 10, circuit 5-EG7 (BU/RD), harness side and DLC C251 pin 4, circuit 31-ED6 (BK), harness side; and between DLC C251 pin 10, circuit 5-EG7 (BU/RD), harness side and DLC C251 pin 16, circuit 29-ED6 (OG/YE).

• Is any voltage indicated?

→ Yes
GO to [N11](#).

→ No
INSTALL a new instrument cluster.
REFER to [Section 413-01](#). TEST the system for normal operation.

N11 CHECK SCP CIRCUITS FOR THE SHORT TO VOLTAGE AND GROUND

1



2



Joint Connector #4 C223

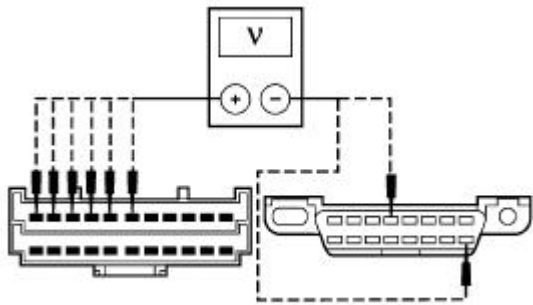
3



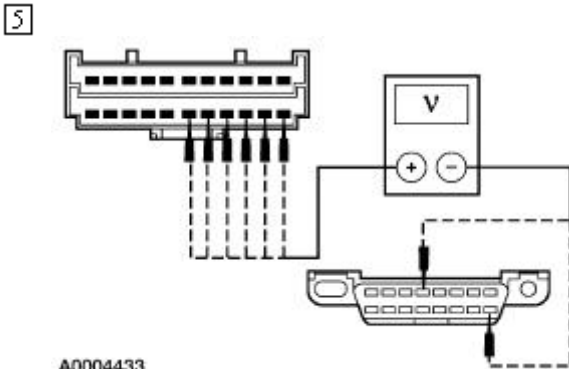
4

4

Using the following table, measure the voltage between joint connector #4 C223



A0004432



A0004433

pins, harness side and DLC C251 pin 4, circuit 31-ED6 (BK), harness side; and between joint connector #4 C223 pins, harness side and DLC C251 pin 16, circuit 29-ED6 (OG/YE).

Pin	Circuit
17 (if equipped with SCLM)	4-GL58 (GY/OG)
18	4-EG10 (GY/BK)
19	4-FA10 (GY/BK)
20	4-EG7 (GY/RD)
21	4-EG8 (GY/VT)
22	4-EG1 (GY)

5 Using the following table, measure the voltage between joint connector #4 C223 pins, harness side and DLC C251 pin 4, circuit 31-ED6 (BK), harness side; and between joint connector #4 C223 pins, harness side and DLC C251 pin 16, circuit 29-ED6 (OG/YE).

Pin	Circuit
6 (if equipped with SCLM)	5-GL58 (BU/BK)
5	5-EG10 (BU/YE)
4	5-FA10 (BU/YE)
3	5-EG7 (BU/RD)
2	5-EG8 (BU/WH)
1	5-EG1 (BU)

- Is any voltage indicated for any measurement?

→ Yes

REPAIR the circuit(s) in question between joint connector #4 C223 and in-line C248M (if equipped with SCLM), ACM C240a, instrument cluster C220b, DATC C228, interior AJB C283d, or DLC C251. REFER to [Communication Circuit Wiring Repair](#) in this section. TEST the system for normal operation.

→ No

REPAIR joint connector #4 C223. TEST the system for normal operation.

N12 CHECK SCP COMMUNICATIONS WITH INTERIOR AJB C283a DISCONNECTED

1



2



Interior AJB C283d

3



Interior AJB C283a

4



5



DATA LINK DIAGNOSTICS

- Did only the DDM and DSM fail the DATA LINK DIAGNOSTICS test (RESCU module, DSM, and SCLM are optional modules and will fail if not equipped on the vehicle)?

→ Yes
GO to [N16](#).

→ No
GO to [N13](#).

N13 CHECK SCP COMMUNICATIONS WITH DDM C501 DISCONNECTED

1

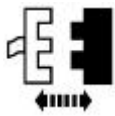


2



Interior AJB C283a

3



DDM C501

4



5



DATA LINK DIAGNOSTICS

- Did only the DDM fail the DATA LINK DIAGNOSTICS test (RESCU module, DSM, and SCLM are optional modules and will fail if not equipped on the vehicle)?

→ **Yes**
 INSTALL a new DDM. REFER to [Section 419-10](#). TEST the system for normal operation.

→ **No**
 If equipped with the DSM, GO to [N14](#).
 If not equipped with the DSM, GO to [N15](#).

N14 CHECK SCP COMMUNICATIONS WITH DSM C341c DISCONNECTED

1



2



DSM C341c

3



4



DATA LINK DIAGNOSTICS

- Did only the DSM and DDM fail the

DATA LINK DIAGNOSTICS test (RESCU module, DSM, and SCLM are optional modules and will fail if not equipped on the vehicle)?

→ **Yes**
INSTALL a new DSM. REFER to [Section 419-10](#). TEST the system for normal operation.

→ **No**
GO to [N15](#).

N15 CHECK SCP COMMUNICATIONS WITH IN-LINE C315 DISCONNECTED

1



2



In-Line C315

3



4



DATA LINK DIAGNOSTICS

● **Did only the DDM and DSM fail the DATA LINK DIAGNOSTICS test (RESCU module, DSM, and SCLM are optional modules and will fail if not equipped on the vehicle)?**

→ **Yes**
REPAIR the circuit in question between in-line C315M and DSM C341c. TEST the system for normal operation.

→ **No**
REPAIR the circuit(s) in question between interior AJB C283a and in-line C315F (if equipped with DSM) or DDM. REFER to [Communication Circuit Wiring Repair](#) in this section. TEST the system for normal operation.

N16 CHECK SCP COMMUNICATIONS WITH INTERIOR AJB C283b DISCONNECTED

1

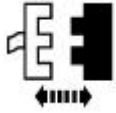


2



Interior AJB C283a

3



Interior AJB C283b

4



5



DATA LINK DIAGNOSTICS

- Did only the REM and RESC fail the DATA LINK DIAGNOSTICS test (RESCU module, DSM, and SCLM are optional modules and will fail if not equipped on the vehicle)?

→ Yes
GO to [N17](#).

→ No
GO to [N19](#).

N17 CHECK SCP COMMUNICATIONS WITH REM C420b DISCONNECTED

1

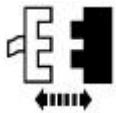


2



Interior AJB C283b

3



REM C420b

4



5



DATA LINK DIAGNOSTICS

- Did only the REM fail the DATA LINK DIAGNOSTICS test (RESCU module, DSM, and SCLM are optional modules and will fail if not equipped on the vehicle)?

→ Yes

INSTALL a new REM. REFER to [Section 419-10](#). TEST the system for normal operation.

→ No

If equipped with the RESCU module, GO to [N18](#).

If not equipped with the RESCU module, REPAIR Circuits 4-EG12 (GY/WH) and 5-EG12 (BU/OG). TEST the system for normal operation.

N18 CHECK SCP COMMUNICATIONS WITH RESCU MODULE C401a DISCONNECTED

1



2



RESCU Module C401a

3



4



DATA LINK DIAGNOSTICS

- Did only the RESC and REM fail the DATA LINK DIAGNOSTICS test (DSM, and SCLM are optional

modules and will fail if not equipped on the vehicle)?

→ **Yes**
INSTALL a new RESCU module. REFER to [Section 419-05](#). TEST the system for normal operation.

→ **No**
REPAIR circuits 4-GP8 (GY/BK) and 5-GP8 (BU/YE). TEST the system for normal operation.

N19 CHECK SCP COMMUNICATIONS WITH INTERIOR AJB C283c DISCONNECTED

1



2



Interior AJB C283b

3



Interior AJB C283c

4



5



DATA LINK DIAGNOSTICS

● Did only the ABS, GEM, and PCM fail the DATA LINK DIAGNOSTICS test (RESCU module, DSM, and SCLM are optional modules and will fail if not equipped on the vehicle)?

→ **Yes**
GO to [N20](#).

→ **No**
INSTALL a new AJB. TEST the system for normal operation.

N20 CHECK SCP COMMUNICATIONS WITH FEM C201c DISCONNECTED

1

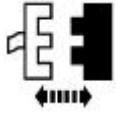


2



Interior AJB C283c

3



FEM C201c

4



5



DATA LINK DIAGNOSTICS

- Did only the GEM fail the DATA LINK DIAGNOSTICS test (RESCU module, DSM, and SCLM are optional modules and will fail if not equipped on the vehicle)?

→ **Yes**
 INSTALL a new FEM. REFER to [Section 419-10](#). TEST the system for normal operation.

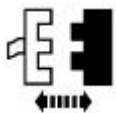
→ **No**
 GO to [N21](#).

N21 CHECK SCP COMMUNICATIONS WITH ANTI-LOCK BRAKE CONTROL MODULE C135 OR C155 DISCONNECTED

1



2



3



2 Disconnect the anti-lock brake control module with or without traction control C135 or the stability assist module C155.

4



DATA LINK DIAGNOSTICS

- Did only the ABS and GEM fail the DATA LINK DIAGNOSTICS test (RESCU module, DSM, and SCLM are optional modules and will fail if not equipped on the vehicle)?

→ Yes

INSTALL a new anti-lock brake control module or stability assist module. REFER to [Section 206-09A](#), [Section 206-09B](#), or [Section 206-09C](#).

→ No

GO to [N22](#).

N22 CHECK SCP COMMUNICATIONS WITH FEM C201c DISCONNECTED

1



2



PCM C175a

3



4



DATA LINK DIAGNOSTICS


- Did only the GEM, PCM, and the ABS fail the DATA LINK DIAGNOSTICS test (RESCU module, DSM, and SCLM are optional modules and will fail if not equipped on the vehicle)?

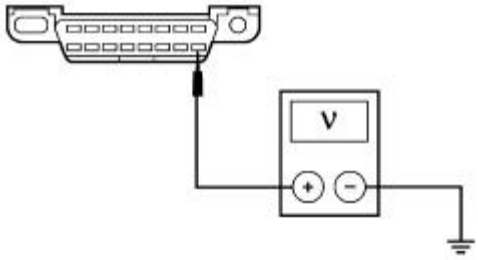
→ Yes

INSTALL a new PCM. REFER to Powertrain Control/Emissions Diagnosis (PC/ED) manual. TEST the system for normal operation.

	<p>→ No REPAIR the circuit(s) in question between interior AJB C283c and FEM C201c, PCM C175a, anti-lock brake control module C135 or stability assist C155. REPAIR circuit 4-CF53 (GY/WH) between interior AJB C283c and the ABS test connector C126. REFER to Communication Circuit Wiring Repair in the section. TEST the system for normal operation.</p>
--	---

PINPOINT TEST O: NO MODULE / NETWORK COMMUNICATION — NO POWER TO THE NGS TESTER

CONDITIONS	DETAILS/RESULTS/ACTIONS
O1 CHECK NGS TESTER PINS FOR DAMAGE	
	<p>1 Inspect New Generation STAR (NGS) Tester pins.</p> <ul style="list-style-type: none"> ● Are the pins OK? <p>→ Yes GO to O2.</p> <p>→ No REPAIR NGS Tester pins. TEST the system for normal operation.</p>
O2 CHECK DLC C251 FOR DAMAGE	
<p>1</p> 	<p>2 Inspect the DLC C251 pins for damage.</p> <ul style="list-style-type: none"> ● Are the pins OK? <p>→ Yes GO to O3.</p> <p>→ No REPAIR DLC C251. TEST the system for normal operation.</p>
O3 CHECK VOLTAGE TO DLC C251 PIN 16 — CIRCUIT 29-ED6 (OG/YE).	
<p>1</p>	<p>1 Measure the voltage between DLC C251 pin 16, circuit 29-ED6 (OG/YE), harness side and ground.</p>



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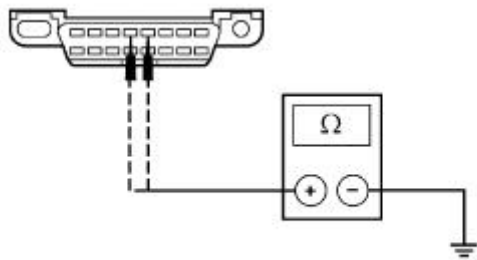
● Is the voltage greater than 10 volts?

→ **Yes**
GO to [O4](#).

→ **No**
REPAIR circuit 29-ED6 (OG/YE). TEST the system for normal operation.

O4 CHECK THE DLC GROUND — CIRCUIT 31-ED6 (BK) AND CIRCUIT 91-ED6 (BN)

1



A0004435

1

Measure the resistance between DLC C251 pin 4, circuit 31-ED6 (BK), harness side and ground; and between DLC C251 pin 5, circuit 91-ED6 (BN), harness side and ground.

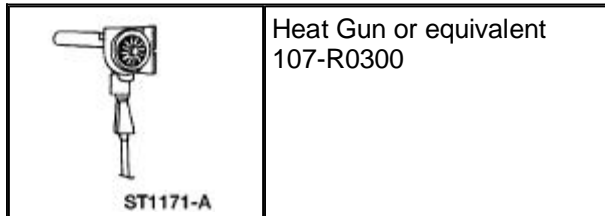
● Is the resistance less than 5 ohms?

→ **Yes**
CHECK NGS Tester. TEST the system for normal operation.

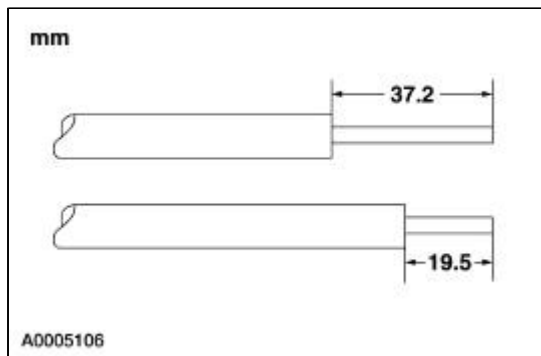
→ **No**
REPAIR the circuit(s) in question. TEST the system for normal operation.

Communication Circuit Wiring Repair

Special Tool(s)



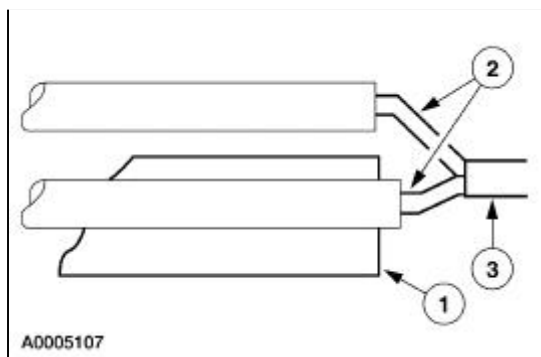
1. Disconnect the battery ground cable. Refer to [Section 414-01](#).
2. Strip the wires.



3. **NOTE:** Use rosin core mildly activated (RMA) solder, not acid core solder.

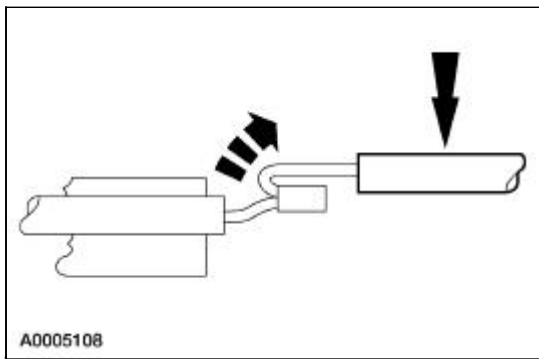
Solder the wires.

1. Install the heat shrink tube.
2. Twist the wires together.
3. Solder the wires together.

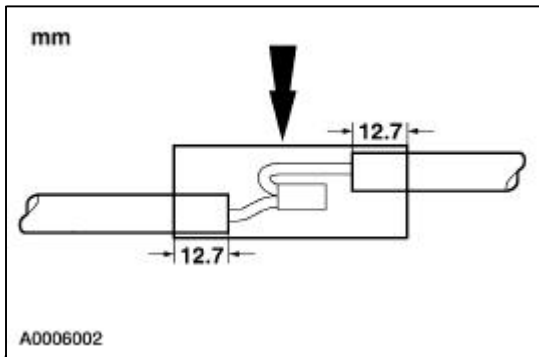


4. **NOTE:** Wait for the solder to cool before moving the wires.

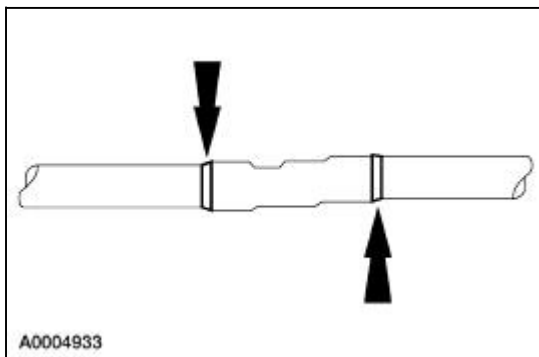
Bend the wires back in a straight line.



5. Position the heat shrink tube over the wire repair.
 - Overlap the heat shrink tube on both wires.





6. Use Heat Gun to heat the repaired area until adhesive flows out both ends of the heat shrink tube.



7. Reconnect the battery ground cable.
-

Module Configuration

Special Tool(s)

 ST2332-A	Worldwide Diagnostic System (WDS) 418-F224, New Generation STAR (NGS) Tester 418-F052, or equivalent scan tool
 ST1270-A	Flash Cable 418-F120 (007-00531) or equivalent

Principles of Operation

Some modules support the ability to change specified factory configuration settings and preset preference items. The process used to change the settings and customer preference items is module configuration. This vehicle supports two different methods of module configuration.

- Programmable Module Installation (PMI)
- Customer preference items

There are three storage locations for module configuration information. One primary storage location and two secondary (or backup) storage locations.

- Primary location is the memory of the specific module.
- First backup location is the VID block memory of the powertrain control module (PCM).
- Second backup is the As-Built Data Center.

During PMI, the scan tool will attempt to extract the module configuration information from the module to be changed. If this is unsuccessful, the scan tool will use the first backup and attempt to extract the module configuration information from the VID block in the PCM. If this also fails, the scan tool will display instructions to contact the As-Built Data Center. This is the only time the As-Built Data Center should be contacted.

Programmable Module Installation (PMI)

NOTE: If the powertrain control module (PCM) needs to have a powertrain calibration flash programmed, refer to the Powertrain Control/Emissions Diagnosis (PC/ED) manual. Make sure to use the flash cable when programming calibrations or running a PMI routine on the PCM.

The PMI configuration method is used when a new programmable module is to be installed. During the PMI routine the scan tool attempts to gather two pieces of information:

- Option content information from the old module. (module configuration and customer preference settings)
- The vehicle identification number (VIN) from the PCM.

During PMI the scan tool first looks to the PCM for the VIN number of the vehicle. Once the VIN is retrieved the scan tool will carry out a self-test of the suspect module to determine if the module has been configured.

- If DTC B2477 is present the module does not contain complete configuration information. The PMI routine will then halt and give instructions on how to proceed.
- If DTC B2477 is not present the module will allow the scan tool to retrieve its option content information. The scan tool will then store the option content information and the VIN.

The scan tool can store the combined option content information and VIN for only one module at a time. Once information is stored, the scan tool cannot be used to retrieve any other option content information without erasing the previous option content information. Make sure the new module is on hand for installation before retrieving option content information data from the old module.

After the new module is installed, use the scan tool to restore the option content information into the new module.

Vehicle Identification (VID) Block

NOTE: If the powertrain control module (PCM) needs to have a powertrain calibration flash programmed, refer to the Powertrain Control/Emissions Diagnosis (PC/ED) manual. Make sure to use the flash cable when programming calibrations or running a PMI routine on the PCM.

NOTE: When carrying out a PMI routine on any non-PCM module, use the OBDII cable.

NOTE: Flash programming powertrain calibrations onto the PCM is different than PMI. It has no effect on the backup data in the VID block memory area of the PCM.

The PCM contains a memory area called a vehicle identification (VID) block. A portion of the VID block is used to store the backup data for each programmable module on the vehicle.

The VID block is the first backup of information when using the PMI configuration method. If the scan tool cannot retrieve option content information from the suspect module, the scan tool will attempt to extract backup information from the VID block of the PCM.

The VID block is not related to or effected by the powertrain calibration information stored in the PCM. If a new powertrain calibration has been flashed onto the PCM, the VID block will not be affected.

If using the PMI routine to install a new PCM, the scan tool will reprogram only VID information. The engine calibration information may still need to be flashed. For more information, refer to the powertrain control emissions diagnosis (PC/ED) manual for flash programming information.

As-Built Data Center

The As-Built Data Center keeps a record of the vehicle configuration in a database retrievable using the VIN. The As-Built Data Center records the applicable module configurations stored in each module before the vehicle leaves the factory. The As-Built Data Center will always reflect the original build of the vehicle as it left the factory. Only contact the As-Built Data Center when directed to do so by the scan tool.

Customer Preference Items

This method is used to enable or disable module-controlled items or systems to suit the preference of

the customer. Not all features controlled by a module are listed in this configuration method. Refer to the Module Configuration Index in this section for a list of features per module.

If an item is changed using the customer preference items configuration method, the changed information will not be stored in the PCM VID block. The VID block will retain the original settings as they were recorded when the vehicle left the factory.

Inspection and Verification

1. Visually inspect for obvious signs of electrical damage. Refer to the following chart:

Visual Inspection Chart

Electrical
<ul style="list-style-type: none"> ● Damaged wiring harness ● Loose or corroded connectors ● Anti-lock brake control module (ABS) ● Rear electronics module (REM) ● Front electronics module (FEM) ● Driver door module (DDM) ● Instrument cluster module (ICM) ● Message center module (MCM) ● Dual automatic temperature control (DATC) module ● Audio control module (ACM) ● Remote emergency satellite cellular unit (RESCU) module

2. If the concern remains after inspection, connect the scan tool to the data link connector (DLC) located beneath the instrument panel and select the vehicle to be tested from the scan tool menu. If the scan tool does not communicate with the vehicle:
 - check that the program card is correctly installed.
 - check the connections to the vehicle.
 - check the ignition switch is in RUN position.
3. If the scan tool still does not communicate with the vehicle, refer to [Section 418-00](#).
4. Refer to the Symptom Chart.

Module Configuration Index

NOTE: Do not contact the As-Built Data Center unless the scan tool instructs you to do so. The scan tool will not allow you to use as-built data information unless the scan tool first prompts you for the As-Built Data Center information.

Module Configuration Index

Module	Configuration Method	Customer Preference Items	Manufacturer Options	As-Built Data Center
ABS	PMI	None	—	Supported
DATC	PMI	None	—	Supported
DDM	PMI	<ul style="list-style-type: none"> ● Two-Stage Unlock 	—	Supported

		<ul style="list-style-type: none"> ● Easy Entry/Exit ● Autolocks 		
ICM	PMI	None	—	Supported
FEM	PMI	None	—	Supported
MCM	PMI	None	—	Supported
ACM	PMI	None	—	Supported
REM	PMI	None	—	Supported
RESCU	PMI	None	—	Supported

Scan Tool Message Index

Scan Tool Message Index

Scan Tool Message	Explanation	Action
Unable to Retrieve VIN from vehicle - Enter the VIN below.	PCM VIN area blank.	Enter VIN using scan tool.
This module has not been configured - Reinstall original module to retrieve config. data - If old module is not available, continue for backup data.	A new module was installed before retrieving configuration data from suspect module. DTC B2477 should be set.	Install the original module and retrieve configuration data. If original module is currently in the vehicle continue with the routine to retrieve backup data from the PCM. Continue with routine to extract backup data from the PCM.
Data previously stored for the following vehicle VIN# - Data will be lost if you continue - Press trigger to continue.	The scan tool has configuration data stored for the same module that could be overwritten.	Make sure that data already stored on scan tool is not needed, then continue with routine to retrieve configuration data.
The module is not configurable - Refer to service manual for info	The module has no configuration information.	Make sure module supports Programmable Module Installation. Refer to Module Configuration Index.
Unable to retrieve (XXX) data from (XXX) module. Unable to locate (XXX) backup data in PCM. Call As-Built Data Center. PCM requires programming.	The suspect module returned DTC B2477 and the PCM did not have backup data.	Make sure module is listed on the Module Configuration Index and that it supports as-built data. Only if As-Built Data Center supports the module, contact the As-Built Data Center.
No data available for module - Select retrieve module config. to obtain vehicle data.	The restore routine was run without retrieving configuration data. The scan tool memory storing configuration data has expired.	Use Programmable Module Installation to retrieve module configuration data.
Unable to retrieve VIN from vehicle - Enter the last five characters of VIN below.	Scan tool was unable to extract VIN for verification.	Enter the last five characters of the VIN.
VIN mismatch for stored data. VIN ##### Current VIN ##### - If you continue, data may not match intended configuration.	The VIN was entered incorrectly. The VIN assigned to the data stored in the scan tool does not match the VIN number of the vehicle that is attempting to utilize the	Exit the routine and attempt to retrieve module configuration data entering the correct VIN.

	configuration data.	
Entered data is not valid	Vehicle data was incorrectly entered. Module configuration data was incorrectly entered.	Refer to As-Built Data Center information and enter the correct module configuration.
Unable to verify download - Refer to service manual for info.	The module will not allow the scan tool to verify the correct information was configured.	Exit the routine and verify correct information manually.
Block data is not valid for the vehicle - Clear block 1 and re-enter.	Block data entered for the module is not correct.	Refer to As-Built Data Center information and enter correct data for each block.
Data is not valid for the entered VIN - Check VIN and re-enter.	The VIN was entered incorrectly.	Exit the routine and repeat the routine entering the correct VIN.




Symptom Chart

Symptom Chart

Condition	Possible Sources	Action
<ul style="list-style-type: none"> Unable to configure the new module 	<ul style="list-style-type: none"> Module is not programmable. Module. Circuitry. 	<ul style="list-style-type: none"> Make sure the module is listed on the module configuration index. GO to Pinpoint Test A.

Pinpoint Tests

PINPOINT TEST A: UNABLE TO CONFIGURE THE NEW MODULE

CONDITIONS	DETAILS/RESULTS/ACTIONS
A1 INITIATE DATA LINK DIAGNOSTICS	
<p>1 </p> <p>2 </p> <p>3 </p> <p>4</p>	<p>4 Carry out the DATA LINK DIAGNOSTICS test.</p>



- Does the module in question appear on the results screen as no response/not equipped?

- **Yes**
REFER to [Section 418-00](#).
- **No**
GO to [A2](#).

A2 CHECK FOR COMMUNICATION WITH THE MODULE

1



- 1 Carry out the suspect module self-test.

- Did the module self-test function correctly?

- **Yes**
RECORD the DTCs and GO to [A3](#).
- **No**
For the FEM, REFER to [Section 501-11](#).
For the ICM, REFER to [Section 413-01](#).
For the MCM, REFER to [Section 413-08](#).
For the ABS, REFER to [Section 206-09A](#).
For the ABS/TC, REFER to [Section 206-09B](#).
For the REM, REFER to [Section 501-11](#).
For the DDM, REFER to [Section 501-14B](#).
For the DATC, REFER to [Section 412-00](#).
For the ACM, REFER to [Section 415-01](#).
For the RESCU, REFER to [Section 419-05](#).

A3 VERIFY THE PROGRAMMABLE ITEM

- 1 Check for the item to be programmed on the module configuration index in this section.

- Does the item appear on the index under the module?

- **Yes**
CARRY OUT the configuration method on the module in question and follow the text screens. REFER to the corresponding configuration method under General Procedures in this section. If the module does not accept configuration, INSTALL a different programmable module.

→ **No**
The item is not configurable.

Programmable Module Installation

NOTE: If using the WDS, select Module Configuration and Programming, then follow the screen prompts.

NOTE: Do not remove the original module from the vehicle until the scan tool has retrieved the modules configuration information.

NOTE: Make sure the module is listed as being supported by Programmable Module Installation in the Module Configuration Index in this section.

NOTE: Make sure to use the flash cable when programming calibrations or running a PMI routine on the PCM.

NOTE: It is important to keep a record of any error message given by the tester during the programmable module installation routine. Additionally, observe the point during the routine that the error message is given and refer to the Scan Tool Message Index in this section. This will help determine what is causing the error message.

1. Select Programmable Module Installation on the scan tool.
 2. Select Retrieve Module Configuration — Old ECU, and follow the text screens until successful.
 3. Install the new module.
 4. Select Restore Module Configuration — New ECU, and follow the text screens until successful.
-

Programmable Module Installation —Using Backup Data

NOTE: If using the WDS, select Module Configuration and Programming, then follow the screen prompts.

NOTE: Make sure to use the flash cable when programming calibrations or running a PMI routine on the PCM.

1. Select Programmable Module Installation on the scan tool.
 2. Select Retrieve Module Configuration — Old ECU. The scan tool will give you a message to reinstall the old module or to continue for backup data. If the module to be replaced will not communicate or has incorrect data, continue and allow the scan tool to find backup data. If the scan tool successfully retrieves the backup data, GO to Step 7 in this procedure. If the scan tool prompts you to contact the As-Built Data Center for backup information, contact the As-Built Data Center and obtain the backup data for the vehicle and continue on.
 3. After the As-Built Data Center backup data is obtained continue with the routine by entering the VIN number of the vehicle when the scan tool prompts you to do so.
 4. The scan tool will prompt you to enter the vehicle data. The vehicle data is listed on the As-Built Data Center sheet in the upper left-hand portion, directly underneath the VIN for the vehicle.
 5. The scan tool will prompt you to enter information for the module that needs to be reprogrammed. Enter all of the data that the scan tool requests. If the scan tool requests information that is not listed on the As-Built Data Center sheet, press NO.
 6. Follow the text screens until all pertinent data is entered and the module data is stored.
 7. Select Restore Module Configuration — New ECU, and follow the text screens until successful.
 8. Manually validate each customer preference item for correct setting. If necessary, ask the customer what setting would be their preference. Refer to the Module Configuration Index in this section for the list of customer preference items.
-

Customer Preference Items

NOTE: If using the WDS, select Module Configuration and Programming, then follow the screen prompts.

NOTE: Make sure module is listed as supporting customer preference items and supports the specific item to be configured in the Module Configuration Index in this section.

1. Select Service Bay Functions on the scan tool.
 2. Select the module that contains the customer preference item to be programmed. Refer to the Module Configuration Index in this section.
 3. Select Customer Preference Items on the scan tool.
 4. Select Module Option Content.
 5. Select the item to be enabled or disabled.
 6. Enable or disable the item as necessary to reflect the customer preference.
-

Torque Specifications

Description	Nm	lb-in
Battery ground cable	10	89

Anti-Theft —Perimeter



The perimeter anti-theft system consists of:

- front door ajar switches (integral part of the latch assemblies)
 - rear door ajar switches (integral part of the latch assemblies)
 - underhood ajar switch
-

Anti-Theft — Perimeter

Refer to Wiring Diagrams Section [419-01A](#) for schematic and connector information.

Special Tool(s)

 ST1137-A	73III Automotive Meter 105-R0057
 ST1217-A	New Generation STAR (NGS) Tester or equivalent 418-F048 (007-00500)

Principles of Operation

Anti-Theft Perimeter Protection Feature

The anti-theft perimeter protection feature is controlled by the front electronic module (FEM), the rear electronic module (REM), and the driver door module (DDM). This feature is configurable to the FEM and REM. The alarm can be armed using the remote transmitter to the DDM module which sends a message via the Standard Corporate Protocol (SCP) communication network to the FEM, or by using the driver door lock switch. The FEM and REM will then monitor all features which will activate the alarm. These features are:

- all door ajar switches
- hood and luggage compartment lid ajar switches
- radio and ignition switch, anti-theft switches

Additionally, a single security hardwire from the FEM to the REM is monitored for an open.

If any of the above features receive any activation once the alarm has been armed, the alarm will activate the visual and audible alerts.

Inspection and Verification

NOTE: If installing a new FEM, REM or DDM, the new module must be reconfigured. Refer to [Section 418-01](#).

1. Verify the customer concern by operating the perimeter anti-theft system.
2. Visually inspect for obvious signs of mechanical and electrical damage.

Visual Inspection Chart

Mechanical	Electrical
<ul style="list-style-type: none"> ● Hood switch ● Door disarm switch(es) ● Luggage compartment lid disarm switch ● Ignition switch ● Anti-theft horn 	<ul style="list-style-type: none"> ● Central junction box CJB (CJB) Fuses: <ul style="list-style-type: none"> ■ 205 (5A) ■ 207 (5A) ■ 222 (10A) ● Battery junction box (BJB) Fuses: <ul style="list-style-type: none"> ■ 422 (20A) ■ 425 (40A) ● FEM ● REM ● DDM ● Connectors ● Circuitry

3. If the concern remains after the inspection, connect the New Generation STAR (NGS) Tester to the data link connector (DLC) located beneath the instrument panel and select the vehicle to be tested from the NGS Tester menu. If the NGS Tester does not communicate with the vehicle:
 - check that the program card is correctly installed.
 - check the connections to the vehicle.
 - check the ignition switch position.
4. If the NGS still does not communicate with the vehicle, refer to the New Generation STAR Tester manual.
5. Carry out the DATA LINK DIAGNOSTIC TEST. If the NGS responds with:
 - CKT914, CKT915 or CKT70 = ALL ECUS NO RESP/NOT EQUIP, refer to [Section 418-00](#).
 - NO RESP/NOT EQUIP for front electronic module (FEM), go to Pinpoint Test A.
 - NO RESP/NOT EQUIP for rear electronic module (REM), go to Pinpoint Test B.
 - NO RESP/NOT EQUIP for driver door module (DDM), go to Pinpoint Test C.
 - SYSTEM PASSED, retrieve and record the continuous diagnostic trouble codes (DTCs), erase the continuous DTCs and carry out self-test diagnostics for the FEM or REM.
6. If the DTCs retrieved are related to the concern, go to FEM Diagnostic Trouble Code (DTC) Index or REM Diagnostic Trouble Code (DTC) Index to continue diagnostics.
7. If no DTCs related to the concern are retrieved, proceed to Symptom Chart to continue diagnostics.

FEM Diagnostic Trouble Code (DTC) Index

DTC	Description	Source	Action
B1319	Driver Door Ajar Circuit Failure	FEM	REFER to Section 417-02 .
B1327	Passenger Door Ajar Circuit Failure	FEM	REFER to Section 417-02 .

B1342	ECU Is Defective	FEM	CLEAR the DTC. RETRIEVE the DTCs. If DTC B1342 is retrieved, INSTALL a new FEM. REFER to Section 419-10 . CLEAR the DTCs. REPEAT the self-test.
B1438	Wiper Mode Select Switch Circuit Failure	FEM	REFER to Section 501-16 .
B1446	Wiper Park Sense Circuit Failure	FEM	REFER to Section 501-16 .
B1479	Wiper Washer Fluid Level Sensor Circuit Failure	FEM	REFER to Section 413-01 .
B1499	Lamp Turn Signal Left Circuit Failure	FEM	REFER to Section 417-01 .
B1501	Lamp Turn Signal Left Circuit Short to Battery	FEM	REFER to Section 417-01 .
B1503	Lamp Turn Signal Right Circuit Failure	FEM	REFER to Section 417-01 .
B1505	Lamp Turn Signal Right Circuit Short to Battery	FEM	REFER to Section 417-01 .
B1519	Hood Switch Circuit Failure	FEM	GO to Pinpoint Test D .
B1567	Lamp Headlamp High Beam Circuit Failure	FEM	REFER to Section 417-01 .
B1676	Battery Pack Voltage Out of Range	FEM	REFER to Section 414-00 .
B1794	Lamp Headlamp Low Beam Circuit Failure	FEM	REFER to Section 417-01 .
B2214	Window Passenger Front Up Switch Short to Battery	FEM	REFER to Section 501-11 .
B2215	Window Passenger Front Down Switch Short to Battery	FEM	REFER to Section 501-11 .
B2312	Mirror Passenger Horizontal Feedback Potentiometer Circuit Failure	FEM	REFER to Section 501-09 .
B2316	Mirror Passenger Vertical Feedback Potentiometer Circuit Failure	FEM	REFER to Section 501-09 .
B2443	Powertrain Performance Mode Switch Circuit Failure	FEM	Not Used
B2477	Module Configuration Failure	FEM	REFER to Section 418-01 .
C1284	Oil Pressure Switch Failure	FEM	REFER to Section 413-01 .
C1446	Brake Switch Circuit Failure	FEM	REFER to Section 413-01 .
C1924	VAPS Solenoid Actuator Output Circuit Short to Ground	FEM	REFER to Section 211-00 .
C1925	VAPS Solenoid Actuator Return Circuit Failure	FEM	REFER to Section 211-00 .
U1027	SCP (J1850) Invalid or Missing Data for Engine RPM	PCM	CARRY OUT the Powertrain Control Module (PCM) self-test. REFER to the Powertrain Control/Emissions Diagnosis (PC/ED) manual.
U1041	SCP (J1850) Invalid or Missing Data for Vehicle Speed	ABS	CARRY OUT the Anti-Lock Brake Control Module (ABS) self-test. REFER to Section 206-09A .

U1059	SCP (J1850) Invalid or Missing Data for Transmission / Transaxle / PRNDL	PCM	CARRY OUT the Powertrain Control Module (PCM) self-test. REFER to the Powertrain Control/Emissions Diagnosis (PC/ED) manual.
U1218	SCP (J1850) Invalid or Missing Data for External Lamps	ICM	CARRY OUT the Instrument Cluster (ICM) self-test. REFER to Section 413-01 .
U1222	SCP (J1850) Invalid or Missing Data for Interior Lamps	ICM	CARRY OUT the Instrument Cluster (ICM) self-test. REFER to Section 413-01 .
U1227	SCP (J1850) Invalid or Missing Data for Body Status Request	ICM	CARRY OUT the Instrument Cluster (ICM) self-test. REFER to Section 413-01 .

FEM Parameter Identification (PID) Index

PID	Description	Expected Value
AL_EVT1	Last 8 Alarm Events	DROPEN, HOODTR, IGNTAM, PANIC, T_AJAR, RR_SD, LR_SD, P_DOOR, D_DOOR, RADIO, WINDO, ULTRS, NOEVNT, BB_SND
AL_EVT2	Last 8 Alarm Events	DROPEN, HOODTR, IGNTAM, PANIC, T_AJAR, RR_SD, LR_SD, P_DOOR, D_DOOR, RADIO, WINDO, ULTRS, NOEVNT, BB_SND
AL_EVT3	Last 8 Alarm Events	DROPEN, HOODTR, IGNTAM, PANIC, T_AJAR, RR_SD, LR_SD, P_DOOR, D_DOOR, RADIO, WINDO, ULTRS, NOEVNT, BB_SND
AL_EVT4	Last 8 Alarm Events	DROPEN, HOODTR, IGNTAM, PANIC, T_AJAR, RR_SD, LR_SD, P_DOOR, D_DOOR, RADIO, WINDO, ULTRS, NOEVNT, BB_SND
AL_EVT5	Last 8 Alarm Events	DROPEN, HOODTR, IGNTAM, PANIC, T_AJAR, RR_SD, LR_SD, P_DOOR, D_DOOR, RADIO, WINDO, ULTRS, NOEVNT, BB_SND
AL_EVT6	Last 8 Alarm Events	DROPEN, HOODTR, IGNTAM, PANIC, T_AJAR, RR_SD, LR_SD, P_DOOR, D_DOOR, RADIO, WINDO, ULTRS, NOEVNT, BB_SND
AL_EVT7	Last 8 Alarm Events	DROPEN, HOODTR, IGNTAM, PANIC, T_AJAR, RR_SD, LR_SD, P_DOOR, D_DOOR, RADIO, WINDO, ULTRS, NOEVNT, BB_SND
AL_EVT8	Last 8 Alarm Events	DROPEN, HOODTR, IGNTAM, PANIC, T_AJAR, RR_SD, LR_SD, P_DOOR, D_DOOR, RADIO, WINDO, ULTRS, NOEVNT, BB_SND
CCNT	Number Of Continuous DTCs In Module	one count per bit
D_DOOR	Left Front Door Ajar Switch	CLOSED, AJAR
FLUID_1	Brake Fluid Level Switch #1	OFF, ON
HOOD_SW	Hood Ajar Switch	CLOSED, AJAR
IGN_R	Ignition Switch -RUN Position	NO, YES

L_HIGH	Left High Beam Lamp Driver	Off---, Off-B-, On---, On-B-
L_LOW	Left Low Beam Lamp	Off---, Off-B-, On---, On-B-
LF_TURN	Left Front Turn Lamp	Off---, Off-B-, On---, On-B-
LMRKOUT	Left Front Marker Lamp	Off---, Off-B-, On---, On-B-
OILWRN	Oil Level Warning Lamp	Off---, On---
P_DN_SW	Passenger Down Activated	OFF, DOWN
P_DOOR	Passenger Door Ajar Switch	CLOSED, AJAR
P_UP_SW	Passenger Up Activated	OFF, UP
PRK_BRK	Parking Brake Switch Input	OFF, ON
PSMRPSH	Passenger Mirror Position Sensor (Left/Right)	#####
PSMRPSV	Passenger Mirror Position	#####
PSPWAMP	Power Window Passenger's Peak Motor Current	#####
PWM_DC1	PWM Duty Cycle #1	%
R_HIGH	Right High Beam Lamp Driver	Off---, Off-B-, On---, On-B-
R_LOW	Right Low Beam Lamp	Off---, Off-B-, On---, On-B-
RADIOSW	Security Input Switch Status	OFF, ON
RF_TURN	Right Front Turn Lamp	Off---, Off-B-, On---, On-B-
RMRKSTB	Right Front Marker Lamp	Off---, Off-B-, On---, On-B-
STLKOUT	Steering Column Lock Ground Output	OFF, ON
VBAT	Battery Voltage	Volts
WFLUID	Washer Fluid Level	LOW, OK
WPMODE	Wiper Control Mode Select	WASH, OPEN, INVLD, OFF, INTVL1, INTVL2, INTVL3, INTVL4, INTVL5, INTVL6, INTVL7, LOW, HIGH
WPPRKSW	Windshield Wiper Park Sense	notPRK, PARKED

FEM Active Command Index

Active Command	Display	Action
BACKLIGHTING INTENSITY CONTROL COMMAND	ILLUM	%
BRAKE SYSTEM CONTROL COMMAND	SHFT LOCK	OFF, ON
EXTERIOR LAMP CONTROL	PARKLAMPS	OFF, ON
FRONT WINDOW CONTROL	RR UP	OFF, ON
FRONT WINDOW CONTROL	PR DOWN	OFF, ON

FRONT WINDSHIELD WIPER/WASHER	SPEED RLY	OFF, ON
FRONT WINDSHIELD WIPER/WASHER	WASH RLY	OFF, ON
FRONT WINDSHIELD WIPER/WASHER	WIPER RLY	OFF, ON
HEAD/CORNERING LAMP CONTROL	HIGH BEAM	OFF, ON
HEAD/CORNERING LAMP CONTROL	LOW BEAM	OFF, ON
INDICATOR LAMP CONTROL	NON MIL	OFF, ON
LAMP CONTROL COMMAND	HDLMPWSH	OFF, ON
POWER MIRROR CONTROL	PR DOWN	OFF, ON
POWER MIRROR CONTROL	PR LEFT	OFF, ON
POWER MIRROR CONTROL	PR RIGHT	OFF, ON
POWER MIRROR CONTROL	PR UP	OFF, ON
STEERING COLUMN CONTROL COMMAND	LOCK_GND	OFF, ON
TURN SIGNAL AND MARKER LAMPS	HAZARD	OFF, ON
VAPS II OUTPUT PULSE CONTROL	VAPSIIOUT	%

REM Diagnostic Trouble Code (DTC) Index

DTC	Description	Source	Action
B1201	Fuel Sender Circuit Failure	REM	REFER to Section 413-01 .
B1300	Power Door Lock Circuit Failure	REM	REFER to Section 501-14B .
B1310	Power Door Unlock Circuit Failure	REM	REFER to Section 501-14B .
B1331	Decklid Ajar Rear Door Circuit Failure	REM	REFER to Section 417-02 .
B1335	Door Ajar RR Circuit Failure	REM	REFER to Section 417-02 .
B1342	ECU Is Defective	REM	CLEAR the DTC. RETRIEVE the DTCs. If DTC B1342 is retrieved, INSTALL a new REM. REFER to Section 419-10 . CLEAR the DTCs. REPEAT the self-test.
B1483	Brake Pedal Input Circuit Failure	REM	REFER to Section 417-01 .
B1499	Lamp Turn Signal Left Circuit Failure	REM	REFER to Section 417-01 .
B1501	Lamp Turn Signal Left Circuit Short to Battery	REM	REFER to Section 417-01 .
B1503	Lamp Turn Signal Right Circuit Failure	REM	REFER to Section 417-01 .
B1505	Lamp Turn Signal Right Circuit Short to Battery	REM	REFER to Section 417-01 .
B1551	Decklid Release Circuit Failure	REM	REFER to Section 501-14B .
B1571	Door Ajar LR Circuit Failure	REM	REFER to Section 417-02 .
B1676	Battery Pack Voltage Out of Range	REM	REFER to Section 414-00 .
B2172	Inertia Switch Input Circuit Open	REM	REFER to Powertrain Control/Emissions Diagnosis (PC/ED) manual.
B2174	Window Driver Rear Remote Up	REM	REFER to Section 501-11 .

	Switch Short to Battery		
B2178	Window Driver Rear Remote Down Switch Short to Battery	REM	REFER to Section 501-11 .
B2190	Window Passenger Rear Remote Up Switch Short to Battery	REM	REFER to Section 501-11 .
B2194	Window Passenger Rear Remote Down Switch Short to Battery	REM	REFER to Section 501-11 .
B2477	Module Configuration Failure	REM	REFER to Section 418-01 .
U1041	SCP (J1850) Invalid or Missing Data for Vehicle Speed	ABS	CARRY OUT the Anti-Lock Brake Control Module (ABS) self-test. REFER to Section 206-09A .
U1059	SCP (J1850) Invalid or Missing Data for Transmission/Transaxle/PRNDL	PCM	CARRY OUT the Powertrain Control Module (PCM) self-test. REFER to the Powertrain Control/Emissions Diagnosis (PC/ED) manual.
U1218	SCP (J1850) Invalid or Missing Data for External Lamps	ICM	CARRY OUT the Instrument Cluster (ICM) self-test. REFER to Section 413-01 .

REM Parameter Identification (PID) Index

PID	Description	Expected Value
BOO	Brake Switch Input	OFF, ON
DECKLID	Decklid Ajar Switch	CLOSED, AJAR
DL_DSRM	Decklid Disarm	NO, YES
DLIDOUT	Decklid Driver	Off---, Off--G, Off-B-, Off-BG, OffO--, OffO-G, OffOB-, OffOBG, On---, On--G, On-B-, On-BG, OnO--, OnO-G, OnOB-, OnOBG
DLIDRLS	Deck Lid Release	OFF, ON
L_TAIL	Left and Right Tail Lamp	Off---, Off--G, Off-B-, Off-BG, OffO--, OffO-G, OffOB-, OffOBG, On---, On--G, On-B-, On-BG, OnO--, OnO-G, OnOB-, OnOBG
LMRKOUT	Left Marker Lamp Driver Output State	OFF, ON
LMRKSTB	Left Marker Lamp Driver Short To Battery	NO, YES
LR_TURN	Left and Right Rear Turn Lamp	Off---, Off--G, Off-B-, Off-BG, OffO--, OffO-G, OffOB-, OffOBG, On---, On--G, On-B-, On-BG, OnO--, OnO-G, OnOB-, OnOBG
LRDN_SW	Left Rear Window Down Switch	OFF, UP
LRDR_SW	Left Rear Door Ajar Switch	CLOSED, AJAR
LRUP_SW	Left Rear Window Up Switch	OFF, DOWN
PD_LOCK	Passenger Door Lock	NO, YES
PD_UNLK	Passenger Door Unlock	NOTLOC, LOCK
R_TAIL	Left and Right Tail Lamp	Off---, Off--G, Off-B-, Off-BG, OffO--, OffO-G, OffOB-, OffOBG, On---, On--G, On-B-, On-BG, OnO--, OnO-G,

		OnOB-, OnOBG
RR_TURN	Left and Right Rear Turn Lamp	Off---, Off--G, Off-B-, Off-BG, OffO--, OffO-G, OffOB-, OffOBG, On---, On--G, On-B-, On-BG, OnO--, OnO-G, OnOB-, OnOBG
RRDN_SW	Right Rear Window Down Switch	OFF, UP
RRDR_SW	Right Rear Door Ajar Switch	CLOSED, AJAR
RRUP_SW	Right Rear Window Up Switch	OFF, DOWN

REM Active Command Index

Active Command	Display	Action
EXTERIOR LAMP CONTROL	BACKUPLMP	OFF, ON
EXTERIOR LAMP CONTROL	H MNT STP	OFF, ON
EXTERIOR LAMP CONTROL	L STOP	OFF, ON
EXTERIOR LAMP CONTROL	PARKLAMPS	OFF, ON
EXTERIOR LAMP CONTROL	R DEF RLY	OFF, ON
EXTERIOR LAMP CONTROL	R FOG LMP	OFF, ON
EXTERIOR LAMP CONTROL	R STOP	OFF, ON
POWER WINDOW ENABLE COMMAND	PSGR RLY	OFF, ON
REAR DOOR LOCK CONTROL	LR LOCK	OFF, ON
REAR DOOR LOCK CONTROL	LR UNLOCK	OFF, ON
REAR DOOR LOCK CONTROL	RELEASE	OFF, ON
REAR WINDOW CONTROL	LR DOWN	OFF, ON
REAR WINDOW CONTROL	LR UP	OFF, ON
REAR WINDOW CONTROL	RR DOWN	OFF, ON
REAR WINDOW CONTROL	RR UP	OFF, ON
TURN SIGNAL AND MARKER LAMPS	HAZARD	OFF, ON

DDM Diagnostic Trouble Code (DTC) Index

DTC	Description	Source	Action
B1309	Power Door Lock Circuit Short to Ground	DDM	REFER to Section 501-14B .
B1341	Power Door Unlock Circuit Short to Ground	DDM	REFER to Section 501-14B .
B1342	ECU Is Defective	DDM	CLEAR the DTC. RETRIEVE the DTCs. If DTC B1342 is retrieved, INSTALL a new DDM. REFER to Section 419-10 . CLEAR the DTCs. REPEAT the self-test.
B1400	Driver Power Window One	DDM	REFER to Section 501-11 .

	Touch Window Relay Circuit Short to Battery		
B1405	Driver Power Window Down Circuit Short to Battery	DDM	REFER to Section 501-11 .
B1408	Driver Power Window Up Circuit Short to Battery	DDM	REFER to Section 501-11 .
B1416	Power Window LR Motor Circuit Short to Battery	DDM	REFER to Section 501-11 .
B1420	Passenger Power Window Motor Circuit Short to Battery	DDM	REFER to Section 501-11 .
B1424	Power Window RR Motor Circuit Short to Battery	DDM	REFER to Section 501-11 .
B1530	Memory Set Switch Circuit Short to Ground	DDM	REFER to Section 501-09 .
B1534	Memory 1 Switch Circuit Short to Ground	DDM	REFER to Section 501-09 .
B1538	Memory 2 Switch Circuit Short to Ground	DDM	REFER to Section 501-09 .
B1676	Battery Pack Voltage Out of Range	DDM	REFER to Section 419-10 .
B2112	Door Driver Set Switch Stuck Failure	DDM	REFER to Section 501-14B .
B2116	Door Driver Reset Switch Stuck Failure	DDM	REFER to Section 501-14B .
B2320	Mirror Driver Horizontal Feedback Potentiometer Circuit Failure	DDM	REFER to Section 501-09 .
B2324	Mirror Driver Vertical Feedback Potentiometer Circuit Failure	DDM	REFER to Section 501-09 .
B2336	Mirror Switch Assembly Circuit Failure	DDM	REFER to Section 501-09 .
B2425	Remote Keyless Entry Out of Synchronization	DDM	REFER to Section 501-14B .
B2477	Module Configuration Failure	DDM	REFER to Section 418-01 .
U1041	SCP (J1850) Invalid or Missing Data for Vehicle Speed	ABS	CARRY OUT the Anti-Lock Brake Control Module (ABS) self-test. REFER to Section 206-09A .
U1059	SCP (J1850) Invalid or Missing Data for Transmission / Transaxle / PRNDL	PCM	CARRY OUT the Powertrain Control Module (PCM) self-test. REFER to Powertrain Control/Emissions Diagnosis (PC/ED) manual.

DDM Parameter Identification (PID) Index

PID	Description	Expected Value
ALLOCK	All Doors Lock Sense	notACT, ACTIVE
CCNT	Number Of Continuous DTCs In Module	one count per bit

CNTUNLK	Central Door Unlock Switch Status	notACT, ACTIVE
D_DN_SW	Driver Window Down Switch	OFF, DOWN
D_DSRM	Driver Door Unlock Disarm Switch	NO, YES
D_PWPK	Driver Power Window Peak Current	AMP
D_UP_SW	Driver Window Up Switch	OFF, UP
DMIR_H	Driver Side Mirror Horizontal Motor	notSEN, SENSED
DMIR_V	Driver Mirror Vertical	notSEN, SENSED
DR_LOCK	Driver Door Lock Output State	NO, YES
DR_UNLK	All Doors Unlock Output State	NO, YES
DRLKCYL	Door Lock Cylinder	notACT, ACTIVE
DVMRPSH	Driver Mirror Horizontal Position	one count per bit
DVMRPSV	Driver Mirror Position	one count per bit
LRDN_SW	Left Rear Down Activated	OFF, DOWN
LRUP_SW	Left Rear Up Activated	OFF, UP
MEM1_SW	Memory Recall Switch #1	notACT, ACTIVE
MEM2_SW	Memory Recall Switch #2	notACT, ACTIVE
MEMS_SW	Memory Set Switch	notACT, ACTIVE
MIR_SEL	Power Mirror Select Switch	DRVMIR, PSGMIR, OFF
MIRH_SW	Pow Mir Position Switch - Horizontal	SHORT, RIGHT, LEFT, OFF
MIRV_SW	Power Mir Position Switch - Vertical	SHORT, UP, DOWN, OFF
OTD_SW	One Touch Down Switch	OFF, DOWN
P_DN_SW	Passenger Down Activated	OFF, DOWN
P_UP_SW	Passenger Up Activated	OFF, UP
RRDN_SW	Right Rear Down Activated	OFF, DOWN
RRUP_SW	Right Rear Up Activated	OFF, UP
VBAT	Battery Voltage	Volts

DDM Active Command Index

Active Command	Display	Action
DOOR LOCK CONTROL	DD LOCK	OFF, ON
DOOR LOCK CONTROL	DD UNLOCK	OFF, ON
DOUBLE LOCK COMMAND	DOUBLE LK	UNLOCK, LOCK
FRONT WINDOW CONTROL	DR DOWN	OFF, ON
FRONT WINDOW CONTROL	DR UP	OFF, ON
ONE TOUCH WINDOW DOWN & ACCY DELAY	ONE TOUCH	OFF, ON
POWER MIRROR CONTROL	DR DOWN	OFF, ON
POWER MIRROR CONTROL	DR LEFT	OFF, ON
POWER MIRROR CONTROL	DR RIGHT	OFF, ON
POWER MIRROR CONTROL	DR UP	OFF, ON

Symptom Chart

Symptom Chart


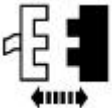
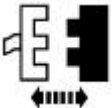

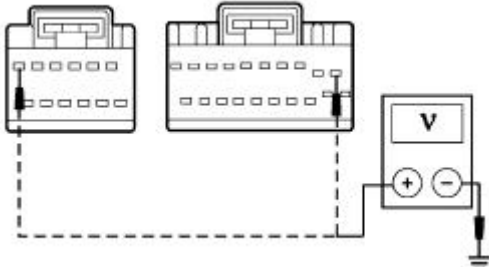
Condition	Possible Sources	Action
<ul style="list-style-type: none"> No communication with the front electronic module (FEM) 	<ul style="list-style-type: none"> FEM. BJB Fuses 425 (40A), 422 (20A). Circuitry. 	<ul style="list-style-type: none"> GO to Pinpoint Test A.
<ul style="list-style-type: none"> No communication with the rear electronic module (REM) 	<ul style="list-style-type: none"> CJB Fuse 235 (5A). Circuitry. REM. 	<ul style="list-style-type: none"> GO to Pinpoint Test B.
<ul style="list-style-type: none"> No communication with the driver door module (DDM) 	<ul style="list-style-type: none"> CJB Fuse 207 (5A), 222 (10A). Circuitry. DDM. 	<ul style="list-style-type: none"> GO to Pinpoint Test C.
<ul style="list-style-type: none"> The alarm system does not operate correctly — lights flash five times when arming the system 	<ul style="list-style-type: none"> CJB Fuse 205 (5A). Ignition switch. Hood ajar switch. Door ajar switch. Circuitry. FEM. REM. 	<ul style="list-style-type: none"> GO to Pinpoint Test D.
<ul style="list-style-type: none"> The alarm system does not arm/disarm — using the driver set switch 	<ul style="list-style-type: none"> Switch. Circuitry. DDM. 	<ul style="list-style-type: none"> GO to Pinpoint Test E.
<ul style="list-style-type: none"> The alarm system does not arm/disarm — using the remote transmitter 	<ul style="list-style-type: none"> Transmitter. DDM. 	<ul style="list-style-type: none"> GO to Pinpoint Test F.
<ul style="list-style-type: none"> Battery voltage out of range — FEM 	<ul style="list-style-type: none"> Circuitry. FEM. 	<ul style="list-style-type: none"> GO to Pinpoint Test G.
<ul style="list-style-type: none"> Battery voltage out of range — REM 	<ul style="list-style-type: none"> Circuitry. REM. 	<ul style="list-style-type: none"> GO to Pinpoint Test H.
<ul style="list-style-type: none"> Battery voltage out of range — DDM 	<ul style="list-style-type: none"> Circuitry. DDM. 	<ul style="list-style-type: none"> GO to Pinpoint Test I.
<ul style="list-style-type: none"> The alarm system does not operate correctly — alarm does not activate with hood ajar/open 	<ul style="list-style-type: none"> Circuitry. Hood ajar switch. FEM. 	<ul style="list-style-type: none"> GO to Pinpoint Test J.

Pinpoint Tests



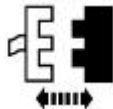
CAUTION: Electronic modules are sensitive to electrical charges. If exposed to these charges, damage may result.

PINPOINT TEST A: NO COMMUNICATION WITH THE FRONT ELECTRONIC MODULE (FEM)

CONDITIONS	DETAILS/RESULTS/ACTIONS
A1 CHECK CIRCUITS 29-DK20 (OG/GN) AND 29S-DK22 (OG/YE) FOR VOLTAGE	
NOTE: Cycle ignition switch from OFF to RUN to enable the switched system power feature.	
<div style="display: flex; flex-direction: column; align-items: flex-start;"> <div style="margin-bottom: 10px;"> 1  </div> <div style="margin-bottom: 10px;"> 2  <p style="margin-left: 100px;">FEM C201c</p> </div> <div style="margin-bottom: 10px;"> 3  <p style="margin-left: 100px;">FEM C201f</p> </div> <div style="margin-bottom: 10px;"> 4  </div> <div style="margin-bottom: 10px;"> 5  <p style="margin-left: 20px;">A0006297</p> </div> </div>	<div style="margin-top: 20px;"> 5 Measure the voltage between FEM C201c pin 6, circuit 29-DK20 (OG/GN), harness side and ground; and between FEM C201f pin 1, circuit 29S-DK22 (OG/YE) harness side and ground. </div> <div style="margin-top: 20px;"> <ul style="list-style-type: none"> ● Are the voltages greater than 10 volts? </div> <div style="margin-top: 10px;"> <p>→ Yes GO to A2.</p> </div> <div style="margin-top: 10px;"> <p>→ No REPAIR the circuit(s) in question. TEST the system for normal operation.</p> </div>
A2 CHECK CIRCUITS 31-DK20 (BK/RD), 31-DK20A (BK/RD), 31-DK20B (BK/RD), 31-DK20C (BK/RD) AND 31-DK20D (BK/RD) FOR OPENS	
1	

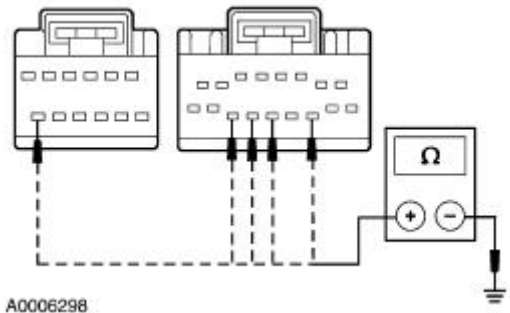


2



FEM C201a

3



A0006298

3 Using the following table, measure the resistance between FEM connectors, harness side and ground:

FEM	Pin	Circuit
C201c	12	31-DK20 (BK/RD)
C201a	11	31-DK20A (BK/RD)
C201a	13	31-DK20B (BK/RD)
C201a	14	31-DK20C (BK/RD)
C201a	15	31-DK20D (BK/RD)

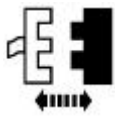
• Are the resistances less than 5 ohms?

→ Yes
REFER to [Section 418-00](#).

→ No
REPAIR the circuit(s) in question. TEST the system for normal operation.

PINPOINT TEST B: NO COMMUNICATION WITH THE REAR ELECTRONIC MODULE (REM)

CONDITIONS	DETAILS/RESULTS/ACTIONS
B1 CHECK CIRCUIT 29-DK31 (OG/BK) FOR VOLTAGE	
NOTE: Cycle ignition switch from OFF to RUN to enable the switched system power feature.	
<p>1</p> <p>2</p> <p>REM C420d</p> <p>3</p>	

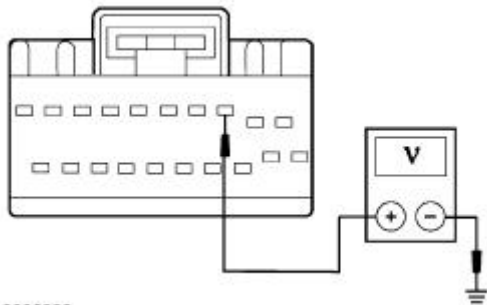


REM C420c

4



5



A0006299

5 Measure the voltage between REM C420d pin 3, circuit 29-DK31 (OG/BK), harness side and ground.

• Is the voltage greater than 10 volts?

→ **Yes**
GO to [B2](#).

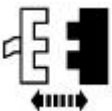
→ **No**
REPAIR the circuit. TEST the system for normal operation.

B2 CHECK CIRCUITS 29S-DK31 (OG/BK), 31-DK30D (BK), 31-DK30E (BK), 31-DK30F (BK), 31-DK30G (BK) AND 31-DK30H (BK/OG), FOR OPENS

1

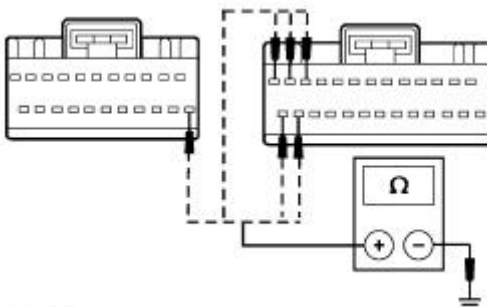


2



REM C420b

3



A0006300

3 Using the following table, measure the resistance between REM connectors, harness side and ground:

REM	Pin	Circuit
C420c	13	29S-DK31 (OG/BK)
C420c	12	31-DK30E (BK)
C420c	11	31-DK30D (BK)
C420c	26	31-DK30G (BK)
C420c	25	31-DK30F (BK)

C420b | 12 | 31-DK30H (BK/OG)

- Are the resistances less than 5 ohms?


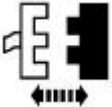

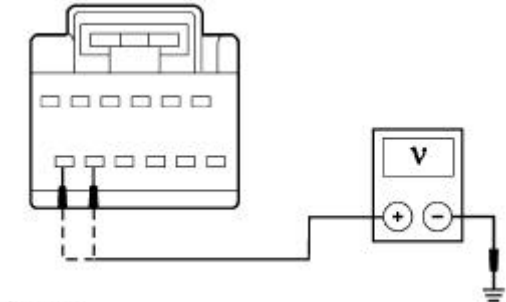
→ Yes


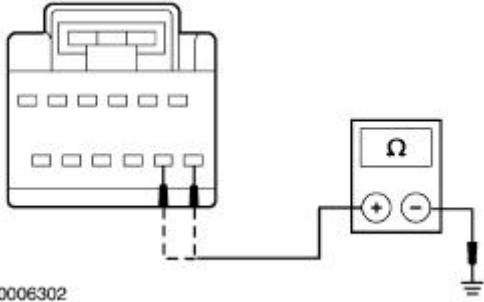
REFER to [Section 418-00](#).

→ No

REPAIR the circuit(s) in question. TEST the system for normal operation.

PINPOINT TEST C: NO COMMUNICATION WITH THE DRIVER DOOR MODULE (DDM)

CONDITIONS	DETAILS/RESULTS/ACTIONS
C1 CHECK CIRCUITS 29-AJ80 (OG) AND 29S-AJ86 (OG/BU) FOR VOLTAGE	
NOTE: Cycle ignition switch from OFF to RUN to enable the switched system power feature.	
<p>1 </p> <p>2 </p> <p>DDM C501a</p> <p>3 </p> <p>4 </p>	<p>4 Measure the voltage between DDM C501a pin 11, circuit 29-AJ80 (OG), harness side and ground; and between DDM C501a pin 12, circuit 29S-AJ86 (OG/BU), harness side and ground.</p> <ul style="list-style-type: none">● Is the voltage greater than 10 volts? <p>→ Yes GO to C2.</p> <p>→ No</p>

REPAIR the circuit(s) in question. TEST the system for normal operation.	
C2 CHECK CIRCUITS 31-AJ80B (BK/OG) AND 91-AJ80 (BN/BU) FOR OPENS	
<p>1</p>  <p>2</p>  <p>A0006302</p>	<p>2</p> <p>Measure the resistance between DDM C501a pin 7, circuit 91-AJ80 (BN/BU), harness side and ground; and between DDM C501a pin 8, circuit 31-AJ80B (BK/OG), harness side and ground.</p> <p>● Is the resistance less than 5 ohms?</p> <p>→ Yes REFER to Section 418-00.</p> <p>→ No REPAIR the circuit(s) in question. TEST the system for normal operation.</p>

PINPOINT TEST D: THE ANTI-THEFT SYSTEM DOES NOT OPERATE CORRECTLY — LIGHTS FLASH FIVE TIMES WHEN ARMING THE SYSTEM

CONDITIONS	DETAILS/RESULTS/ACTIONS
D1 RETRIEVE THE RECORDED DTCS FROM BOTH CONTINUOUS AND ON-DEMAND SELF-TEST — FEM	<p>1</p> <p>Use the recorded FEM DTCs from the continuous and on-demand self-test.</p> <p>● Are any FEM DTCs recorded?</p> <p>→ Yes If DTC B1519, GO to D5.</p> <p>For all other FEM DTCs, REFER to the FEM Diagnostic Trouble Code (DTC) Index.</p> <p>→ No GO to D2.</p>
D2 RETRIEVE THE RECORDED DTCS FROM BOTH CONTINUOUS AND ON-DEMAND SELF-TEST — REM	

	<p>1 Use the recorded REM DTCs from the continuous and on-demand self-test.</p> <ul style="list-style-type: none"> ● Are any REM DTCs recorded? <p>→ Yes REFER to the REM Diagnostic Trouble Code (DTC) Index.</p> <p>→ No GO to D3.</p>
--	--



D3 RETRIEVE THE RECORDED DTCS FROM BOTH CONTINUOUS AND ON-DEMAND SELF-TEST — DDM

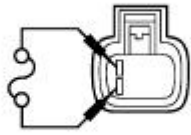
	<p>1 Use the recorded DDM DTCs from the continuous and on-demand self-test.</p> <ul style="list-style-type: none"> ● Are any DDM DTCs recorded? <p>→ Yes REFER to the DDM Diagnostic Trouble Code (DTC) Index.</p> <p>→ No GO to D4.</p>
--	--

D4 CHECK THE INTERIOR COURTESY LAMP OPERATION

	<p>1 Open and close each door, while observing the interior courtesy lamps.</p> <p>2 Open and close the luggage compartment lid, while observing the luggage compartment lamp.</p> <ul style="list-style-type: none"> ● Do the courtesy lamps operate correctly? <p>→ Yes GO to D5.</p> <p>→ No REFER to Section 417-02.</p>
--	--

D5 CHECK FOR A FAULTY HOOD AJAR SWITCH

<p>1 </p> <p>2 </p> <p>Hood Ajar Switch C127</p> <p>3</p>	<p>3 Monitor the FEM PID HOOD_SW, while connecting a fused jumper wire between</p>
---	--



A0003769

hood ajar switch C127 pin 1, circuit 8-GL7 (WH), harness side and hood ajar switch C127 pin 2, circuit 31-GL7 (BK/YE), harness side.

- Does the FEM PID HOOD_SW change from AJAR to CLOSED?

→ **Yes**
INSTALL a new hood ajar switch. CLEAR the DTCs. REPEAT the self-test.

→ **No**
GO to [D6](#).

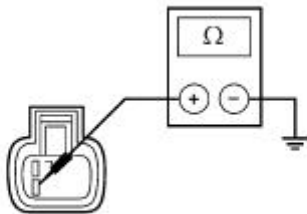
D6 CHECK CIRCUIT 31S-GL7 (BK/YE) FOR AN OPEN

1



Hood Ajar Switch C127

2



A0003770

- 2 Measure the resistance between hood ajar switch C127 pin 2, circuit 31-GL7 (BK/YE), harness side and ground.

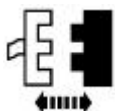
- Is the resistance less than 5 ohms?

→ **Yes**
GO to [D7](#).

→ **No**
REPAIR the circuit. CLEAR the DTCs. REPEAT the self-test.

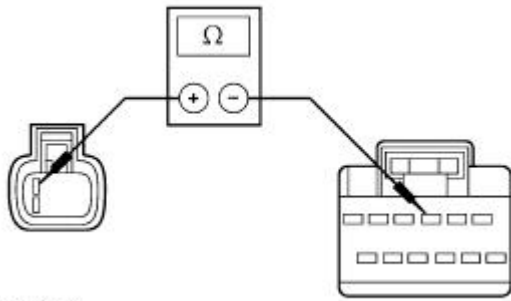
D7 CHECK CIRCUIT 8-GL7 (WH) FOR AN OPEN

1



FEM C201c

2



A0003771

2 Measure the resistance between hood ajar switch C127 pin 2, circuit 8-GL7 (WH), harness side and FEM C201c pin 3, circuit 8-GL7 (WH) harness side.

● Is the resistance less than 5 ohms?

→ **Yes**

Vehicles equipped with manual transmission GO to [D8](#).

All others INSTALL a new FEM. For additional information, REFER to [Section 419-10](#).

CLEAR the DTCs. REPEAT the self-test.

→ **No**

REPAIR the circuit. CLEAR the DTCs. REPEAT the self-test.

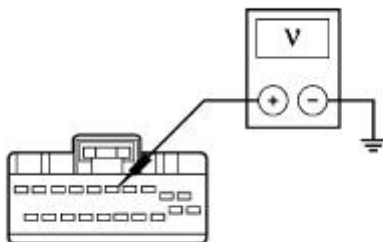
D8 CHECK CIRCUIT 91S-GL13 (BK/YE) FOR SHORT TO BATTERY

1



FEM C201f

2



A0003766

2 Measure the voltage between FEM C201f pin 5, circuit 91S-GL13 (BK/YE), harness side and ground.

● Is the voltage greater than 10 volts?

→ **Yes**

GO to [D9](#).

→ **No**

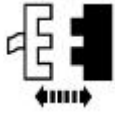
GO to [D10](#).

D9 CHECK REM FOR AN INTERNAL SHORT TO BATTERY

1



2

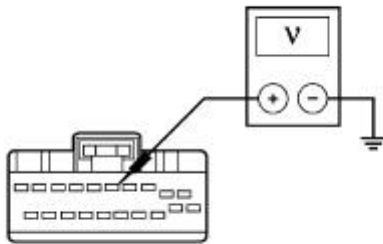


REM C420d

3



4



A0003766

4 Measure the voltage between FEM C201f pin 5, circuit 91S-GL13 (BK/YE), harness side and ground.

• Is the voltage greater than 10 volts?

→ **Yes**
REPAIR the circuit. CLEAR the DTCs.
REPEAT the self-test.

→ **No**
INSTALL a new REM. For additional information, REFER to [Section 419-10](#).
CLEAR the DTCs. REPEAT the self-test.

D10 CHECK REM OPERATION

1

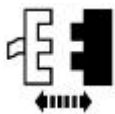


2



FEM C201f

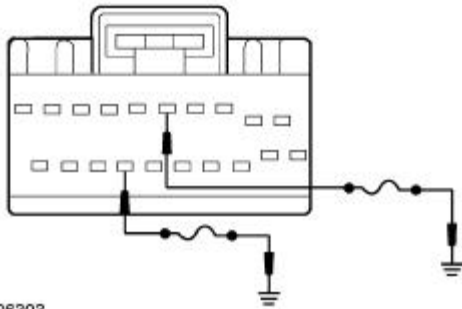
3



REM C420d

4

4 Using a fused jumper wire, jumper REM



A0006303

C420d pin 5, circuit 91S-GL13 (BN) to ground. Using a second fused jumper wire, jumper C420d pin 17, circuit 31S-GL19 (BK/GN) to ground.

- 5 Close all doors, hood and luggage compartment lid.
- 6 Arm the anti-theft system.

● **Do the lights flash five times when the system is armed?**

→ **Yes**
Remove jumper wires. GO to [D11](#).

→ **No**
INSTALL a new REM. For additional information, REFER to [Section 419-10](#). CLEAR the DTCs. REPEAT the self-test.

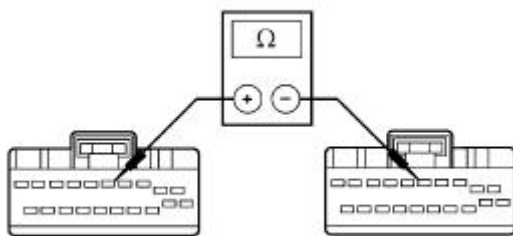
D11 CHECK CIRCUIT 91S-GL13 (BK/YE) FOR AN OPEN

1



FEM C201f

2



A0003768


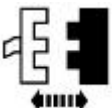
- 2 Measure the resistance between FEM C201f pin 5, circuit 91S-GL13 (BK/YE), harness side and REM C420d pin 5, circuit 91S-GL13 (BK/YE), harness side.

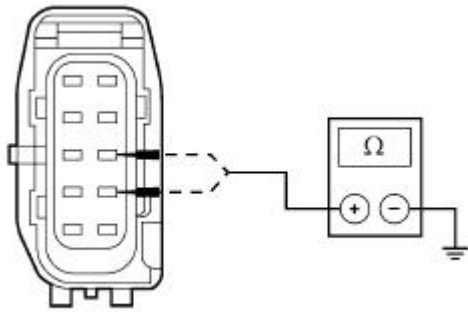
● **Is the resistance less than 5 ohms?**

→ **Yes**
INSTALL a new FEM. For additional information, REFER to [Section 419-10](#). CLEAR the DTCs. REPEAT the self-test.

→ **No**
REPAIR the circuit. CLEAR the DTCs. REPEAT the self-test.

PINPOINT TEST E: THE ALARM SYSTEM DOES NOT ARM/DISARM — USING THE DRIVER SET SWITCH

CONDITIONS	DETAILS/RESULTS/ACTIONS
E1 RETRIEVE THE RECORDED DTC CODES — DDM	
	<p>1 Use the recorded DDM DTCs from the continuous and on-demand self-test.</p> <ul style="list-style-type: none"> ● Are any DDM DTCs recorded? <p>→ Yes If DTC B2112 or B2116, GO to E3.</p> <p>→ No GO to E2.</p>
E2 CHECK THAT THE DRIVER DOOR LOCK AND UNLOCK PIDS READ CORRECTLY	
	<p>1 Monitor the DDM PIDs D_DSRRM and DRLKCYL while turning the key in the driver door lock cylinder to the LOCK and UNLOCK positions.</p> <ul style="list-style-type: none"> ● Do the DDM PID values agree with the LOCK positions? <p>→ Yes INSTALL a new DDM. For additional information, REFER to Section 419-10. CLEAR the DTCs. REPEAT the self-test.</p> <p>→ No GO to E5.</p>
E3 CHECK CIRCUIT 31S-AA78 (BK/BU) AND 31S-AA79 (BK/WH) FOR SHORT TO GROUND	
<p>1</p>  <p>2</p>  <p style="text-align: center;">Driver Door Lock Actuator C525</p> <p>3</p>	<p>3 Measure the resistance between driver door lock actuator C525 pin 5, circuit 31S-AA79 (BK/WH) harness side and ground; and between C525 pin 7, circuit 31S-AA78 (BK/BU) harness side and ground.</p>



A0003772

- Are the resistances greater than 10,000 ohms?

→ **Yes**
 INSTALL a new driver door lock actuator/ajar switch. For additional information, REFER to [Switch—Front Door Ajar](#). CLEAR the DTCs. REPEAT the self-test.

→ **No**
 GO to [E4](#).

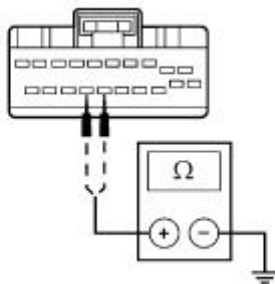
E4 CHECK THE DDM FOR INTERNAL SHORT TO GROUND

1



DDM C501c

2



A0003773

- 2 Measure the resistance between DDM C501c pin 16, circuit 31S-AA78 (BK/BU), harness side and ground; and between DDM C501c pin 17, circuit 31S-AA79 (BK/WH), harness side and ground.

- Are the resistances greater than 10,000 ohms?

→ **Yes**
 INSTALL a new DDM. For additional information, REFER to [Section 419-10](#). CLEAR the DTCs. REPEAT the self-test.

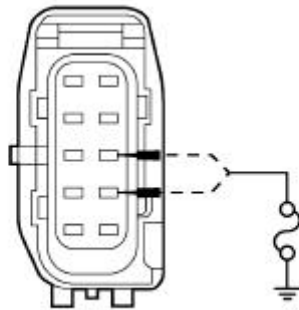
→ **No**
 REPAIR the circuit(s) in question. CLEAR the DTCs. REPEAT the self-test.

E5 CHECK THE DRIVER SET AND DRIVER RESET SWITCH

1



2



A0003774

2

Monitor the DDM PIDs D_DSRLM and DRLKCYL while connecting a jumper wire between the driver door ajar switch C525 pin 5, circuit 31S-AA79 (BK/WH) harness side and ground; and between C525 pin 7, circuit 31S-AA78 (BK/BU) harness side and ground.

- Do the DDM PID values agree with the LOCK positions?

→ Yes

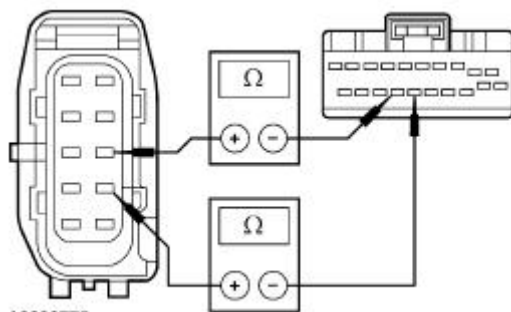
INSTALL a new driver door lock actuator/ajar switch. For additional information, REFER to [Switch—Front Door Ajar](#). CLEAR the DTCs. REPEAT the self-test.

→ No

GO to [E6](#).

E6 CHECK CIRCUITS 31S-AA78 (BK/BU) AND 31S-AA79 (BK/WH)

1



A0003775

1

Measure the resistance between DDM C501c pin 16, circuit 31S-AA78 (BK/BU), harness side and driver door ajar switch C525 pin 7, circuit 31S-AA78 (BK/BU), harness side; and DDM C501c pin 17, circuit 31S-AA79 (BK/WH), harness side and driver door ajar switch C525 pin 5, circuit 31S-AA79 (BK/WH), harness side.

- Is the resistance less than 5 ohms?

→ Yes



INSTALL a new DDM. For additional information, REFER to [Section 419-10](#). CLEAR the DTCs. REPEAT the self-test.

→ No

REPAIR the circuit(s) in question. CLEAR the DTCs. REPEAT the self-test.

PINPOINT TEST F: THE ALARM SYSTEM DOES NOT ARM/DISARM



— USING THE REMOTE TRANSMITTER

CONDITIONS	DETAILS/RESULTS/ACTIONS
F1 CHECK THE ALARM SYSTEM USING THE DRIVER SET SWITCH	
	<p>1 ARM and DISARM the alarm system using the driver set switch.</p> <ul style="list-style-type: none"> ● Does the alarm system set and reset correctly? <p>→ Yes GO to F2.</p> <p>→ No GO to Pinpoint Test E.</p>
F2 DETERMINE IF DDM IS RECEIVING CORRECT UNLOCK COMMANDS FROM THE KEY FOB	
<p>2</p> 	<p>1 Remove the key from the ignition.</p> <p>2 Monitor the DDM FUNCTION TEST TIC/DATA, while pressing the lock and unlock buttons on the remote transmitter.</p> <ul style="list-style-type: none"> ● Does LAST DATA RECEIVED match the button pressed of the remote transmitter? <p>→ Yes INSTALL a new DDM. For additional information, REFER to Section 419-10. CLEAR the DTCs. REPEAT the self-test.</p> <p>→ No GO to F3.</p>
F3 REPLACE THE BATTERY IN REMOTE TRANSMITTER AND RETEST	
<p>2</p> 	<p>1 Replace battery in remote transmitter.</p> <p>2 Monitor the DDM FUNCTION TEST TIC/DATA, while pressing the lock and unlock buttons on the remote transmitter.</p> <ul style="list-style-type: none"> ● Does LAST DATA RECEIVED match the button pressed of the remote transmitter? <p>→ Yes Fault found as low battery. TEST for normal operation.</p> <p>→ No GO to F4.</p>
F4 REPROGRAM REMOTE TRANSMITTER TO DDM	
<p>NOTE: When carrying out the following procedure, it must be noted that all previous programmed remote transmitters will be erased. The customer needs to be informed that any remote transmitters not present during the programming mode will not operate the vehicle. All remote transmitters must be programmed at the same time.</p>	

Reprogram the remote transmitter to the DDM. For additional information, refer to [Section 501-14B](#).

	<p>1 Monitor the DDM FUNCTION TEST TIC/DATA while pressing the lock and unlock buttons on the remote transmitter.</p> <ul style="list-style-type: none"> ● Does LAST DATA RECEIVED match the button pressed of the remote transmitter? <p>→ Yes SYSTEM is OK. CLEAR the DTCs. REPEAT the self-test.</p> <p>→ No PROGRAM a new remote transmitter to the vehicle. For additional information, REFER to Section 501-14B. CLEAR the DTCs. REPEAT the self-test. If the problem still remains, INSTALL a new DDM and program the remote transmitter to the vehicle. For additional information, REFER to Section 419-10. CLEAR the DTCs. REPEAT the self-test.</p>
--	--

PINPOINT TEST G: BATTERY VOLTAGE OUT OF RANGE— FEM

CONDITIONS	DETAILS/RESULTS/ACTIONS
G1 RETRIEVE THE RECORDED DTCS FROM BOTH CONTINUOUS AND ON-DEMAND SELF-TEST — FEM	<p>1 Use the recorded FEM DTCs from the continuous and on-demand self-test.</p> <ul style="list-style-type: none"> ● Are any FEM DTCs recorded? <p>→ Yes If DTC B1676, GO to G2.</p> <p>→ No GO to G3.</p>
G2 CHECK PID FOR BATTERY VOLTAGE	
NOTE: Cycle the ignition from OFF to RUN to enable the switched system power feature.	
<p>1 </p> <p>2 </p>	<p>2 Monitor the FEM PID VBAT.</p> <ul style="list-style-type: none"> ● Is the voltage between 9 and 16 volts? <p>→ Yes RUN self-test. If DTC B1676 is still present, INSTALL a new FEM. For</p>

additional information, REFER to [Section 419-10](#). CLEAR the DTCs. REPEAT the self-test.

→ **No**
GO to [G3](#).

G3 CHECK VOLTAGE SUPPLY TO THE MODULE

1



2



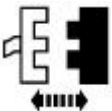
FEM C201f

3



FEM C201c

4



FEM C201a

5



FEM C201d

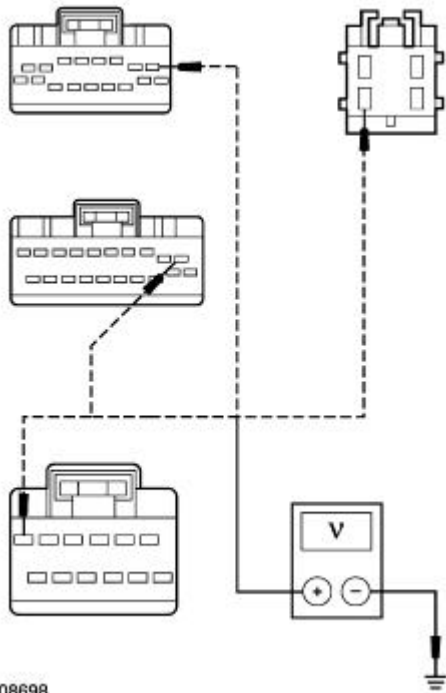
6



7

7 Using the following table, measure the voltage between FEM connectors, harness side and ground:

FEM Connector	Pin	Circuit
C201f	1	29-DK22 (OG/YE)
C201c	6	29-DK20 (OG/GN)
C201a	1	29S-DK21 (OG/WH)
C201d	3	30-AJ71 (RD/YE)



- Are the voltages between 9 and 16 volts?

→ **Yes**
 INSTALL a new FEM. For additional information, REFER to [Section 419-10](#). CLEAR the DTCs. REPEAT the self-test.

→ **No**
 REFER to [Section 414-00](#) for further diagnosis.

PINPOINT TEST H: BATTERY VOLTAGE OUT OF RANGE— REM

CONDITIONS	DETAILS/RESULTS/ACTIONS
H1 RETRIEVE THE RECORDED DTCS FROM BOTH CONTINUOUS AND ON-DEMAND SELF-TEST — REM	<p>1 Use the recorded REM DTCs from the continuous and on-demand self-test.</p> <ul style="list-style-type: none"> ● Are any DTCs recorded? <p>→ Yes If DTC B1676, GO to H2.</p> <p>→ No GO to H3.</p>
H2 CHECK PID FOR BATTERY VOLTAGE	
NOTE: Cycle the ignition from OFF to RUN to enable the switched system power feature.	

1



2



2

Monitor the REM PID VBAT.

● Is the voltage between 9 and 16 volts?

→ Yes

RUN self-test. If DTC B1676 is still present, INSTALL a new REM. For additional information, REFER to [Section 419-10](#). CLEAR the DTCs. REPEAT the self-test.

→ No

GO to [H3](#).

H3 CHECK VOLTAGE SUPPLY TO THE MODULE

1



2



REM C420d

3



REM C420c

4



REM C420f

5

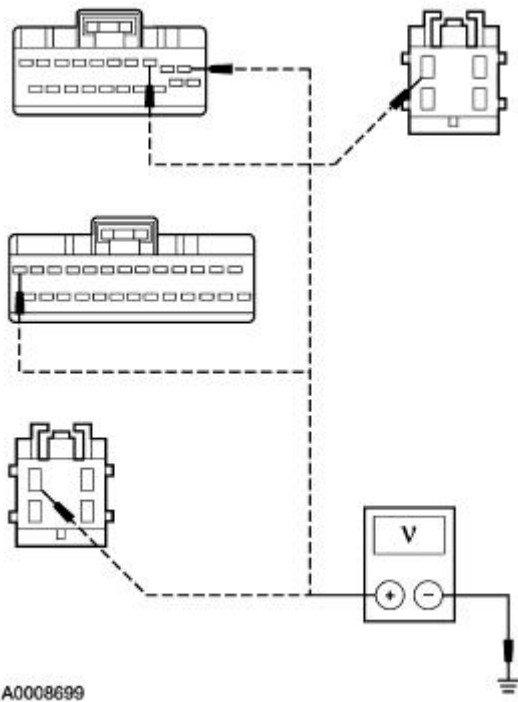


REM C420g

6



7



7

Using the following table, measure the voltage between REM connectors, harness side and ground:

REM Connector	Pin	Circuit
C420d	1	15S-DK32 (GN/RD)
C420d	3	30-DK31 (OG/BK)
C420c	13	29S-DK31 (OG/BK)
C420f	4	30-DK30A (BK)
C420g	2	30-DK30 (RD)

- Are the voltages between 9 and 16 volts?

→ **Yes**
 INSTALL a new REM. For additional information, REFER to [Section 419-10](#). CLEAR the DTCs. REPEAT the self-test.

→ **No**
 REFER to [Section 414-00](#) for further diagnosis.

PINPOINT TEST I: BATTERY VOLTAGE OUT OF RANGE— DDM

CONDITIONS	DETAILS/RESULTS/ACTIONS
I1 RETRIEVE THE RECORDED DTCs FROM BOTH CONTINUOUS AND ON-DEMAND SELF-TEST — DDM	<p>I1 Use the recorded DDM DTCs from the continuous and on-demand self-test.</p> <ul style="list-style-type: none"> • Are any DTCs recorded? <p>→ Yes If DTC B1676, GO to I2.</p> <p>→ No GO to I3.</p>
I2 CHECK PID FOR BATTERY VOLTAGE	

NOTE: Cycle the ignition from OFF to RUN to enable the switched system power feature.

1



2



2

Monitor the DDM PID VBAT.

● **Is the voltage between 9 and 16 volts?**

→ **Yes**

RUN self-test. If DTC B1676 is still present, INSTALL a new DDM. For additional information, REFER to [Section 419-10](#). CLEAR the DTCs. REPEAT the self-test.

→ **No**

GO to [13](#).

I3 CHECK VOLTAGE SUPPLY TO THE MODULE

1



2



DDM C501a

3



DDM C501b

4



5

5

Using the following table, measure the voltage between DDM connectors, harness side and ground:

DDM Connector	Pin	Circuit
C501a	11	29-AJ80 (OG)
C501a	12	29S-AJ86 (OG/BU)

	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 33%; text-align: center;">C501b</td> <td style="width: 33%; text-align: center;">4</td> <td style="width: 33%; text-align: center;">30-AJ80 (RD)</td> </tr> </table> <ul style="list-style-type: none"> ● Are the voltages between 9 and 16 volts? <p>→ Yes INSTALL a new DDM. For additional information, REFER to Section 419-10. CLEAR the DTCs. REPEAT the self-test.</p> <p>→ No REFER to Section 414-00 for further diagnosis.</p>	C501b	4	30-AJ80 (RD)
C501b	4	30-AJ80 (RD)		

PINPOINT TEST J: THE ALARM SYSTEM DOES NOT OPERATE CORRECTLY — ALARM DOES NOT ACTIVATE WITH HOOD AJAR/OPEN

CONDITIONS	DETAILS/RESULTS/ACTIONS
J1 RETRIEVE THE RECORDED DTCs FROM BOTH CONTINUOUS AND ON-DEMAND SELF-TEST — FEM	<ol style="list-style-type: none"> 1 Use the recorded FEM DTCs from the continuous and on-demand self-test. <ul style="list-style-type: none"> ● Are any FEM DTCs recorded? <p>→ Yes If DTC B1519, GO to D5.</p> <p>For all other FEM DTCs, REFER to the FEM Diagnostic Trouble Code (DTC) Index.</p> <p>→ No GO to J2.</p>
J2 RETRIEVE THE RECORDED DTCs FROM BOTH CONTINUOUS AND ON-DEMAND SELF-TEST — REM	<ol style="list-style-type: none"> 1 Use the recorded REM DTCs from the continuous and on-demand self-test. <ul style="list-style-type: none"> ● Are any REM DTCs recorded? <p>→ Yes</p>

REFER to the REM Diagnostic Trouble Code (DTC) Index.

→ **No**
GO to [J3](#).

J3 RETRIEVE THE RECORDED DTCS FROM BOTH CONTINUOUS AND ON-DEMAND SELF-TEST — DDM

1 Use the recorded DDM DTCs from the continuous and on-demand self-test.

● **Are any DDM DTCs recorded?**

→ **Yes**
REFER to the DDM Diagnostic Trouble Code (DTC) Index.

→ **No**
GO to [J4](#).

J4 CHECK HOOD AJAR SWITCH OPERATION

1



3



2 Close hood.

3 Monitor the FEM PID HOOD_SW while opening the hood.

● **Does the FEM PID HOOD_SW change from CLOSED to AJAR?**

→ **Yes**
CHECK for sticking hood ajar switch.
TEST for normal operation.

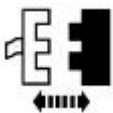
→ **No**
GO to [J5](#).

J5 CHECK FOR A FAULTY HOOD AJAR SWITCH

1



2



Hood Ajar Switch C127

1 Monitor the FEM PID HOOD_SW.

● **Does the FEM PID HOOD_SW change when hood ajar switch is**

disconnected?

- **Yes**
INSTALL a new hood ajar switch. CLEAR the DTCs. REPEAT the self-test.
- **No**
GO to [J6](#).

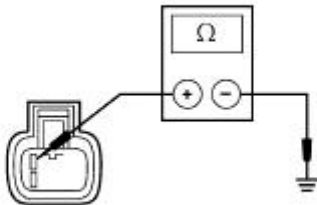
J6 CHECK CIRCUIT 8-GL7 (WH) FOR AN OPEN

1



FEM C201c

2



A0006304

- 2 Measure the resistance between hood ajar switch C127 pin 1, circuit 8-GL7 (WH), harness side and ground.

- Is the resistance greater than 10,000 ohms?

- **Yes**
INSTALL a new FEM. For additional information, REFER to [Section 419-10](#) .
CLEAR the DTCs. REPEAT the self-test.
- **No**
REPAIR the circuit. CLEAR the DTCs.
REPEAT the self-test.

Switch —Front Door Ajar

Removal and Installation

NOTE: The front door ajar switch is an integral part of the door latch assembly.

For additional information, refer to [Section 501-14A](#).

Switch —Rear Door Ajar

Removal and Installation

NOTE: The rear door ajar switch is an integral part of the door latch assembly.

For additional information, refer to [Section 501-14A](#).

Torque Specifications

Description	Nm	lb-in
Battery ground cable	10	89

Anti-Theft — Passive Anti-Theft System (PATS)

The passive anti-theft system (PATS) contains the following components:

- theft indicator
- encoded ignition key
- transceiver module
- instrument cluster
- powertrain control module (PCM)
- standard corporate protocol (SCP) communication network
- starter relay

The PATS uses radio frequency identification technology to deter a driveaway theft. Passive means that it does not require any activity from the user. This system is known as SecuriLock® in North America, Safeguard® in the U.K. and PATS in continental Europe. This information can be found in customer literature such as the Owner's Literature.

The PATS uses a specially encoded ignition key. Each encoded ignition key contains a permanently installed electronic device called a transponder. Each transponder contains a unique electronic identification code, with over 10 billion billion combinations.

Each encoded ignition key must be programmed into the vehicle instrument cluster before it can be used to start the engine. There are special diagnostic procedures outlined in the manual that must be carried out if the encoded ignition keys need to be replaced.

The encoded key is larger than a traditional ignition key. The key does not require batteries and should last the life of the vehicle.

The transceiver module communicates with the encoded ignition key. The transceiver contains an antenna connected to a small electronics module and is located behind the instrument panel attached to the ignition lock casting. During each vehicle start sequence, the transceiver module reads the encoded ignition key identification code and sends the data to the instrument cluster.

The control functions are contained in the instrument cluster. This module carries out all of the PATS functions such as receiving the identification code from the encoded ignition key and controlling the engine enable. The instrument cluster initiates the key interrogation sequence when the key is inserted into the vehicle ignition switch and also when the vehicle ignition switch is turned to RUN or START.

The PATS uses the PCM to enable or disable the engine. The instrument cluster communicates with the PCM over the SCP communication network in order to enable engine operation. The instrument cluster and the PCM use sophisticated messages in order to prevent a theft. The instrument cluster and the PCM share security data when first installed together that makes them a matched pair. After this security data sharing, these modules will not function in other vehicles. The shared PCM ID is remembered even if the battery is disconnected. The instrument cluster also stores the vehicle key identification code even if the battery is disconnected. There are special diagnostic procedures outlined in this workshop manual that may be carried out if either the instrument cluster or the PCM needs replacement.

All elements of PATS must be functional before the engine is allowed to start. If any of the components are not working correctly, the vehicle will not start.

PATS uses a visual theft indicator. This indicator will prove out for three seconds when the ignition

switch is turned to RUN or START under normal operation. If there is a PATS problem, this indicator will either flash rapidly or glow steadily (for more than three seconds) when the ignition switch is turned to RUN or START.

PATS differs from perimeter anti-theft systems in that PATS enables and disables the engine from starting. If equipped, the perimeter anti-theft system protects the perimeter of the vehicle (doors, hood and trunk) and sounds an alarm.

PATS also disables the starter motor in addition to the PCM disabling the engine. When PATS disables the vehicle, it will neither crank nor start. If the instrument cluster is removed from the vehicle, the engine will not crank.



The starter relay is used as an additional means of disabling the vehicle engine. The starter relay is disabled when the PATS cannot read a valid encoded ignition key at ignition ON. The PATS will not store a diagnostic trouble code (DTC) or flash the theft indicator if a valid encoded ignition key is read but a fault occurs in the starter relay circuit.

The PATS is not compatible with aftermarket remote start system, which allow the vehicle to be started from outside the vehicle. These systems may reduce the vehicle security level, and also may cause no-start issues. Remote start systems must be removed before investigation of PATS-related no start issues.

Anti-Theft — Passive Anti-Theft System (PATS)

Refer to Wiring Diagrams Section [419-01B](#), Anti-Theft for schematic and connector information.

Special Tool(s)

 <p>ST1137-A</p>	<p>73III Automotive Meter 105-R0057</p>
 <p>ST1217-A</p>	<p>New Generation STAR (NGS) Tester 418-F048 (007-00500) or equivalent</p>

Inspection and Verification

NOTE: The instrument cluster must be reconfigured after replacement. Refer to [Section 418-01](#).

1. Verify the customer concern by operating the system.
2. Visually inspect for obvious signs of mechanical and electrical damage.

Visual Inspection Chart

Mechanical	Electrical
<ul style="list-style-type: none"> ● Large metallic objects, devices such as electronic debit transponders or a second ignition key on the same key ring as the PATS ignition key ● Ignition lock cylinder ● Encoded ignition key (PATS key) ● Use of non-encoded ignition key (key without the molded plastic head, non-PATS key) ● Use of a non-programmed encoded ignition key 	<ul style="list-style-type: none"> ● Central junction box (CJB) Fuse 224 (5A) ● Instrument cluster ● PATS transceiver module ● Connectors ● Ignition switch

3. If the concern remains after the inspection, connect the New Generation STAR (NGS) Tester to the data link connector (DLC) located beneath the instrument panel and select the vehicle to be tested from the NGS menu. If the NGS Tester does not communicate with the vehicle:
 - check that the program card is correctly installed.
 - check the connections to the vehicle.
 - check the ignition switch position.

4. If NGS Tester still does not communicate with the vehicle, refer to the New Generation STAR Tester manual.
5. Carry out the DATA LINK DIAGNOSTICS. If NGS Tester responds with:
 - CKT914, CKT915 or CKT70 = ALL ECUS NO RESP/NOT EQUIP, refer to [Section 418-00](#).
 - NO RESP/NOT EQUIP for instrument cluster module (ICM), go to Pinpoint Test A.
 - SYSTEM PASSED, retrieve and record the continuous diagnostic trouble codes (DTCs), erase the continuous DTCs and carry out self-test diagnostics for the ICM.
6. If the DTCs retrieved are related to the concern, go to Instrument Cluster Diagnostic Trouble Code (DTC) Index to continue diagnostics.
7. If no DTCs related to the concern are retrieved, proceed to Symptom Chart to continue diagnostics.

Instrument Cluster Diagnostic Trouble Code (DTC) Index

DTC	Description	Source	Action
B1201	Fuel Sender Circuit Failure	ICM	REFER to Section 413-01 .
B1205	EIC Switch-1 Assembly Circuit Failure	ICM	REFER to Section 413-01 .
B1209	EIC Switch-2 Assembly Circuit Failure	ICM	REFER to Section 413-01 .
B1213	Anti-Theft Number of Programmed Keys Is Below Minimum	ICM	GO to Pinpoint Test D .
B1246	Dim Panel Potentiometer Switch Circuit Failure	ICM	REFER to Section 413-00 .
B1342	ECU Is Defective	ICM	CLEAR the DTCs. Carry out the instrument cluster self-test. If DTC B1342 is retrieved again, INSTALL a new instrument cluster. REFER to Section 413-01 .
B1352	Ignition Key-In Circuit Failure	ICM	REFER to Section 211-05 .
B1470	Lamp Headlamp Input Circuit Failure	ICM	REFER to Section 417-01 .
B1567	Lamp Headlamp High Beam Circuit Failure	ICM	REFER to Section 417-01 .
B1600	PATS Ignition Key Transponder Signal Is Not Received	ICM	GO to Pinpoint Test G .
B1601	PATS Received Incorrect Key-Code From Ignition Key Transponder	ICM	GO to Pinpoint Test H .
B1602	PATS Received Invalid Format of Key-Code From Ignition Key Transponder	ICM	GO to Pinpoint Test I .
B1676	Battery Pack Voltage Out of Range	ICM	REFER to Section 413-01 .
B1681	PATS Transceiver Module Signal Is Not Received	ICM	GO to Pinpoint Test J .

B1689	Autolamp Delay Circuit Failure	ICM	REFER to Section 417-01 .
B1875	Turn Signal / Hazard Switch Signal Circuit Failure	ICM	REFER to Section 417-01 .
B2103	Antenna Not Connected	ICM	GO to Pinpoint Test K .
B2139	Data Mismatch (Receive Data Does Not Match What Was Expected)	ICM	GO to Pinpoint Test E .
B2141	NVM Configuration Failure	ICM	GO to Pinpoint Test F .
B2143	NVM Memory Failure	ICM	REFER to Section 413-01 .
B2162	Data Mismatch #2 (receive data does not match what was expected)	ICM	GO to Pinpoint Test E .
B2328	Column Reach Feedback Potentiometer Circuit Failure	ICM	REFER to Section 211-04 .
B2332	Column Tilt Feedback Potentiometer Circuit Failure	ICM	REFER to Section 211-04 .
B2351	Steering Column Switch Circuit Failure	ICM	REFER to Section 211-04 .
B2431	Transponder Programming Failed	ICM	GO to Pinpoint Test G .
B2472	Fog Lamp Switch Failure	ICM	REFER to Section 417-01 .
B2477	Module Configuration Failure	ICM	REFER to Section 418-01 .
U1041	SCP (J1850) Invalid or Missing Data for Vehicle Speed	ABS, ABS/TC, IVD	CARRY OUT the ABS, ABS/TC, or IVD self-test.
U1059	SCP (J1850) Invalid or Missing Data for Transmission/Transaxle/PRNDL	PCM	CARRY OUT the PCM self-test. REFER to the Powertrain Control/Emissions Diagnosis (PC/ED) manual.
U1073	SCP (J1850) Invalid or Missing Data for Engine Coolant Fluid Temperature	PCM	CARRY OUT the PCM self-test. REFER to the Powertrain Control/Emissions Diagnosis (PC/ED) manual.
U1123	SCP (J1850) Invalid or Missing Data for Odometer Rolling Count	ABS, ABS/TC, IVD	CARRY OUT the ABS, ABS/TC, IVD self-test.
U1147	SCP (J1850) Invalid or Missing Data for Vehicle Security	PCM	CARRY OUT the PCM self-test. REFER to the Powertrain Control/Emissions Diagnosis (PC/ED) manual.

Instrument Cluster Parameter Identification (PID) Index

PID	Description	Expected Value
ABCHIME	Air Bag Chime	OFF, ON
ANTISCN	Anti-Scan Function	DISABL, ENABLE
ASWSTAT	Autolamp Switch Input Status	OFF, DELAY7, DELAY6, DELAY5, DELAY4, DELAY3, DELAY2, DELAY1, INVLD
CCNT	Number Of Continuous DTCs In Module	one count per bit
D_SBELT	Driver Seat Belt	OUT, IN

DSWSTAT	Dimmer Switch Input Status	ON, LVL1, LVL2, LVL3, LVL4, LVL5, LVL6, LVL7, LVL8, LVL9, LVL10, LVL11, LVL12, LVL13, LVL14, LVL15, LVL16, LVL17, LVL18, LVL19, LVL20, LVL21, INVLD
ENABL_S	Vehicle Enable Status	DISABL, ENABLE
FOG_SW	Fog Lamp Switch	OFF, ON
HAZ_SW	Hazard Switch	OFF, ON
HEAD_L	Headlamp Switch Input Status	OFF, PARK, HEADLP, R_FOG, INVLD, (OPEN/SHORT)
HIBEAM	High Beam Switch Input Status	OFF, HIGH, PASS, INVLD, ?
HORN_SW	Horn Input Switch	OFF, ON
IGN_A	Ignition Switch -ACCY Position	NO, YES
IGN_KEY	Ignition Key In / Out	OUT, IN
IGN_O/U	Ignition Switch -OFF/Unlock Position	NO, YES
IGN_R	Ignition Switch -RUN Position	NO, YES
IGN_S	Ignition Switch -START Position	NO, YES
LIGHTSN	Night(True) / Day(False)	NO, YES
LTURN	Left Turn Switch	OFF, ON
M_KEY	Master Key Present	notPRE, PRESNT
MIN#KEY	Number of Key Codes Required to be Initially Programmed to Start the Vehicle	2 to 8
NUMKEYS	Number Of Keys Stored In Module	one count per bit
PCM_ID	PCM ID Status	notSTR, STORED
PCM_VFY	PCM Verify OK	NO, YES
RESETSW	Reset Switch	OFF, ON
RURN	Right Turn Switch	OFF, ON
SELECT	Select/Mode Switch	OFF, ON
SERVMOD	Service Module	0-25
SPARE_KY	Spare Key Programming Switch Status	ENABLE, DISABLE
TILT	Steering Column Tilt Switch	SHORT, UP, DOWN, OFF
TELEPOS	Telescope Position Sensor	notSEN, SENSED
TELESCP	Steering Column Telescope Switch	SHORT, IN, OUT, OFF
TILTPOS	Tilt Position Sensor	notSEN, SENSED
TR_PARK	Transmission Select Lever In Park Pos	NO, YES

Instrument Cluster Active Command Index

Active Command	Display	Action
ANTI-THEFT INDICATOR LAMP	THEFT_LAMP	OFF, ON
DISPLAY DIMMING CONTROL	ILLUMINAT	OFF, ON
DISPLAY SEGMENT CONTROL II	SEGMENTS	OFF, ON
ENGINE COOLANT GAUGE CONTROL	ENGCOOLNT	0%-100%
EXTERIOR LAMP CONTROL	R_FOG_LMP	OFF, ON
FUEL GAUGE CONTROL	FUELLEVEL	0%-100%
MEMORY SELECT CONTROL	MEMORY 1	OFF, ON
MEMORY SELECT CONTROL	MEMORY 2	OFF, ON
RF_SIGNAL	RF	OFF, ON
SPEEDOMETER CONTROL	SPDOMETER	0%-100%
TACHOMETER CONTROL	TCHOMETER	0%-100%
WARNING LAMPS AND CHIME	ALL_LAMPS	OFF, ON
WARNING LAMPS AND CHIME	CHIME	OFF, ON

Symptom Chart


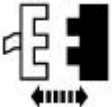
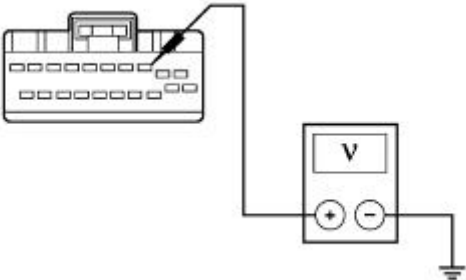
Symptom Chart

Condition	Possible Sources	Action
<ul style="list-style-type: none"> No communication with the instrument cluster 	<ul style="list-style-type: none"> CJB Fuse 204 (5A). Circuitry. Instrument cluster. 	<ul style="list-style-type: none"> GO to Pinpoint Test A.
<ul style="list-style-type: none"> The anti-theft indicator is always/never on — no three second theft indicator prove out 	<ul style="list-style-type: none"> Instrument cluster. Circuitry. CJB Fuse 207 (5A). 	<ul style="list-style-type: none"> GO to Pinpoint Test B.
<ul style="list-style-type: none"> The alarm system does not operate correctly — the vehicle starts but flashes rapidly at key on 	<ul style="list-style-type: none"> Incorrect PCM calibration. 	<ul style="list-style-type: none"> GO to Pinpoint Test C.
<ul style="list-style-type: none"> The vehicle does not start — theft indicator does not prove out and flashes rapidly 	<ul style="list-style-type: none"> SCP not connected/failure. PCM. Instrument Cluster. 	<ul style="list-style-type: none"> GO to Pinpoint Test L.
<ul style="list-style-type: none"> The vehicle does not start — theft indicator proves out for three seconds as normal, vehicle does not crank 	<ul style="list-style-type: none"> Starter circuit. Steering column lock module. 	<ul style="list-style-type: none"> REFER to Section 303-06. CARRY OUT steering column lock module diagnostics. REFER to Section 211-05.
<ul style="list-style-type: none"> The vehicle does not start — theft indicator proves out for three 	<ul style="list-style-type: none"> Powertrain concern. 	<ul style="list-style-type: none"> CARRY OUT powertrain diagnostics. REFER to Powertrain

seconds as normal but the starter does not engage		Control/Emissions Diagnosis (PC/ED) manual.
<ul style="list-style-type: none"> The vehicle starts and runs for longer than one second, then stalls 	<ul style="list-style-type: none"> This is not a PATS issue. PATS never disables a running engine. 	<ul style="list-style-type: none"> CARRY OUT powertrain diagnostics.REFER to Powertrain Control/Emissions Diagnosis (PC/ED) manual.

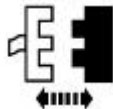
Pinpoint Tests

PINPOINT TEST A: NO COMMUNICATION WITH THE MODULE — INSTRUMENT CLUSTER

CONDITIONS	DETAILS/RESULTS/ACTIONS
A1 CHECK HOT AT ALL TIMES POWER SUPPLY CIRCUIT	
<p>1</p>  <p>2</p>  <p>Instrument Cluster C220b</p> <p>3</p>  <p>A0002792</p>	<p>3</p> <p>Measure the voltage between instrument cluster C220b pin 3, circuit 29-GG11 (OG/BU), harness side and ground.</p> <ul style="list-style-type: none"> Is the voltage greater than 10 volts? <p>→ Yes GO to A2.</p> <p>→ No REPAIR the circuit. REPEAT the self-test. CLEAR the DTCs.</p>
A2 CHECK HOT IN RUN POWER SUPPLY CIRCUITS	
<p>1</p>	



2

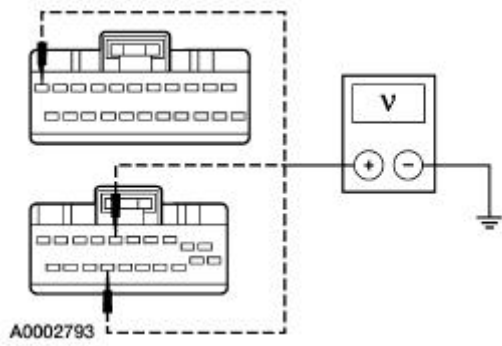


Instrument cluster C220a

3



4



4 Measure the voltage between the instrument cluster and ground as follows:

Connector Pin	Circuit
C220a pin 11	15-JA14 (GN/BK)
C220b pin 6	15-GG14 (GN/RD)
C220b pin 17	75-GG15 (YE/GN)

• Are the voltages greater than 10 volts?

→ Yes
GO to [A3](#).

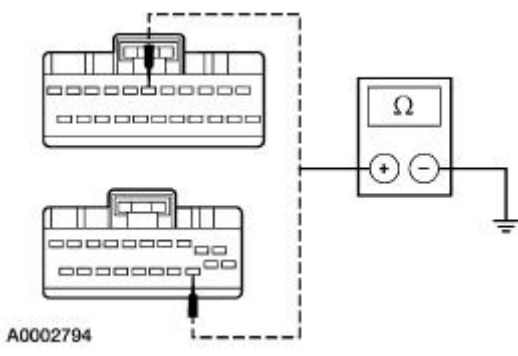
→ No
REPAIR the circuit(s). REPEAT the self-test. CLEAR the DTCs.

A3 CHECK GROUND CIRCUITS

1



2







2 Using the following table, measure the resistance between the instrument cluster connectors, harness side and ground.

Connector Pin	Circuit
C220a pin 6	31-AL11 (BK/BU)
C220b pin 13	91-GG11 (BN/RD)

• Are the resistances less than 5

	<p>ohms?</p> <p>→ Yes REFER to Section 418-00.</p> <p>→ No REPAIR the circuit(s). REPEAT the self-test. CLEAR the DTCs.</p>
--	--

PINPOINT TEST B: THE ANTI-THEFT INDICATOR IS ALWAYS/NEVER ON — NO THREE SECOND THEFT INDICATOR PROVE OUT

CONDITIONS	DETAILS/RESULTS/ACTIONS
B1 ENTER THE ICM ACTIVE COMMAND MODE	
<p>1 </p> <p>2 </p> <p>3 </p> <p style="text-align: center;">NGS</p>	<p>3 Enter the ICM active command mode.</p> <p>● Can the ICM active command mode be entered?</p> <p>→ Yes GO to B2.</p> <p>→ No GO to Pinpoint Test A.</p>
B2 CHECK THE ANTI-THEFT INDICATOR — TRIGGER THE ICM ACTIVE COMMAND THEFT_LAMP TO ON	
<p>1 </p>	<p>1 Trigger the ICM active command THEFT_LAMP to ON.</p> <p>● Does the anti-theft indicator illuminate?</p> <p>→ Yes The anti-theft indicator is OK. VERIFY the</p>

concern with the customer.

→ **No**
GO to [B3](#).

B3 CHECK THE INSTRUMENT CLUSTER OUTPUT TO THE AUTOLAMP DAY/NIGHT SENSOR FOR VOLTAGE — CIRCUIT 10-GL6 (GY/VT)

1



2

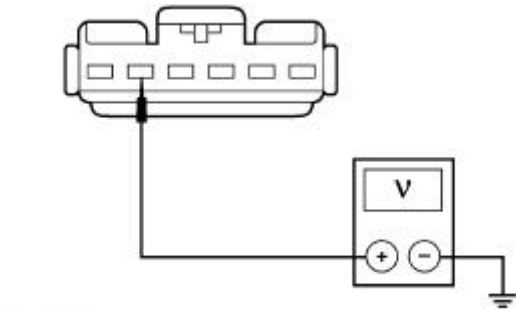


Autolamp Day/Night Sensor C287

3



4



A0003818

4 While triggering the ICM active command THEFT_LAMP to ON, measure the voltage between autolamp day/night sensor C287 pin 2, circuit 10-GL6 (GY/VT), harness side and ground.

● Is the voltage greater than 10 volts?

→ **Yes**
GO to [B5](#).

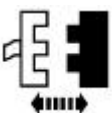
→ **No**
GO to [B4](#).

B4 CHECK CIRCUIT 10-GL6 (GY/VT) FOR OPEN

1



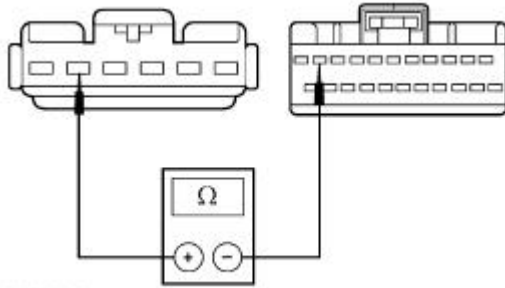
2



Instrument Cluster C220a

3

3 Measure the resistance between instrument cluster C220a pin 10, circuit



A0003819

10-GL6 (GY/VT), harness side and autolamp day/night sensor C287 pin 2, circuit 10-GL6 (GY/VT), harness side.

● Is the resistance less than 5 ohms?

→ **Yes**
 INSTALL a new instrument cluster. Refer to [Section 413-01](#). REPEAT the self-test. CLEAR the DTCs.

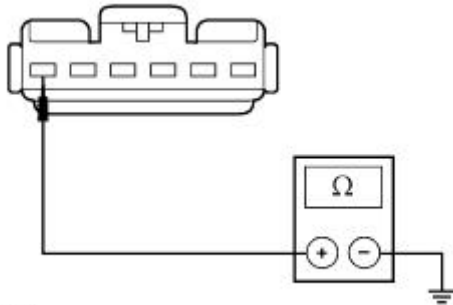
→ **No**
 REPAIR the circuit. REPEAT the self-test. CLEAR the DTCs.

B5 CHECK THE AUTOLAMP DAY/NIGHT SENSOR GROUND — CIRCUIT 31-LE42 (BK)

1



2



A0003895

2 Measure the resistance between autolamp day/night sensor C287 pin 1, circuit 31-LE42 (BK), harness side and ground.

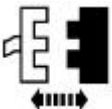
● Is the resistance less than 5 ohms?

→ **Yes**
 GO to [B6](#).

→ **No**
 REPAIR the circuit. REPEAT the self-tast. CLEAR the DTCs.

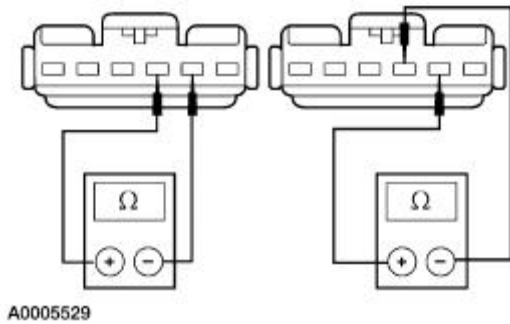
B6 CHECK THE ANTI -THEFT LED

1



Anti-Theft LED

2



2

Measure the resistance between C287 pin 2 and pin 3 component side.

- Is the resistance greater than 10,000 ohms in one direction and 10-20 ohms in the other direction?

→ Yes

GO to [B7](#).

→ No

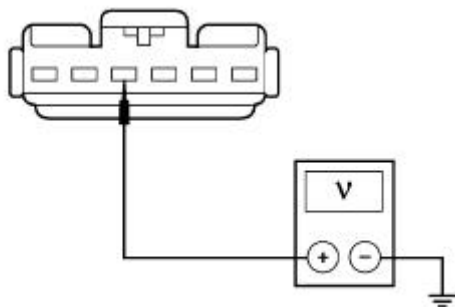
REPLACE the anti-theft LED. REFER to [Section 413-01](#). REPEAT the self-test. CLEAR the DTCs. .

B7 CHECK THE AUTOLAMP DAY/NIGHT SENSOR FOR VOLTAGE — CIRCUIT 29-GL6 (OG)

1



2



2

Measure the voltage between autolamp day/night sensor C287 pin 3, circuit 29-GL6 (OG), and ground.

- Is the voltage greater than 10 volts?


→ Yes

INSTALL a new autolamp day/night sensor. Refer to [Section 417-01](#). REPEAT the self-test. CLEAR the DTCs.





→ No

REPAIR the circuit. REPEAT the self-test. CLEAR the DTCs.

PINPOINT TEST C: THE ALARM SYSTEM DOES NOT OPERATE CORRECTLY — THE VEHICLE STARTS BUT FLASHES RAPIDLY AT KEY ON

CONDITIONS	DETAILS/RESULTS/ACTIONS
C1 CHECK THE ANTI-THEFT INDICATOR FOR CORRECT OPERATION	
<p>1</p> 	<p>2 Verify the anti-theft indicator proves out correctly.</p> <ul style="list-style-type: none"> • Does the vehicle start with the anti-theft indicator flashing? <p>→ Yes If the vehicle starts, VERIFY proper PCM calibration for vehicle. REFER to Powertrain Control/Emissions Diagnosis (PC/ED) manual.</p> <p>→ No System is OK.</p>

PINPOINT TEST D: ANTI-THEFT NUMBER OF PROGRAMMED KEYS IS BELOW MINIMUM

CONDITIONS	DETAILS/RESULTS/ACTIONS
D1 RETRIEVE THE ICM DTCS	
<p>1</p>  <p>2</p>  <p>NGS</p> <p>3</p>  <p>4</p>  <p>Clear Continuous DTCs</p> <p>5</p>	<p>3 Retrieve and document continuous ICM DTCs.</p>



ICM On-Demand
Self-Test

- Is DTC B1213 the only DTC retrieved?

→ **Yes**

GO to [D2](#).

→ **No**

REPAIR the other DTCs retrieved. REFER to the Instrument Cluster Diagnostic Trouble Code (DTC) Index. CLEAR the DTCs. REPEAT the instrument cluster self-test.

D2 CHECK FOR PROGRAMMED ENCODED IGNITION KEYS — MONITOR THE ICM PID NUMKEYS

1



1 Monitor the ICM PID NUMKEYS.

- Does the ICM PID NUMKEYS display less than two encoded ignition keys programmed?

→ **Yes**

GO to [D3](#).

→ **No**

System is OK.

D3 PROGRAM ENCODED IGNITION KEYS

2



1 **NOTE:** Two encoded ignition keys must be programmed in order to start the vehicle.

Cut a new encoded ignition key.

2 Turn the ignition switch to RUN. The new encoded ignition key should now be programmed.

3 Program the new encoded ignition key.

- Does the anti-theft indicator illuminate for three seconds and then go out?







→ **Yes**

CLEAR the DTCs. CARRY OUT instrument cluster self-test to verify all codes have been cleared. REFER to the Instrument Cluster Diagnostic Trouble Code (DTC) Index. If the vehicle is equipped with the valet feature, program the third key (if available) or instruct the customer on how to carry out this service. REFER to [Key Programming—Program a Key Using Two Programmed Keys](#) in this section.

→ **No**
 If the anti-theft indicator is on continuously, REPEAT step D3 with a second new encoded ignition key.

If the theft indicator is flashing, RETRIEVE DTC stored for new fault and REPAIR the other DTC(s) retrieved. REFER to the Instrument Cluster Diagnostic Trouble Code (DTC) Index

PINPOINT TEST E: DATA MISMATCH (RECEIVE DATA DOES NOT MATCH WHAT WAS EXPECTED)

CONDITIONS	DETAILS/RESULTS/ACTIONS
E1 USE THE DTCS FROM THE INSTRUMENT CLUSTER SELF-TEST	
	<p>1 Use the recorded instrument cluster continuous self-test DTCs.</p> <ul style="list-style-type: none"> ● Is DTC B2139 or U1147 recorded? <p>→ Yes GO to E2.</p> <p>→ No System is OK.</p>
E2 CLEAR PCM ID FROM INSTRUMENT CLUSTER AND PCM	
<p>2 </p> <p>3 </p> <p>4 </p> <p>6 </p> <p>7 </p> <p>8 </p>	<p>1 Carry out the security access procedure for the instrument cluster. Refer to Security Access—Procedure.</p> <p>2 NOTE: DO NOT carry out ignition key code erase.</p> <p>Select Ford service function (FSF) card PARAMETER RESET command for instrument cluster.</p> <p>3 Use diagnostic card for PCM active command KEEP ALIVE MEMORY RESET.</p> <p>5 Turn the ignition switch to RUN for three seconds.</p> <p>6 Clear the DTCs.</p> <p>8 Retrieve continuous DTCs.</p>



● **Is DTC B2139, B2162 or U1147 retrieved?**


→ **Yes**

VERIFY PCM calibration is correct for the vehicle. If correct, VERIFY instrument cluster calibration and configuration for the vehicle. If correct, INSTALL a new instrument cluster. Refer to [Section 413-01](#). CYCLE the ignition to RUN using two encoded ignition keys. REPEAT [Pinpoint Test E](#). CLEAR the DTCs. REPEAT instrument cluster self-test. If DTC B2139 or U1147 still exists, REFER to Powertrain Control/Emissions Diagnosis (PC/ED) manual. If the vehicle is equipped with the valet feature, program the third key (if available) or instruct the customer on how to carry out this service. REFER to [Key Programming—Program a Key Using Two Programmed Keys](#) in this section.

→ **No**

System is OK. CHECK for any other DTCs. REFER to the Instrument Cluster Diagnostic Trouble Code (DTC) Index.

PINPOINT TEST F: THE ANTI-THEFT SYSTEM DOES NOT OPERATE CORRECTLY — NVM CONFIGURATION FAILURE (NO PCM ID EXCHANGED BETWEEN INSTRUMENT CLUSTER AND PCM)

CONDITIONS	DETAILS/RESULTS/ACTIONS
F1 USE THE DTCS FROM THE INSTRUMENT CLUSTER SELF-TEST	
	<p>1 Use the recorded instrument cluster continuous self-test DTCs.</p> <p>● Is DTC B2141 retrieved?</p> <p>→ Yes GO to F2.</p> <p>→ No System is OK.</p>
F2 CARRY OUT KEEP ALIVE MEMORY RESET FROM PCM	
<p>1</p> 	<p>1 Use diagnostic card for PCM active command — KEEP ALIVE MEMORY RESET.</p> <p>● Did the keep alive memory reset occur?</p> <p>→ Yes GO to F3.</p> <p>→ No REFER to Powertrain Control/Emissions Diagnosis (PC/ED) manual.</p>
F3 CARRY OUT KEEP ALIVE MEMORY RESET FROM PCM	

1



1 Use diagnostic card for PCM active command — KEEP ALIVE MEMORY RESET.

2



3



3 Leave the key in the RUN position for 30 seconds.

4



5



● Does the vehicle START?

→ Yes
System is OK.

→ No
GO to [F4](#).

F4 RETRIEVE THE INSTRUMENT CLUSTER DTCS

1



Clear Continuous DTCS

2



3



4




4 Retrieve continuous instrument cluster DTCS.

● Is DTC B2141 retrieved?

	<p>→ Yes REPEAT step F2. If the fault persists, VERIFY the PCM calibration. If the calibration is OK, INSTALL a new instrument cluster. REFER to Section 413-01. Cycle the ignition key to RUN using two encoded ignition keys. GO to Pinpoint Test E to initialize the module. REPEAT the self-test. CLEAR the DTCs. If the vehicle is equipped with the valet feature, program the third key (if available) or instruct the customer on how to carry out this service. REFER to Key Programming—Program a Key Using Two Programmed Keys in this section.</p> <p>→ No REFER to the Instrument Cluster Diagnostic Trouble Code (DTC) Index.</p>
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PINPOINT TEST G: THE ANTI-THEFT SYSTEM DOES NOT OPERATE CORRECTLY — PATS IGNITION KEY TRANSPONDER SIGNAL IS NOT RECEIVED OR TRANSPONDER PROGRAMMING FAILED (DAMAGED KEY OR NON-PATS KEY)

CONDITIONS	DETAILS/RESULTS/ACTIONS
	<p>NOTE: Large metallic objects, electronic debit transponder devices or a second key on the same key ring as the PATS ignition key may cause vehicle starting problems and record DTCs under certain conditions. If a fault cannot be identified, examine the customer's key for such objects or devices. If present, inform the customer that they need to keep these objects from touching the PATS ignition key while starting the engine. These objects and devices cannot damage the PATS ignition key, but can cause a momentary problem if they are too close to the key during engine start. If a problem occurs, turn ignition OFF and restart the engine with all other objects on the key ring held away from the ignition key. Check to ensure the encoded ignition key used by the customer is an approved Ford encoded ignition key (encoded ignition keys from Rotunda, Ilco, Curtis, C.E. Marshall, or Strattec are approved Ford encoded ignition keys).</p>
	<p>G1 USE THE DTCS FROM THE INSTRUMENT CLUSTER SELF-TEST</p>
	<p>1 Use the recorded instrument cluster continuous self-test DTCs.</p> <p style="padding-left: 40px;">● Is DTC B1600 or B2431 retrieved?</p> <p>→ Yes GO to G2.</p> <p>→ No If other DTCs are retrieved, REFER to Instrument Cluster Diagnostic Trouble Code (DTC) Index.</p> <p style="padding-left: 40px;">If no DTCs are retrieved, system is OK.</p>
	<p>G2 PROGRAM A NEW ENCODED IGNITION KEY</p>
<p>1</p> 	<p>2 NOTE: Check to make sure the customer and replacement encoded ignition keys are approved Ford encoded PATS ignition keys. Unapproved PATS keys do not always operate correctly over different temperature ranges (encoded ignition keys from Rotunda, Ilco, Curtis, C.E. Marshall, or Strattec are approved encoded ignition keys).</p>

Cut a new encoded ignition key.

3



4 Program the new encoded ignition key. Refer to [Key Programming—Additional Key With One Programmed Key](#).

5



5 Clear the DTCs. Carry out the instrument cluster self-test.

● Is DTC B1600 or B2431 still present?

→ **Yes**
GO to [G3](#).

→ **No**
If no other DTCs are retrieved, system is OK.

If other DTCs are retrieved, REFER to Instrument Cluster Diagnostic Trouble Code (DTC) Index.

G3 INSTALL A NEW PATS TRANSCIEVER

1



2 Install a new PATS transceiver. Refer to [Module—Passive Anti-Theft Transceiver](#).

3



3 **NOTE:** Use the customer's original encoded ignition key, not the encoded ignition key that was cut in the previous step.

4




4 Clear the DTCs. Carry out the instrument cluster self-test.

● Is DTC B1600 or B2431 retrieved?

→ **Yes**
INSTALL a new instrument cluster. REFER to [Section 413-01](#). CYCLE the ignition to RUN using two encoded ignition keys. GO to [Pinpoint Test E](#) to initialize the module. REPEAT the self-test. CLEAR the DTCs. If the vehicle is equipped with the valet feature, program the third key (if available) or instruct the customer on how to carry out this service. REFER to [Key Programming—Program a Key Using Two Programmed Keys](#) in this section.

→ **No**
System is OK.

PINPOINT TEST H: THE ANTI-THEFT SYSTEM DOES NOT OPERATE CORRECTLY — PATS RECEIVED INCORRECT KEY-CODE FROM IGNITION KEY TRANSPONDER (UNPROGRAMMED ENCODED IGNITION KEY)

CONDITIONS	DETAILS/RESULTS/ACTIONS
<p>NOTE: Large metallic objects, electronic debit transponder devices or a second key on the same key ring as the PATS ignition key may cause vehicle starting problems and record DTCs under certain conditions. If a fault cannot be identified, examine the customer's key for such objects or devices. If present, inform the customer that they need to keep these objects from touching the PATS ignition key while starting the engine. These objects and devices cannot damage the PATS ignition key, but can cause a momentary problem if they are too close to the key during engine start. If a problem occurs, turn ignition OFF and restart the engine with all other objects on the key ring held away from the ignition key. Check to ensure the encoded ignition key used by the customer is an approved Ford encoded ignition key (encoded ignition keys from Rotunda, Ilco, Curtis, C.E. Marshall, or Strattec are approved Ford encoded ignition keys).</p>	
<p>H1 USE THE DTCS FROM THE INSTRUMENT CLUSTER SELF-TEST</p>	
	<p>1 Use the recorded instrument cluster continuous self-test DTCs.</p> <ul style="list-style-type: none"> ● Is DTC B1601 recorded? <p>→ Yes GO to H2.</p> <p>→ No System is OK. CHECK all customer encoded ignition keys with instrument cluster self-test to verify all other encoded ignition keys are programmed.</p>
<p>H2 CHECK FOR PROGRAMMED ENCODED IGNITION KEYS — MONITOR THE INSTRUMENT CLUSTER PID NUMKEYS</p>	
<p>1</p> 	<p>1 Monitor the INSTRUMENT CLUSTER PID NUMKEYS.</p> <ul style="list-style-type: none"> ● Does the INSTRUMENT CLUSTER PID NUMKEYS display 8? <p>→ Yes ERASE and REPROGRAM the key codes. REFER to Key Programming—Erase All Key Codes and Program Two Keys. REPEAT the self-test. CLEAR the DTCs. If the vehicle is equipped with the valet feature, program the third key (if available) or instruct the customer on how to carry out this service. REFER to Key Programming—Program a Key Using Two Programmed Keys in this section.</p> <p>→ No GO to H3.</p>
<p>H3 CHECK THE NUMBER OF PROGRAMMED ENCODED IGNITION KEYS AVAILABLE</p>	
	<p>1 Verify there are at least two currently programmed encoded ignition keys available with the vehicle.</p> <ul style="list-style-type: none"> ● Are at least two currently programmed encoded ignition keys available with the vehicle?

→ **Yes**
GO to [H4](#).

→ **No**
CUT new encoded ignition key(s) so that at least two encoded ignition keys are available. PROGRAM the encoded ignition keys; REFER to [Key Programming—Erase All Key Codes and Program Two Keys](#). If the vehicle is equipped with the valet feature, program the third key (if available) or instruct the customer on how to carry out this service. REFER to [Key Programming—Program a Key Using Two Programmed Keys](#) in this section. GO to [H4](#).

H4 VERIFY THE INSTRUMENT CLUSTER PID SPARE_KY INDICATES ENABLE

1



1 Monitor the INSTRUMENT CLUSTER PID SPARE_KY.

● **Does the INSTRUMENT CLUSTER PID SPARE_KY indicate ENABLE?**

→ **Yes**
GO to [H5](#).

→ **No**
ENABLE the PID SPARE KEY to the enable setting. REFER to [Key Programming—Enable/Disable Spare Key Programming](#). REPEAT the self-test. CLEAR the DTCs. Once completed, GO to [H5](#).

H5 CHECK THE ENCODED IGNITION KEYS FOR CORRECT OPERATION

1



2



3



4



2 Start the vehicle using the first encoded ignition key.

3 Start the vehicle with the second ignition key.

● **Does the vehicle start correctly using both encoded ignition keys?**

→ **Yes**
System is OK. If there are additional keys that need to be programmed. REFER to [Key Programming—Program a Key Using Two Programmed Keys](#). If the vehicle is equipped with the valet feature, program the third key (if available) or instruct the customer on how to carry out this service.

REFER to [Key Programming—Program a Key Using Two Programmed Keys](#) in this section.

→ **No**
GO to [H6](#).

H6 RETRIEVE THE INSTRUMENT CLUSTER DTCS — CHECK FOR DTC B1601

1



1 Retrieve and document continuous DTCs.

2



Clear Continuous DTCs

3 Carry out the instrument cluster self-test using both ignition keys from Step H5.

3



● **Is DTC B1601 retrieved?**

→ **Yes**
INSTALL a new instrument cluster. REFER to [Section 413-01](#). CYCLE the ignition to RUN using two encoded ignition keys. GO to [Pinpoint Test E](#) to initialize the vehicle. REPEAT the self-test. CLEAR the DTCs. If the vehicle is equipped with the valet feature, program the third key (if available) or instruct the customer on how to carry out this service. REFER to [Key Programming—Program a Key Using Two Programmed Keys](#) in this section.

→ **No**
System is OK.

If other DTCs are retrieved, REFER to Instrument Cluster Diagnostic Trouble Code (DTC) Index.

PINPOINT TEST I: THE ANTI-THEFT SYSTEM DOES NOT OPERATE CORRECTLY — PATS RECEIVED INVALID FORMAT OF KEY-CODE FROM IGNITION KEY TRANSPONDER (PARTIAL KEY READ)

CONDITIONS	DETAILS/RESULTS/ACTIONS
	<p>NOTE: Large metallic objects, electronic debit transponder devices or a second key on the same key ring as the PATS ignition key may cause vehicle starting problems and record DTCs under certain conditions. If a fault cannot be identified, examine the customer's key for such objects or devices. If present, inform the customer that they need to keep these objects from touching the PATS ignition key while starting the engine. These objects and devices cannot damage the PATS ignition key, but can cause a momentary problem if they are too close to the key during engine start. If a problem occurs, turn ignition OFF and restart the engine with all other objects on the key ring held away from the ignition key. Check to ensure the encoded ignition key used by the customer is an approved Ford encoded ignition key (encoded ignition keys from Rotunda, Ilco, Curtis, C.E. Marshall, or Strattec are approved Ford encoded ignition keys).</p>

I1 USE THE DTCS FROM THE INSTRUMENT CLUSTER SELF-TEST

1 Use the recorded instrument cluster continuous self-test DTCs.

● **Is DTC B1602 retrieved?**

→ **Yes**
GO to [12](#).

→ **No**
System is OK. CHECK all customer encoded ignition keys with instrument cluster self-test to verify all other keys are programmed.

I2 OBTAIN A NEW ENCODED IGNITION KEY

1



2 Cut a new encoded ignition key.

3



4 Program a new encoded ignition key. Refer to [Key Programming—Additional Key With One Programmed Key](#).

5



5 Carry out the instrument cluster self-test.

● **Is DTC B1602 retrieved?**

→ **Yes**
GO to [13](#).

→ **No**
System is OK.

I3 INSTALL A NEW PATS TRANSCIEVER

1



2 Install a new PATS transceiver. Refer to [Module—Passive Anti-Theft Transceiver](#).

3



4 Clear the DTCs. Carry out the instrument cluster self-test.

4



● Are any DTCs retrieved?


→ **Yes**

REFER to Instrument Cluster Diagnostic Trouble Code (DTC) Index.

→ **No**

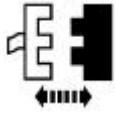
System is OK.

PINPOINT TEST J: THE ANTI-THEFT SYSTEM DOES NOT OPERATE CORRECTLY — PATS TRANSCEIVER SIGNAL IS NOT RECEIVED (NOT CONNECTED, DAMAGED, OR WIRING)

CONDITIONS	DETAILS/RESULTS/ACTIONS
J1 USE THE DTCS FROM THE INSTRUMENT CLUSTER SELF-TEST	
	<p>1 Use the recorded instrument cluster continuous self-test DTCs.</p> <p>● Is DTC B1681 retrieved?</p> <p>→ Yes GO to J2.</p> <p>→ No System is OK.</p>
J2 INSPECT THE PATS TRANSCEIVER FOR CORRECT INSTALLATION	
<p>1</p> 	<p>2 Verify the PATS transceiver is correctly installed. Refer to Module—Passive Anti-Theft Transceiver.</p> <p>● Was the transceiver correctly installed?</p> <p>→ Yes GO to J3.</p> <p>→ No Correct installation. REPEAT instrument cluster self-test.</p>
J3 CHECK THE PATS TRANSCEIVER FOR VOLTAGE — CIRCUIT 29S-GL36 (OG/BU)	
<p>1</p>	



2

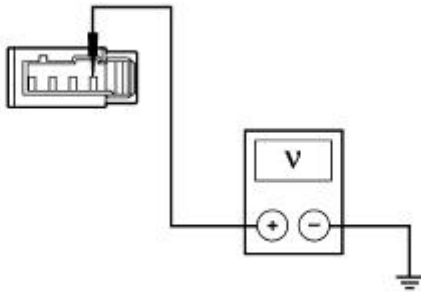


PATS Transceiver C252

3



4



A0003898

4 Measure the voltage between PATS transceiver C252 pin 1, circuit 29S-GL36 (OG/BU), harness side and ground.

• Is the voltage greater than 9 volts?

→ **Yes**
GO to [J4](#).

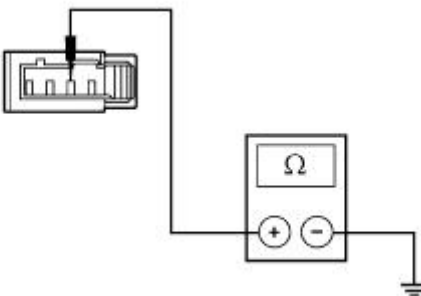
→ **No**
REPAIR the circuit. REPEAT the self-test.
CLEAR the DTCs.

J4 CHECK THE PATS TRANSCEIVER GROUND — CIRCUIT 31-GL36 (BK)

1



2



A0003899

2 Measure the resistance between PATS transceiver C252 pin 2, circuit 31-GL36 (BK), harness side and ground.

• Is the resistance less than 5 ohms?

- **Yes**
GO to [J5](#).
- **No**
REPAIR the circuit. REPEAT the self-test.
CLEAR the DTCs.

J5 CHECK THE PATS TRANSCEIVER RECEIVE CIRCUIT FOR VOLTAGE — CIRCUIT 10-GL36 (GY/RD)

1

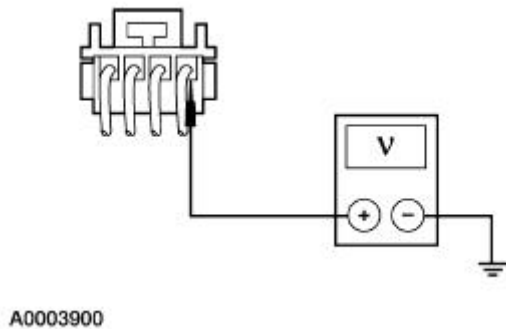


PATS Transceiver C252

2



3



- 3 Measure the voltage by back probing between PATS transceiver C252 pin 4, circuit 10-GL36 (GY/RD), harness side and ground.

● Is the voltage greater than 9 volts?

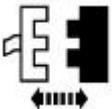
- **Yes**
GO to [J7](#).
- **No**
GO to [J6](#).

J6 CHECK THE PATS TRANSCEIVER RECEIVE CIRCUIT FOR SHORT TO GROUND — CIRCUIT 10-GL36 (GY/RD)

1



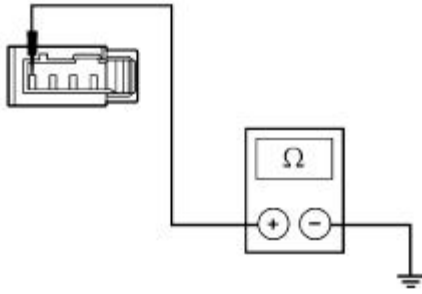
2



PATS Transceiver C252

3

- 3 Measure the resistance between PATS transceiver C252 pin 4, circuit 10-GL36 (GY/RD), harness side and ground.



A0003901

- Is the resistance greater than 100 ohms?

→ **Yes**
GO to [J7](#).

→ **No**
CHECK circuit 10-GL36 (GY/RD) for short to ground with instrument cluster disconnected.

If the circuit is OK, INSTALL a new instrument cluster. REFER to [Section 413-01](#). CYCLE the ignition key to RUN using two encoded ignition keys. GO to [Pinpoint Test E](#) to initialize the module. REPEAT the self-test. CLEAR the DTCs.

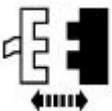
If the circuit is not OK, REPAIR circuit 10-GL36 (GY/RD). REPEAT the self-test. CLEAR the DTCs. If the vehicle is equipped with the valet feature, program the third key (if available) or instruct the customer on how to carry out this service. REFER to [Key Programming—Program a Key Using Two Programmed Keys](#) in this section.

J7 CHECK CIRCUIT 10-GL36 (GY/RD) FOR OPEN

1

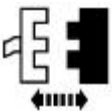


2



PATS Transceiver C252

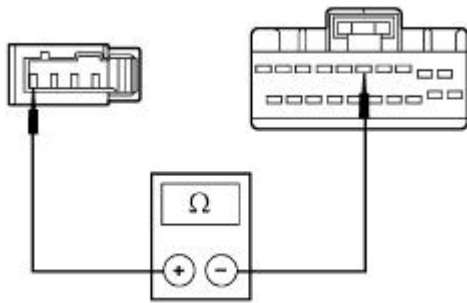
3



Instrument Cluster C220b

4

4 Measure the resistance between PATS



A0003902

transceiver C252 pin 4, circuit 10-GL36 (GY/RD), harness side and instrument cluster C220b pin 5, circuit 10-GL36 (GY/RD), harness side.

● Is the resistance less than 5 ohms?

→ **Yes**
GO to [J8](#).

→ **No**
REPAIR the circuit. REPEAT the self-test. CLEAR the DTCs.

J8 CHECK THE PATS TRANSCIEVER TRANSMIT CIRCUIT FOR VOLTAGE — CIRCUIT 8-GL36 (WH/RD)

1



2



PATS Transceiver C252

3

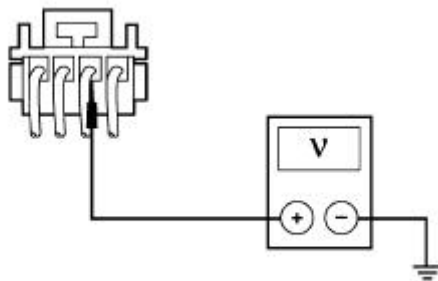


Instrument Cluster C220b

4



5



A0003903

5 Measure the voltage by back probing between PATS transceiver C252 pin 3, circuit 8-GL36 (WH/RD), harness side and ground.

● Is the voltage greater than 9 volts?

→ **Yes**
GO to [J10](#).

→ **No**
GO to [J9](#).

J9 CHECK THE PATS TRANSCIEVER TRANSMIT CIRCUIT FOR OPEN — CIRCUIT 8-GL36 (WH/RD)

1

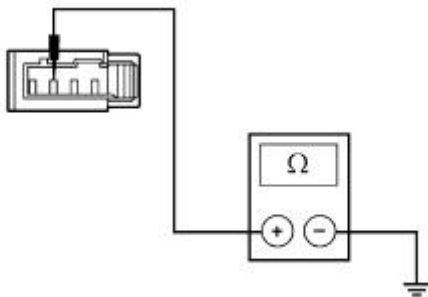


2



PATS Transceiver C252

3



A0003904

3 Measure the resistance between PATS transceiver C252 pin 3, circuit 8-GL36 (WH/RD), harness side and ground.

● Is the resistance greater than 100 ohms?

→ **Yes**
GO to [J10](#).

→ **No**
CHECK circuit 8-GL36 (WH/RD) for short to ground with instrument cluster disconnected.

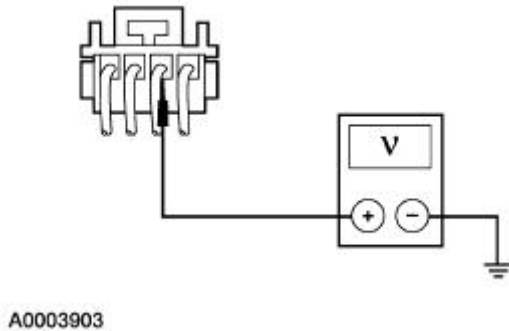
If the circuit is OK, INSTALL a new instrument cluster. REFER to [Section 413-01](#). CYCLE the ignition to RUN using two encoded ignition keys. GO to [Pinpoint Test E](#) to initialize the module. REPEAT the self-test. CLEAR the DTCs. If the vehicle is equipped with the valet feature, program the third key (if available) or instruct the customer on how to carry out this service. REFER to [Key Programming—Program a Key Using Two Programmed Keys](#) in this section.

If the circuit is not OK, REPAIR circuit 8-

GL36 (WH/RD). REPEAT the self-test.
CLEAR the DTCs.

J10 CHECK THE PATS TRANSMIT CIRCUIT FOR CORRECT OPERATION — CIRCUIT 8-GL36 (WH/RD)

1



1

Trigger the ICM active command RF_ SIGNAL to ON while measuring the voltage by back probing between PATS transceiver C252 pin 3, circuit 8-GL36 (WH/RD), harness side and ground.

- Does the voltage drop from greater than 9 volts to less than 1 volt when the ICM active command RF_ SIGNAL is triggered ON?

→ **Yes**
GO to [J11](#).

→ **No**
CHECK circuit 8-GL36 (WH/RD) for an open between instrument cluster C220b pin 4 and PATS transceiver C252 pin 3.

If the circuit is OK, INSTALL a new instrument cluster. REFER to [Section 413-01](#). CYCLE the ignition to RUN using two encoded ignition keys. GO to [Pinpoint Test E](#) to initialize the module. REPEAT the self-test. CLEAR the DTCs. If the vehicle is equipped with the valet feature, program the third key (if available) or instruct the customer on how to carry out this service. REFER to [Key Programming—Program a Key Using Two Programmed Keys](#) in this section.

If the circuit is not OK, REPAIR circuit 8-GL36 (WH/RD). REPEAT the self-test. CLEAR the DTCs.

J11 CHECK THE PATS SYSTEM WITH A NEW PATS TRANSCIEVER INSTALLED

1



3

2

Install a new PATS transceiver. Refer to [Module—Passive Anti-Theft Transceiver](#).



4



4 Carry out the instrument cluster self-test.

● **Is DTC B1681 retrieved?**

→ **Yes**
GO to [J12](#).

→ **No**
System is OK.

J12 CHECK THE PATS SYSTEM WITH A NEW INSTRUMENT CLUSTER

1



2 Install a new instrument cluster. Refer to [Section 413-01](#). Cycle the ignition to RUN using two encoded ignition keys. GO to Pinpoint Test E to initialize the module. If the vehicle is equipped with the valet feature, program the third key (if available) or instruct the customer on how to carry out this service. REFER to [Key Programming—Program a Key Using Two Programmed Keys](#) in this section.

3



4



4 Clear the DTCs.

5






5 Carry out the instrument cluster self-test.

● **Is DTC B1681 retrieved?**

→ **Yes**
REPAIR circuits 8-GL36 (WH/RD), 10-GL36 (GY/RD), 29S-GL36 (OG/BU), and 31-GL36 (BK). REPEAT the self-test. CLEAR the DTCs.

	<p>→ No If no DTCs are retrieved, the system is OK.</p> <p>If other DTCs are retrieved, REFER to Instrument Cluster Diagnostic Trouble Code (DTC) Index.</p>
--	---

PINPOINT TEST K: THE ANTI-THEFT SYSTEM DOES NOT OPERATE CORRECTLY — ANTENNA NOT CONNECTED OR DEFECTIVE TRANSCEIVER

CONDITIONS	DETAILS/RESULTS/ACTIONS
K1 INSPECT THE PATS TRANSCEIVER FOR CORRECT INSTALLATION	
<p>1 </p> <p>3  NGS</p> <p>4  Instrument Cluster Self-Test</p>	<p>2 Verify the PATS transceiver is correctly installed. REFER to Module—Passive Anti-Theft Transceiver.</p> <p>4 Carry out the instrument cluster self-test.</p> <p>● Is DTC B2103 retrieved?</p> <p>→ Yes INSTALL a new PATS transceiver module. REFER to Module—Passive Anti-Theft Transceiver. REPEAT the instrument cluster self-test. CLEAR the DTCs.</p> <p>→ No System is OK.</p>

PINPOINT TEST L: THE VEHICLE DOES NOT START — THEFT INDICATOR DOES NOT PROVES OUT AND FLASHES RAPIDLY

CONDITIONS	DETAILS/RESULTS/ACTIONS
L1 RECORD THE DTCs FROM THE INSTRUMENT CLUSTER SELF-TEST	

1



2



NGS

3



4



4 Carry out the instrument cluster self-test.

5



5 Use the recorded instrument cluster continuous self-test.

- Is ICM DTC B1213, B1600, B1601, 1602, B1681, B2103, B2139, B2141, B2431 or U1147 retrieved?

→ **Yes**
REPAIR the instrument cluster DTC. Refer to the Instrument Cluster Diagnostic Trouble Code (DTC) Index. REPEAT the self-test. CLEAR the DTCs.

→ **No**
GO to [L2](#).

L2 CHECK FOR THEFT INDICATOR FLASHING FAULT CODE SEQUENCE 16

1 **NOTE:** The sequence 1-6 will repeat itself.

Check for flashing fault code 16 on the theft indicator.

- When turning ignition to RUN, does the theft indicator flash rapidly for one minute, pause briefly, flash one time, pause briefly and then flash 6 times?

→ **Yes**
GO to [L3](#).

→ **No**
CHECK for other no-start fault.

L3 CARRY OUT PCM DIAGNOSTICS

1 CARRY OUT diagnostics on the PCM module. REFER to Powertrain Control/Emissions Diagnosis (PC/ED) manual.

● **Does a PCM module concern exist?**

→ **Yes**


REFER to Powertrain Control/Emissions Diagnosis (PC/ED) manual.
REPEAT the self-test. CLEAR the DTCs.

→ **No**

INSTALL a new instrument cluster. REFER to [Section 413-01](#). CYCLE the ignition to RUN using two encoded ignition keys. GO to [Pinpoint Test E](#) to initialize the module. REPEAT the self-test. CLEAR the DTCs. If the vehicle is equipped with the valet feature, program the third key (if available) or instruct the customer on how to carry out this service. REFER to [Key Programming—Program a Key Using Two Programmed Keys](#) in this section.

Security Access —Procedure

Special Tool(s)

 ST1217-A	New Generation STAR (NGS) Tester or equivalent 418-F048 (007-00500)
---	---

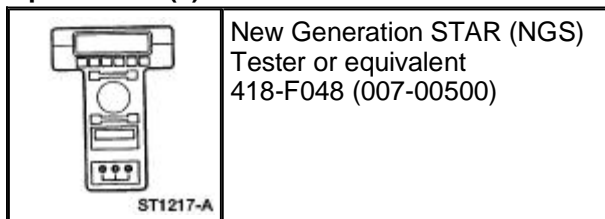
NOTE: The security access procedure is utilized to obtain passive anti-theft system (PATS) security access. PATS security access must be granted to erase ignition keys, enable/disable the spare key programming switch or carry out parameter resets for the instrument cluster. The security access procedure invokes an inherent 10 minute time delay prior to granting security access during which time the New Generation STAR (NGS) Tester must remain connected to the vehicle. Once security access has been granted, a security access command menu is displayed that offers various command options.

NOTE: Select only the commands required by the appropriate pinpoint test.

1. Using the Ford Service Function (FSF) card, select the appropriate instrument cluster. Enter SECURITY ACCESS PROCEDURE. This procedure will take 10 minutes to carry out, during which time the the ignition switch must be in RUN and the NGS must be connected to the vehicle.
 2. After the 10-minute security access procedure has been completed, a new menu will be displayed with command options. Select only those functions required before exiting out of this menu. Once exited out of this menu, the security access procedure must be carried out again to select additional commands.
-

Key Programming —Program a Key Using Two Programmed Keys

Special Tool(s)



NOTE: This procedure only works if two or more programmed ignition keys are available and it is desired to program additional key(s). If two keys are not available, follow the procedure in [Key Programming—Erase All Key Codes and Program Two Keys](#).

NOTE: The PID SPARE_KY must be enabled for this procedure to operate. If this Parameter Identification (PID) is not enabled, follow the security access procedure and select Spare Key Programming Switch: Enabled. Refer to [Key Programming—Enable/Disable Spare Key Programming](#).

NOTE: If the programming procedure is successful, the new key(s) will start the vehicle and the THEFT INDICATOR will illuminate for approximately three seconds.

NOTE: If the programming procedure is not successful, the new key(s) will not start the vehicle and the THEFT INDICATOR will flash. If the programming procedure was not successful, repeat the key programming procedure from Step 1. If the failure repeats, check hot at all times in instrument cluster for correct battery voltage. Repair the circuit if voltage is not present. For additional information, refer to Diagnosis and Testing to review diagnostic trouble codes (DTCs) and carry out pinpoint tests as required.

NOTE: A maximum of eight ignition keys can be programmed to a passive anti-theft system (PATS) equipped vehicle. Use INSTRUMENT CLUSTER PID NUMKEYS to determine how many keys are programmed to the vehicle.

NOTE: If the steps are not carried out as outlined, the programming procedure will end.

NOTE: Ignition keys must have correct mechanical key cut for the vehicle and must be a PATS encoded key.

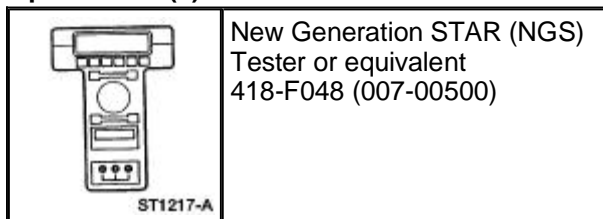
1. Insert the first programmed ignition key into the ignition lock cylinder and turn the ignition switch from OFF to RUN (maintain the ignition switch in RUN for one second).
2. Turn the ignition switch to OFF and remove the first key from the ignition lock cylinder.
3. Within five seconds of turning the ignition switch to OFF, insert the second programmed ignition key into the ignition lock cylinder and turn the ignition switch from OFF to RUN (maintain the ignition switch in RUN for one second).
4. Within five seconds of turning the ignition switch to RUN, turn the ignition switch to OFF and remove the second key from the ignition lock cylinder.
5. Within 10 seconds of turning the ignition lock cylinder to OFF, insert the unprogrammed ignition

key (new key) into the ignition lock cylinder and turn the ignition switch from OFF to RUN (maintain the ignition switch in RUN for one second).

6. If it is desired to program additional key(s), repeat the key programming procedure from the beginning.
-

Key Programming —Erase All Key Codes and Program Two Keys

Special Tool(s)



NOTE: This procedure is used when a customer needs keys programmed into the system and does not have two programmed ignition keys available. This procedure is also useful when programmed ignition key(s) have been lost or a new ignition switch assembly has been installed, and it is desired to erase key(s) from the passive anti-theft system (PATS) memory.

NOTE: This procedure will erase all programmed ignition keys from the vehicle memory and the vehicle will not start until two keys have been reprogrammed to the vehicle.

NOTE: Two PATS encoded keys with the correct mechanical cut must be available to carry out this procedure. One or both of them may be the customer's original keys.

NOTE: If additional (more than two) keys are to be programmed, refer to Key Programming — Program a Key Using Two Programmed Keys. If the remaining keys are with the customer and are not available with the vehicle, then instruct the customer to refer to the owner's literature under the "Programming Spare [SecuriLock ® (North America), Safeguard ® (U.K.) or PATS for all other markets] Keys Procedure" for instructions on programming the remaining keys.

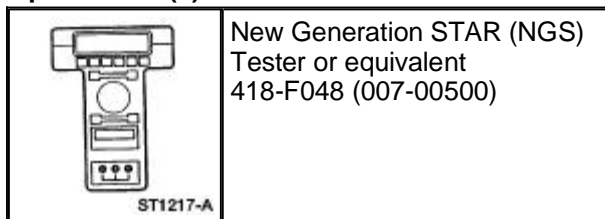
1. Turn the ignition switch from OFF to RUN.
2. Connect the New Generation STAR (NGS) Tester. Follow the SECURITY ACCESS PROCEDURE for instrument cluster to obtain security access.
3. From NGS menu, select IGNITION KEY CODE ERASE.
4. **NOTE:** DO NOT select any additional commands from this menu.

Turn the ignition switch to OFF and disconnect NGS.

5. Insert the first encoded ignition key into the ignition lock cylinder and turn the switch to RUN for three seconds.
6. Insert the second encoded ignition key into the ignition lock cylinder and turn the switch to RUN for three seconds.
7. The vehicle should now start with both ignition keys.

Key Programming —Enable/Disable Spare Key Programming

Special Tool(s)



NOTE: The spare key programming switch is a New Generation STAR (NGS) Tester programmable switch that provides the capability to enable/disable the spare key programming procedure. The spare key programming procedure can be found in the owner's literature and also in this section under [Key Programming—Program a Key Using Two Programmed Keys](#). This programmable switch is provided as a convenience for rental company fleets or other fleet purchasers who may not want the spare key programming procedure available to the vehicle driver.

NOTE: The spare key programming switch state can be viewed by the instrument cluster PID SPARE_KY found on the Diagnostic Card.

1. Insert a programmed ignition key into the ignition lock cylinder and turn the ignition switch to RUN.
2. Enter NGS. Follow the SECURITY ACCESS PROCEDURE. For additional information, refer to [Security Access—Procedure](#) to obtain security access.
3. **NOTE:** The default setting on delivery of all new vehicles is <ENABLE>.

From NGS menu, select SPARE KEY PROGRAMMING SWITCH selection to the desired setting:

<ENABLE> Spare key programming procedure is accessible.

<DISABLE> Spare key programming procedure is not accessible.

Key Programming —Additional Key With One Programmed Key

NOTE: This procedure is used when a customer needs to have an additional key programmed into the vehicle without erasing stored key codes, but does not have two programmed keys available. This procedure is also useful when attempting to determine if an ignition key is defective, as a new key can be installed without erasing keys or without having two programmed keys available.

NOTE: Before programming, the new key must have the correct mechanical cut for the ignition lock.

NOTE: If eight keys are already programmed, this procedure will not allow any further ignition keys to be programmed without erasing all stored key codes first. The number of keys programmed into the system can be determined using the INSTRUMENT CLUSTER PID NUMKEYS.

1. Turn the ignition switch from the OFF position to the RUN position using the new, unprogrammed ignition key.
 2. Enter NGS using the Ford Service Function (FSF) card and enter the appropriate instrument cluster. Follow Security Access to obtain security access. For additional information, refer to [Security Access—Procedure](#).
 3. From the NGS menu Select: IGNITION KEY CODE PROGRAM.
 4. Turn the ignition switch to the OFF position and disconnect NGS.
 5. Attempt to start the engine with the new ignition key. The vehicle engine should start and run normally.
-

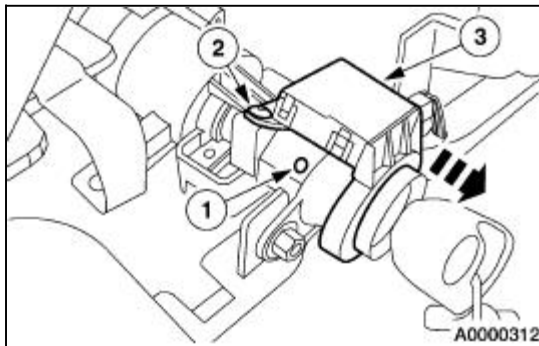
Module —Passive Anti-Theft Transceiver

Removal and Installation

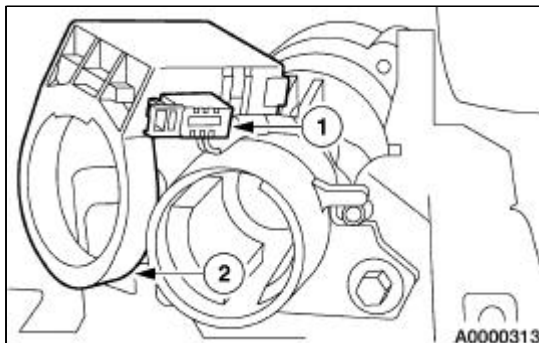
1.  **CAUTION:** Electronic modules are sensitive to electrical charges. If exposed to these charges, damage may result.

Disconnect the battery ground cable. Refer to [Section 414-01](#).

2. Remove the instrument panel cluster finish panel. Refer to [Section 501-12](#).
3. Position the passive anti-theft system (PATS) transceiver module aside.
 1. **NOTE:** The ignition must be turned to the RUN position to remove ignition lock cylinder.
 - Push the tab and remove the ignition lock cylinder.
 - Remove the screw.
 - Position the PATS transceiver module aside.

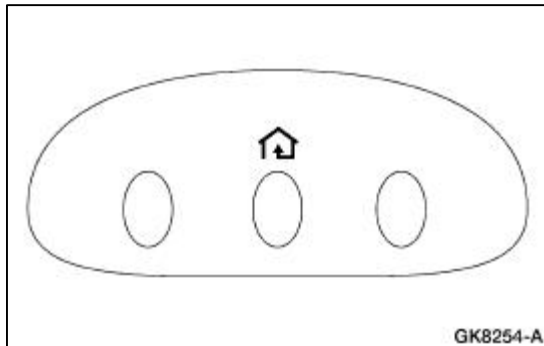


4. Remove the PATS transceiver module.
 1. Disconnect the electrical connector.
 2. Remove the PATS transceiver module.



5. To install, reverse the removal procedure.

Universal Transmitter



The HomeLink® universal transmitter provides a convenient way to replace up to three hand-held transmitters with a single built-in device. The universal transmitter:

- will operate garage doors, gates and home/office lighting and security systems.
 - will actually learn and transmit the radio frequency of up to three hand-held transmitters from any of the systems mentioned above.
 - is an integral part of the left sun visor assembly and is powered by the vehicle battery and charging system.
-

Universal Transmitter

Inspection and Verification

1. Verify the customer concern by operating the system.
2. Visually inspect for obvious signs of mechanical damage.

Visual Inspection Chart

Mechanical
<ul style="list-style-type: none"> ● Damaged universal transmitter ● Damaged receiver

3. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
4. If the fault is not visually evident, verify the symptom and refer to the Symptom Chart.

Symptom Chart

Symptom Chart

Condition	Possible Sources	Action
<ul style="list-style-type: none"> ● The universal transmitter is inoperative 	<ul style="list-style-type: none"> ● Universal transmitter. ● Receiver unit. 	<ul style="list-style-type: none"> ● GO to Pinpoint Test A.

Pinpoint Tests

PINPOINT TEST A: THE UNIVERSAL TRANSMITTER IS INOPERATIVE

CONDITIONS	DETAILS/RESULTS/ACTIONS
A1 CHECK LEFT VANITY MIRROR OPERATION	
	<p>1 Check the illumination of the left vanity mirror lamps.</p> <ul style="list-style-type: none"> ● Do the left vanity mirror lamps illuminate?

→ **Yes**
GO to [A2](#).

→ **No**
For additional information, REFER to [Section 417-02](#).

A2 PROGRAM HAND-HELD TRANSMITTER INTO UNIVERSAL TRANSMITTER

1 **NOTE:** If the garage door is equipped with rolling codes, refer to Training a Garage Door Opener Equipped With "Rolling Codes."

Program the universal transmitter; for additional information, refer to [Programming](#).

● **Did the universal transmitter program successfully?**

→ **Yes**
The universal transmitter is OK. VERIFY receiver operation.

→ **No**
REPLACE the left sun visor assembly. TEST the system for normal operation.

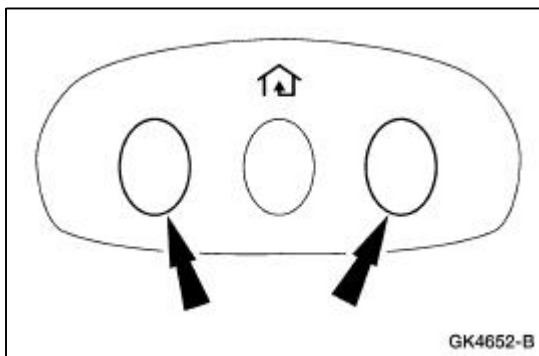
Programming

⚠ WARNING: A garage door opening system that cannot stop or reverse itself after detecting an object in its path does not meet current federal safety standards. To decrease the risk of serious injury or death, do not use this HomeLink® transmitter with a door opening system that lacks stop and reverse features as required by federal standards. This includes any garage door opening system manufactured before April 1, 1982. For more information, call HomeLink® customer assistance at 1-800-355-3515.

1. **⚠ CAUTION:** During this procedure, the system that you are programming will be made to operate. Make sure that people or objects are clear of the garage door or gate being programmed.

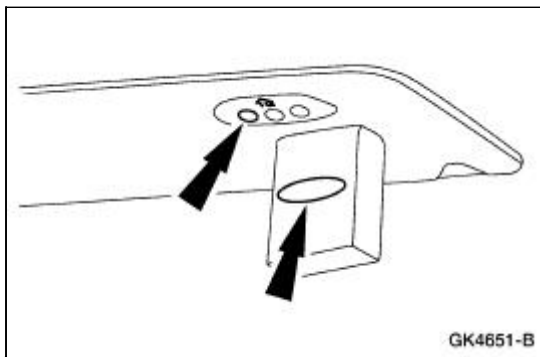
Verify the hand-held transmitter is operative.

2. Prepare for programming the universal transmitter by erasing all three channels by holding down the two outside buttons until the red light begins to flash (20-30 seconds). Release both buttons.



3. Select one of the three universal transmitter channels to be programmed by pressing the desired button.
4. Hold the end of the hand-held transmitter 25-51mm (1-2 in) from the front surface of the universal transmitter so that the red light can still be seen.
5. **NOTE:** During programming, the hand-held transmitter may automatically stop transmitting after two seconds, which may not be long enough to program the universal transmitter. If programming this type of hand-held transmitter, continue to hold the button on the universal transmitter while re-pressing the hand-held transmitter button every two seconds (Canada only).

Use both hands to press the hand-held transmitter button and the desired button on the universal transmitter. Do not release either button.



6. Hold down both buttons until the red light on the universal transmitter flashes, first slowly and then rapidly. Release both buttons when the rapid flashing begins. The universal transmitter has successfully learned the new frequency signal and can be used in place of the hand-held transmitter(s).
7. **NOTE:** If the hand-held transmitter appears to program the universal transmitter but does not open the garage door, the garage door opener may have a "code protected" or "rolling code" feature.

To operate, simply press the appropriate button on the universal transmitter. The red light is on while the signal is being transmitted.

Training a Garage Door Opener Equipped With "Rolling Codes"

8. Program the hand-held transmitter to the universal transmitter; for additional information, refer to [Programming](#).
9. Train the garage door opener receiver to recognize the universal transmitter.
 1. Remove the cover panel from the garage door opener receiver.
 2. Locate the training button on the garage door opener receiver. Location and color of the button may vary by garage door opener manufacturer. Refer to the garage door opener instruction manual or call HomeLink® customer assistance at 1-800-355-3515.
 3. Press the training button on the garage door opener receiver for 1-2 seconds.
 4. Press the programmed universal transmitter button for as long as the universal transmitter red light flashes (1-2 seconds). Release the button and re-press the button to confirm that the universal transmitter is trained to the receiver.
 5. The garage door opener should recognize the universal transmitter.

Erasing Channels

1. **NOTE:** Individual channels cannot be erased, but can be reprogrammed using the procedures for programming; for additional information, refer to [Programming](#).

To erase all three programmed channels, hold down the two outside buttons until the red light begins to flash (20-30 seconds). Release both buttons.

Torque Specifications

Description	Nm	lb-in
Remote emergency satellite cellular unit module nuts	9	80

Vehicle Emergency Message (VEMS) —Remote Emergency Satellite Cellular Unit (RESCU)

The remote emergency satellite cellular unit (RESCU) system consists of the following:



- global positioning sensor (GPS) antenna 14B286 (located on the package tray).
- RESCU switch assembly (located in the overhead console)
- RESCU module 14B284 (located in the LH quarter panel)

The vehicle emergency message system (VEMS) is a system that allows a user to request emergency assistance (police, ambulance, fire, wrecker) or roadside assistance. Also, if any of the vehicle's airbags are deployed while the VEMS is powered ON, the system automatically issues a call for emergency assistance.

Vehicle Emergency Message (VEMS) —RESCU

Refer to Wiring Diagrams Section [419-05](#), Vehicle Emergency Message for schematic and connector information.

Special Tool(s)

 ST1137-A	73III Automotive Meter or equivalent 105-R0057
 ST1217-A	New Generation STAR (NGS) Tester or equivalent 418-F048 (007-00500)

Principles of Operation

System Description

The remote emergency satellite cellular unit (RESCU) module controls the system. It is hardwired to the vehicle's cellular phone system, radio, restraint control module (RCM), message center, console RESCU switch, and global positioning sensor (GPS) antenna. The RESCU module uses the cellular phone system to place calls to the Lincoln Security Response Center. It mutes the radio upon placing a call and un-mutes the radio when the call is ended. It monitors an input from the RCM to determine if an airbag has deployed and it provides the user with visual feedback during an activation by displaying status messages on the message center.

The console RESCU switch provides the user with two buttons (SOS and i) for activating the system. The console RESCU switch SOS button is used to place a call for emergency assistance and the console RESCU switch i button is used to place a call for roadside assistance.

The GPS antenna receives data from a group of GPS satellites and is used by the RESCU module to determine the location of the vehicle when one of the activation buttons is pressed or an airbag is deployed.

Powering Up

The VEMS powers up when the ignition switch is turned to RUN. During power up, the RESCU module will carry out a check of the system. The system check takes about 15 seconds. If a failure is detected, the RESCU module will display RESCU FAILURE on the message center for five seconds.

If the cellular phone is not detected, the RESCU module will display RESCU FAILURE on the message center for five seconds, followed by CELLULAR PHONE REMOVED and RESCU FEATURE DISABLED. Each of these messages will be displayed on the message center for five seconds.

Pressing SOS, Pressing i, and Airbag Deployment

When the console RESCU switch SOS or i button is pressed, or one of the airbags is deployed, the VEMS will try to take control of the cellular phone system and inform the user that an activation is in progress by displaying SOS REQUEST or INFO REQUEST on the message center. The VEMS also mutes the radio causing PHONE to be displayed on the radio display.

If the VEMS determines that the cellular phone is not correctly connected, the message center will display CELLULAR PHONE REMOVED followed by RESCU FEATURE DISABLED then UNABLE TO PLACE CALL and INSTALL PHONE TO CONTINUE.

If the cellular phone is connected, but the VEMS determines that the phone is not RESCU compatible, NON-RESCU PHONE will be displayed on the message center.

Upon determining that the cellular phone is connected and communication with it can be established, the VEMS checks to see if cellular service is available (a cellular signal is sensed by the vehicle's cellular phone).

If cellular service is not available, the VEMS will continue to check for service for up to two minutes. During this time, NO CELLULAR SIGNAL followed by WAITING TO ACQUIRE are continually displayed in rotation on the message center. If service is still not available after two minutes, UNABLE TO PLACE CALL is displayed on the message center and the activation is terminated.

If service is available, the VEMS places a data call to the Lincoln Security Response Center's central computer and CALL IN PROGRESS is displayed on the message center.

If the call has trouble going through because the cellular system is busy, the VEMS will continue trying to place the call for up to one minute. During this time, CELLULAR SYSTEM BUSY followed by PLEASE WAIT are continuously displayed in rotation on the message center, and then the activation is terminated. If the data call goes through, RINGING RESPONSE CENTER is displayed on the message center.

Once the data call is answered by the response center, the VEMS sends it an electronic data message. This message includes: the type of activation (SOS, i, or airbag), a customer identification number (CID), the most recently recorded location (latitude and longitude), the speed and direction of travel of the vehicle, the time at which the location and speed data was taken, and the system's cellular phone number. While this data is being transmitted, the system updates the message center with SENDING LOCATION DATA.

After the data has been received by the response center, DATA RECEIVED will be displayed on the message center. The call will then be displayed on the message center. The call will then be forwarded to the response center's operator switchboard.

If the data call fails to go through, the VEMS will carry out a voice call redial to the Lincoln Security Response Center's operator switchboard. While this call is being placed, REDIAL IN PROGRESS will be displayed on the message center. While the system is waiting for an operator to answer, WAITING FOR OPERATOR will be displayed on the message center.

Upon answering the call, the operator will attempt to talk with the caller to determine the level of assistance required. The operator will contact the appropriate emergency assistance provider if the call was made due to a console RESCU switch SOS button press or an airbag deployment. If the call was caused by pressing the console RESCU switch i button, the operator will provide directions to the location asked for by the caller.

Throughout the rest of the call CID... AT..., and LON... data that was sent to the response center will be continually displayed in rotation on the message center.

If the call is initiated by pressing the console RESCU switch SOS button or by the deployment of an airbag, the caller has no control of the phone and all communication with the response center operator will occur hands-free. If the call is initiated by pressing the console RESCU switch i button, communication with the response center operator defaults to hands-free but may be switched to private mode (using the phone's internal speaker and microphone) by removing the phone from its cradle.

When the RESCU call is ended, the message center will return to displaying vehicle information and the radio will un-mute and return to its previous operating mode.

Powering Down

When the ignition switch is turned from RUN to OFF, or from RUN to ACC, the VEMS may be powered off so no status messages will be displayed. If the ignition switch is turned from RUN to OFF or ACC while the VEMS is in a call, the call will continue, but the message center will be turned off. After the call is ended, the VEMS will remain on for six minutes. After the six minutes have expired, the VEMS will power OFF. To reuse the VEMS after this time, the ignition switch will have to be turned back to the RUN position.

Inspection and Verification

1. **NOTE:** The RESCU module must be reconfigured upon replacement. For more information refer to [Section 418-01](#).

Verify the customer concern by operating the VEMS. Observe the information and message center display while operating the VEMS. If there is no status information displayed by the information and message center display, refer to [Section 413-08](#).

2. Visually inspect for obvious signs of electrical damage.

Visual Inspection Chart

Electrical
<ul style="list-style-type: none">● BJB Fuse 414 (5A)● CJB Fuse 229 (5A)● Cellular phone system● Circuitry● Console RESCU switch● RESCU module● GPS antenna coaxial cable and connectors● Portable support electronics (PSE) module

3. Verify the cellular phone system has an activated service.
4. If the concern remains after the inspection, connect the New Generation STAR (NGS) Tester to the data link connector (DLC) located beneath the instrument panel and select the vehicle to be tested from NGS tester menu. If NGS tester does not communicate with the vehicle:
 - check that the program card is correctly installed.
 - check the connections to the vehicle.
 - check the ignition switch position.
5. If the NGS tester still does not communicate with the vehicle, refer to the New Generation STAR Tester manual.
6. Carry out the DATA LINK DIAGNOSTICS. If the NGS tester responds with:
 - CKT914, CKT915 or CKT70 = ALL ECUS NO RESP/NOT EQUIP, refer to [Section 418-00](#).
 - NO RESP/NOT EQUIP for RESCU, go to Pinpoint Test A.

- SYSTEM PASSED, retrieve and record the continuous diagnostic trouble codes (DTCs), clear the continuous DTCs and carry out self-test diagnostics for the RESCU module.

7. If the DTCs retrieved are related to the concern, go to RESCU Diagnostic Trouble Code (DTC) Index.
8. If no DTCs related to the concern are retrieved, proceed to the Symptom Chart.

RESCU Diagnostic Trouble Code (DTC) Index

DTC	Description	Source	Action
B1216	Emergency & Road Side Assistance Switch Circuit Short to Ground	RESCU	GO to Pinpoint Test E .
B1342	ECU is Defective	RESCU	CLEAR the DTCs. RETRIEVE the DTCs. If DTC B1342 is retrieved, INSTALL a new RESCU module. For additional information, REFER to Module—Remote Emergency Satellite Cellular Unit (RESCU) . CLEAR the DTCs. REPEAT the self-test.
B1871	Passenger Air Bag Disable Module Fault	RESCU	GO to Pinpoint Test F .
B1874	Cellular Phone Handset Not Present (Phone transceiver is connected but not responding to any RESCU query)	RESCU	GO to Pinpoint Test G .
B1893	GPS Antenna Open Circuit	RESCU	GO to Pinpoint Test H .
B2102	GPS Antenna Circuit Short to Ground	RESCU	GO to Pinpoint Test J .
B2141	NVM Configuration Failure [No/invalid telephone number(s) present]	RESCU	CLEAR the DTCs. CARRY OUT RESCU On-Demand Self-Test. If DTC B2141 is retrieved, INSTALL a new RESCU module. For additional information, REFER to Module—Remote Emergency Satellite Cellular Unit (RESCU) . CLEAR the DTCs. REPEAT the self-test.
B2477	Module Configuration Failure (No/invalid VIN present or RESCU configuration error)	RESCU	CHECK the RESCU module configuration. For additional information, REFER to Section 418-01 .

RESCU Parameter Identification (PID) Index

PID	Description	Expected Value
AIRBAGI	Airbag Input Status	notACT, ACTIVE
ASSTREQ	Button Status Assistance Request	notACT, ACTIVE
CCNT	Number Of Continuous DTCs In Module	one count per bit
DEP_IND	Airbag Deployment Indication Input	NORMAL, OPEN, STG, STB
INFOREQ	Button Status Information Request	notACT, ACTIVE



Symptom Chart

Symptom Chart

Condition	Possible Sources	Action
<ul style="list-style-type: none"> No communication with the remote emergency satellite cellular unit (RESCU) module 	<ul style="list-style-type: none"> BJB Fuse 414 (5A). CJB Fuse 229 (5A). Circuitry. RESCU module. 	<ul style="list-style-type: none"> GO to Pinpoint Test A.
<ul style="list-style-type: none"> The VEMS does not operate correctly—RESCU does not respond to the console RESCU switch i button 	<ul style="list-style-type: none"> Console RESCU switch. RESCU module. Circuitry. 	<ul style="list-style-type: none"> GO to Pinpoint Test B.
<ul style="list-style-type: none"> The VEMS does not operate correctly — RESCU/cellular phone interface is inoperative 	<ul style="list-style-type: none"> RESCU module. Circuitry. PC phone. Portable support electronics (PSE) module. 	<ul style="list-style-type: none"> GO to Pinpoint Test C.
<ul style="list-style-type: none"> The VEMS does not operate correctly — air bag warning indicator on continuously 	<ul style="list-style-type: none"> RESCU module. Circuitry. Restraint control module (RCM). 	<ul style="list-style-type: none"> GO to Pinpoint Test D.
<ul style="list-style-type: none"> The VEMS does not operate correctly — RESCU does not respond to the console RESCU switch SOS button 	<ul style="list-style-type: none"> Console RESCU switch. RESCU module. Circuitry. 	<ul style="list-style-type: none"> GO to Pinpoint Test K.

Pinpoint Tests

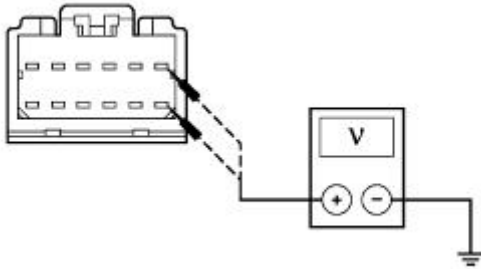
PINPOINT TEST A: NO COMMUNICATION WITH THE REMOTE EMERGENCY SATELLITE CELLULAR UNIT (RESCU) MODULE

CONDITIONS	DETAILS/RESULTS/ACTIONS
A1 CHECK THE RESCU MODULE FOR VOLTAGE — CIRCUITS 31-GP8 (BK/RD) AND 20-GP8 (PK/OG)	
<p>1</p>  <p>2</p>  <p>RESCU Module C401a</p>	

3



4



A0004042

4

Measure the voltage between RESCU module C401a pin 1, circuit 31-GP8 (BK/RD), harness side and ground; and between RESCU Module C401a pin 7, circuit 20-GP8 (PK/OG), harness side and ground

- Are both voltages greater than 10 volts?

→ **Yes**
GO to [A2](#).

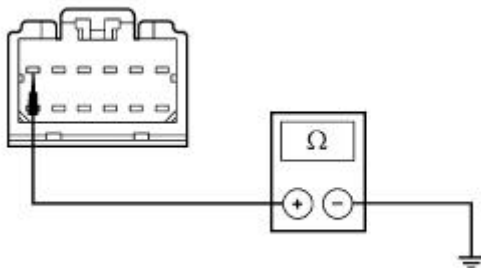
→ **No**
REPAIR the circuit in question. TEST the system for normal operation.

A2 CHECK THE RESCU MODULE GROUND — CIRCUIT 31-GP8 (BK/RD)

1



2



A0004043

2

Measure the resistance between RESCU module C401a pin 6, circuit 31-GP8 (BK/RD), harness side and ground.


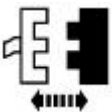
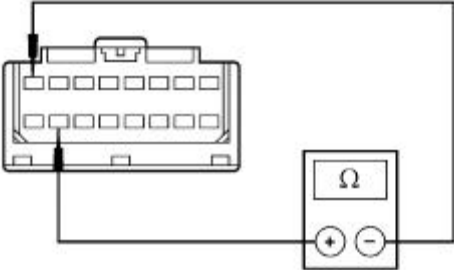
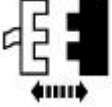
- Is the resistance less than 5 ohms?

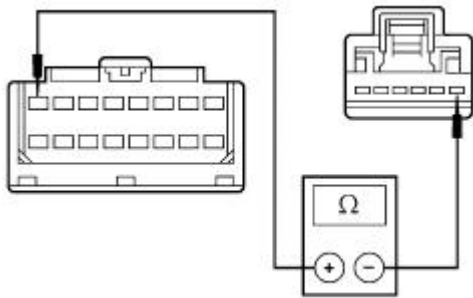
→ **Yes**
REFER to [Section 418-00](#).

→ **No**
REPAIR the circuit. TEST the system for normal operation.

PINPOINT TEST B: THE VEMS DOES NOT OPERATE CORRECTLY

— RESCU DOES NOT RESPOND TO THE CONSOLE RESCU SWITCH i BUTTON

CONDITIONS	DETAILS/RESULTS/ACTIONS
B1 CHECK THE CONSOLE RESCU SWITCH INPUT	
<p>1 </p> <p>2  RESCU Module C401b</p> <p>3  A0004044</p>	<p>3 Measure the resistance between RESCU module C401b pin 1, circuit 10-GP6 (GY/RD), harness side and RESCU module C401b pin 10, circuit 9-GP6 (BN/RD), harness side, while pressing the console RESCU switch i button.</p> <p>● Is the resistance less than 5 ohms?</p> <p>→ Yes INSTALL a new RESCU module; REFER to Module—Remote Emergency Satellite Cellular Unit (RESCU). REPEAT the self-test.</p> <p>→ No GO to B2.</p>
B2 CHECK CIRCUIT 10-GP6 (GY/RD) FOR OPEN	
<p>1  Console RESCU switch C915</p> <p>2</p>	<p>2 Measure the resistance between RESCU module C401b pin 1, circuit 10-GP6 (GY/RD), harness side and console RESCU switch C915 pin 1, circuit 10-GP6 (GY/RD), harness side.</p>



A0004045

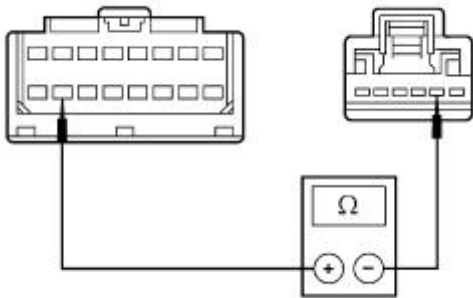
● Is the resistance less than 5 ohms?

→ **Yes**
GO to [B3](#).

→ **No**
REPAIR the circuit. CLEAR the DTCs.
REPEAT the self-test.

B3 CHECK CIRCUIT 9-GP6 (BN/RD) FOR OPEN

1



A0004046

1

Measure the resistance between RESCU module C401b pin 10, circuit 9-GP6 (BN/RD), harness side and console RESCU switch C915 pin 2, circuit 9-GP6 (BN/RD) harness side.

● Is the resistance less than 5 ohms?

→ **Yes**
INSTALL a new console RESCU switch;
REFER to [Console—Remote Emergency Satellite Cellular Unit \(RESCU\) Switch](#).
CLEAR the DTCs. REPEAT the self-test.

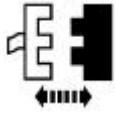
→ **No**
REPAIR the circuit. CLEAR the DTCs.
REPEAT the self-test.

PINPOINT TEST C: THE VEMS DOES NOT OPERATE CORRECTLY — RESCU/CELLULAR PHONE INTERFACE IS INOPERATIVE

CONDITIONS	DETAILS/RESULTS/ACTIONS
C1 CHECK THE CELLULAR PHONE DISCONNECTED FROM THE VEMS	
1	



2



Cellular Handset Coil Cord C318

3 Operate the cellular phone.

• Does the cellular phone operate correctly?

→ Yes
GO to [C2](#).

→ No
REPAIR the cellular phone. REFER to [Section 419-08](#). CLEAR the DTCs. REPEAT the self-test.

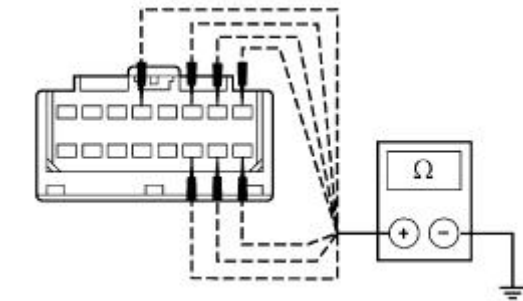
C2 CHECK THE RESCU MODULE CIRCUITS FOR SHORTS TO GROUND

1



RESCU Module C401b

2



A0004047

2 Using the following table, measure the resistance between RESCU module C401b pins, harness side and ground:

Pin	Circuit
8	9-MC10 (BN/YE)
7	2-MC10 (GY/BK)
6	1-MC10 (WH/BK)
4	31-MC10 (BK/RD)
16	4-MC10 (GY/BK)
15	5-MC10 (BU/YE)
14	8-MC10 (WH/BK)

• Are the resistances greater than 10,000 ohms?

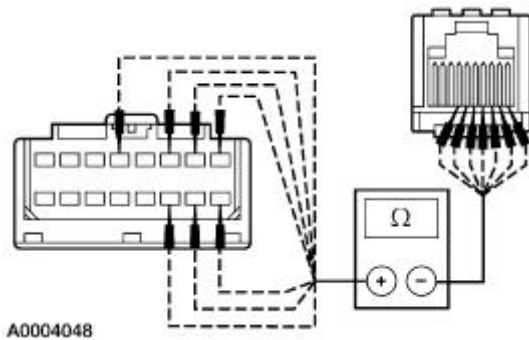
→ Yes
GO to [C3](#).

→ No
REPAIR the circuit(s) in question. CLEAR the DTCs. REPEAT the self-test.

C3 CHECK THE CIRCUITS BETWEEN THE RESCU MODULE AND CELLULAR HANDSET

COIL CORD FOR OPENS

1



A0004048

1

Using the following table, measure the resistance between RESCU module C401b pins, harness side and cellular handset coil cord C318 pins, harness side:

RESCU Module Pin	Circuit	Cellular Handset Coil Cord Pin
6	1-MC10 (WH/BK)	3
7	2-MC10 (GY/BK)	2
16	4-MC10 (GY/BK)	7
15	5-MC10 (BU/YE)	6
14	8-MC10 (WH/BK)	5
8	9-MC10 (BN/YE)	1
4	31-MC10 (BK/RD)	4

- Are the resistances less than 5 ohms?

→ **Yes**

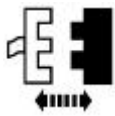
INSTALL a new RESCU module: REFER to [Module—Remote Emergency Satellite Cellular Unit \(RESCU\)](#). CLEAR the DTCs. REPEAT the self-test.

→ **No**

REPAIR the circuit(s) in question. CLEAR the DTCs. REPEAT the self-test.

PINPOINT TEST D: THE VEMS DOES NOT OPERATE CORRECTLY — AIR BAG WARNING INDICATOR ON CONTINUOUSLY

CONDITIONS	DETAILS/RESULTS/ACTIONS
D1 CHECK THE AIR BAG WARNING INDICATOR — RESCU MODULE DISCONNECTED	
<p>1</p> <p>2</p>	



RESCU Module C401b

3



- Does the air bag warning indicator flash code 25 or code 27?

→ **Yes**
GO to [D2](#).

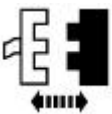
→ **No**
DIAGNOSE the RCM; REFER to [Section 501-20B](#).

D2 CHECK CIRCUIT 8-GP8 (WH/BK) FOR OPEN

1

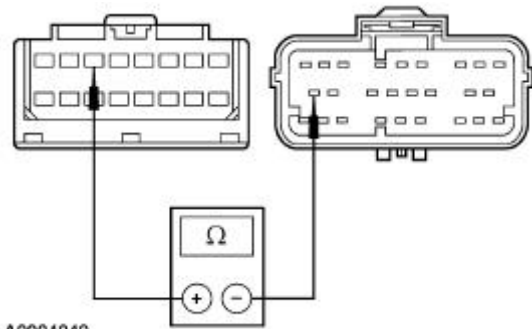


3



RCM C310a

4



2 Deactivate the air bags. Refer to [Section 501-20B](#).


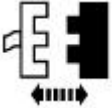




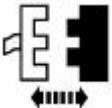
4 Measure the resistance between RESCU module C401b pin 3, circuit 8-GP8 (WH/BK), harness side and RCM C310a pin 17, circuit 8-GP8 (WH/BK), harness side.

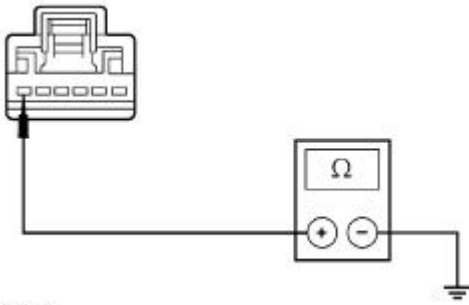
- Is the resistance less than 5 ohms?

→ **Yes**
DIAGNOSE the RCM; REFER to [Section 501-20B](#).

→ **No**
REPAIR the circuit. CLEAR the DTCs. REPEAT the self-test.

PINPOINT TEST E: EMERGENCY & ROAD SIDE ASSISTANCE SWITCH CIRCUIT SHORT TO GROUND

CONDITIONS	DETAILS/RESULTS/ACTIONS
E1 CHECK CONSOLE RESCU SWITCH FOR SHORT TO GROUND	
<p>1 </p> <p>2  Console RESCU switch C915</p> <p>3  NGS</p> <p>4 </p> <p>5 </p>	<p>5 Clear the RESCU DTCs. Carry out the RESCU on-demand self-test.</p> <p>● Is DTC B1216 retrieved?</p> <p>→ Yes GO to E2.</p> <p>→ No INSTALL a new console RESCU switch; REFER to Console—Remote Emergency Satellite Cellular Unit (RESCU) Switch. CLEAR the DTCs. REPEAT the self-test.</p>
E2 CHECK CIRCUIT 8-GP6 (WH/RD) FOR SHORT TO GROUND	
<p>1 </p> <p>2  RESCU Module C401b</p> <p>3</p>	<p>3 Measure the resistance between console</p>



A0004050

RESCU switch C915 pin 6, circuit 8-GP6 (WH/RD), harness side and ground.

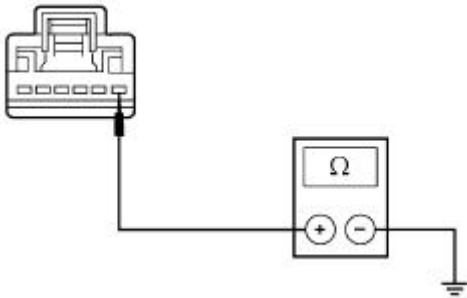
- Is the resistance greater than 10,000 ohms?

→ **Yes**
GO to [E3](#).

→ **No**
REPAIR the circuit. CLEAR the DTCs. REPEAT the self-test.

E3 CHECK CIRCUIT 10-GP6 (GY/RD) FOR SHORT TO GROUND

1



A0004051

1

Measure the resistance between console RESCU switch C915 pin 1, circuit 10-GP6 (GY/RD), harness side and ground.

- Is the resistance greater than 10,000 ohms?

→ **Yes**
INSTALL a new RESCU module; REFER to [Module—Remote Emergency Satellite Cellular Unit \(RESCU\)](#). CLEAR the DTCs. REPEAT the self-test.

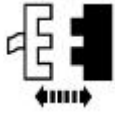
→ **No**
REPAIR the circuit. CLEAR the DTCs. REPEAT the self-test.

PINPOINT TEST F: PASSENGER AIR BAG DISABLE MODULE FAULT

CONDITIONS	DETAILS/RESULTS/ACTIONS
F1 CHECK CIRCUIT 8-GP8 (WH/BK) FOR SHORT TO GROUND — RCM CONNECTED	
1	

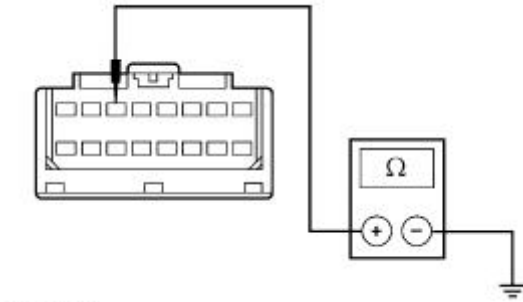


2



RESCU Module C401b

3



A0004052

3

Measure the resistance between RESCU module C401b pin 3, circuit 8-GP8 (WH/BK), harness side and ground.

- Is the resistance greater than 10,000 ohms?

→ Yes

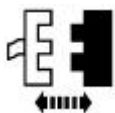
INSTALL a new RESCU module; REFER to [Module—Remote Emergency Satellite Cellular Unit \(RESCU\)](#). CLEAR the DTCs. REPEAT the self-test.

→ No

GO to [F2](#).

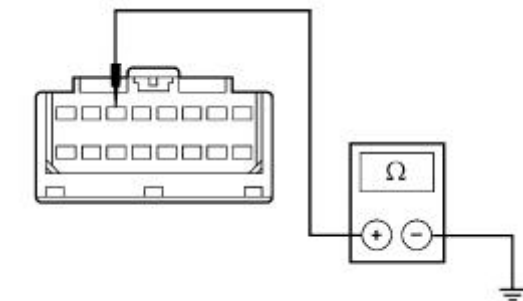
F2 CHECK CIRCUIT 8-GP8 (WH/BK) FOR SHORT TO GROUND — RCM DISCONNECTED

1



RCM C310a

2



A0004052



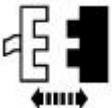
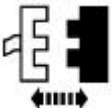
2

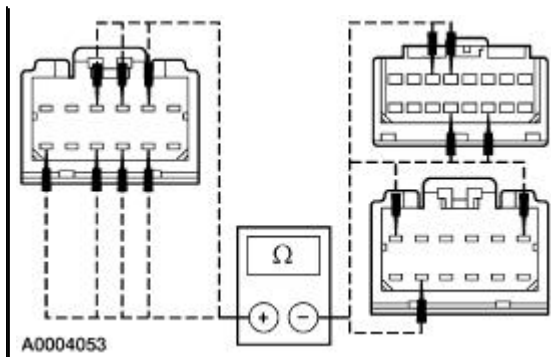
Measure the resistance between RESCU module C401b pin 3, circuit 8-GP8 (WH/BK), harness side and ground.

- Is the resistance greater than 10,000 ohms?

- **Yes**
DIAGNOSE the RCM; REFER to [Section 501-20B](#) . CLEAR the DTCs. REPEAT the self-test.
- **No**
REPAIR the circuit. CLEAR the DTCs. REPEAT the self-test.

PINPOINT TEST G: CELLULAR PHONE HANDSET NOT PRESENT (PHONE TRANSCEIVER IS CONNECTED BUT NOT RESPONDING TO ANY RESCU QUERY)

CONDITIONS	DETAILS/RESULTS/ACTIONS
G1 CHECK THE CELLULAR PHONE	
<p>1</p> 	<p>2 Operate the cellular phone.</p> <ul style="list-style-type: none"> ● Does the cellular phone operate correctly? <p>→ Yes GO to G2.</p> <p>→ No DIAGNOSE the cellular phone; REFER to Section 419-08 . CLEAR the DTCs. REPEAT the self-test.</p>
G2 CHECK THE CIRCUITS BETWEEN THE RESCU MODULE AND THE PSE FOR OPENS	
<p>1</p>  <p>2</p>  <p>RESCU Module C401a</p> <p>3</p>  <p>PSE C403a and C403b</p> <p>4</p>	<p>4 Using the following table, measure the resistance between RESCU module C401a pins, harness side and PSE</p>



connector pins, harness side:

RESCU Module Pin	Circuit	PSE Module Connector
10	1-GP11 (WH/GN)	C403a Pin 1
9	2-GP10 (GY/VT)	C403a Pin 6
2	4-GP14 (GY/RD)	C403b Pin 5
3	5-GP12 (BU/YE)	C403b Pin 6
4	8-GP13 (WH/VT)	C403a Pin 11
8	10-GP9 (GY)	C403b Pin 11
12	31-MC10A (BK/RD)	C403b Pin 13

- Are the resistances less than 5 ohms?

→ **Yes**

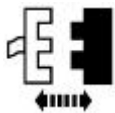
INSTALL a new RESCU module; REFER to [Module—Remote Emergency Satellite Cellular Unit \(RESCU\)](#). CLEAR the DTCs. REPEAT the self-test.

→ **No**

REPAIR the circuit(s) in question. CLEAR the DTCs. REPEAT the self-test.

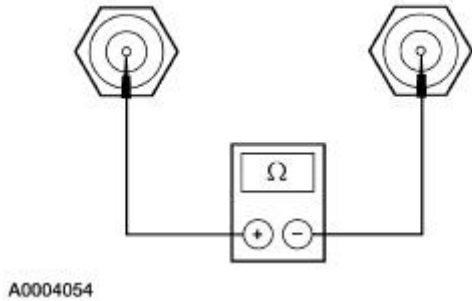
PINPOINT TEST H: GPS ANTENNA OPEN CIRCUIT

CONDITIONS	DETAILS/RESULTS/ACTIONS
H1 CHECK THE COAXIAL ANTENNA CENTER CONDUCTOR FOR OPEN	
<p>1</p> <p>2</p> <p>GPS Coaxial Antenna Connector C325</p> <p>3</p>	



RESCU Module Coaxial Antenna Connector C401c

4



4

Measure the resistance between GPS coaxial antenna C325 center conductor pin, harness side and RESCU module coaxial antenna C401c center conductor pin, harness side.

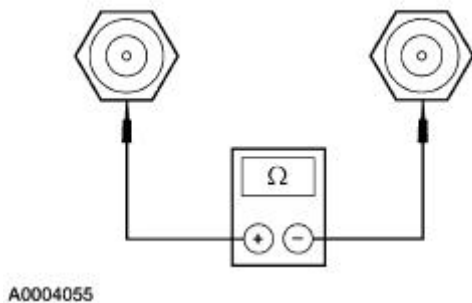
● Is the resistance less than 5 ohms?

→ **Yes**
GO to [H2](#).

→ **No**
INSTALL a new antenna coaxial cable.
CLEAR the DTCs. REPEAT the self-test.

H2 CHECK THE COAXIAL ANTENNA SHIELD FOR OPEN

1



1

Measure the resistance between GPS coaxial antenna C325 shield, harness side and RESCU module coaxial antenna C401c shield, harness side.

● Is the resistance less than 5 ohms?

→ **Yes**
GO to [H3](#).

→ **No**
INSTALL a new antenna coaxial cable.
CLEAR the DTCs. REPEAT the self-test.

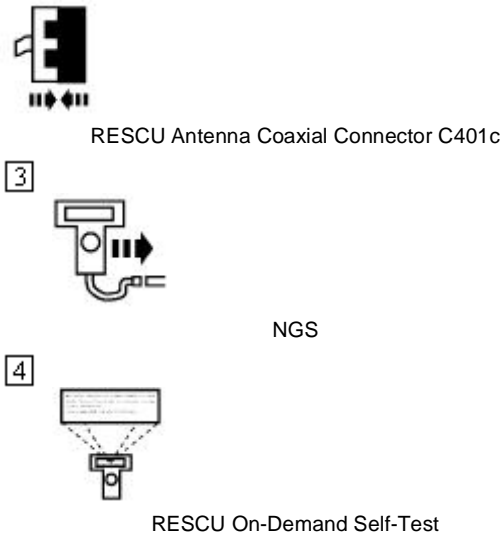
H3 REPEAT RESCU ON-DEMAND SELF-TEST

1


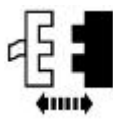


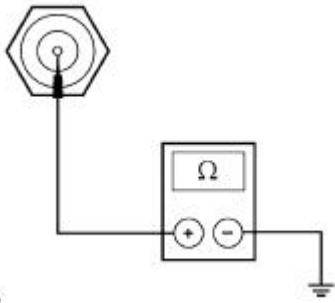
GPS Coaxial Antenna Connector C325

2

 <p>RESCU Antenna Coaxial Connector C401c</p> <p>3</p> <p>NGS</p> <p>4</p> <p>RESCU On-Demand Self-Test</p>	<ul style="list-style-type: none"> ● Is DTC B1893 retrieved? <p>→ Yes INSTALL a new GPS antenna; REFER to Antenna—Global Positioning Sensor (GPS). CLEAR the DTCs. REPEAT the self-test.</p> <p>→ No System is OK.</p>
--	---

PINPOINT TEST J: GPS ANTENNA CIRCUIT SHORT TO GROUND

CONDITIONS	DETAILS/RESULTS/ACTIONS
J1 CHECK THE COAXIAL ANTENNA CENTER CONDUCTOR FOR SHORT TO GROUND — RESCU MODULE CONNECTED	
<p>1</p>  <p>2</p>  <p>GPS Coaxial Antenna Connector C325</p> <p>3</p>	<p>3 Measure the resistance between GPS coaxial antenna C325 center conductor, harness side and ground.</p>



A0004056

- Is the resistance greater than 10,000 ohms?

→ **Yes**
 INSTALL a new GPS antenna; REFER to [Antenna—Global Positioning Sensor \(GPS\)](#). CLEAR the DTCs. REPEAT the self-test.

→ **No**
 GO to [J2](#).

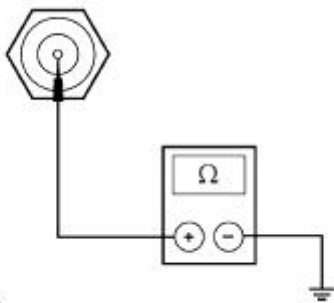
J2 CHECK THE COAXIAL ANTENNA CENTER CONDUCTOR FOR SHORT TO GROUND — RESCU MODULE DISCONNECTED

1



RESCU Module Coaxial Antenna C401c

2



A0004056


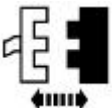
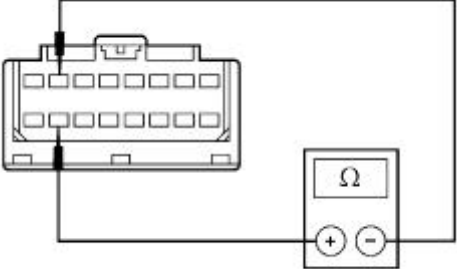
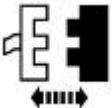
- 2 Measure the resistance between RESCU module coaxial antenna C401c connector center conductor, harness side and ground.

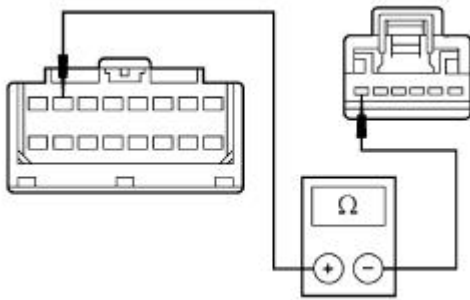
- Is the resistance greater than 10,000 ohms?

→ **Yes**
 INSTALL a new RESCU module; REFER to [Module—Remote Emergency Satellite Cellular Unit \(RESCU\)](#). CLEAR the DTCs. REPEAT the self-test.

→ **No**
 INSTALL a new antenna coaxial cable. CLEAR the DTCs. REPEAT the self-test.

PINPOINT TEST K: THE VEMS DOES NOT OPERATE CORRECTLY — RESCU DOES NOT RESPOND TO THE CONSOLE RESCU SWITCH SOS BUTTON

CONDITIONS	DETAILS/RESULTS/ACTIONS
K1 CHECK THE CONSOLE RESCU SWITCH SOS BUTTON CIRCUIT FOR CONTINUITY	
<p>1 </p> <p>2  RESCU Module C401b</p> <p>3  A0004057</p>	<p>3 Measure the resistance between RESCU module C401b pin 2, circuit 8-GP6 (WH/RD), harness side and RESCU module C401b pin 10, circuit 9-GP6 (BN/RD), harness side while pressing the console RESCU switch SOS button.</p> <ul style="list-style-type: none"> ● Is the resistance less than 5 ohms? <p>→ Yes INSTALL a new RESCU module; REFER to Module—Remote Emergency Satellite Cellular Unit (RESCU). CLEAR the DTCs. REPEAT the self-test.</p> <p>→ No GO to K2.</p>
K2 CHECK CIRCUIT 8-GP6 (WH/RD) FOR OPEN	
<p>1  Console RESCU switch C915</p> <p>2</p>	<p>2 Measure the resistance between RESCU module C401b pin 2, circuit 8-GP6 (WH/RD), harness side and console RESCU switch C915 pin 6, circuit 8-GP6 (WH/RD), harness side.</p>



A0004058

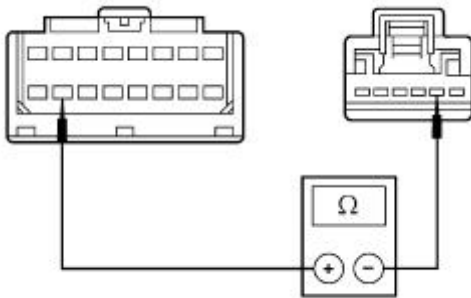
● Is the resistance less than 5 ohms?

→ **Yes**
GO to [K3](#).

→ **No**
REPAIR the circuit. CLEAR the DTCs.
REPEAT the self-test.

K3 CHECK CIRCUIT 9-GP6 (BN/RD) FOR OPEN

1



A0004046

1

Measure the resistance between RESCU module C401b pin 10, circuit 9-GP6 (BN/RD), harness side and console RESCU switch C915 pin 2, circuit 9-GP6 (BN/RD), harness side.


● Is the resistance less than 5 ohms?

→ **Yes**
INSTALL a new console RESCU switch;
REFER to [Console—Remote Emergency Satellite Cellular Unit \(RESCU\) Switch](#).
CLEAR the DTCs. REPEAT the self-test.

→ **No**
REPAIR the circuit. CLEAR the DTCs.
REPEAT the self-test.

Module —Remote Emergency Satellite Cellular Unit (RESCU)

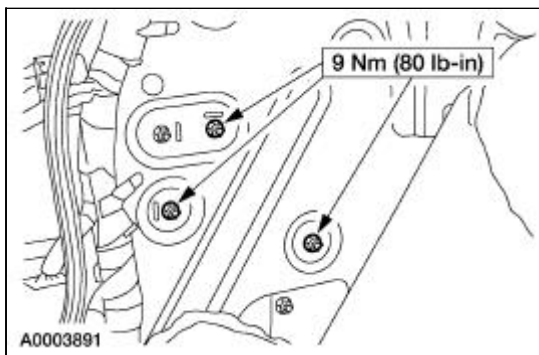
Removal and Installation

1.  **CAUTION:** Electronic modules are sensitive to electrical charges. If exposed to these charges, damage may result.

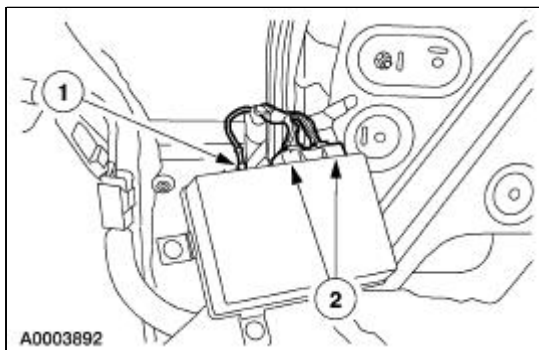
NOTE: The remote emergency satellite cellular unit (RESCU) module must be reconfigured upon replacement. Refer to [Section 418-01](#).

Disconnect the battery ground cable. Refer to [Section 414-01](#).

2. Position the LH quarter trim panel aside.
3. Remove the RESCU module nuts.



4. Remove the RESCU module.
 1. Disconnect the antenna.
 2. Disconnect the electrical connector.

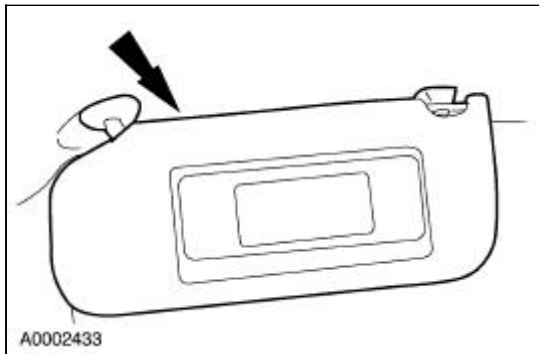


5. To install, reverse the removal procedure.

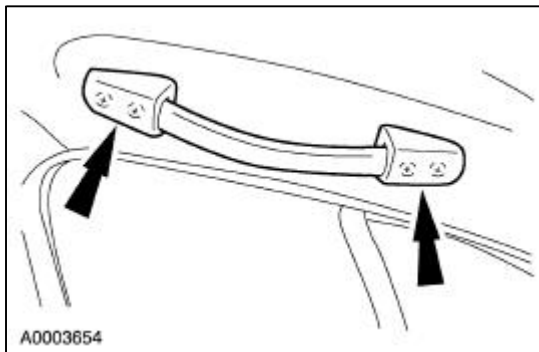
Console —Remote Emergency Satellite Cellular Unit (RESCU) Switch

Removal and Installation

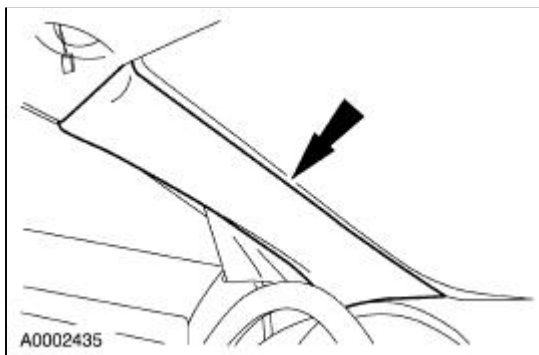
1. Remove the sun visors from each side.



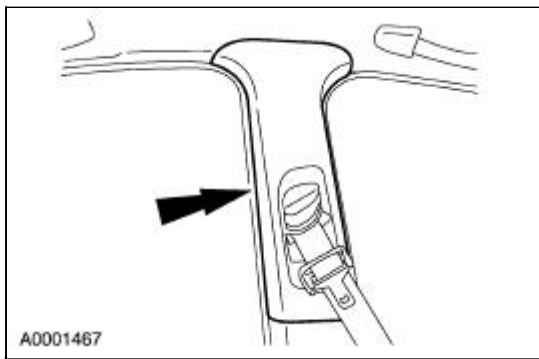
2. Remove the assist handle.



3. Remove the windshield garnish mouldings.



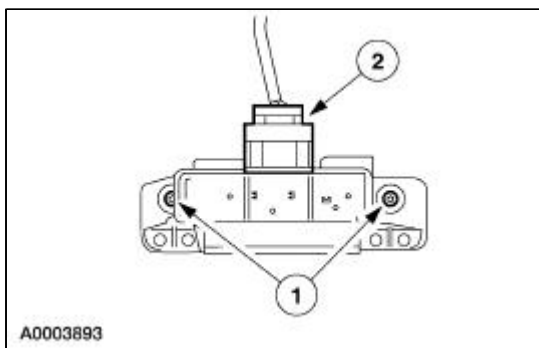
4. Remove the upper B-pillar trim.



5. Remove the front dome lamp assembly bezel.
6. **NOTE:** Folding the headliner will require installing a new headliner.

Carefully pull the front of the headliner down to gain access to the console remote emergency satellite cellular unit (RESCU) switch.

7. Remove the switch.
 1. Remove the screws.
 2. Disconnect the electrical connector.

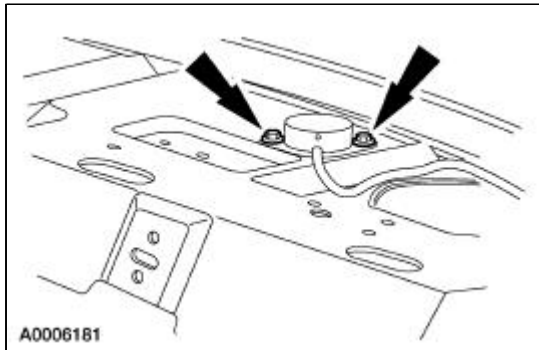


8. To install, reverse the removal procedure.
-

Antenna —Global Positioning Sensor (GPS)

Removal and Installation

1. Remove the package tray trim panel. For additional information, refer to [Section 501-05](#).
2. Remove the two bolts and the global positioning sensor (GPS) antenna.



3. To install, reverse the removal procedure.
-

General Specifications

Item	Specification
Ultra-Clear Spray Glass Cleaner E4AZ-19C507-AA	ESR-M14P5-A

Torque Specifications

Description	Nm	lb-in
Cellular phone module (CPM) nuts	9	80

Cellular Phone



The portable cellular phone system consists of:

- cellular phone handset
 - handset battery
 - handset holder
 - coil cord
 - steering column shroud mounted microphone
 - steering wheel switch controls
 - cellular phone module (CPM)
 - on-glass cellular phone antenna (late production)
 - antenna cable
 - audio unit controls
-

Cellular Phone

Refer to Wiring Diagrams Section [419-08](#) for schematic and connector information.

Special Tool(s)

 ST1137-A	73III Automotive Meter or equivalent 105-R0057
 ST1217-A	New Generation STAR (NGS) Tester or equivalent 418-F048 (007-00500)

Inspection and Verification

1. Verify the customer concern by operating the portable cellular phone both in portable mode and while connected to the vehicle.
2. Make sure the portable cellular phone is turned ON. With the power button ON, the system should be on while the ignition switch is in ACC or RUN.
3. Make sure the customer is calling within the coverage area. No Svc will appear in the display if the customer is calling from outside the coverage area.
4. Check to see if the Roam indicator is on. If so, follow the roaming instructions in the owner literature.
5. Check to see if the display reads Locked. If so, press Clr and enter the customer three-digit unlock code.
6. Make sure the portable cellular phone is securely connected to the coil cord and seated in the holder.
7. Check the coil cord connections in the console.
8. Check the portable cellular phone antenna and cellular phone module connections.
9. Check the portable cellular phone system registration. Also, check to make sure that the portable cellular phone is correctly programmed. Incorrect programming can result in single system scanning, loss of speed dialing, loss of hands-free audio, loss of auto redial, loss of dial tone multi-frequency tones, and the loss of other keypad/portable cellular phone functions.
10. Check the customer account status with the cellular carrier.

If the customer concern is still present, follow these steps to diagnose the concern:

11. Inspect to determine if one of the following mechanical or electrical concerns apply:

Visual Inspection Chart

Mechanical	Electrical
<ul style="list-style-type: none"> ● Damaged portable cellular phone ● Damaged microphone ● Damaged cellular phone module (CPM) ● Damaged vehicle emergency messaging system (VEMS) module (if equipped) ● Damaged portable cellular phone holder ● Damaged coil cord 	<ul style="list-style-type: none"> ● Central junction box (CJB) fuses <ul style="list-style-type: none"> ■ 218 (20A) ■ 227 (10A) ■ 202 (5A) ● Battery junction box (BJB) fuses <ul style="list-style-type: none"> ■ 422 (20A) ■ 414 (5A) ● Damaged, loose or corroded connectors

12. If inspection reveals obvious concerns which can be readily identified, repair as necessary.
13. If the cause of the fault is not visually evident, proceed to diagnose the portable cellular phone system by:
- Entering the New Generation STAR (NGS) Tester Diagnostics or
 - Entering Audio Control Module (ACM) Self-Diagnostic Mode.

ACM Self-Diagnostic Mode

NOTE: To enter the Speaker Walk-Around Test or ACM self-diagnostic mode, the ACM must be turned on and in radio tuner mode (AM/FM).

ACM self-diagnostic mode can only be entered while in the Speaker Walk-Around Test.

14. To enter the Speaker Walk-Around Test, press the ACM preset buttons 3 and 6 simultaneously.
15. The Speaker Walk-Around Test stops at each speaker and applies a tone to each speaker for about 1-2 seconds. Each speaker is tested and displayed on the ACM in the following sequence: SPEAKER RF, SPEAKER LF, SPEAKER LR, SPEAKER RR, SUBWOOFER I (for subwoofer, if equipped), and SUBWOOFER II (for center imaging speakers, if equipped). This test can isolate an open circuit for each speaker (broken wire or disconnect), however, a short circuit can only be isolated to either the right pair or left pair.
16. The Speaker Walk-Around Test automatically continues and tests:
- for a speaker circuit short. If a short is present, SPKR SHORT will be displayed. Speaker circuit shorts are detected only in the RF, LF, LR, and RR speaker circuitry.
 - for the CD/DJ. The ACM display will show NO DJ if not present. The Speaker Walk-Around Test will end and the ACM will return to its previous setting.
17. ACM self-diagnostic mode has six tests available:
- Preset Button 1 = Audio internal/external SELF TEST. If SELF FAIL is displayed, press TUNE > to scroll view the DTCs stored. Refer to the ACM Diagnostic Trouble Codes (DTC) Index. If the system is OK, SELF PASS is displayed.
 - Preset button 2 = View/Clear continuous diagnostic trouble codes (DTCs). NO DTCS is

displayed if no DTCs are retrieved. If DTCS FOUND is displayed, press TUNE > button to view the DTCs retrieved. Refer to the ACM Diagnostic Trouble Codes (DTC) Index. To clear all DTCs, press the EJECT button. DTCS CLEAR will be displayed.

- Preset button 3 = SIGNAL TEST. This test measures the average strength at the current tuner setting.
- Preset button 4 = Software configuration level. This test queries each radio system controller for the software configuration level. SOFT LEVELS will be displayed upon completion of the query. Press TUNE > to scroll view the software configuration version level.

Controller	Description	Radio Display Example
Main	Main Micro Software Version	MAIN ##.##.##
CDSP	CDSP Micro Software Version	CDSP ##.##.##
ADSP	ADSP Micro Software Version	ADSP ##.##.##
Auxiliary	Auxiliary Software Version	AUX ##.##.##
CD/DJ	CDDJ Software Version	DJ ##.##.##
CD Changer	CDR Software Version	CD ##.##.##
Tape Deck	Tape Deck Software Version	TAP ##.##.##
RSC	Rear Seat Controller Software Version	RCP ##.##.##

- Preset button 5 = DISPLAY TEST. This test will light all the ACM display segments for five seconds, then turn all segments off. When the test is complete, DISPLAY TEST is displayed on the bezel.
 - Preset button 6 = Configuration/EQ ID. This test queries the audio system controller for the software configuration and EQ ID.
18. To enter these tests, press the preset button desired while in the Speaker Walk-Around Test. This will abort the Speaker Walk-Around Test and start the selected test.
 19. To exit ACM self-diagnostic mode, turn the ignition switch or the ACM off.
 20. If the concern remains and the fault is not detected, proceed to the New Generation STAR (NGS) Tester Diagnostics to continue diagnostics.

New Generation STAR (NGS) Tester Diagnostics

1. Connect the New Generation STAR (NGS) Tester to the data link connector (DLC) located beneath the instrument panel and select the vehicle to be tested from the NGS menu. If the NGS does not communicate with the vehicle:
 - check that the program card is correctly installed.
 - check the connections to the vehicle.
 - check the ignition switch position.
2. **NOTE:** The ACM must be in AM, FM1, or FM2 mode to enter NGS tester diagnostics.

NOTE: The portable cellular phone system is diagnosed through the ACM.

NOTE: The cellular phone module (CPM) is also referred to as the portable support electronics (PSE) module.

If the NGS still does not communicate with the vehicle, refer to the New Generation STAR Tester manual.

3. Carry out the DATA LINK DIAGNOSTIC TEST. If the NGS responds with:
 - CKT914, CKT915 or CKT70 = ALL ECUS NO RESP/NOT EQUIP, refer to [Section 418-00](#).
 - NO RESP/NOT EQUIP for audio control module (ACM), go to Pinpoint Test A.
 - NO RESP/NOT EQUIP for cellular phone module (CPM), go to Pinpoint Test B.
 - SYSTEM PASSED, retrieve and record the continuous diagnostic trouble codes (DTCs), erase the continuous DTCs, and carry out self-test diagnostics for the CPM.
4. If the DTCs retrieved are related to the concern, go to the ACM Diagnostic Trouble Code (DTC) Index or to the CPM Diagnostic Trouble Code (DTC) Index to continue diagnostics.
5. If no DTCs related to the concern are retrieved, proceed to the Symptom Chart to continue diagnostics.

ACM Diagnostic Trouble Code (DTC) Index

DTC	Description	Source	Action
B1342	ECU Is Defective	ACM	CLEAR and DOCUMENT the DTCs. CARRY OUT the ACM On-Demand Self-Test. If DTC B1342 is retrieved again, REMOVE the ACM and SEND it to an authorized Ford Audio System repair facility.
B2401	Audio Tape Deck Mechanism Fault	ACM	VERIFY that no tape is inserted in the ACM. CLEAR and DOCUMENT the DTCs. CARRY OUT the ACM On-Demand self-test. If DTC B2401 is retrieved again, REMOVE the ACM and SEND it to an authorized Ford Audio System repair facility.
B2402	Audio CD/DJ Thermal Shutdown Fault	ACM	REFER to Section 415-00 .
B2403	Audio CD/DJ Internal Fault	ACM	REFER to Section 415-00 .
B2404	Audio Steering Wheel Switch Circuit Fault	ACM	REFER to Section 415-00 .
B2405	Audio Single-Disc CD Player Thermal Shutdown Fault	ACM	REFER to Section 415-00 .
B2406	Audio Single-Disc CD Player Internal Fault	ACM	REFER to Section 415-00 .
B2477	Module Configuration Fault	ACM	REFER to Section 418-01 .
U2003	CD/DJ Is Not Responding	ACM	NOTE: U2003 is retrieved if CDDJ is not present, disconnected, or inoperative. REFER to Section 415-00 .
U2005	Audio Rear Integrated Control Panel Unit Is	ACM	NOTE: U2005 is retrieved if RICP is not present, disconnected, or inoperative.

	Not Responding		REFER to Section 415-00 .
U2008	Audio Phone Is Not Responding	ACM	GO to Pinpoint Test B .
U2014	Audio Subwoofer Unit Is Not Responding	ACM	NOTE: U2014 is retrieved if subwoofer is not present, disconnected, or inoperative. REFER to Section 415-00 .
U2020	Center Image Amplifier Is Not Responding	ACM	NOTE: U2020 is retrieved if center image amplifier is not present, disconnected, or inoperative. REFER to Section 415-00 .

ACM Parameter Identification (PID) Index

Display	Description	Expected Value
ASYSON	ASYSON output state	ACTIVE, not ACT
BAND_SW	Band switch (steering wheel controls)	ACTIVE, not ACT
MEM_SW	Memory switch (steering wheel controls)	ACTIVE, not ACT
PHONE	Phone switch (steering wheel controls)	ACTIVE, not ACT
PTA	PTA input state	ACTIVE, not ACT
VOL+_SC	Volume + switch (steering wheel controls)	ACTIVE, not ACT
VOL-_SC	Volume - switch (steering wheel controls)	ACTIVE, not ACT

ACM Active Command Index

Active Command	Display	Action
Speaker Walk-Around Test	SPEAKER WALKAROUND	RF, LF, LR, RR, Subwoofer I, Subwoofer II

CPM Diagnostic Trouble Code (DTC) Index

DTC	Description	Source	Action
B1342	ECU Is Defective	CPM	INSTALL a new CPM; REFER to Module—Cellular Phone (CPM) .
B1844	Phone Handset Circuit Failure	CPM	INSTALL a new portable cellular phone. CALL Audiotronics at 1-800-755-4161 for replacement information.

CPM Parameter Identification (PID) Index

PID	Description	Expected Value
CCNT	Number Of Continuous	one count per bit

	DTCs In Module	
FNC_PAD	Cell Phone Handset Input (Func.Keys)	SEND, END, RECALL, STORE, FUNCT, # KEY, * KEY, CLR, VOL +, VOL -, MUTE, NO KEY
IGN_A	Ignition Switch -ACCY Position	NO, YES
IGN_KEY	Ignition Key In/Out	OUT, IN
IGN_O/L	Ignition Switch -OFF/Lock Position	NO, YES
IGN_O/U	Ignition Switch -OFF/Unlock Position	NO, YES
IGN_R	Ignition Switch -RUN Position	NO, YES
IGN_S	Ignition Switch -START Position	NO, YES
NUM_PAD	Cellular Phone Handset Input(0-9)	1 KEY, 2 KEY, 3 KEY, 4 KEY, 5 KEY, 6 KEY, 7 KEY, 8 KEY, 9 KEY, 0 KEY, NO KEY
SIG_STR	Cellular Network Signal Strength	%

System/Carrier Concerns

Dropped calls, bad connections, noisy audio and other intermittent symptoms usually indicate a system or cellular carrier concern, and are not the fault of the phone itself. Such symptoms may occur in situations such as the following:

- In certain geographic areas (for example: areas of excessive foliage or hills) or at the edge of coverage areas.
- At the same place each day.
- At the same time each day.
- Under bridges, tunnels, in lower freeways, or in congested downtown areas.

If the customer phone exhibits any of the above symptoms or symptoms occur under the above conditions, the customer or the dealer should contact customer assistance at their particular cellular provider/carrier or call the 1-800 assistance number provided in the Ford Cellular System Dealer kit.

Other Possible Concerns

1. If, for some reason, the customer's electronic serial number was incorrectly recorded in the carrier switch, the phone will not work. Call the 1-800 number in your dealer kit to check the electronic serial number.
2. A customer initial call must be made in his/her home coverage area for correct activation of the Ford Cellular System.
3. A customer may have to wait 24 hours after the coverage activation before making a call from outside of his/her home coverage area or the phone might be reported stolen and coverage stopped.
4. There may be a slight delay in activation after leaving the dealership.

If, after checking these possibilities, the phone still does not function, do not attempt to repair the phone. Call the cellular distributor, Audiotronics, at 1-800-755-4161.

Symptom Chart


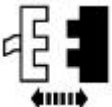

Symptom Chart

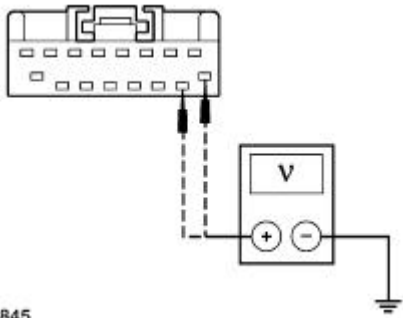
Condition	Possible Sources	Action
<ul style="list-style-type: none"> No communication with the module — audio control module (ACM) 	<ul style="list-style-type: none"> CJB Fuse 218 (20A). CJB Fuse 227 (10A). BJB Fuse 422 (20A). SCP. ACM. Circuitry. 	<ul style="list-style-type: none"> GO to Pinpoint Test A.
<ul style="list-style-type: none"> No communication with the module — cellular phone (CPM) 	<ul style="list-style-type: none"> CJB Fuse 227 (10A). CJB Fuse 229 (5A). BJB Fuse 414 (5A). BJB Fuse 422 (20A). CPM. Portable cellular phone. ACM. Circuitry. 	<ul style="list-style-type: none"> GO to Pinpoint Test B.
<ul style="list-style-type: none"> The phone does not power up 	<ul style="list-style-type: none"> CJB Fuse 227 (10A). CJB Fuse 229 (5A). BJB Fuse 414 (5A). BJB Fuse 422 (20A). CPM. Portable cellular phone. Circuitry. 	<ul style="list-style-type: none"> GO to Pinpoint Test C.
<ul style="list-style-type: none"> Reduced sound or no sound through the speakers 	<ul style="list-style-type: none"> CPM. Portable cellular phone. Microphone. Audio unit. Circuitry. 	<ul style="list-style-type: none"> GO to Pinpoint Test D.
<ul style="list-style-type: none"> The phone system will not go into hands-free mode 	<ul style="list-style-type: none"> CPM. Portable cellular phone. Microphone. Circuitry. 	<ul style="list-style-type: none"> GO to Pinpoint Test E.
<ul style="list-style-type: none"> Poor reception, static on calls, frequent drop of calls 	<ul style="list-style-type: none"> CPM. Portable cellular phone. Microphone. Antenna. 	<ul style="list-style-type: none"> GO to Pinpoint Test F.

	<ul style="list-style-type: none"> ● Circuitry. 	
<ul style="list-style-type: none"> ● The cellular phone microphone is not operating correctly 	<ul style="list-style-type: none"> ● CPM. ● Portable cellular phone. ● Microphone. ● Circuitry. 	<ul style="list-style-type: none"> ● GO to Pinpoint Test G.
<ul style="list-style-type: none"> ● No Svc display stays on 	<ul style="list-style-type: none"> ● CPM. ● Portable cellular phone. ● Circuitry. 	<ul style="list-style-type: none"> ● GO to Pinpoint Test H.
<ul style="list-style-type: none"> ● Cannot enter the programming mode 	<ul style="list-style-type: none"> ● CPM. ● Portable cellular phone. ● Circuitry. 	<ul style="list-style-type: none"> ● GO to Pinpoint Test I.
<ul style="list-style-type: none"> ● The voice activated phone functions are inoperative 	<ul style="list-style-type: none"> ● CPM. ● Portable cellular phone. ● Microphone. ● Circuitry. 	<ul style="list-style-type: none"> ● GO to Pinpoint Test J.

Pinpoint Tests

PINPOINT TEST A: NO COMMUNICATION WITH THE MODULE — AUDIO CONTROL MODULE (ACM)

CONDITIONS	DETAILS/RESULTS/ACTIONS
A1 CHECK THE VOLTAGE TO THE ACM	
<p>1</p>  <p>2</p>  <p>ACM C240c</p> <p>3</p>  <p>4</p>	<p>4</p> <p>Measure the voltage between ACM C240c pin 9, circuit 29-MD15 (OG/BK), harness side and ground; and between ACM C240c pin 10, circuit 75-MD15 (YE/GN), harness side and ground.</p>



A0004845

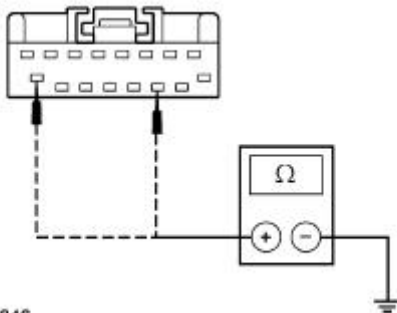
- Are the voltages greater than 10 volts?

→ **Yes**
GO to [A2](#).

→ **No**
REPAIR the circuit in question. TEST the system for normal operation.

A2 CHECK THE GROUND TO THE ACM

1



A0004846

1

Measure the resistance between ACM C240c pin 11, circuit 31-MD15B (BK), harness side and ground; and between C240c pin 16, circuit 31-MD15A (BK), harness side and ground.

- Are the resistances less than 5 ohms?

→ **Yes**
REFER to [Section 418-00](#),
Communication System Diagnostics, to
diagnose the network concern.

→ **No**
REPAIR the circuit. TEST the system for
normal operation.

PINPOINT TEST B: NO COMMUNICATION WITH THE MODULE — CELLULAR PHONE MODULE (CPM)

CONDITIONS	DETAILS/RESULTS/ACTIONS
B1 RETRIEVE THE RECORDED ACM DTCS FROM BOTH CONTINUOUS AND ON-DEMAND SELF-TESTS	
	1 Retrieve the recorded ACM DTCs from

both continuous and on-demand self-tests.

- **Are any DTCs retrieved?**

→ **Yes**

If DTC U2008 is retrieved, GO to [B2](#).

→ **No**

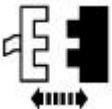
The system is OK.

B2 CHECK THE VOLTAGE TO THE CPM

1



2

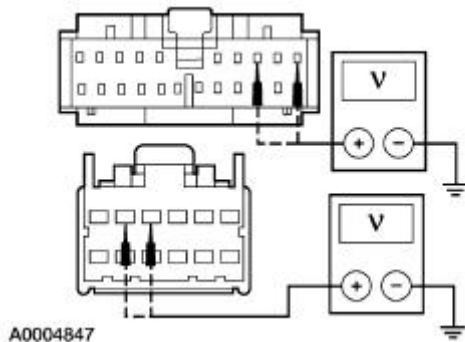


CPM

3



4



4

Measure the voltage between CPM C404 pin 8, circuit 75-MC9 (YE/GN), harness side and ground; and between CPM C404 pin 10, circuit 30-MC9 (RD/GN), harness side and ground (without VEMS) or between CPM C403a pin 5, circuit 75-MC9 (YE/GN), harness side and ground; and between CPM C403a pin 4, circuit 30-MC9B (RD/GN), harness side and ground (with VEMS).

- **Are the voltages greater than 10 volts?**

→ **Yes**

GO to [B3](#).

→ **No**

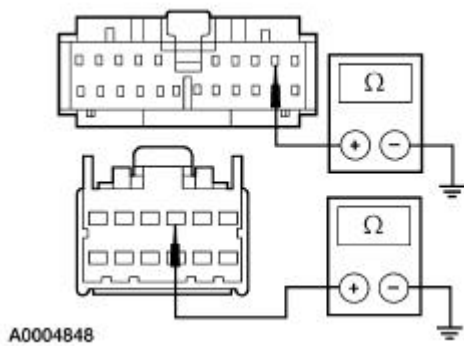
REPAIR the circuit in question. TEST the system for normal operation.

B3 CHECK THE GROUND TO THE CELLULAR PHONE MODULE (CPM)

1



2



2 Measure the resistance between CPM C403a pin 3, circuit 31-MC9F (BK/GN), harness side and ground (with VEMS) or between CPM C404 pin 9, circuit 31-MC9 (BK/GN), harness side and ground (without VEMS).

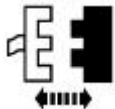
● Is the resistance less than 5 ohms?

→ **Yes**
GO to [B4](#).

→ **No**
REPAIR the circuit in question. TEST the system for normal operation.

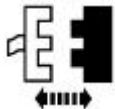
B4 CHECK ACP CIRCUITS FOR OPEN OR SHORT TO GROUND

1



CD Changer C243 (if equipped)

2

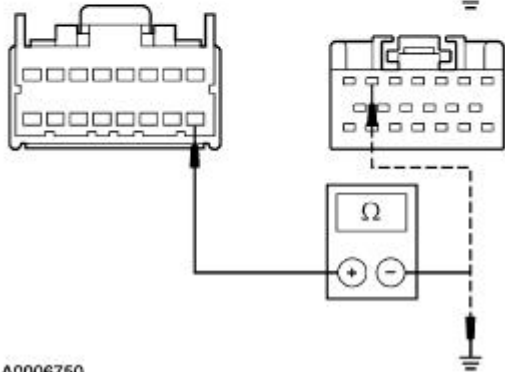
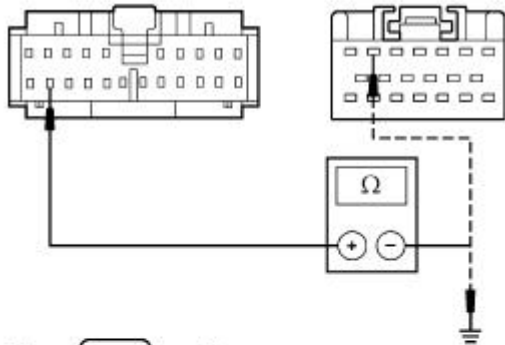


Audio Unit C240a

3

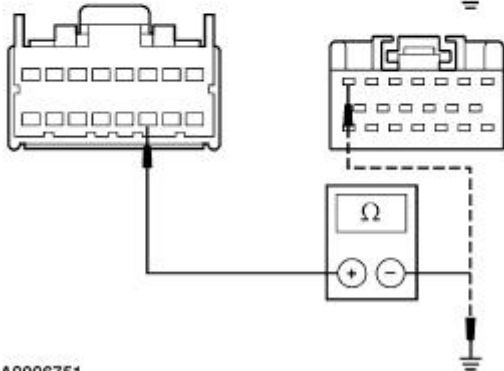
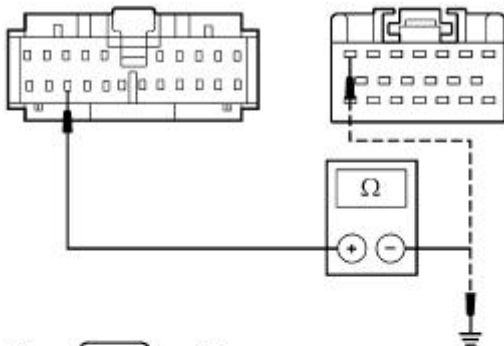
3 Measure the resistance between:

- CPM C404 pin 12, circuit 4-MC9 (GY/OG), harness side and audio unit C240a pin 6, circuit 4-EA8 (GY/VT), harness side (without VEMS); or between CPM C403b pin 9, circuit 4-MC9 (GY/OG), harness side and audio unit C240a pin 6, circuit 4-EA8 (GY/VT), harness side (with VEMS).
- CPM C404 pin 12, circuit 4-MC9 (GY/OG), harness side and ground (without VEMS).
- CPM C403b pin 9, circuit 4-MC9 (GY/OG), harness side and ground (with VEMS).



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4



A0006751

4 Measure the resistance between:



- CPM C404 pin 13, circuit 5-MC9 (BU/BK), harness side and audio unit C240a pin 7, circuit 5-EA8 (BU/WH), harness side (without VEMS); or between CPM C403b pin 10, circuit 5-MC9 (BU/BK), harness side and audio unit C240a pin 7, circuit 5-EA8 (BU/WH), harness side (with VEMS).
- CPM C404 pin 13, circuit 5-MC9 (BU/BK), harness side and ground (without VEMS).
- CPM C403b pin 10, circuit 5-MC9 (BU/WH), harness side and ground (with VEMS).

- Are the resistances less than 5 ohms between the CPM and the audio unit, and greater than 10,000 ohms between the CPM and ground?

→ Yes
GO to [Pinpoint Test C](#).

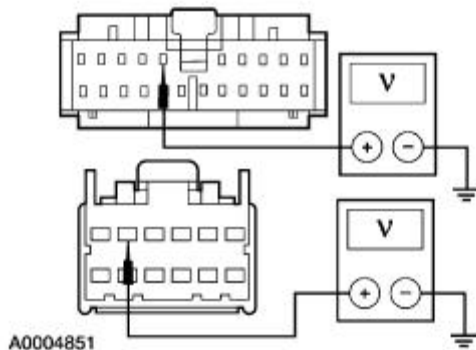
→ **No**
REPAIR the circuit in question. TEST the system for normal operation.

PINPOINT TEST C: THE PHONE DOES NOT POWER UP

CONDITIONS	DETAILS/RESULTS/ACTIONS
C1 CHECK THE PORTABLE CELLULAR PHONE	
	<p>1 Disconnect the portable cellular phone from the vehicle.</p> <ul style="list-style-type: none"> • Does the portable cellular phone power up in portable cellular mode? <p>→ Yes GO to C3.</p> <p>→ No GO to C2.</p>
C2 CHECK THE BATTERY	
	<p>1 Install a known good, charged battery on the portable cellular phone.</p> <ul style="list-style-type: none"> • Does the portable cellular phone power up in portable cellular mode? <p>→ Yes INSTALL a new portable cellular phone battery. TEST the system for normal operation.</p> <p>→ No INSTALL a new portable cellular phone. CALL Audiotronics at 1-800-755-4161 for replacement information. TEST the system for normal operation.</p>
C3 CHECK FOR IGNITION SUPPLY	
<p>1 </p> <p>2 </p> <p>CPM</p> <p>3</p>	



4



- 4 Measure the voltage between CPM C404 pin 8, circuit 75-MC9 (YE/GN), harness side and ground (without VEMS); or between CPM C403a pin 5, circuit 75-MC9 (YE/GN), harness side and ground (with VEMS).

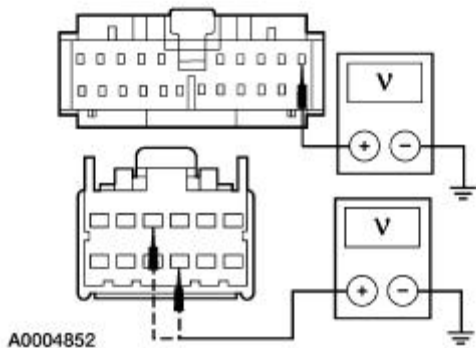
● Is the voltage greater than 10 volts?

→ **Yes**
GO to [C4](#).

→ **No**
REPAIR the circuit. TEST the system for normal operation.

C4 CHECK FOR BATTERY SUPPLY

1



- 1 Measure the voltage between:

- CPM C403a pin 4, circuit 30-MC9B (RD/GN), harness side and ground.
- CPM C404 pin 10, circuit 30-MC9 (RD/GN), harness side and ground (without VEMS); or between PSE module C403a pin 9, circuit 30-MC9C (RD/GN), harness side and ground (with VEMS).

● Is the voltage(s) greater than 10 volts?

→ **Yes**
GO to [C5](#).

→ **No**
REPAIR the circuit. TEST the system for normal operation.

C5 CHECK THE SYSTEM GROUND

1

- 1 Measure the resistance between CPM C403a pin 3, circuit 31-MC9F (BK/GN), harness side and ground (with VEMS); or between CPM C404 pin 9, circuit 31-MC9 (BK/GN), harness side and ground

(without VEMS).

- Is the resistance less than 5 ohms?

→ **Yes**
GO to [C6](#).

→ **No**
REPAIR the circuit. TEST the system for normal operation.

C6 SUBSTITUTE A KNOWN GOOD PORTABLE CELLULAR PHONE

- Substitute the portable cellular phone with a known good component.

- Does the system power up?

→ **Yes**
INSTALL a new portable cellular phone. CALL Audiotronics at 1-800-755-4161 for replacement information. TEST the system for normal operation.

→ **No**
INSTALL a new CPM; REFER to [Module—Cellular Phone \(CPM\)](#). TEST the system for normal operation.

PINPOINT TEST D: REDUCED SOUND OR NO SOUND THROUGH THE SPEAKERS

CONDITIONS	DETAILS/RESULTS/ACTIONS
D1 CHECK HANDS-FREE MODE	<ol style="list-style-type: none"> Place the portable cellular phone in the hands-free mode. Refer to the owner literature. <ul style="list-style-type: none"> ● Does the portable cellular phone operate in the hands-free mode? <p>→ Yes GO to D2.</p> <p>→ No</p>

GO to [Pinpoint Test E](#).

D2 CHECK THE RADIO SPEAKERS

1



2 Turn the audio unit on.

- Do the radio speakers operate correctly?

→ Yes
GO to [D3](#).

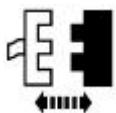
→ No
REFER to [Section 415-00](#).

D3 CHECK CIRCUITS 8-MD15 (WH/GN), 2-MC9 (GY/OG), AND 1-MC9 (WH/GN)

1

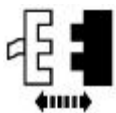


2



CPM

3



Audio Unit C240a

4 Measure the resistance between CPM and audio unit C240a; and between CPM and ground as follows:

With VEMS

Circuit	Audio Unit	CPM C403b
8-MD15 (WH/GN)	C240a Pin 10	C403b Pin 4
2-MC9 (GY/OG)	C240a Pin 11	C403b Pin 14
1-MC9 (WH/GN)	C240a Pin 12	C403b Pin 15

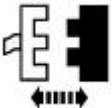

Without VEMS

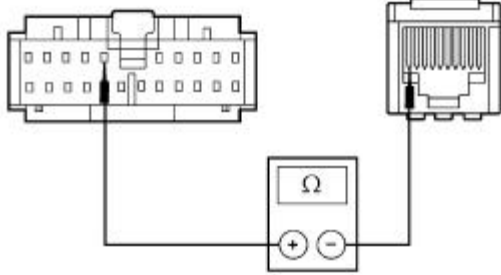
Circuit	Audio Unit	CPM C404
8-MD15 (WH/GN)	C240a Pin 10	C404 Pin 11
2-MC9 (GY/OG)	C240a Pin 11	C404 Pin 21
1-MC9 (WH/GN)	C240a Pin 12	C404 Pin 22

- Are the resistances less than 5 ohms between the CPM and audio unit C240a; and greater than 10,000 ohms between the CPM and

	<p style="text-align: center;">ground?</p> <p>→ Yes GO to D4.</p> <p>→ No REPAIR the circuit in question. TEST the system for normal operation.</p>
D4 SUBSTITUTE A KNOWN GOOD CPM	
	<p>1 Substitute the CPM with a known good component.</p> <ul style="list-style-type: none"> ● Do the speakers operate correctly? <p>→ Yes INSTALL a new CPM; REFER to Module—Cellular Phone (CPM). TEST the system for normal operation.</p> <p>→ No REMOVE the audio unit and SEND it to an authorized Ford Audio System repair facility. TEST the system for normal operation.</p>

PINPOINT TEST E: THE PHONE SYSTEM WILL NOT GO INTO HANDS-FREE MODE

CONDITIONS	DETAILS/RESULTS/ACTIONS
E1 CHECK THE VEHICLE OPTION CONTENT	
	<p>1 Check the option content of the vehicle.</p> <ul style="list-style-type: none"> ● Is the vehicle equipped with VEMS? <p>→ Yes REFER to Section 419-05.</p> <p>→ No GO to E2.</p>
E2 CHECK CIRCUIT 2-MC10 (GY/BK)	
<p>1</p>  <p style="text-align: center;">Console C318</p> <p>2</p>  <p style="text-align: center;">CPM C404</p> <p>3</p>	<p>3 Measure the resistance between CPM C404 pin 5, circuit 2-MC10 (GY/BK), harness side and console C318 pin 1, circuit 2-MC10 (GY/BK), harness side.</p>



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- Is the resistance less than 5 ohms?

→ **Yes**
GO to [E3](#).

→ **No**
REPAIR the circuit. TEST the system for normal operation.

E3 SUBSTITUTE A KNOWN GOOD PORTABLE CELLULAR PHONE HOLDER

1 Substitute the portable cellular phone holder with a known good component.

- Is the system OK?

→ **Yes**
INSTALL a new portable cellular phone holder. TEST the system for normal operation.

→ **No**
GO to [E4](#).

E4 SUBSTITUTE A KNOWN GOOD COIL CORD

1 Substitute the coil cord with a known good component.

- Is the system OK?

→ **Yes**
INSTALL a new coil cord. TEST the system for normal operation.

→ **No**
GO to [E5](#).

E5 SUBSTITUTE A KNOWN GOOD PORTABLE CELLULAR PHONE

1 Substitute the portable cellular phone with a known good component.

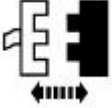
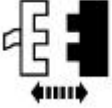
- Is the system OK?

→ **Yes**
INSTALL a new portable cellular phone.

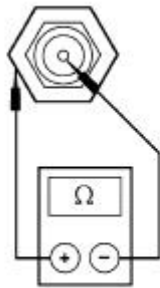
CALL Audiotronics at 1-800-755-4161 for replacement information. TEST the system for normal operation.

→ **No**
 INSTALL a new CPM; REFER to [Module—Cellular Phone \(CPM\)](#). TEST the system for normal operation.

PINPOINT TEST F: POOR RECEPTION, STATIC ON CALLS, FREQUENT DROP OF CALLS

CONDITIONS	DETAILS/RESULTS/ACTIONS
F1 SUBSTITUTE A KNOWN GOOD COIL CORD	
	<p>1 Substitute the coil cord with a known good component.</p> <ul style="list-style-type: none"> ● Is the system OK? <p>→ Yes INSTALL a new coil cord. TEST the system for normal operation.</p> <p>→ No GO to F2.</p>
F2 SUBSTITUTE A KNOWN GOOD PORTABLE CELLULAR PHONE	
	<p>1 Substitute the portable cellular phone with a known good component.</p> <ul style="list-style-type: none"> ● Is the system OK? <p>→ Yes INSTALL a new portable cellular phone. CALL Audiotronics at 1-800-755-4161 for replacement information. TEST the system for normal operation.</p> <p>→ No GO to F3.</p>
F3 CHECK THE ANTENNA CABLE RESISTANCE	
<p>1</p>  <p>Antenna Console Connection</p> <p>2</p>  <p>Antenna Cable Rear Window Connection</p>	

3



A0004930

3

Measure the resistance between the antenna cable center conductor and the outer shield.

- Is the resistance greater than 10,000 ohms?



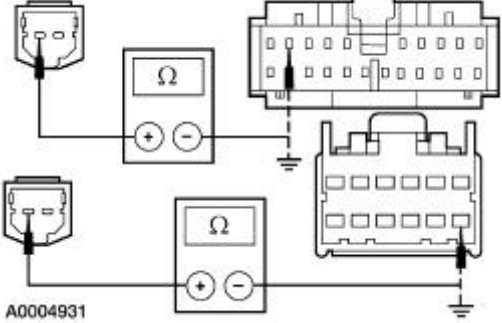
→ Yes

The system is operating correctly.

→ No

INSTALL a new antenna cable. TEST the system for normal operation.

PINPOINT TEST G: THE CELLULAR PHONE MICROPHONE IS NOT OPERATING CORRECTLY

CONDITIONS	DETAILS/RESULTS/ACTIONS
<p>G1 CHECK CIRCUIT 9-MC8 (BN/RD)</p>	
<p>1</p>  <p>CPM</p> <p>2</p>  <p>Microphone C221</p> <p>3</p>  <p>A0004931</p>	<p>3 Measure the resistance between:</p> <ul style="list-style-type: none"> ■ microphone C221, circuit 9-MC8 (BN/RD), harness side and CPM C404 pin 2, circuit 9-MC8 (BN/RD) (without VEMS); or between microphone C221, circuit 9-MC8 (BN/RD), harness side and CPM C403a pin 7, circuit 9-MC8 (BN/RD) (with VEMS). ■ microphone C221, circuit 9-MC8 (BN/RD), harness side and ground (without VEMS); or

between microphone C221, circuit 9-MC8 (BN/RD), harness side and ground (with VEMS).

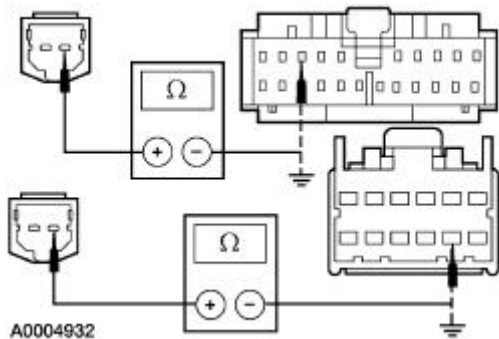
- **Is the resistance less than 5 ohms between the microphone and the CPM and greater than 10,000 ohms between the microphone and ground?**

→ **Yes**
GO to [G2](#).

→ **No**
REPAIR the circuit. TEST the system for normal operation.

G2 CHECK CIRCUIT 8-MC8 (WH/RD)

1



1 Measure the resistance between:

- microphone C221, circuit 8-MC8 (WH/RD), harness side and CPM C404 pin 3, circuit 8-MC8 (WH/RD) (without VEMS); or between microphone C221, circuit 8-MC8 (WH/RD), harness side and CPM C403a pin 8, circuit 8-MC8 (WH/RD) (with VEMS).
- microphone C221, circuit 8-MC8 (WH/RD), harness side and ground (without VEMS); or between microphone C221, circuit 8-MC8 (WH/RD), harness side and ground (with VEMS).

- **Is the resistance less than 5 ohms between the microphone and the CPM and greater than 10,000 ohms between the microphone and ground?**

→ **Yes**
GO to [G3](#).

→ **No**
REPAIR the circuit. TEST the system for normal operation.

G3 SUBSTITUTE A KNOWN GOOD MICROPHONE

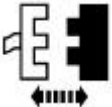
1 Substitute the microphone with a known good component.

- **Is the system OK?**

→ **Yes**

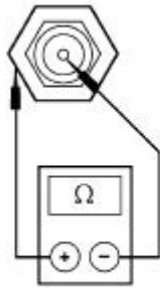
	<p>INSTALL a new microphone; REFER to Microphone. TEST the system for normal operation.</p> <p>→ No GO to G4.</p>
G4 SUBSTITUTE A KNOWN GOOD PORTABLE CELLULAR PHONE	
	<p>1 Substitute the portable cellular phone with a known good component.</p> <p>● Is the system OK?</p> <p>→ Yes INSTALL a new portable cellular phone. CALL Audiotronics at 1-800-755-4161 for replacement information. TEST the system for normal operation.</p> <p>→ No INSTALL a new CPM; REFER to Module—Cellular Phone (CPM). TEST the system for normal operation.</p>

PINPOINT TEST H: NO SVC DISPLAY STAYS ON

CONDITIONS	DETAILS/RESULTS/ACTIONS
H1 CHECK THE PORTABLE CELLULAR PHONE	
<p>NOTE: No Svc indicator might illuminate within the coverage area when the vehicle is in totally enclosed areas such as underground parking garages or tunnels. This does not indicate a hardware failure.</p>	
	<p>1 Disconnect the portable cellular phone from the coil cord.</p> <p>2 Power up portable cellular phone in a known good cellular coverage area.</p> <p>● Is No Svc still displayed in the portable cellular mode?</p> <p>→ Yes INSTALL a new portable cellular phone. CALL Audiotronics at 1-800-755-4161 for replacement information. TEST the system for normal operation.</p> <p>→ No GO to H2.</p>
H2 CHECK THE ANTENNA RESISTANCE	
<p>1</p> 	

Antenna Console Connection

2



A0004930

2

Measure the resistance between the antenna cable center conductor and the outer shield at the antenna console connection.

- Is the resistance greater than 100 ohms?

→ **Yes**

INSTALL a new inside antenna base (early production) or REPAIR the cellular phone antenna grid (late production); REFER to [Section 415-02](#) for antenna grid repair procedure. TEST the system for normal operation.

→ **No**

INSTALL a new antenna cable. TEST the system for normal operation.

PINPOINT TEST I: CANNOT ENTER THE PROGRAMMING MODE

CONDITIONS	DETAILS/RESULTS/ACTIONS
I1 VERIFY THE SECURITY CODE	<p>1 Make sure the:</p> <ul style="list-style-type: none"> ■ correct entry sequence is used. ■ entry sequence is entered quickly enough. <p>2 Verify the security code.</p> <ul style="list-style-type: none"> ● Has the programming mode been entered? <p>→ Yes The system is operating correctly.</p> <p>→ No INSTALL a new portable cellular phone. CALL Audiotronics at 1-800-755-4161 for replacement information. TEST the system for normal operation.</p>

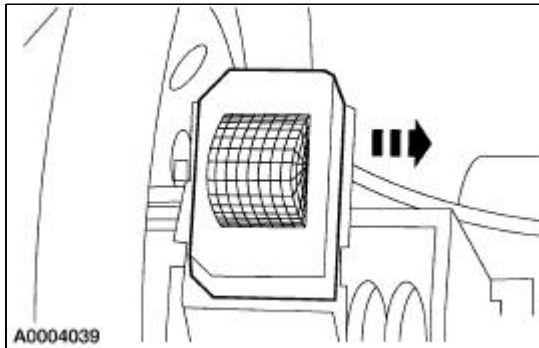
PINPOINT TEST J: THE VOICE ACTIVATED PHONE FUNCTIONS ARE INOPERATIVE

CONDITIONS	DETAILS/RESULTS/ACTIONS
J1 CHECK FOR A BEEP FROM THE AUDIO SYSTEM	
	<p>1 Connect the portable cellular phone to the console coil cord and mount in the holder.</p> <p>2 Power up the phone.</p> <p>● Can a beep be heard?</p> <p>→ Yes GO to J2.</p> <p>→ No GO to Pinpoint Test E.</p>
J2 CHECK FOR PHONE RESPONSE	
	<p>1 With the portable cellular phone mounted in the holder, press and hold the # or * button on the portable cellular phone.</p> <p>● Does the phone display: READY?</p> <p>→ Yes GO to J3.</p> <p>→ No INSTALL a new CPM; REFER to Module—Cellular Phone (CPM). TEST the system for normal operation.</p>
J3 CHECK THE FUNCTION BUTTON	
	<p>1 With the portable cellular phone mounted in the holder, press the phone button on the radio.</p> <p>● Does the phone display: READY?</p> <p>→ Yes The system is operating correctly.</p> <p>→ No GO to Pinpoint Test G.</p>

Microphone

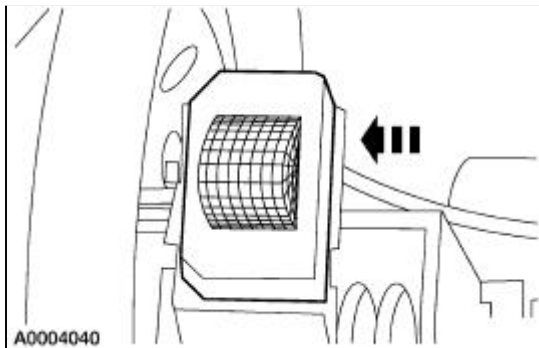
Removal

1. Remove the air bag sliding contact. For additional information, refer to [Section 501-20B](#).
2. Remove the cellular phone microphone from the air bag sliding contact.



Installation

1. Install the cellular phone microphone on to the air bag sliding contact.

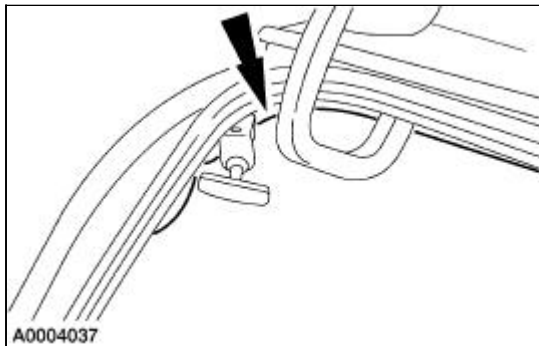


2. Install the air bag sliding contact; For additional information, refer to [Section 501-20B](#).
-

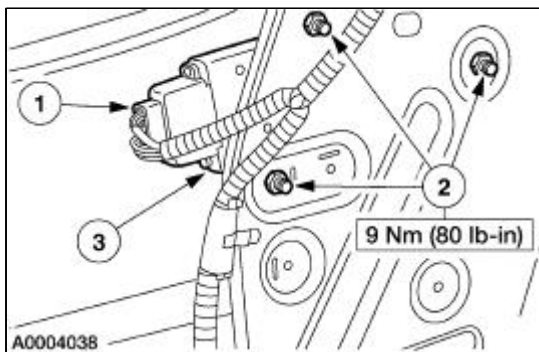
Module —Cellular Phone (CPM)

Removal and Installation

1. Open the luggage compartment and position the LH trim near the rear seat release handle aside.



2. Remove the cellular phone module (CPM).
 1. Disconnect the electrical connector.
 2. Remove the nuts.
 3. Remove the CPM.



3. To install, reverse the removal procedure.

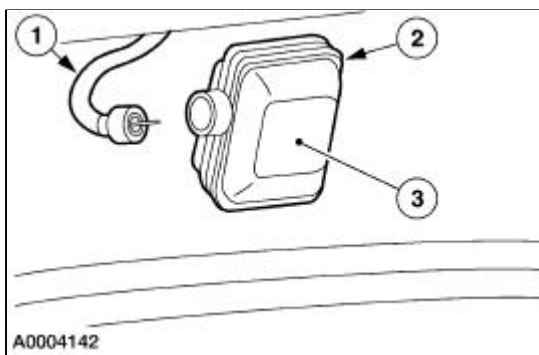
Antenna —Vehicle Portable Cellular Phone

Removal and Installation



CAUTION: To avoid damage to the glass, do not pry the antenna base when removing.

1. Remove the cellular phone antenna base.
 1. Disconnect the antenna cable.
 2. Cut the two-way tape holding the cellular phone antenna base to the glass.
 3. Remove the cellular phone antenna base.



2. **NOTE:** Before applying new two-way tape to install the cellular phone antenna base, use Ultra-Clear Spray Glass Cleaner E4AZ-19C507-AA meeting Ford specification ESR-M14P5-A or equivalent to thoroughly clean the glass.

NOTE: Inside and outside antenna bases must be carefully and accurately aligned so they don't cover any heater wire grids.

NOTE: The coaxial cable connector must be installed toward the right of the vehicle.

To install, reverse the removal procedure.

Torque Specifications

Description	Nm	lb-in
Battery ground cable	10	89
Rear electronic module (REM) nuts	7	62
Front electronic module (FEM) bolt	9	80
Front electronic module (FEM) nuts	4	35
Auxiliary junction block nuts	3	27

Module Controlled Functions

The multifunction modules consist of the:

- front electronic module (FEM)
 - rear electronic module (REM)
 - driver door module (DDM)
 - driver seat module (DSM)
-

Multifunction Electronic Module

For warning chime concerns, refer to [Section 413-09](#).

For exterior lighting concerns, refer to [Section 417-01](#).

For interior lighting concerns, refer to [Section 417-02](#).

For perimeter anti-theft concerns, refer to [Section 419-01A](#).

For power mirror concerns, refer to [Section 501-09](#).

For power seat concerns, refer to [Section 501-10](#).

For power window concerns, refer to [Section 501-11](#).

For remote keyless entry and power door lock concerns, refer to [Section 501-14B](#).


For daytime running lamp concerns, refer to [Section 417-04](#).

For variable assist power steering (VAPS) concerns, refer to [Section 211-00](#).

For roof opening panel concerns, refer to [Section 501-17](#).

Module —Driver Door (DDM)

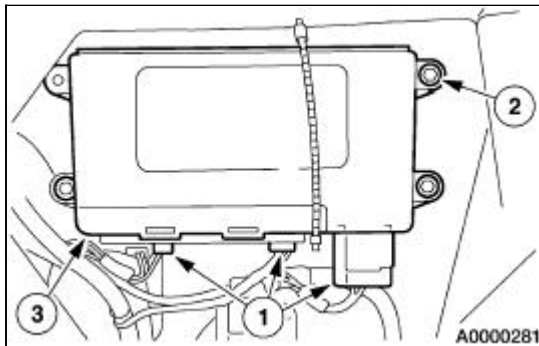
Removal and Installation

1.  **CAUTION:** Prior to removal of the module, it is necessary to upload module configuration information to the appropriate diagnostic equipment. This information needs to be downloaded into the new module once installed. For additional information, refer to [Section 418-01](#).

 **CAUTION:** Electronic modules are sensitive to electrical charges. If exposed to these charges, damages may result.

Disconnect the battery ground cable. Refer to [Section 414-01](#).

2. Remove the driver door trim panel. For additional information, refer to [Section 501-05](#).
3. Remove the driver door module.
 1. Disconnect the electrical connectors.
 2. Remove the three bolts.
 3. Remove the DDM.

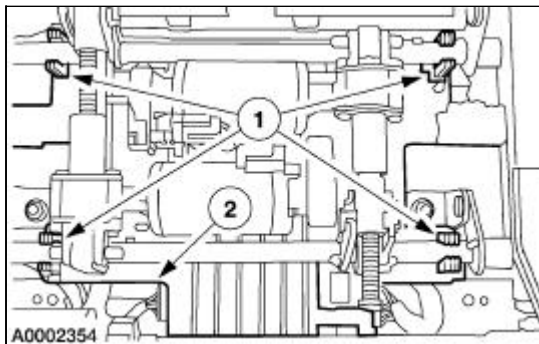


4. To install, reverse the removal procedure.

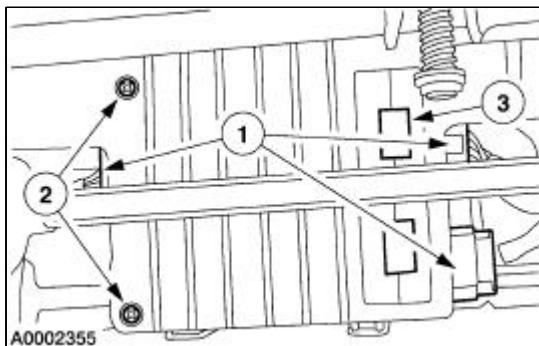
Module —Driver Seat (DSM)

Removal and Installation

1. Remove the driver seat; refer to [Section 501-10](#).
2. Release the driver seat module (DSM) bracket from the seat track.
 1. Release the four retainers.
 2. Release the module bracket.



3. Remove the DSM.
 1. Disconnect the electrical connectors.
 2. Remove the screws.
 3. Remove the DSM.




4. **NOTE:** Once the new module is installed, it is necessary to calibrate the seat. For additional information, refer to [Section 501-10](#).

NOTE: It is important to make sure that the locking tabs are in the correct locations.

To install, reverse the removal procedure.

Module —Rear Electronic (REM)

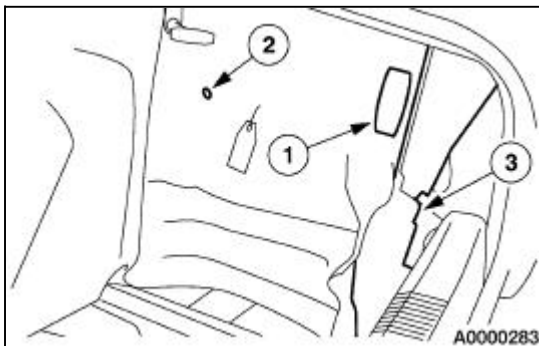
Removal and Installation

1.  **CAUTION:** Prior to removal of the module, it is necessary to upload module configuration information to the appropriate diagnostic equipment. This information needs to be downloaded into the new module once installed. For additional information, refer to [Section 418-01](#).

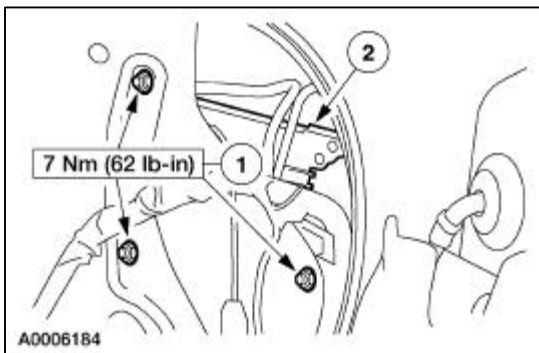
 **CAUTION:** Electronic modules are sensitive to static electrical charges. If exposed to these charges, damage may result.

Disconnect the battery ground cable. Refer to [Section 414-01](#).

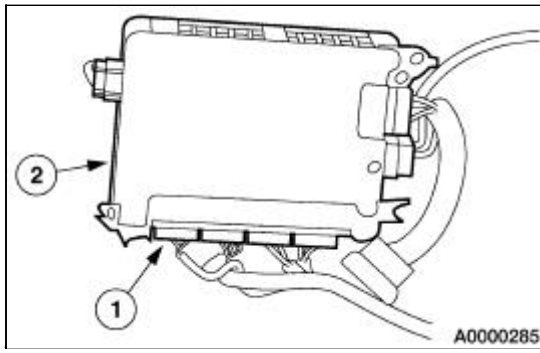
2. Position the RR quarter trim panel aside.
 1. Disconnect the luggage compartment lamp.
 2. Remove the push clip.
 3. Position RR quarter trim panel aside.



3. Position the rear electronic module (REM) aside.
 1. Remove the nuts.
 2. Position the REM aside.




4. Remove the REM.
 1. Disconnect the seven electrical connectors.
 2. Remove the REM.



5. To install, reverse the removal procedure.

Module —Front Electronic (FEM)

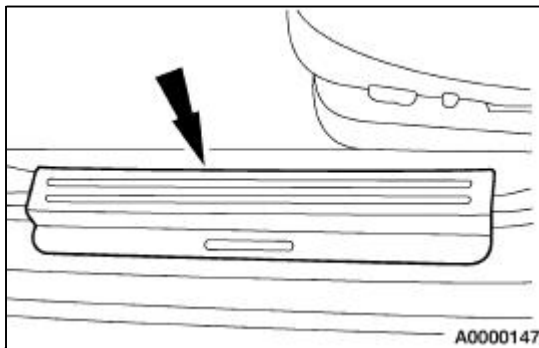
Removal and Installation

1.  **CAUTION:** Prior to removal of the module, it is necessary to upload module configuration information to the appropriate diagnostic equipment. This information needs to be downloaded into the new module once installed. For additional information, refer to [Section 418-01](#).

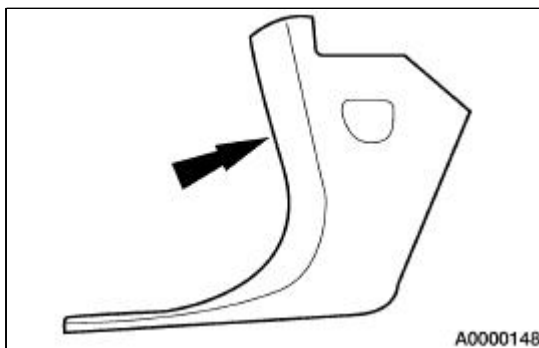
 **CAUTION:** Electronic modules are sensitive to static electrical charges. If exposed to these charges, damage may result.

Disconnect the battery ground cable. Refer to [Section 414-01](#).

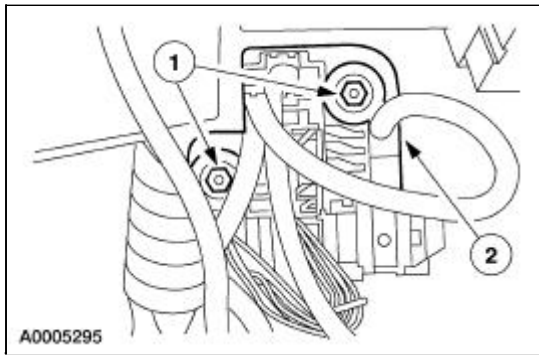
2. Remove the LH scuff plate.



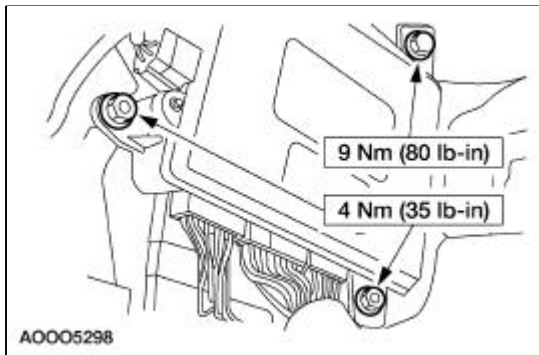
3. Release the retaining clips and remove the LH A-pillar lower trim panel.



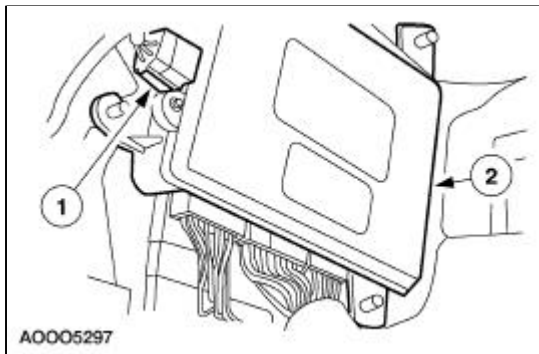
4. Remove the lower instrument panel finish panel.
 - Remove the courtesy lamp from the instrument panel finish panel.
5. Position the driver side carpet aside.
6. Position interior auxiliary junction box (AJB) aside.
 1. Remove the nuts.
 2. Position the AJB aside.



7. Remove the nuts, bolt and position the FEM aside.



8. Remove the FEM.
 1. Disconnect the six electrical connectors.
 2. Remove the FEM.



9. To install, reverse the removal procedure.
-

General Specifications

Item	Specification
Adhesives	
Weatherstrip Adhesive E8AZ-19552-A	ESB-M2G14-A
Lubricants	
Silicone Lubricant F7AZ-19G208-BA	ESR-M13P4-A
Sealers	
Liquid Butyl Sealer F8AZ-19554-CA	ESB-M4G162-A
3M Strip Caulk-Black 051135-08578	WSB-M4G32-C
Silicone Gasket and Sealant F7AZ-19554-EA	WSE-M4G323-A4

Body

Body and Sheet Metal

The body:

- is a uni-body open cowl structure.
 - is constructed of a monocoque, lightweight, all-steel material with removable bolted hood (16612), front fenders (16005), doors, and luggage compartment lid.
-

Insulation

Insulation is comprised of urethane, PVC, and recycled felt. Insulation is installed:

- under the roof panel.
 - above and below the instrument panel.
 - on the cowl sides.
 - over the front and rear floor areas.
 - in the B-pillar and C-pillar sections.
-

Body Sealer Types and Applications

Liquid Butyl Sealer

Liquid Butyl Sealer F8AZ-19554-CA or equivalent meeting Ford Specification ESB-M4G162-A:

- does not run.
- is fast drying.
- remains semi-elastic.
- can be used for seam sealing on the floor pan, wheelhouse, door openings, and drip rails.

Caulking Cord

3M Strip Caulk-Black 051135-08578 or equivalent meeting Ford specification WSB-M4G32-C:

- is a heavy-bodied, plastic base with a filler.
- is commonly known as perma-gum.
- is used on spot-welds holes and between surfaces not sealed with a gasket.

Weatherstrip Adhesive

Weatherstrip Adhesive E8AZ-19552-A or equivalent meeting Ford specification ESB-M2G14-A:

- is a quick drying, strong adhesive designed to hold weatherstripping onto all body panels and surrounding metal.

Silicone Lubricant

Silicone Lubricant F7AZ-19G208-BA meeting Ford specification ESR-M13P4-A:

- is used to keep the door and the window weatherstrip pliable and soft.
 - should be applied to the weatherstrip at every lubrication period.
 - makes the door easier to close.
 - retards weatherstrip squeaks.
 - retards weatherstrip wear.
 - helps retain door window alignment by reducing friction between the glass frame and the rubber weatherstrip.
 - should not be used prior to painting.
-

Body System

Inspection and Verification

Leaks

NOTE: Trim will reveal the location of most leaks.

1. Remove any trim or carpet in the general area of the leak.
2. Road test or water test the vehicle.
3. Inspect for a dust pattern around the area in question. Inspect for water paths near and above the area in question.
4. Some leaks can be located by placing bright light under the vehicle, removing any necessary trim or carpet, and inspecting the interior of the body at joints and weld lines.

Noise

Wind noise, rattles and their sources are detected by driving the vehicle at highway speeds. The vehicle should be driven in four different directions with all of the windows closed, the radio off, the blower motor off, and all of the ventilation ducts open.

Most wind noise leaks will occur at the door and window seals or at the sheet metal joints in the door or the door opening.

Symptom Chart

Symptom Chart

Condition	Possible Sources	Action
<ul style="list-style-type: none">● Dust and water leaks	<ul style="list-style-type: none">● Body sealer missing.● Opening in weldings or body joints.● Components not fully installed.● Components missing.● Components damaged.	<ul style="list-style-type: none">● REMOVE trim. CHECK for leaks and SEAL with appropriate sealer. ROAD TEST or WATER TEST for leaks. RECHECK trim for leaks; USE light under the vehicle with trim removed. CHECK interior of body at joints and weld lines.
<ul style="list-style-type: none">● Dust/water leaks at floor pan and grommets	<ul style="list-style-type: none">● Missing or damaged plugs and/or grommets.	<ul style="list-style-type: none">● CHECK plugs for proper installation. REPLACE if necessary.
<ul style="list-style-type: none">● Door drain holes collecting water	<ul style="list-style-type: none">● Holes clogged with mud or road tar.	<ul style="list-style-type: none">● CLEAN drain holes of dirt and foreign material with a punch or screwdriver. CHECK drain holes regularly. TEST the

		system for normal operation.
<ul style="list-style-type: none"> ● Wind noise, air entering vehicle through small holes in body 	<ul style="list-style-type: none"> ● Leaks at door and window seals or sheet metal joints in doors or door openings. 	<ul style="list-style-type: none"> ● SEAL leaks with Silicone Gasket and Sealant F7AZ-19554-EA meeting Ford specifications WSE-M4G323-A4. ROAD TEST.
<ul style="list-style-type: none"> ● Rattles 	<ul style="list-style-type: none"> ● Loose objects in wells, pillars, and quarter panels. ● Misalignment (if tightening bolts does not eliminate rattle). ● Weatherstripping, anti-squeak material. 	<ul style="list-style-type: none"> ● CHECK doors by carefully STRIKING underside of door with a rubber mallet. LISTEN for loose objects in door. REPAIR. TIGHTEN body bolts and screws. ● REFER to Section 501-03. ● APPLY additional sealer. INSTALL in proper location to eliminate rattle.

General Specifications

Item	Specification
RH wiper blade adjustment tolerance	12 mm (.47 in)
LH wiper blade adjustment tolerance	10 mm (.39 in)

Torque Specifications

Description	Nm	lb-ft	lb-in
Radiator grille opening panel to front fender bolts	11	8	—
Radiator grille opening panel bolts	11	8	—
Pivot arm nuts	25	18	—
Front fender bolts	9	—	80
Hood assist strut ball stud	16	12	—
Speed control module to front fender bolts	10	7	—

Front End Body Panels

The grille opening reinforcement:

- is bolted to the fenders and bumper beam.
- retains the headlamp assemblies and bumper cover.

The cowl vent screen is a two-piece component. The right side of the cowl vent screen may be removed without the removal of the windshield wiper pivot arm.

Cowl Vent Screen

Removal

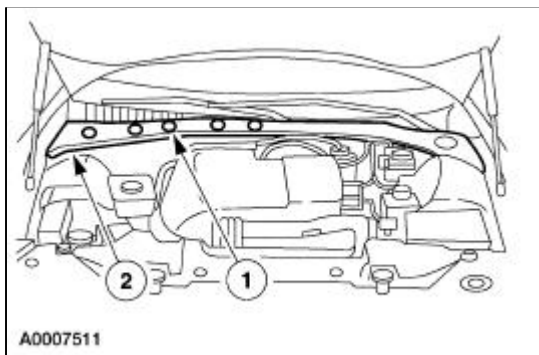
NOTE: To remove the left side cowl vent screen, the right cowl vent screen must be removed first. Follow the entire cowl vent screen procedure.

Right Side Only

1. **NOTE:** The fasteners are reusable.

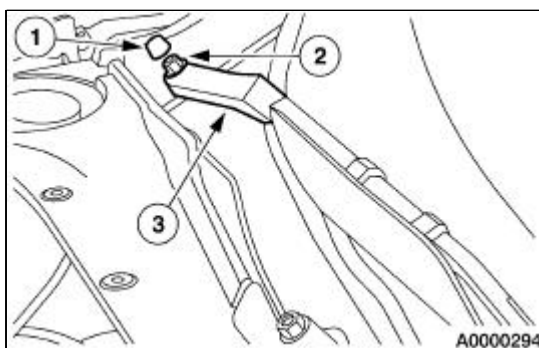
Remove the right side of the cowl vent screen.

1. Remove the two-part pin-type retainers and separate the Velcro® attachment of the rubber hinge cover to the rear outboard corner of the cowl vent screen.
2. Pull up on the cowl vent screen to release the lower clips.



Entire Cowl Vent Screen

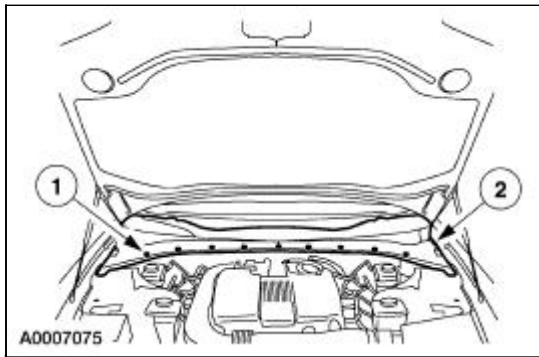
2. Remove the two wiper pivot arms.
 1. Remove the two pivot arm nut covers.
 2. Remove the two nuts.
 3. Remove the two wiper pivot arms.



3. **NOTE:** Remove the right side first when removing the entire cowl vent screen.

Remove the cowl vent screen.

1. Remove the two-part pin-type retainers and separate the Velcro® attachment of the rubber hinge cover to the rear outboard corner of the cowl vent screen.
2. Lift up on the cowl vent screen to release the clips.

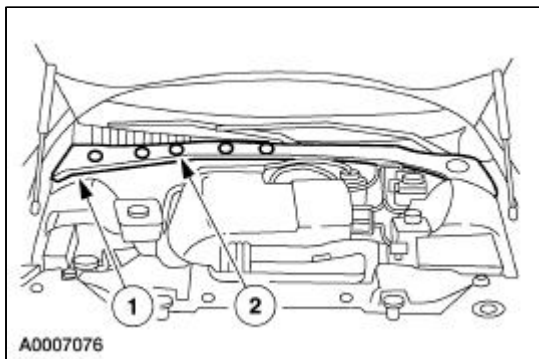


Installation

NOTE: When installing the entire cowl vent screen, install the left side first. Follow the entire cowl vent screen procedure.

Right Side Only

1. Install the right side of the cowl vent screen.
 1. Position the cowl vent screen and the Velcro® attachment of the rubber hinge cover.
 2. Install the two-part pin-type retainers.

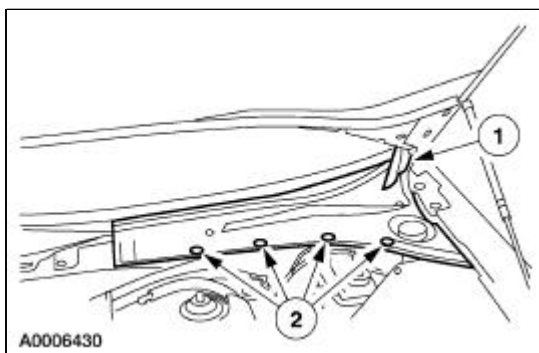


Entire Cowl Vent Screen

2. **NOTE:** Use the lower rearward clips as locators prior to installation, working from the center of the vehicle outward.

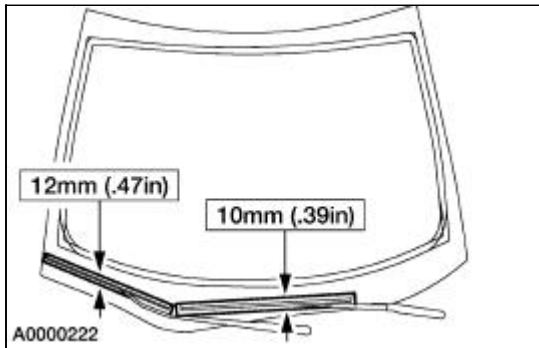
Install the cowl vent screen.

1. Position the windshield moulding flap over the left side cowl vent screen and attach the rubber hinge cover to the cowl screen.
2. Install the cowl vent screens and install the two-part pin-type retainers.

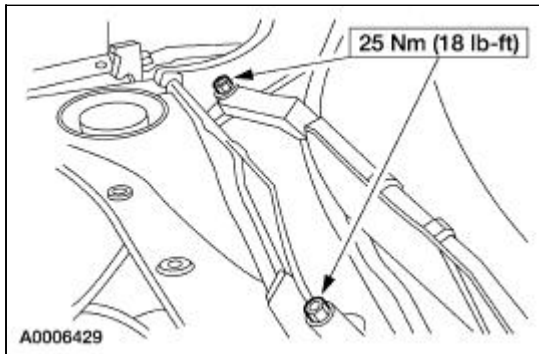


3. Cycle the windshield wiper motor to park the windshield wiper pivot arm shafts.

4. Install the windshield wiper and pivot arms onto the pivot shaft and align the blade to the heated wiper park/windshield wire lines on the windshield glass within the specification.



5. Tighten the windshield wiper pivot arm nuts.
 - Install the two pivot arm nut covers.



Fender

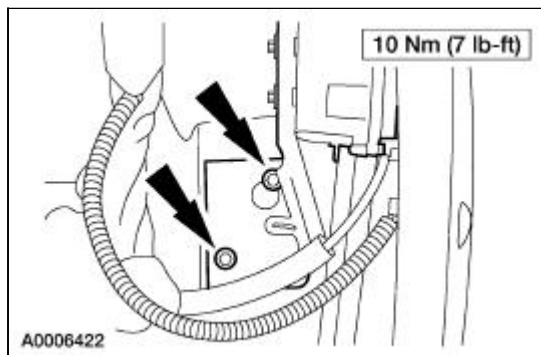
Removal and Installation

LH or RH Side

1. Remove the front bumper cover. For additional information, refer to [Section 501-19](#).
2. Remove the wheel and tire assembly. For additional information, refer to [Section 204-04](#).
3. Remove the front and rear inner splash shield.

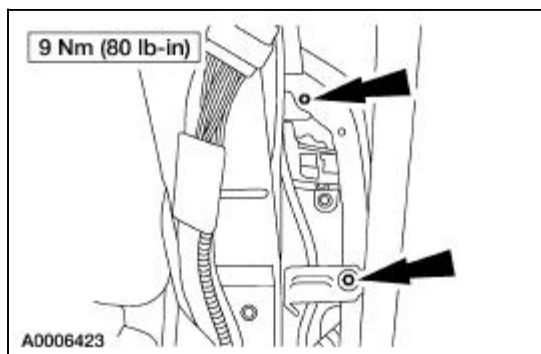
LH Side Only

4. Position the speed control module aside.
 - Loosen the top bolt.
 - Remove the bottom bolt.

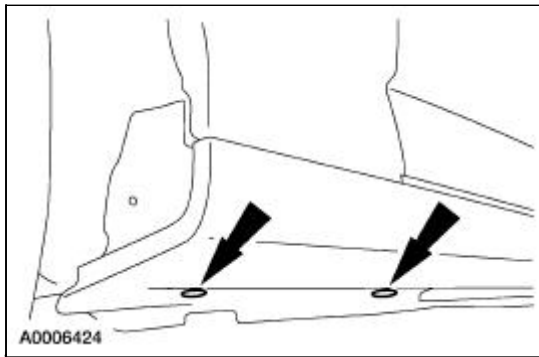


LH or RH Side

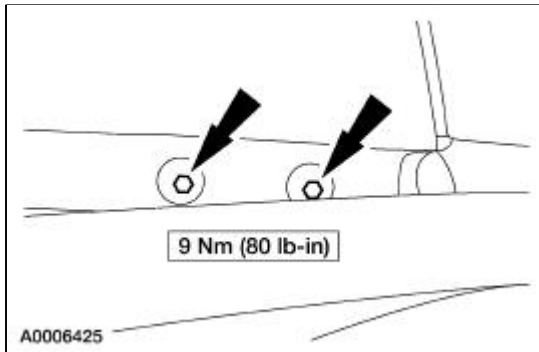
5. Remove the fender stuffer.
6. Remove the inner front fender bolts.



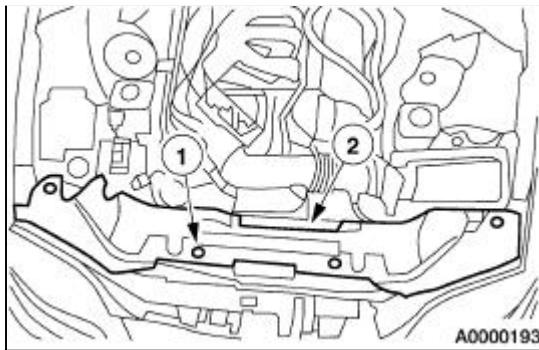
7. Remove the two front two-part pin-type retainers and position the front rocker moulding aside.



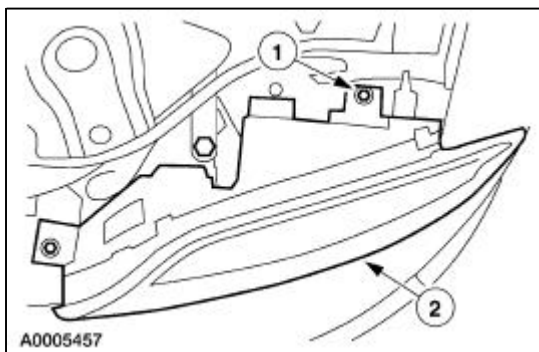
8. Remove the lower front fender bolts.



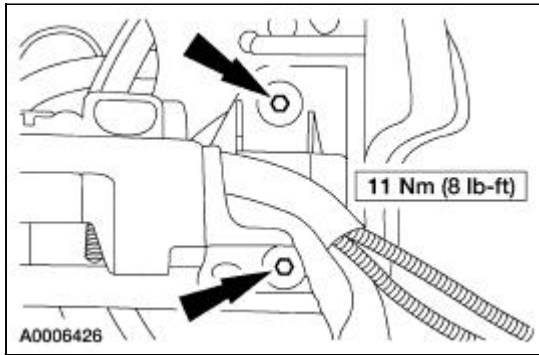
9. Remove the radiator upper sight shield.
 1. Remove the retainers.
 2. Remove the radiator upper sight shield.



10. Remove the headlamp assembly.
 1. Remove the three bolts.
 2. Remove the headlamp assembly.
 - Disconnect the electrical connector.



11. Remove the radiator grille opening panel to front fender bolts.

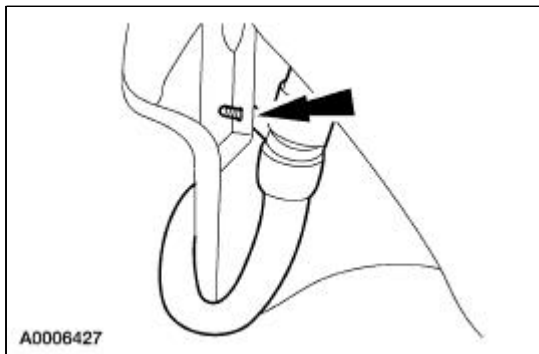


LH Side Only

12. Position the splash shield aside.

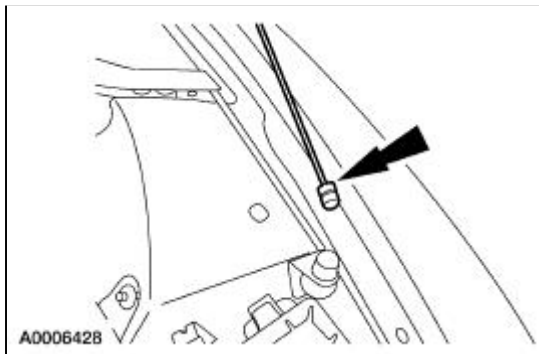
LH or RH Side

13. Disengage the wiring harness locator.

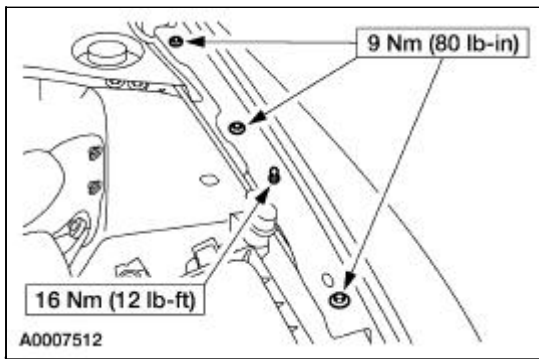


14. **NOTE:** Support the hood using a prop rod.

Disengage the lower hood assist strut.



15. Remove the front fender bolts and the hood assist strut ball stud.

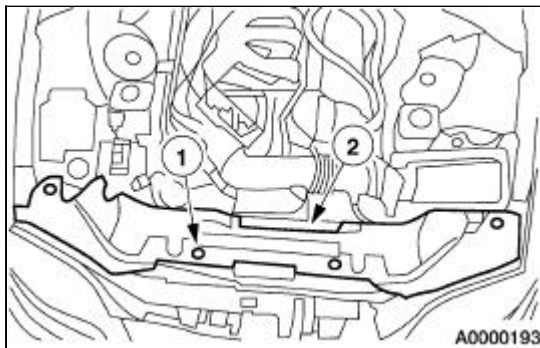


16. Remove the front fender.
 17. To install, reverse the removal procedure.
-

Radiator Grille Opening Panel

Removal and Installation

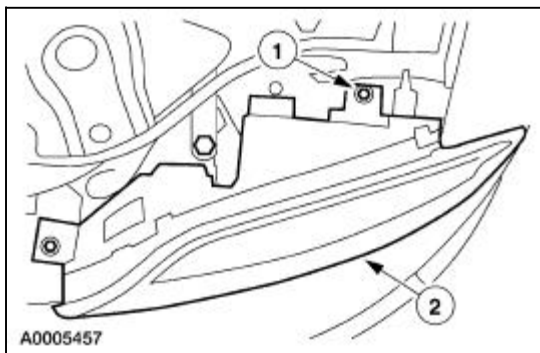
1. Remove the front bumper cover. For additional information, refer to [Section 501-19](#).
2. Remove the radiator upper sight shield.
 1. Remove the retainers.
 2. Remove the radiator upper sight shield.



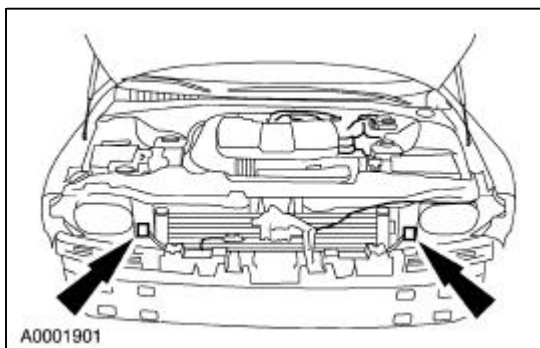
3. **NOTE:** LH side shown, RH side similar.

Remove the two headlamp assemblies.

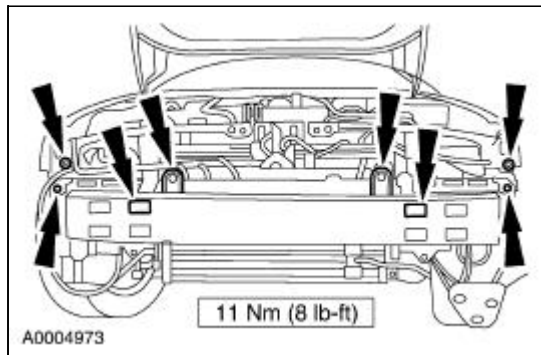
1. Remove the six bolts.
 2. Remove the headlamp assemblies.
- Disconnect the electrical connector.



4. Release the wiring harness fasteners and position the wiring harnesses rearward.



5. Remove the radiator grille opening panel bolts and the brackets.



6. Remove the radiator grille opening panel.
 7. To install, reverse the removal procedure.
-

General Specifications

Item	Specification
Premium Long Life Grease XG-1-C or XG-1-K	ESA-M1C75-B
Silicone Lubricant C0AZ-19553-A	ESR-M13P4-A
Silicone Lubricant (Spray) F5AZ-19533-AA	ESR-M13P4-A
Multi-Purpose Grease Spray F5AZ-19G209-AA	ESR-M1C159-A

Torque Specifications


Description	Nm	lb-ft
Door check strap nuts	12	9
Door check strap screws	12	9
Door latch striker bolts	40	30
Hinge to door bolts	30	22
Hinge to luggage compartment lid bolts	12	9
Inner front door support bracket nuts and bolt	12	9

Torsion Bar Loading

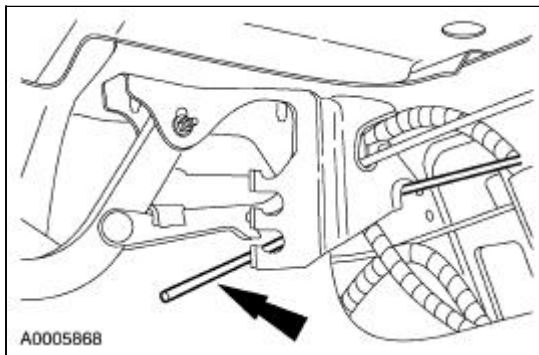
 **WARNING:** Safety glasses must be worn when carrying out this operation. Failure to follow these instructions may result in physical injury.

1. **NOTE:** The luggage compartment lid tension should be decreased if the luggage compartment lid (40110) opens with more force than desired. The luggage compartment lid tension should be increased if the luggage compartment lid opens with less force than desired.

Open and support the luggage compartment lid in the full-open position.

2.  **WARNING:** Use care when adjusting the luggage compartment lid torsion bar. It is under tension and could spring out of control if it is not handled correctly. Failure to follow these instructions could result in personal injury.

Move the luggage compartment lid end of the luggage compartment lid torsion bar to another position.



3. Check the adjustment.
4. If required, move the luggage compartment lid end of the luggage compartment lid torsion bar to another position.

Door

Removal

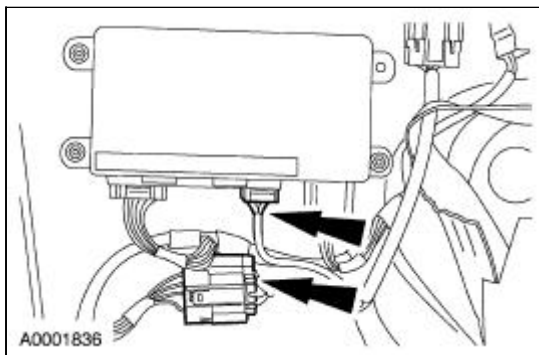
All Doors

1. Remove the door trim panel. For additional information, refer to [Section 501-05](#).
2. Remove the screws and the speaker.

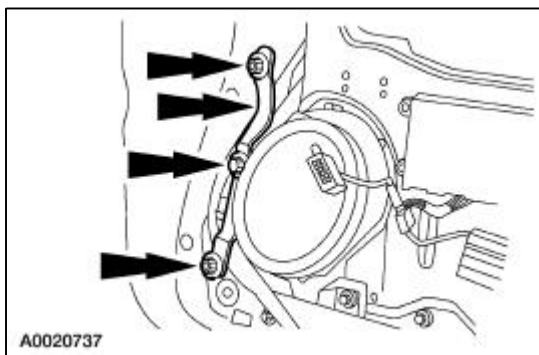
Front Door

3. **NOTE:** Driver door shown, passenger door similar.

Disconnect the electrical connectors.



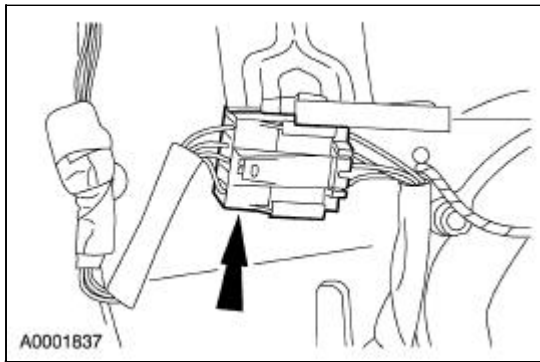
4. Remove the two nuts, the bolt and the inner front door support bracket.



5. Release the wiring harness locators.

Rear Door

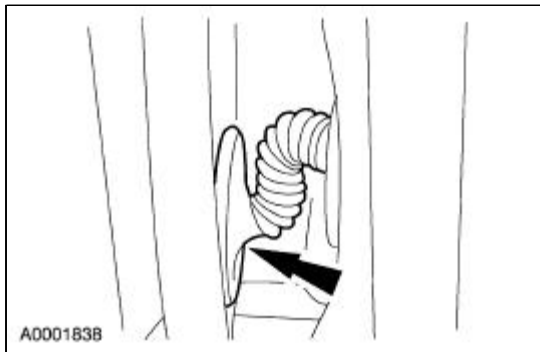
6. Disconnect the electrical connector.



7. Release the wiring harness locators.

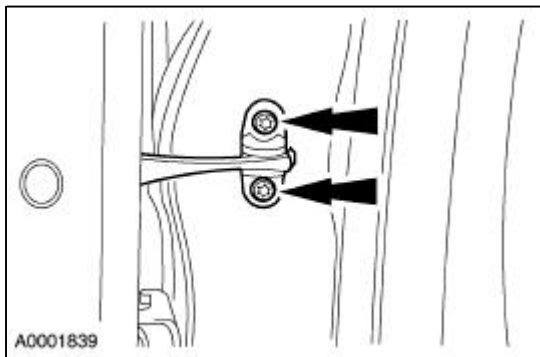
All Doors

8. Remove the grommet and wiring harness.

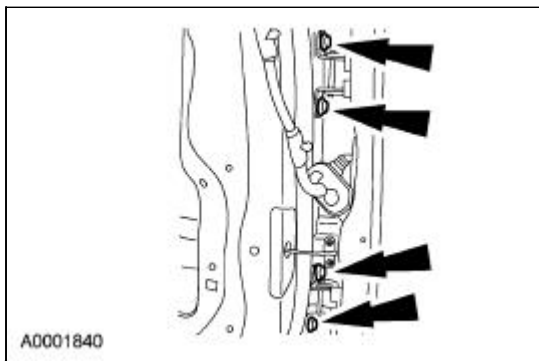


9.  **CAUTION: Do not close the door after the door check screws have been removed.**

Remove the door check strap screws.



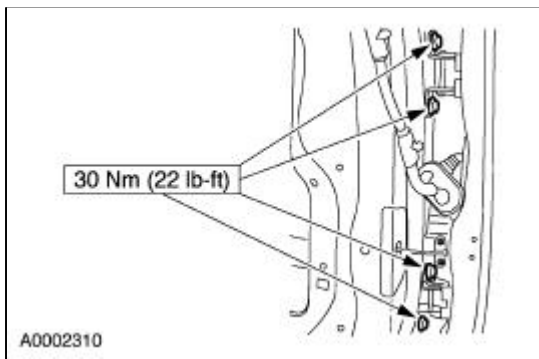
10. Mark the hinge location on the door.
11. **NOTE:** An assistant is required to support the door during its removal.
Remove the hinge to door bolts and the door.



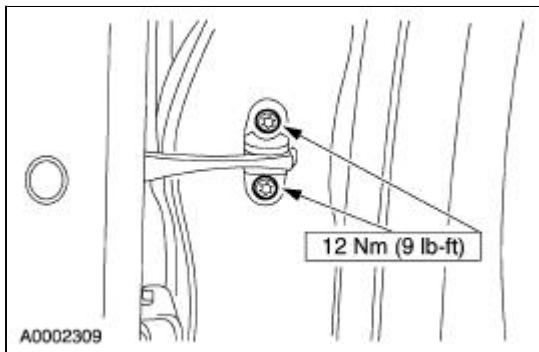
Installation

All Doors

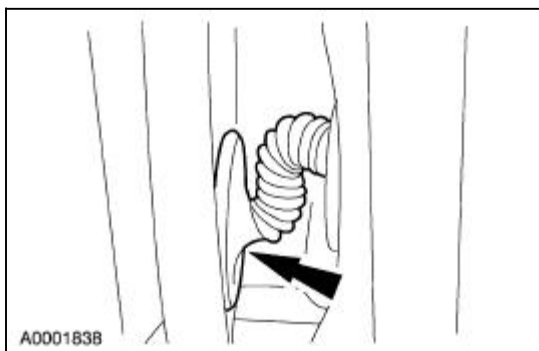
1. Position the door and install the hinge to door bolts.



2. Install the door check strap screws.

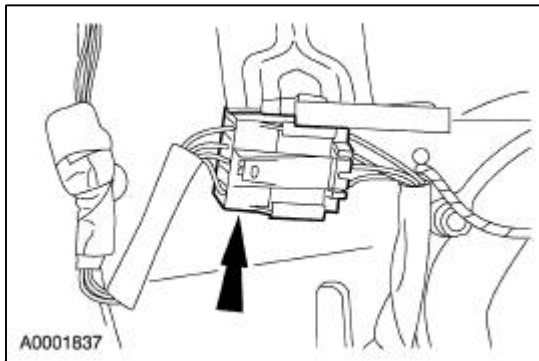


3. Install the grommet and the wiring harness.



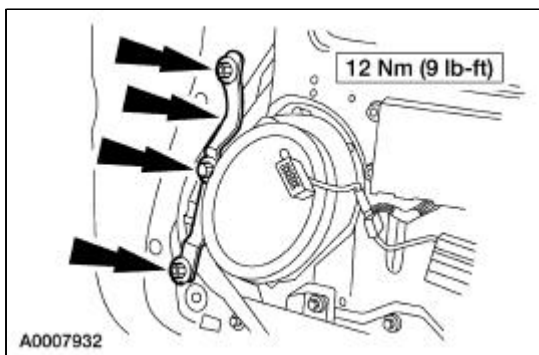
Rear Door

4. Connect the electrical connector.

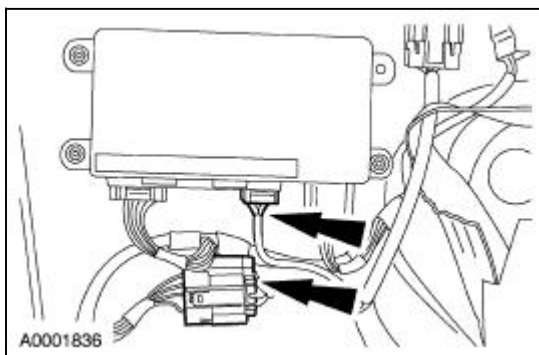


Front Door

5. Install the front door support bracket, the two nuts and the bolt.



6. Connect the electrical connectors.



All Doors

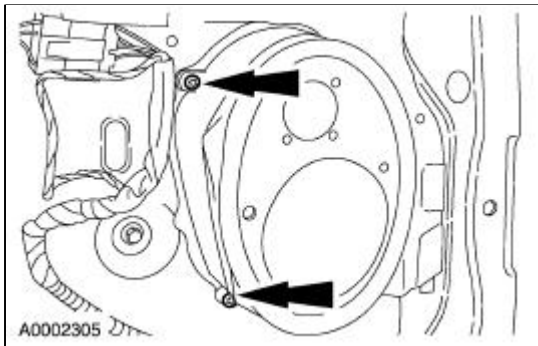
7. Install the screws and the speaker.
 8. Install the door trim panel. For additional information, refer to [Section 501-05](#).
 9. Check the door for a flush fit to the body.
-

Door —Check Strap

Removal and Installation

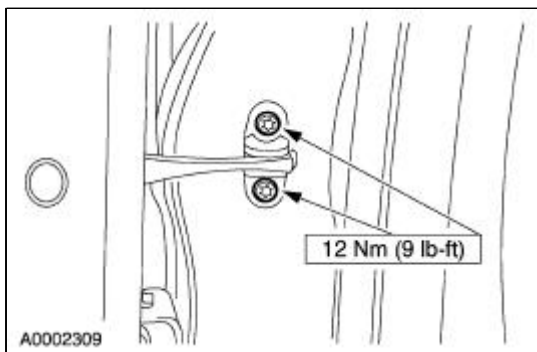
All Doors

1. Remove the door trim panel. For additional information, refer to [Section 501-05](#).
2. Remove the screws and the speaker.



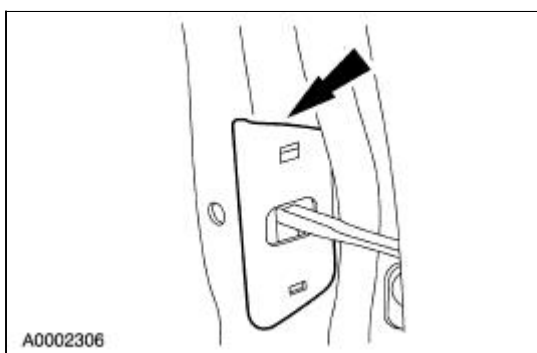
3.  **CAUTION:** Do not close the door after removal of the check strap screws

Remove the door check strap screws.



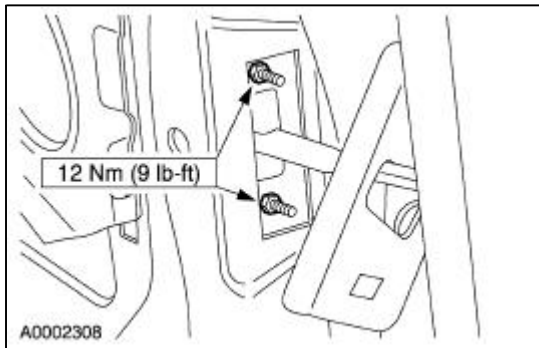
Rear Door

4. Remove the cover.



All Doors

5. Remove the nuts and the door check strap.



6. To install, reverse the removal procedure.
-

General Specifications

Item	Specification
Adhesives	
Headliner Adhesive	WSS-M2G355-B
F1VY-19562-A	

Torque Specifications

Description	Nm	lb-ft
Front seat safety belt nut	40	30
Rear safety belt anchor bolt	40	30

Interior Trim



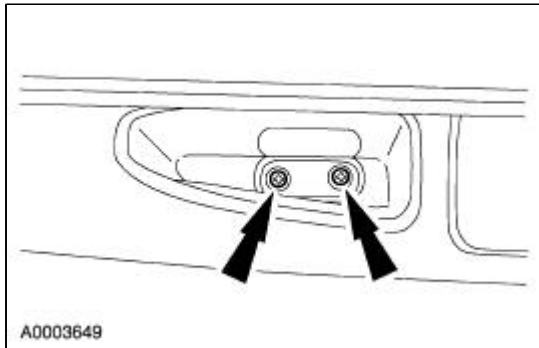
CAUTION: Many of the interior trim panels use concealed fasteners. Use caution when removing or replacing the interior trim panels to avoid damaging the panels.

The shoulder safety belt height adjuster must be at its highest setting before installing the upper B-pillar trim panel to prevent safety belt binding.

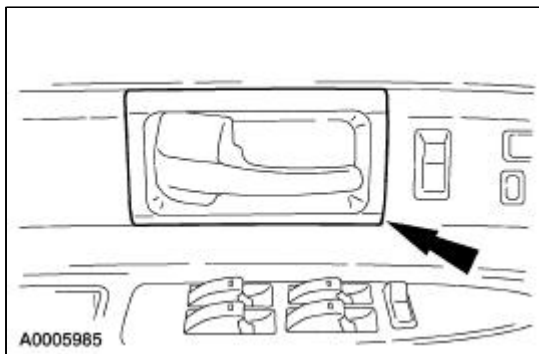
Trim Panel —Front Door

Removal

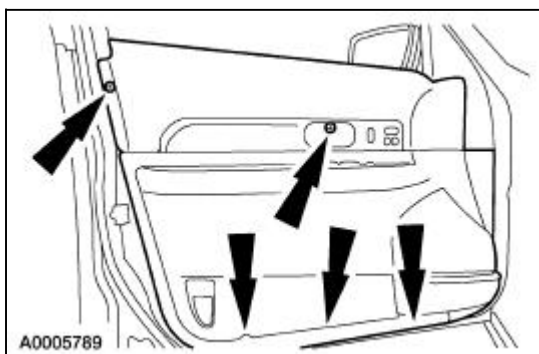
1. Disconnect the battery ground cable. For additional information, refer to [Section 414-01](#).
2. Lift the cover and remove the screws.



3. Remove the interior door handle trim panel.



4. Remove the five screws and remove the trim panel.
 - Disconnect the electrical connectors.



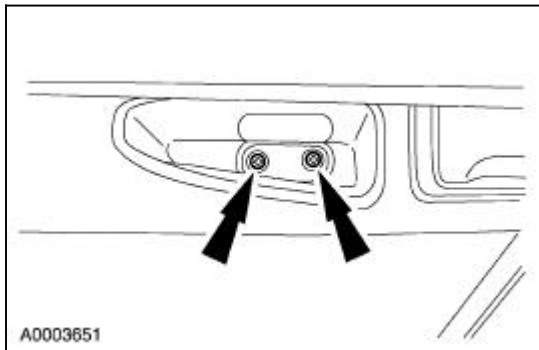
Installation

1. To install, reverse the removal procedure.

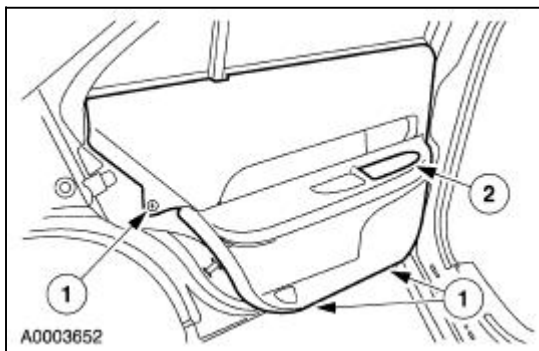
Trim Panel —Rear Door

Removal

1. Lift the cover and remove the screws.



2. Remove the door trim panel.
 1. Remove the three screws.
 2. Remove the ashtray assembly.
 - Disconnect the electrical connectors.



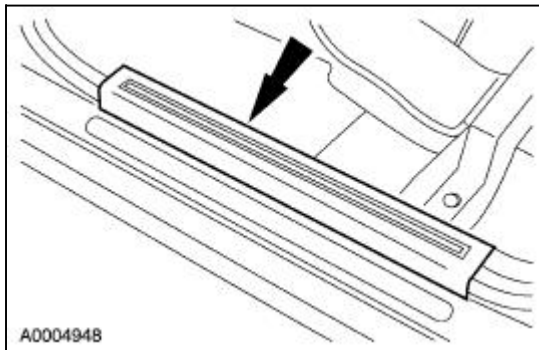
Installation

1. To install, reverse the removal procedure.

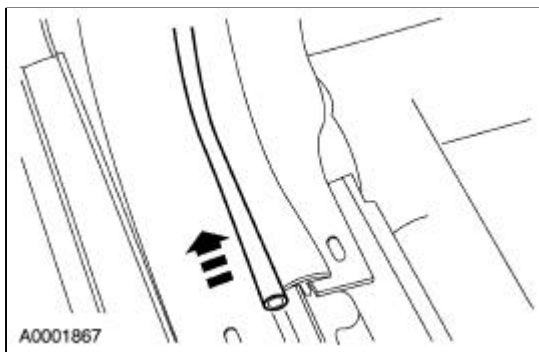
Trim Panel —A-Pillar Lower

Removal

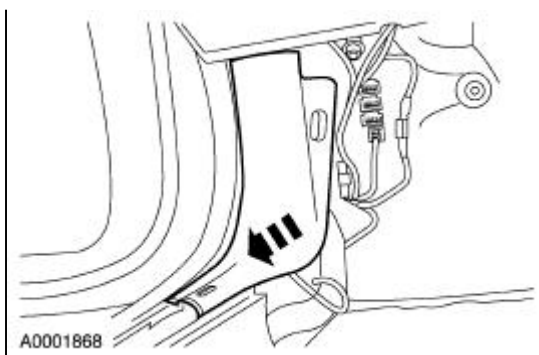
1. Remove the front scuff plate.



2. Pull back the weatherstrip.



3. Remove the A-pillar lower trim panel.



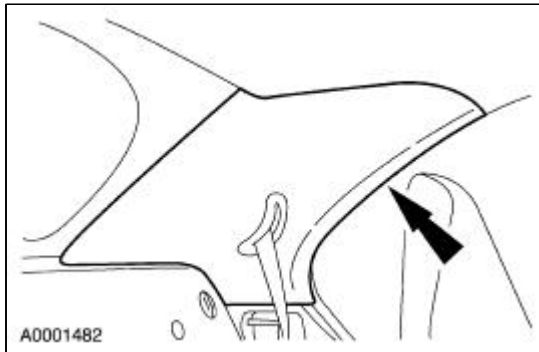
Installation

1. To install, reverse the removal procedure.

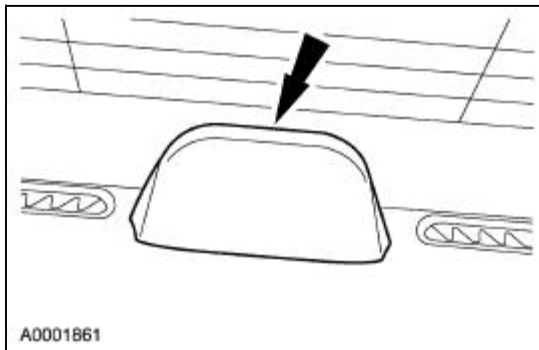
Trim Panel —Package Tray

Removal

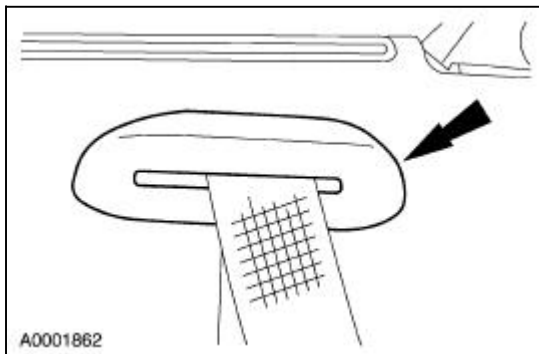
1. Remove the rear seat bolsters. For additional information, refer to [Section 501-10](#).
2. Position the two quarter trim panels aside.



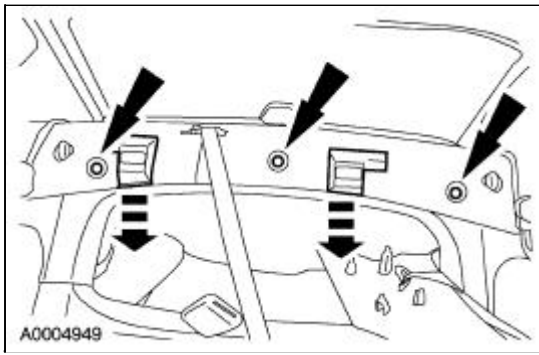
3. Remove the rear high mounted stoplamp (HMSL) cover.



4. Remove the rear center safety belt cover.



5. Remove the pin-type retainers and pull down the rear seat latch covers.



6. Remove the package tray trim panel.

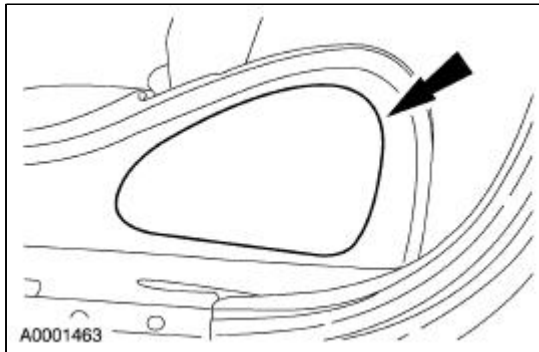
Installation

1. To install, reverse the removal procedure.
-

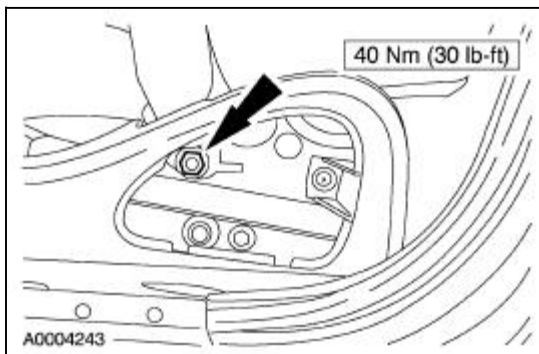
Trim Panel —Upper B-Pillar

Removal

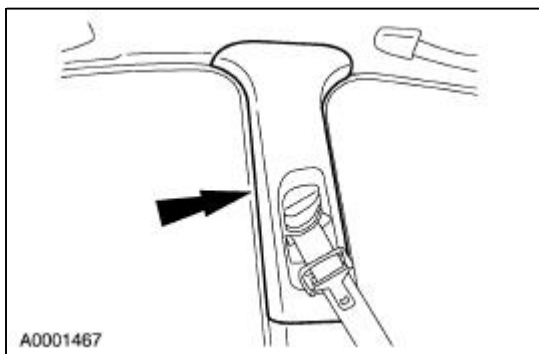
1. Pull back the weatherstrip surrounding the upper B-pillar trim.
2. Remove the front seat safety belt cover.



3. Remove the front seat safety belt nut.



4. Remove the upper B-pillar trim.



Installation

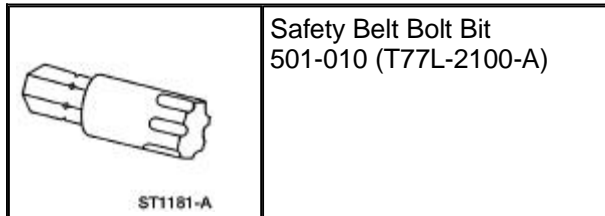
1. **NOTE:** Position the shoulder safety belt height adjuster at its highest setting before installing the B-pillar trim.

To install, reverse the removal procedure.

- Check the restraint system for correct operation.
-

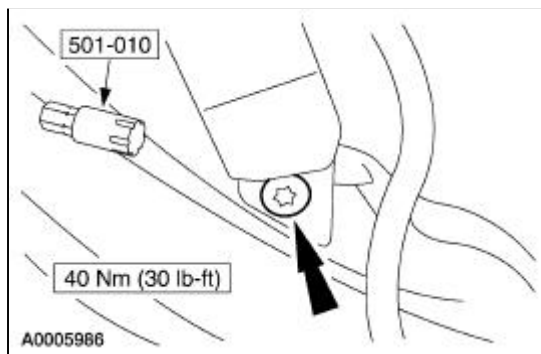
Trim Panel —Quarter

Special Tool(s)

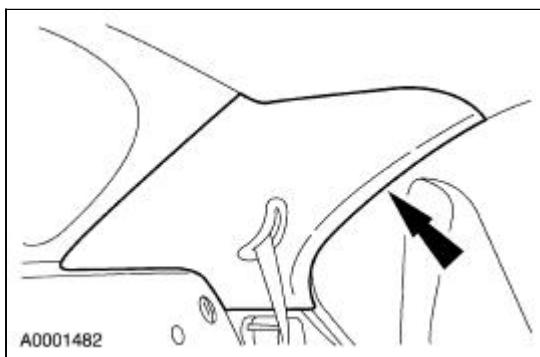


Removal

1. Remove the rear seat bolster. For additional information, refer to [Section 501-10](#).
2. Using the special tool, remove the rear safety belt anchor bolt.



3. Remove the quarter trim panel.



Installation

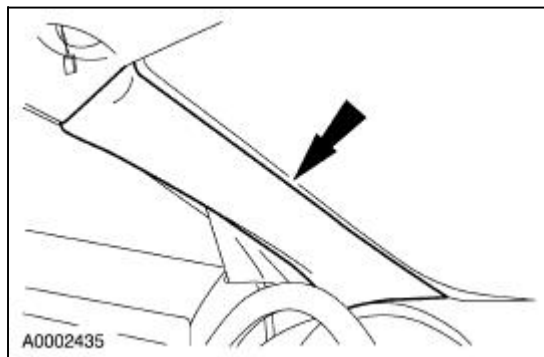
1. **NOTE:** Position the weatherstrip over the quarter trim panel.

To install, reverse the removal procedure.

- Check the restraint system for correct operation.

Trim Panel —Windshield Side Garnish Moulding

1. Position the weatherstrip aside.
2. Remove the windshield side garnish moulding.



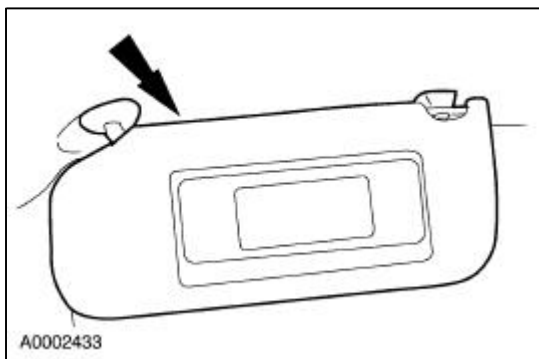
Installation

1. To install, reverse the removal procedure.
-

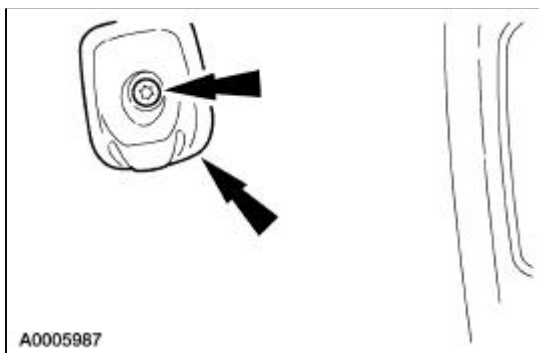
Headliner

Removal

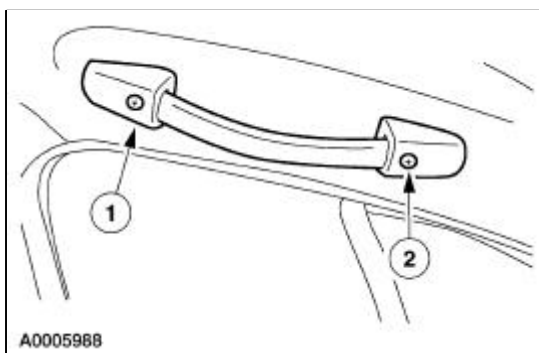
1. Move the front passenger seat fully rearward and fully recline.
2. Move the driver seat fully forward and the seat backrest fully upright.
3. Remove the screws and the sun visors.
 - Disconnect the electrical connectors.



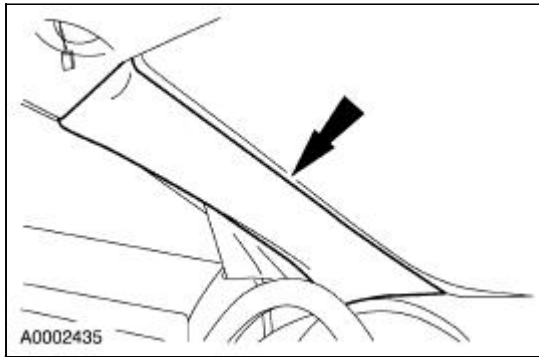
4. Remove the screws and the sun visor clips.



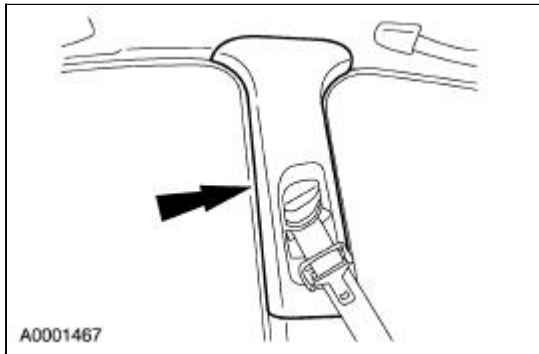
5. Remove the four assist handles.
 1. Position the end caps aside.
 2. Remove the screws.



6. Remove the windshield side garnish mouldings.



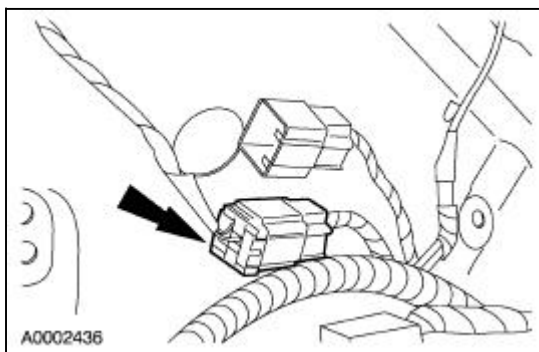
7. Position the upper B-pillar trim aside.



8. Position the upper portion of the door weatherstrip seals aside.
9. Remove the quarter trim panels. For additional information, refer to [Trim Panel—Quarter](#).
10. **NOTE:** Vehicles without moon roofs—Use a plastic scraper to detach the headliner from the roof.

Release the map lamp clips and lower the headliner.

11. Disconnect the electrical connector.



12. Remove the headliner from the left rear door opening.

Installation

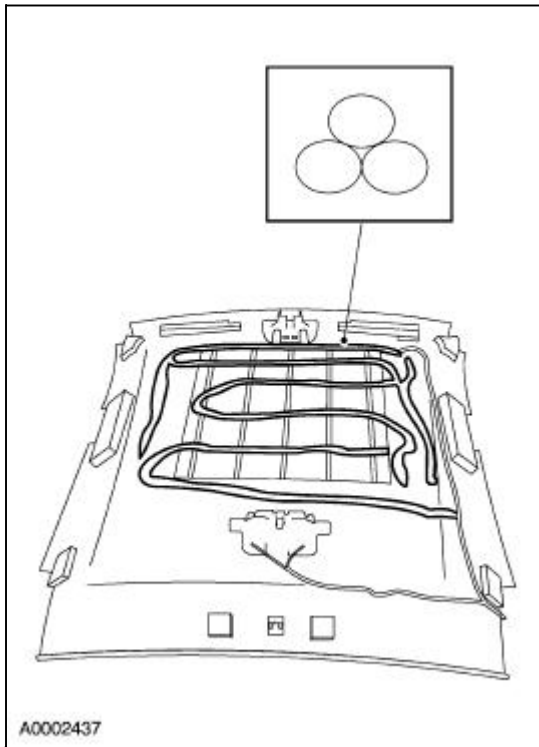
Installing New Headliner

1.  **CAUTION: Folding the headliner will result in damage to the headliner.**

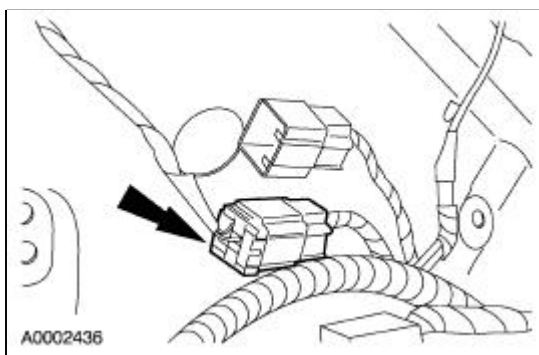
Carefully position the headliner in the vehicle.

2. **NOTE:** Adhesive required for vehicles without moon roofs.

Apply Headliner Adhesive F1VY-19562-A or equivalent meeting Ford specification WSS-M2G355-B in a triangular pattern to the center of the headliner.



3. Connect the electrical connector.



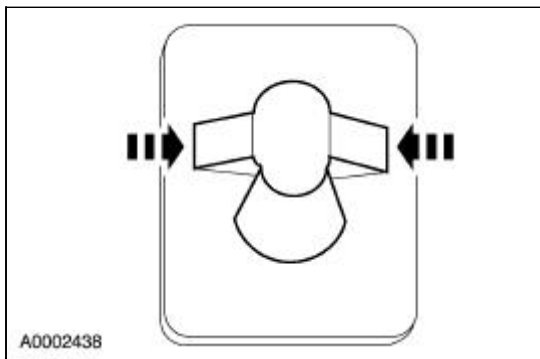
4. Press the headliner against the roof to make sure adhesive contacts both surfaces.

Installing Existing Headliner

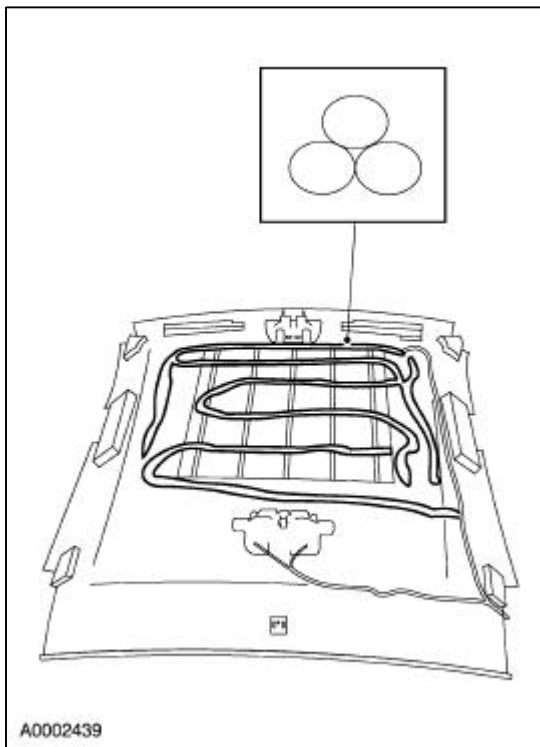
5.  **CAUTION: Folding the headliner will result in damage to the headliner.**

Carefully position the roof headliner in the vehicle.

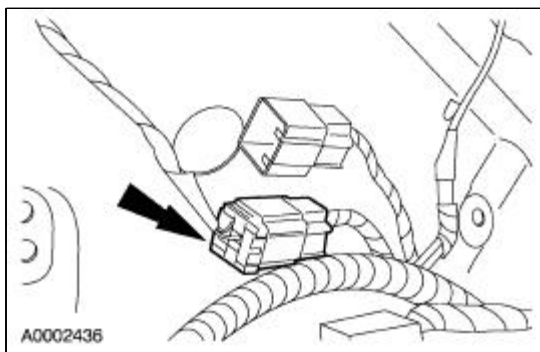
6. Bend the tabs of the rear locator back into their original position.



7. Apply Headliner Adhesive F1VY-19562-A or equivalent meeting Ford specification WSS-M2G355-B in a triangular pattern to the center of the headliner.



8. Connect the electrical connector.

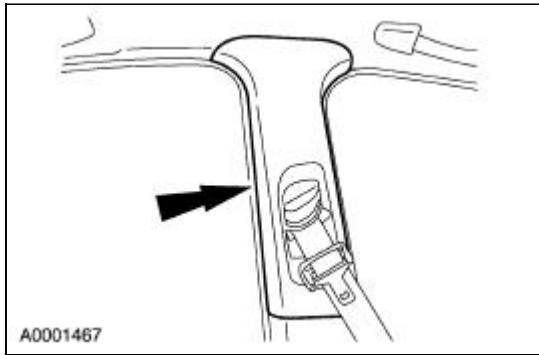


9. Press the headliner against the roof to make sure the adhesive contacts both surfaces.

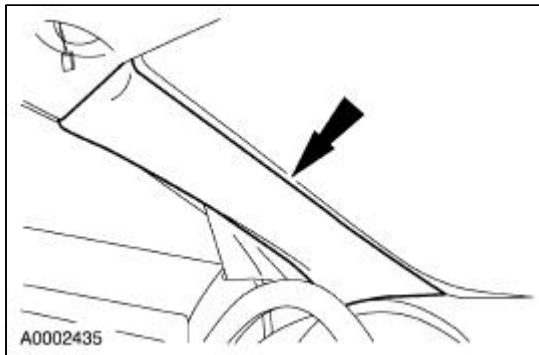
New or Existing Headliner

10. Install the quarter trim panels. For additional information, refer to [Trim Panel—Quarter](#) .

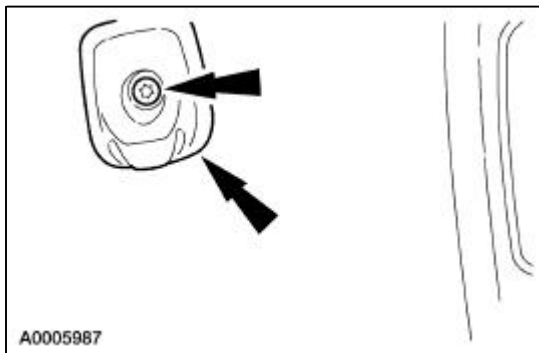
11. Install the upper B-pillar trim.



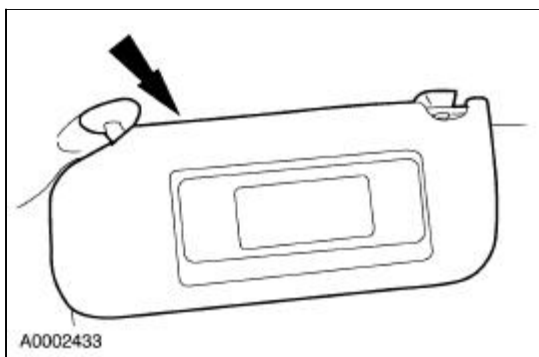
12. Install the windshield garnish mouldings on each side.



13. Position the sun visor clips and install the screws.

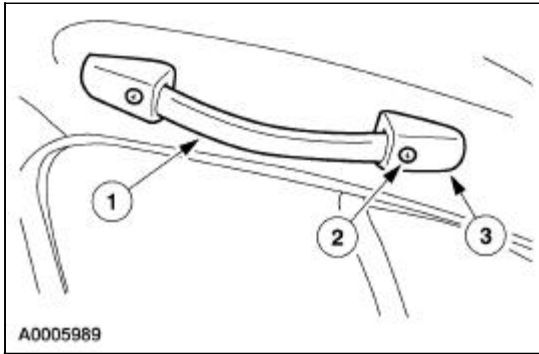


14. Connect the electrical connectors, position the sun visors, and install the screws.



15. Install the four assist handles.
1. Position the assist handles.

2. Install the screws.
3. Install the end caps.

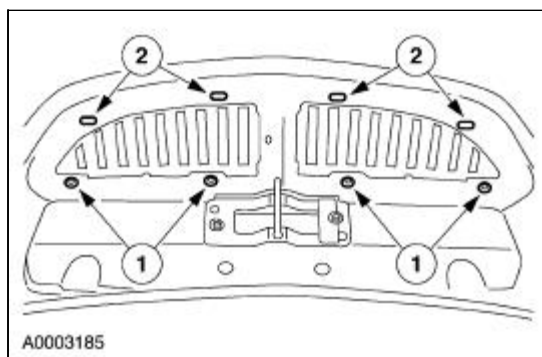


16. Install the door weatherstrips.
 17. Place the seats in upright positions.
-

Radiator Grille

Removal and Installation

1. Open the hood.
2. Remove the radiator grille.
 1. Remove the nuts.
 2. Release the clips.

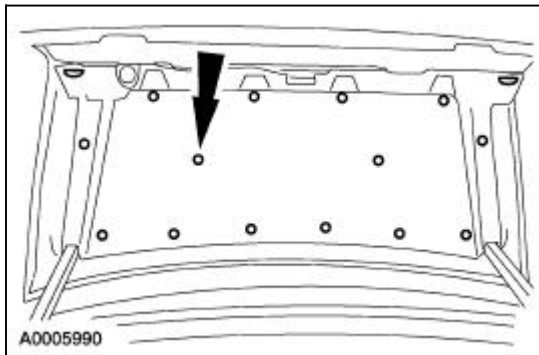


3. To install, reverse the removal procedure.
-

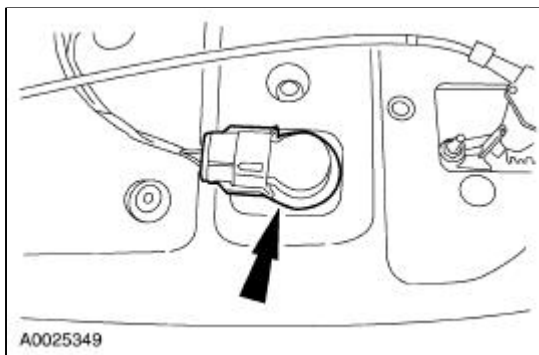
License Plate Housing

Removal and Installation

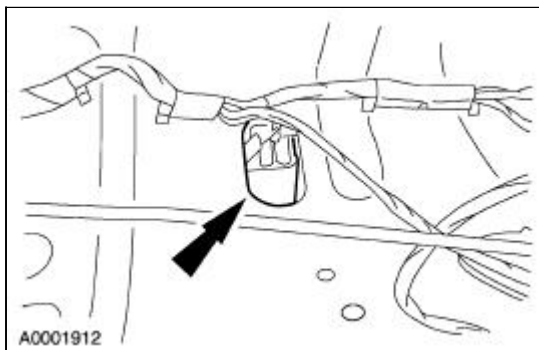
1. Remove the pin-type retainers and the luggage compartment lid trim panel.



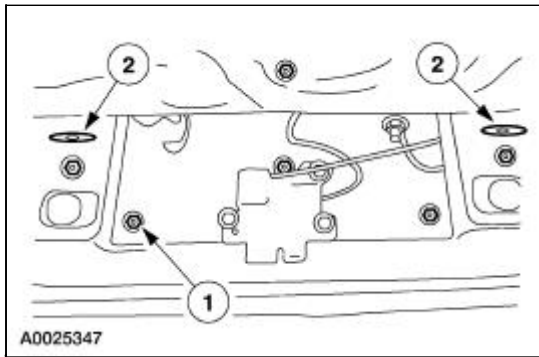
2. Disconnect the two reversing lamp electrical connectors.



3. Disconnect the two license plate lamp electrical connectors.



4. Remove the license plate housing.
 1. Remove the nuts.
 2. Release the retaining clips.



5. To install, reverse the removal procedure.
- Transfer components as necessary.
-

Torque Specifications

Description	Nm	lb-ft	lb-in
Exterior rear view mirror nuts	5	—	44
Mirror motor screws	2	—	18

Rear View Mirrors

Rear View Mirrors

The exterior rear view mirror is:

- electrically operated.
- controlled by the exterior mirror control switch for both vertical and horizontal movement.

The interior rear view mirror features automatic dimming which:

- automatically reduces glare caused by headlamps reflecting in the interior rear view mirror.
- houses two sensors to determine dimmer actuator.
- activates whenever the ignition is in the RUN or ACC position.
- defaults to the NORMAL setting when the transmission is shifted to REVERSE to allow a bright view for backing up.
- is disabled by pushing the mirror-mounted switch to the OFF position.
- can be manually activated or deactivated.

Memory

The memory mirror:

- automatically provides preferred positioning of the exterior rear view mirrors.
- may be recalled through the door-mounted switches, the remote-entry transmitter or keyless entry keypad.
- provides recall when the ignition switch is in the OFF or RUN position and the transmission is in the PARK or NEUTRAL position.
- position is stored in the driver door module (DDM).

Heated Mirrors

The heated mirror function:

- provides electric heating to both the driver and passenger side exterior rear view mirrors.
- raises the temperature of the glass to clear frost and condensation.
- is activated by activating the rear defrost button.
- automatically shuts off after ten minutes.

Electrochromic Interior Rear View Mirror



The optional electrochromic interior rear view mirror:

- is equipped with an automatic dimming feature that controls the interior rear view mirror reflecting surface to reduce glare caused by headlamps reflecting in the mirror.
 - has two integral sensors to control dimming functions.
 - defaults to normal setting when the transmission is shifted to REVERSE to allow a bright view for backing up.
 - can be switched off by pressing the MODE switch to the OFF position.
-

Rear View Mirrors

Refer to Wiring Diagrams Section [501-09](#), Rear View Mirrors for schematic and connector information.

Special Tool(s)

 ST2332-A	Worldwide Diagnostic System (WDS) 418-F224, New Generation STAR (NGS) Tester 418-F052 or equivalent diagnostic tool
 ST1137-A	73 III Automotive Meter 105-R0057 or equivalent

Principles of Operation

Exterior Mirrors

The exterior mirrors are controlled by the exterior rear view mirror control. The exterior rear view mirror control is hardwired to the driver door module (DDM). When the driver exterior rear view mirror is selected, adjustment is carried out by moving the control to the desired position. The DDM receives the adjustment input command from the exterior rear view mirror control and supplies power and ground to the appropriate exterior rear view mirror motor to adjust the exterior rear view mirror. The passenger exterior rear view mirror is controlled by the front electronics module (FEM). When the DDM receives an adjustment command for the passenger exterior rear view mirror, the DDM interprets the command and sends the adjustment command over the SCP communication network to the FEM. The FEM interprets the command and supplies power and ground to the appropriate exterior rear view mirror motor to adjust the exterior rear view mirror.

Memory Operation

The DDM and FEM constantly track mirror position. Each exterior mirror motor is equipped with a potentiometer, which the modules monitor to track the mirror position. This position remains in memory as long as the module retains power. When a position is stored in memory by the operator, the module will retain this position in memory for future recall. When a memory position is recalled by the operator, the DDM and FEM will power the exterior mirror motors simultaneously and monitor the potentiometer circuits. When the stored memory position is reached, the DDM and FEM will remove power from the motors. If the exterior rear view mirror control is operated during a memory recall, the modules will stop the memory recall and respond to the exterior rear view mirror control command.

Heated Exterior Mirrors

The heated exterior mirrors will only function when the rear window defrost is operating. There is no separate control for heated exterior mirrors, they will function anytime the rear window defrost is ON. For additional information on the rear window defrost, refer to [Section 501-11](#).

The heated mirror power is supplied by the rear window defrost relay through a separate battery junction box (BJB) fuse that isolates the heated mirrors from the rear window defrost in the event of a concern.

Automatic Dimming Mirror

The automatic dimming mirror will lighten or darken depending on the input of the sensors that are internal to the mirror.

The automatic dimming mirror reverse input is supplied by a hardwired circuit to the rear electronic module (REM). When REVERSE is selected, the REM will receive the PRNDL message over the SCP communication network from the PCM stating reverse has been selected. The REM will then supply a power signal to the automatic dimming mirror causing the automatic dimming mirror to cancel any dimming function currently operating and return to a full bright status. When the gear selector is moved out of REVERSE, the automatic dimming mirror returns normal operation and resumes any interrupted dimming functions.

If the REM does not receive the PRNDL information from the PCM, a communication DTC will be logged. As a default, the REM will supply power to the dimming circuit preventing the automatic dimming function from operating until the message and communication is restored.

The reverse message supplied to the REM has a time delay before the message is sent by the PCM. This delay allows for the gear selector to be moved through REVERSE without canceling dimming operations.

Switched System Power (SSP)

The SSP is invoked by both the FEM and REM. This function removes power from relays that provide power to the exterior lamps, interior lamps, and power door locks. This is only accomplished when both the FEM and the REM are in sleep mode. The sleep function of the FEM and REM places the modules in sleep mode when the ignition switch is in the OFF position, and no wake up (inputs) signals occur for 30 minutes. The module will not sleep if the parking lamps or the hazard lamps are active. The following relays are controlled by the SSP function: SSP1, SSP2, SSP3, and SSP4. When either the FEM or REM are not in sleep mode, all SSP relays will be energized. Each relay, when energized, will supply power to multiple features/functions. For additional information, refer to the SSP Relay Index for diagnosis and testing of SSP-related issues.

Inspection and Verification

1. Verify the customer concern by operating the system.
2. Visually inspect for obvious signs of mechanical or electrical damage.

Visual Inspection Chart

Mechanical	Electrical
<ul style="list-style-type: none"> ● Damaged exterior rear view mirrors ● Damaged interior rear view mirror 	<ul style="list-style-type: none"> ● Battery junction box (BJB) Fuses 406 (10A), 409 (5A), 422 (20A), 423 (30A), 424 (30A), 425 (40A), 427 (30A), and 432 (30A). ● Central junction box (CJB) Fuse 207 (5A), 216 (5A), 222 (10A), and 235 (5A). ● Switched system power (SSP) relays 1 and 2. ● Exterior rear view mirror control. ● Exterior rear view mirror motor. ● Exterior rear view mirror glass. ● Interior rear view mirror. ● Wiring harness.

3. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.

4. If the diagnostic tool tester does not power up, refer to the diagnostic tool manual.
5. Carry out the DATA LINK DIAGNOSTICS. If the diagnostic tool responds with:
 - CKT 914, CKT 915 or CKT70 = ALL ECUS NO RESP/NOT EQUIP, refer to [Section 418-00](#).
 - NO RESP/NOT EQUIP for FEM, go to Pinpoint Test A.
 - NO RESP/NOT EQUIP for REM, go to Pinpoint Test B.
 - NO RESP/NOT EQUIP for DDM, go to Pinpoint Test C.
 - SYSTEM PASSED, retrieve and record the continuous diagnostic trouble codes (DTCs), erase the continuous DTCs and carry out self-test diagnostics for the FEM, REM and DDM.
6. If the DTCs retrieved are related to the concern, go to the FEM Diagnostic Trouble Code (DTC) Index, REM Diagnostic Trouble Code (DTC) Index, or DDM Diagnostic Trouble Code (DTC) Index.
7. If no DTCs related to the concern are retrieved, proceed to the Symptom Chart to continue the diagnostics.

FEM Diagnostic Trouble Code (DTC) Index

DTC	Description	Source	Action
B1319	Driver Door Ajar Circuit Failure	FEM	REFER to Section 417-02 .
B1327	Passenger Door Ajar Circuit Failure	FEM	REFER to Section 417-02 .
B1342	ECU Is Defective	FEM	CLEAR the DTC. REPEAT the FEM self-test. If DTC B1342 is retrieved, INSTALL a new FEM. REFER to Section 419-10 . CLEAR the DTCs. REPEAT the self-test.
B1438	Wiper Mode Select Switch Circuit Failure	FEM	REFER to Section 501-16 .
B1446	Wiper Park Sense Circuit Failure	FEM	REFER to Section 501-16 .
B1479	Wiper Washer Fluid Level Sensor Circuit Failure	FEM	REFER to Section 413-01 .
B1499	Lamp Turn Signal Left Circuit Failure	FEM	REFER to Section 417-01 .
B1501	Lamp Turn Signal Left Circuit Short to Battery	FEM	REFER to Section 417-01 .
B1503	Lamp Turn Signal Right Circuit Failure	FEM	REFER to Section 417-01 .
B1505	Lamp Turn Signal Right Circuit Short to Battery	FEM	REFER to Section 417-01 .
B1519	Hood Switch Circuit Failure	FEM	REFER to Section 419-01A .
B1567	Lamp Headlamp High-Beam Circuit Failure	FEM	REFER to Section 417-01 .
B1676	Battery Pack Voltage Out of Range	FEM	REFER to Section 414-00 .
B1794	Lamp Headlamp Low-Beam	FEM	REFER to Section 417-01 .

	Circuit Failure		
B2214	Window Passenger Front Up Switch Short to Battery	FEM	REFER to Section 501-11 .
B2215	Window Passenger Front Down Switch Short to Battery	FEM	REFER to Section 501-11 .
B2312	Mirror Passenger Horizontal Feedback Potentiometer Circuit Failure	FEM	GO to Pinpoint Test E .
B2316	Mirror Passenger Vertical Feedback Potentiometer Circuit Failure	FEM	GO to Pinpoint Test E .
B2477	Module Configuration Failure	FEM	REFER to Section 418-01 .
C1284	Oil Pressure Switch Failure	FEM	REFER to Section 413-01 .
C1446	Brake Switch Circuit Failure	FEM	REFER to Section 413-01 .
C1924	VAPS Solenoid Actuator Output Circuit Short to Ground	FEM	REFER to Section 211-00 .
C1925	VAPS Solenoid Actuator Return Circuit Failure	FEM	REFER to Section 211-00 .
U1027	SCP (J1850) Invalid or Missing Data for Engine RPM	PCM	CARRY OUT the PCM self-test.
U1041	SCP (J1850) Invalid or Missing Data for Vehicle Speed	ABS	CARRY OUT the ABS self-test.
U1059	SCP (J1850) Invalid or Missing Data for Transmission / Transaxle / PRNDL	PCM	CARRY OUT the PCM self-test.
U1218	SCP (J1850) Invalid or Missing Data for External Lamps	ICM	CARRY OUT the ICM self-test.
U1222	SCP (J1850) Invalid or Missing Data for Interior Lamps	ICM	CARRY OUT the ICM self-test.
U1227	SCP (J1850) Invalid or Missing Data for Body Status Request	ICM	CARRY OUT the ICM self-test.

FEM Parameter Identification (PID) Index

PID	Description	Expected Value
AL_EVT1	Last 8 Alarm Events	DROPEN, HOODTR, IGNTAM, PANIC, T_AJAR, RR_SD, LR_SD, P_DOOR, D_DOOR, RADIO, WINDO, ULTRS, NOEVNT, BB_SND
AL_EVT2	Last 8 Alarm Events	DROPEN, HOODTR, IGNTAM, PANIC, T_AJAR, RR_SD, LR_SD, P_DOOR, D_DOOR, RADIO, WINDO, ULTRS, NOEVNT, BB_SND
AL_EVT3	Last 8 Alarm Events	DROPEN, HOODTR, IGNTAM, PANIC, T_AJAR, RR_SD, LR_SD, P_DOOR, D_DOOR, RADIO, WINDO, ULTRS, NOEVNT, BB_SND
AL_EVT4	Last 8 Alarm Events	DROPEN, HOODTR, IGNTAM, PANIC, T_AJAR, RR_SD, LR_SD, P_DOOR, D_DOOR, RADIO, WINDO, ULTRS, NOEVNT, BB_SND
AL_EVT5	Last 8 Alarm Events	DROPEN, HOODTR, IGNTAM, PANIC, T_AJAR, RR_SD, LR_SD, P_DOOR, D_DOOR, RADIO, WINDO, ULTRS,

		NOEVNT, BB_SND
AL_EVT6	Last 8 Alarm Events	DROPEN, HOODTR, IGNTAM, PANIC, T_AJAR, RR_SD, LR_SD, P_DOOR, D_DOOR, RADIO, WINDO, ULTRS, NOEVNT, BB_SND
AL_EVT7	Last 8 Alarm Events	DROPEN, HOODTR, IGNTAM, PANIC, T_AJAR, RR_SD, LR_SD, P_DOOR, D_DOOR, RADIO, WINDO, ULTRS, NOEVNT, BB_SND
AL_EVT8	Last 8 Alarm Events	DROPEN, HOODTR, IGNTAM, PANIC, T_AJAR, RR_SD, LR_SD, P_DOOR, D_DOOR, RADIO, WINDO, ULTRS, NOEVNT, BB_SND
CCNT	Number Of Continuous DTCs In Module	one count per bit
D_DOOR	Left Front Door Ajar Switch	CLOSED, AJAR
FLUID_1	Brake Fluid Level Switch #1	OFF, ON
HOOD_SW	Hood Ajar Switch	CLOSED, AJAR
IGN_R	Ignition Switch -RUN Position	NO, YES
L_HIGH	Left High Beam Lamp Driver	Off---, Off-B-, On---, On-B-
L_LOW	Left Low Beam Lamp	Off---, Off-B-, On---, On-B-
LF_TURN	Left Front Turn Lamp	Off---, Off-B-, On---, On-B-
LMRKOUT	Left Front Marker Lamp	Off---, Off-B-, On---, On-B-
OILWRN	Oil Level Warning Lamp	Off---, On---
P_DN_SW	Passenger Down Activated	OFF, DOWN
P_DOOR	Passenger Door Ajar Switch	CLOSED, AJAR
P_UP_SW	Passenger Up Activated	OFF, UP
PRK_BRK	Parking Brake Switch Input	OFF, ON
PSMRPSH	Passenger Mirror Position Sensor (Left/Right)	#####
PSMRPSV	Passenger Mirror Position	#####
PSPWAMP	Power Window Passenger's Peak Motor Current	#####
PWM_DC1	PWM Duty Cycle #1	%
R_HIGH	Right High Beam Lamp Driver	Off---, Off-B-, On---, On-B-
R_LOW	Right Low Beam Lamp	Off---, Off-B-, On---, On-B-
RADIO_SW	Security Input Switch Status	OFF, ON
RF_TURN	Right Front Turn Lamp	Off---, Off-B-, On---, On-B-
RMRKSTB	Right Front Marker Lamp	Off---, Off-B-, On---, On-B-
STLKOUT	Steering Column Lock Ground Output	OFF, ON

VBAT	Battery Voltage	Volts
WFLUID	Washer Fluid Level	LOW, OK
WPMODE	Wiper Control Mode Select	WASH, OPEN, INVLD, OFF, INTVL1, INTVL2, INTVL3, INTVL4, INTVL5, INTVL6, INTVL7, LOW, HIGH
WPPRKS	Windshield Wiper Park Sense	notPRK, PARKED

FEM Active Command Index

Active Command	Display	Action
BACKLIGHTING INTENSITY CONTROL COMMAND	ILLUM	%
BRAKE SYSTEM CONTROL COMMAND	SHFT LOCK	OFF, ON
EXTERIOR LAMP CONTROL	PARKLAMPS	OFF, ON
FRONT WINDOW CONTROL	RR UP	OFF, ON
FRONT WINDOW CONTROL	PR DOWN	OFF, ON
FRONT WINDSHIELD WIPER/WASHER	SPEED RLY	OFF, ON
FRONT WINDSHIELD WIPER/WASHER	WASH RLY	OFF, ON
FRONT WINDSHIELD WIPER/WASHER	WIPER RLY	OFF, ON
HEAD/CORNERING LAMP CONTROL	HIGH BEAM	OFF, ON
HEAD/CORNERING LAMP CONTROL	LOW BEAM	OFF, ON
INDICATOR LAMP CONTROL	NON MIL	OFF, ON
LAMP CONTROL COMMAND	HDLMPWSH	OFF, ON
POWER MIRROR CONTROL	PR DOWN	OFF, ON
POWER MIRROR CONTROL	PR LEFT	OFF, ON
POWER MIRROR CONTROL	PR RIGHT	OFF, ON
POWER MIRROR CONTROL	PR UP	OFF, ON
STEERING COLUMN CONTROL COMMAND	LOCK_GND	OFF, ON
TURN SIGNAL AND MARKER LAMPS	HAZARD	OFF, ON
VAPS II OUTPUT PULSE CONTROL	VAPSIIOUT	%

REM Diagnostic Trouble Code (DTC) Index

DTC	Description	Source	Action
B1201	Fuel Sender Circuit Failure	REM	REFER to Section 413-01 .
B1300	Power Door Lock Circuit Failure	REM	REFER to Section 501-14B .
B1310	Power Door Unlock Circuit Failure	REM	REFER to Section 501-14B .
B1331	Decklid Ajar Rear Door Circuit Failure	REM	REFER to Section 417-02 .
B1335	Door Ajar RR Circuit Failure	REM	REFER to Section 417-02 .
B1342	ECU Is Defective	REM	CLEAR the DTC. REPEAT the REM self-test. If

			DTC B1342 is retrieved, INSTALL a new REM. REFER to Section 419-10 . CLEAR the DTCs. REPEAT the self-test.
B1483	Brake Pedal Input Circuit Failure	REM	REFER to Section 417-01 .
B1499	Lamp Turn Signal Left Circuit Failure	REM	REFER to Section 417-01 .
B1501	Lamp Turn Signal Left Circuit Short to Battery	REM	REFER to Section 417-01 .
B1503	Lamp Turn Signal Right Circuit Failure	REM	REFER to Section 417-01 .
B1505	Lamp Turn Signal Right Circuit Short to Battery	REM	REFER to Section 417-01 .
B1551	Decklid Release Circuit Failure	REM	REFER to Section 501-14B .
B1571	Door Ajar LR Circuit Failure	REM	REFER to Section 417-02 .
B1676	Battery Pack Voltage Out of Range	REM	REFER to Section 414-00 .
B2172	Inertia Switch input Circuit Open	REM	REFER to Powertrain Control/Emissions Diagnosis (PC/ED) manual.
B2174	Window Driver Rear Remote Up Switch Short to Battery	REM	REFER to Section 501-11 .
B2178	Window Driver Rear Remote Down Switch Short to Battery	REM	REFER to Section 501-11 .
B2190	Window Passenger Rear Remote Up Switch Short to Battery	REM	REFER to Section 501-11 .
B2194	Window Passenger Rear Remote Down Switch Short to Battery	REM	REFER to Section 501-11 .
B2477	Module Configuration Failure	REM	REFER to Section 418-01 .
U1041	SCP (J1850) Invalid or Missing Data for Vehicle Speed	ABS	CARRY OUT the ABS self-test.
U1059	SCP (J1850) Invalid or Missing Data for Transmission/Transaxle/PRNDL	PCM	CARRY OUT the PCM self-test.
U1218	SCP (J1850) Invalid or Missing Data for External Lamps	ICM	CARRY OUT the ICM self-test

REM Parameter Identification (PID) Index

PID	Description	Expected Value
BOO	Brake Switch Input	OFF, ON
DECKLID	Decklid Ajar Switch	CLOSED, AJAR
DL_DSRM	Decklid Disarm	NO, YES
DLIDOUT	Decklid Driver	Off---, Off--G, Off-B-, Off-BG, OffO--, OffO-G, OffOB-, OffOBG, On---, On--G, On-B-, On-BG, OnO--, OnO-G, OnOB-, OnOBG
DLIDRLS	Deck Lid Release	OFF, ON
L_TAIL	Left & Right Tail Lamp	Off---, Off--G, Off-B-, Off-BG, OffO--, OffO-G, OffOB-, OffOBG, On---, On--G, On-B-, On-BG, OnO--, OnO-G,

		OnOB-, OnOBG
LMRKOUT	Left Marker Lamp Driver Output State	OFF, ON
LMRKSTB	Left Marker Lamp Driver Short To Battery	NO, YES
LR_TURN	Left & Right Rear Turn Lamp	Off---, Off--G, Off-B-, Off-BG, OffO--, OffO-G, OffOB-, OffOBG, On---, On--G, On-B-, On-BG, OnO--, OnO-G, OnOB-, OnOBG
LRDN_SW	Left Rear Window Down Switch	OFF, UP
LRDR_SW	Left Rear Door Ajar Switch	CLOSED, AJAR
LRUP_SW	Left Rear Window Up Switch	OFF, DOWN
PD_LOCK	Passenger Door Lock	NO, YES
PD_UNLK	Passenger Door Unlock	NOTLOC, LOCK
R_TAIL	Left & Right Tail Lamp	Off---, Off--G, Off-B-, Off-BG, OffO--, OffO-G, OffOB-, OffOBG, On---, On--G, On-B-, On-BG, OnO--, OnO-G, OnOB-, OnOBG
RR_TURN	Left & Right Rear Turn Lamp	Off---, Off--G, Off-B-, Off-BG, OffO--, OffO-G, OffOB-, OffOBG, On---, On--G, On-B-, On-BG, OnO--, OnO-G, OnOB-, OnOBG
RRDN_SW	Right Rear Window Down Switch	OFF, UP
RRDR_SW	Right Rear Door Ajar Switch	CLOSED, AJAR
RRUP_SW	Right Rear Window Up Switch	OFF, DOWN

REM Active Command Index

Active Command	Display	Action
EXTERIOR LAMP CONTROL	BACKUPLMP	OFF, ON
EXTERIOR LAMP CONTROL	H MNT STP	OFF, ON
EXTERIOR LAMP CONTROL	L STOP	OFF, ON
EXTERIOR LAMP CONTROL	PARKLAMPS	OFF, ON
EXTERIOR LAMP CONTROL	R DEF RLY	OFF, ON
EXTERIOR LAMP CONTROL	R FOG LMP	OFF, ON
EXTERIOR LAMP CONTROL	R STOP	OFF, ON
POWER WINDOW ENABLE COMMAND	PSGR RLY	OFF, ON
REAR DOOR LOCK CONTROL	LR LOCK	OFF, ON
REAR DOOR LOCK CONTROL	LR UNLOCK	OFF, ON
REAR DOOR LOCK CONTROL	RELEASE	OFF, ON
REAR WINDOW CONTROL	LR DOWN	OFF, ON
REAR WINDOW CONTROL	RR DOWN	OFF, ON

DDM Diagnostic Trouble Code (DTC) Index

DTC	Description	Source	Action
B1309	Power Door Lock Circuit Short to Ground	DDM	REFER to Section 501-14B .
B1341	Power Door Unlock Circuit Short to Ground	DDM	REFER to Section 501-14B .
B1342	ECU Is Defective	DDM	CLEAR the DTC. REPEAT the DDM self-test. If DTC B1342 is retrieved, INSTALL a new DDM. REFER to Section 419-10 . CLEAR the DTCs. REPEAT the self-test.
B1400	Driver Power Window One Touch Window Relay Circuit Short to Battery	DDM	REFER to Section 501-11 .
B1405	Driver Power Window Down Circuit Short to Battery	DDM	REFER to Section 501-11 .
B1408	Driver Power Window Up Circuit Short to Battery	DDM	REFER to Section 501-11 .
B1416	Power Window LR Motor Circuit Short to Battery	DDM	REFER to Section 501-11 .
B1420	Passenger Power Window Motor Circuit Short to Battery	DDM	REFER to Section 501-11 .
B1424	Power Window RR Motor Circuit Short to Battery	DDM	REFER to Section 501-11 .
B1530	Memory Set Switch Circuit Short to Ground	DDM	GO to Pinpoint Test G .
B1534	Memory 1 Switch Circuit Short to Ground	DDM	GO to Pinpoint Test G .
B1538	Memory 2 Switch Circuit Short to Ground	DDM	GO to Pinpoint Test G .
B1676	Battery Pack Voltage Out of Range	DDM	REFER to Section 414-00 .
B2112	Door Driver Set Switch Stuck Failure	DDM	REFER to Section 501-14B .
B2116	Door Driver Reset Switch Stuck Failure	DDM	REFER to Section 501-14B .
B2320	Mirror Driver Horizontal Feedback Potentiometer Circuit Failure	DDM	GO to Pinpoint Test E .
B2324	Mirror Driver Vertical Feedback Potentiometer Circuit Failure	DDM	GO to Pinpoint Test E .
B2336	Mirror Switch Assembly Circuit Failure	DDM	GO to Pinpoint Test E .
B2425	Remote Keyless Entry Out of Synchronization	DDM	REFER to Section 501-14B .
B2477	Module Configuration Failure	DDM	REFER to Section 418-01 .

U1041	SCP (J1850) Invalid or Missing Data for Vehicle Speed	ABS	CARRY OUT the ABS self-test. REFER to Section 206-09A .
U1059	SCP (J1850) Invalid or Missing Data for Transmission / Transaxle / PRNDL	PCM	CARRY OUT the PCM self-test. REFER to the Powertrain Control/Emissions Diagnosis (PC/ED) manual.

Parameter Identification (PID) Index

PID	Description	Expected Value
ALLOCK	All Doors Lock Sense	notACT, ACTIVE
CCNT	Number Of Continuous Dtc's In Module	one count per bit
CNTUNLK	Central Door Unlock Switch Status	notACT, ACTIVE
D_DN_SW	Drivers Window Down Switch	OFF, DOWN
D_DSRLM	Driver Door Unlock Disarm Switch	NO, YES
D_PWPK	Drivers Power Window Peak Current	AMP
D_UP_SW	Drivers Window Up Switch	OFF, UP
DMIR_H	Drivers Side Mirror Horizontal Motor	notSEN, SENSED
DMIR_V	Drivers Mirror Vertical	notSEN, SENSED
DR_LOCK	Drivers Door Lock Output State	NO, YES
DR_UNLK	All Doors Unlock Output State	NO, YES
DRLKCYL	Door Lock Cylinder	notACT, ACTIVE
DVMRPSH	Driver Mirror Horizontal Position	one count per bit
DVMRPSV	Driver Mirror Position	one count per bit
LRDN_SW	Left Rear Down Activated	OFF, DOWN
LRUP_SW	Left Rear Up Activated	OFF, UP
MEM1_SW	Memory Recall Switch #1	notACT, ACTIVE
MEM2_SW	Memory Recall Switch #2	notACT, ACTIVE
MEMS_SW	Memory Set Switch	notACT, ACTIVE
MIR_SEL	Power Mirror Select Switch	DRVMIR, PSGMIR, OFF
MIRH_SW	Pow Mir Position Switch - Horizontal	SHORT, RIGHT, LEFT, OFF
MIRV_SW	Power Mir Position Switch - Vertical	SHORT, UP, DOWN, OFF
OTD_SW	One Touch Down Switch	OFF, DOWN
P_DN_SW	Passenger's Down Activated	OFF, DOWN
P_UP_SW	Passenger's Up Activated	OFF, UP
RRDN_SW	Right Rear Down Activated	OFF, DOWN
RRUP_SW	Right Rear Up Activated	OFF, UP
VBAT	Battery Voltage	Volts

DDM Active Command Index

Active Command	Display	Action
DOOR LOCK CONTROL	DD LOCK	OFF, ON
DOOR LOCK CONTROL	DD UNLOCK	OFF, ON
DOUBLE LOCK COMMAND	DOUBLE LK	UNLOCK, LOCK
FRONT WINDOW CONTROL	DR DOWN	OFF, ON
FRONT WINDOW CONTROL	DR UP	OFF, ON
ONE TOUCH WINDOW DOWN & ACCY DELAY	ONE TOUCH	OFF, ON
POWER MIRROR CONTROL	DR DOWN	OFF, ON
POWER MIRROR CONTROL	DR LEFT	OFF, ON
POWER MIRROR CONTROL	DR RIGHT	OFF, ON
POWER MIRROR CONTROL	DR UP	OFF, ON

SSP Relay Index ^a

Relay	Fuse	Controlled System(s)
SSP1	BJB Fuse 427 (30A)	<ul style="list-style-type: none"> ● Driver power door lock (FEM) ● LH high beam headlamps (FEM) ● RF park/turn/side marker lamps (FEM) ● RH low beam headlamp ● Driver exterior rear view mirror ● LF park/turn/side marker lamps (FEM)
SSP2	BJB Fuse 432 (30A)	<ul style="list-style-type: none"> ● LH low beam headlamp (FEM) ● RH high beam headlamps (FEM) ● Passenger exterior rear view mirror (FEM) ● Switch illumination backlighting
SSP3	BJB Fuse 424 (30A)	<ul style="list-style-type: none"> ● High mounted stoplamp (REM) ● RR park/stoplamps (REM) ● Reversing lamps (REM) ● LR turn signals (REM) ● Interior courtesy and demand lighting (FEM)
SSP4	BJB Fuse 423 (30A)	<ul style="list-style-type: none"> ● LR park/stoplamps (REM) ● RR turn signals (REM) ● All passenger door locks (REM) ● License lamps ● Luggage compartment release solenoid/switch ● Fuel door release solenoid/switch ● Luggage compartment lamp

^a When diagnosing an SSP relay, check that all systems for that relay are inoperative. REFER to Section 417-01

Symptom Chart

Refer to the Wiring Diagrams for connector numbers stated in the Pinpoint Tests.

Symptom Chart

Condition	Possible Sources	Action
<ul style="list-style-type: none"> ● No communication with the front electronics module 	<ul style="list-style-type: none"> ● BJB Fuse 425 (40A), 422 (20A). 	<ul style="list-style-type: none"> ● GO to Pinpoint Test

(FEM)	<ul style="list-style-type: none"> ● CJB Fuse 207 (5A). ● FEM. ● Circuitry. 	A.
<ul style="list-style-type: none"> ● No communication with the rear electronics module (REM) 	<ul style="list-style-type: none"> ● BJB Fuse 425 (40A). ● CJB Fuses 207 (5A) and 235 (5A). ● REM. ● Circuitry. 	<ul style="list-style-type: none"> ● GO to Pinpoint Test B.
<ul style="list-style-type: none"> ● No communication with the driver door module (DDM) 	<ul style="list-style-type: none"> ● BJB Fuse 425 (40A). ● CJB Fuse 207 (5A). ● DDM. ● Circuitry. 	<ul style="list-style-type: none"> ● GO to Pinpoint Test C.
<ul style="list-style-type: none"> ● The mirrors are inoperative 	<ul style="list-style-type: none"> ● Exterior rear view mirror control. ● Driver door module. ● Circuitry. 	<ul style="list-style-type: none"> ● GO to Pinpoint Test D.
<ul style="list-style-type: none"> ● A single mirror is inoperative 	<ul style="list-style-type: none"> ● Exterior rear view mirror control. ● BJB Fuse 427 (30A), 432 (30A), and 406 (10A) ● CJB Fuse 222 (10A) ● SSP relay 1. ● SSP relay 2. ● FEM. ● DDM. ● Exterior rear view mirror motor. ● Circuitry. 	<ul style="list-style-type: none"> ● GO to Pinpoint Test E.
<ul style="list-style-type: none"> ● The auto dimming mirror does not operate correctly 	<ul style="list-style-type: none"> ● BJB Fuse 409 (5A). ● CJB Fuse 216 (5A). ● Interior rear view mirror. ● Rear electronics module. ● Circuitry. 	<ul style="list-style-type: none"> ● GO to Pinpoint Test F.
<ul style="list-style-type: none"> ● The memory mirror is inoperative 	<ul style="list-style-type: none"> ● DDM. ● FEM. ● Circuitry. 	<ul style="list-style-type: none"> ● GO to Pinpoint Test G.
<ul style="list-style-type: none"> ● The memory mirror is inoperative — memory set switch LED 	<ul style="list-style-type: none"> ● Driver door module. ● Memory set switch. ● Circuitry. 	<ul style="list-style-type: none"> ● GO to Pinpoint Test H.
<ul style="list-style-type: none"> ● The heated exterior mirror does not defrost 	<ul style="list-style-type: none"> ● BJB Fuse 409 (5A). ● Exterior rear view mirrors. ● Circuitry. 	<ul style="list-style-type: none"> ● GO to Pinpoint Test I.





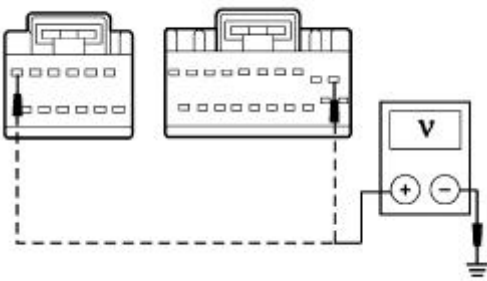

Pinpoint Tests



CAUTION: Electronic modules are sensitive to electrical charges. If exposed to these charges, damage may result.

PINPOINT TEST A: NO COMMUNICATION WITH THE FRONT

ELECTRONIC MODULE (FEM)

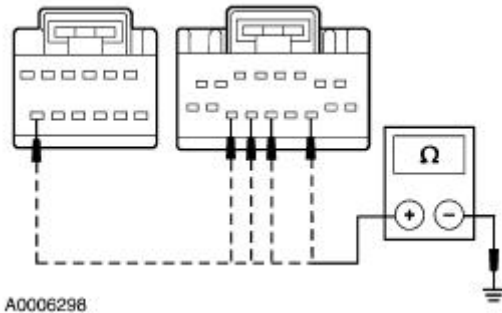
CONDITIONS	DETAILS/RESULTS/ACTIONS
A1 CHECK CIRCUITS 29-DK20 (OG/GN) AND 29S-DK22 (OG/YE) FOR VOLTAGE	
NOTE: Cycle ignition switch from OFF to RUN to enable the switched system power feature.	
<ol style="list-style-type: none"> 1  2  FEM C201c 3  FEM C201f 4  5  A0006297 	<ol style="list-style-type: none"> 5 Measure the voltage between FEM C201c pin 6, circuit 29-DK20 (OG/GN), harness side and ground; and between FEM C201f pin 1, circuit 29S-DK22 (OG/YE) harness side and ground. <ul style="list-style-type: none"> ● Are the voltages greater than 10 volts? <p>→ Yes GO to A2.</p> <p>→ No REPAIR the circuit(s) in question. TEST the system for normal operation.</p>
A2 CHECK CIRCUITS 31-DK20 (BK/RD), 31-DK20A (BK/RD), 31-DK20B (BK/RD), 31-DK20C (BK/RD) AND 31-DK20D (BK/RD) FOR OPENS	
<ol style="list-style-type: none"> 1  	

2



FEM C201a

3



3

Using the following table, measure the resistance between FEM connectors, harness side and ground:

FEM	Pin	Circuit
C201c	12	31-DK20 (BK/RD)
C201a	11	31-DK20A (BK/RD)
C201a	13	31-DK20B (BK/RD)
C201a	14	31-DK20C (BK/RD)
C201a	15	31-DK20D (BK/RD)

• Are the resistances less than 5 ohms?

→ Yes

REFER to [Section 418-00](#).

→ No

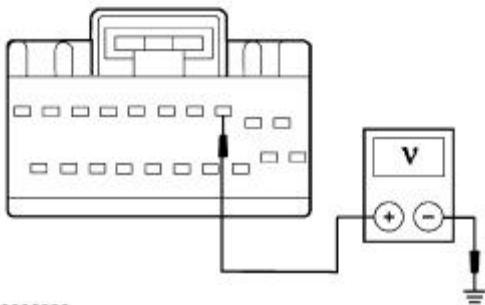
REPAIR the circuit(s) in question. TEST the system for normal operation.

PINPOINT TEST B: NO COMMUNICATION WITH THE REAR ELECTRONIC MODULE (REM)

CONDITIONS	DETAILS/RESULTS/ACTIONS
B1 CHECK CIRCUIT 29-DK31 (OG/BK) FOR VOLTAGE	
NOTE: Cycle ignition switch from OFF to RUN to enable the switched system power feature.	
<p>1</p>	
<p>2</p> <p>REM C420d</p>	
<p>3</p> <p>REM C420c</p>	
<p>4</p>	



5



A0006299

5

Measure the voltage between REM C420d pin 3, circuit 29-DK31 (OG/BK), harness side and ground.

• Is the voltage greater than 10 volts?

→ **Yes**
GO to [B2](#).

→ **No**
REPAIR the circuit. TEST the system for normal operation.

B2 CHECK CIRCUITS 29S-DK31 (OG/BK), 31-DK30D (BK), 31-DK30E (BK), 31-DK30F (BK), 31-DK30G (BK) AND 31-DK30H (BK/OG), FOR OPENS

1

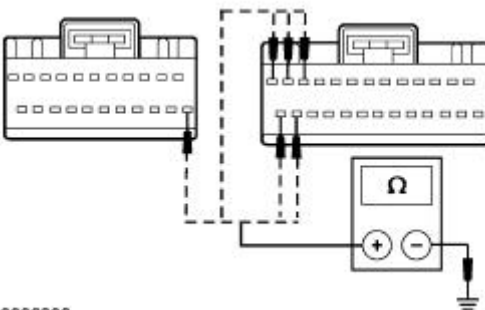


2



REM C420b

3



A0006300

3


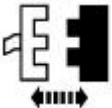

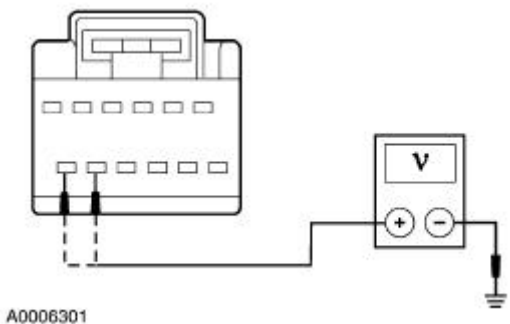
Using the following table, measure the resistance between REM connectors, harness side and ground:

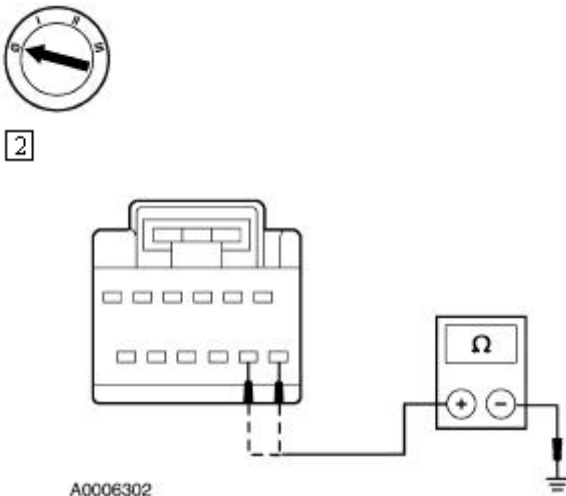
REM	Pin	Circuit
C420c	13	29S-DK31 (OG/BK)
C420c	12	31-DK30E (BK)
C420c	11	31-DK30D (BK)
C420c	26	31-DK30G (BK)
C420c	25	31-DK30F (BK)
C420b	12	31-DK30H (BK/OG)

• Are the resistances less than 5 ohms?

- **Yes**
REFER to [Section 418-00](#).
- **No**
REPAIR the circuit(s) in question. TEST the system for normal operation.

PINPOINT TEST C: NO COMMUNICATION WITH THE DRIVER DOOR MODULE (DDM)

CONDITIONS	DETAILS/RESULTS/ACTIONS
C1 CHECK CIRCUITS 29-AJ80 (OG) AND 29S-AJ86 (OG/BU) FOR VOLTAGE	
NOTE: Cycle ignition switch from OFF to RUN to enable the switched system power feature.	
<p>1 </p> <p>2  DDM C501a</p> <p>3 </p> <p>4  A0006301</p>	<p>4 Measure the voltage between DDM C501a pin 11, circuit 29-AJ80 (OG), harness side and ground; and between DDM C501a pin 12, circuit 29S-AJ86 (OG/BU), harness side and ground.</p> <ul style="list-style-type: none"> • Are the voltages greater than 10 volts? <p>→ Yes GO to C2.</p> <p>→ No REPAIR the circuit(s) in question. TEST the system for normal operation.</p>
C2 CHECK CIRCUITS 31-AJ80B (BK/OG) AND 91-AJ80 (BN/BU) FOR OPENS	
1	



A0006302



2 Measure the resistance between DDM C501a pin 7, circuit 91-AJ80 (BN/BU), harness side and ground; and between DDM C501a pin 8, circuit 31-AJ80B (BK/OG), harness side and ground.

- Are the resistances less than 5 ohms?

→ **Yes**
REFER to [Section 418-00](#).

→ **No**
REPAIR the circuit(s) in question. TEST the system for normal operation.

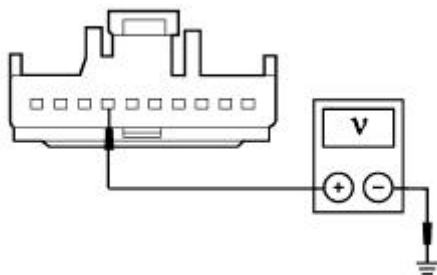
PINPOINT TEST D: THE MIRRORS ARE INOPERATIVE

CONDITIONS	DETAILS/RESULTS/ACTIONS
<p>D1 CHECK DDM AND FEM DTCS</p>	<p>1 Use the recorded results from the FEM and DDM self-tests.</p> <ul style="list-style-type: none"> ● Are any DTCs retrieved? <p>→ Yes For DTC B2336 or B2320, GO to D9.</p> <p>→ No GO to D2.</p>
<p>D2 CHECK CIRCUIT 33-AD12 (YE) FOR VOLTAGE</p> <p>1</p>  <p>2</p>  <p style="text-align: center;">Exterior Rear View Mirror Control C204</p>	

3



4



A0002454

4

Measure the voltage between exterior rear view mirror control C204 pin 7, circuit 33-AD12 (YE), harness side and ground.

● Is the voltage greater than 5 volts?

→ Yes
GO to [D4](#).

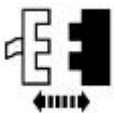
→ No
GO to [D3](#).

D3 CHECK CIRCUIT 33-AD12 (YE) FOR AN OPEN

1



2

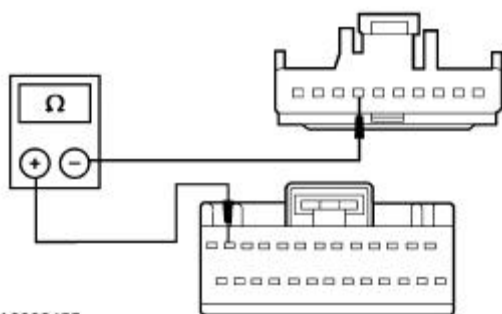


DDM C501d

3



4



A0002455

4

Measure the resistance between the exterior rear view mirror control C204 pin 7, circuit 33-AD12 (YE), harness side and DDM C501d pin 12, circuit 7-AD1 (YE), harness side.

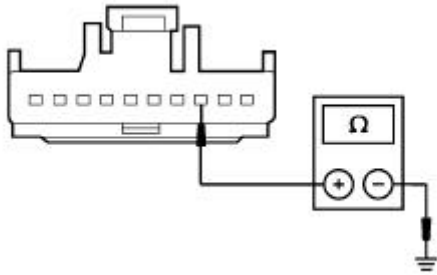
● Is the resistance less than 5 ohms?

→ **Yes**
INSTALL a new DDM. REFER to [Section 419-10](#). CLEAR the DTCs. REPEAT the self-test.

→ **No**
REPAIR the circuit. CLEAR the DTCs. REPEAT the self-test.

D4 CHECK CIRCUIT 31-AD12 (BK/YE) FOR AN OPEN

1



1 Measure the resistance between exterior rear view mirror control C204 pin 3, circuit 31-AD12 (BK/YE), harness side and ground.

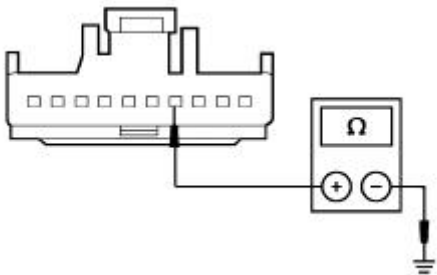
● Is the resistance less than 5 ohms?

→ **Yes**
GO to [D5](#).

→ **No**
REPAIR the circuit. CLEAR the DTCs. REPEAT the self-test.

D5 CHECK CIRCUIT 33-AD12 (YE) FOR A SHORT TO GROUND

1



1 Measure the resistance between exterior rear view mirror control C204 pin 4, circuit 33-AD12 (YE), harness side and ground.

● Is the resistance greater than 10,000 ohms?

→ **Yes**
GO to [D7](#).

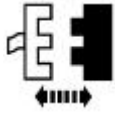
→ **No**
GO to [D6](#).

D6 CHECK DDM FOR AN INTERNAL SHORT TO GROUND

1



2

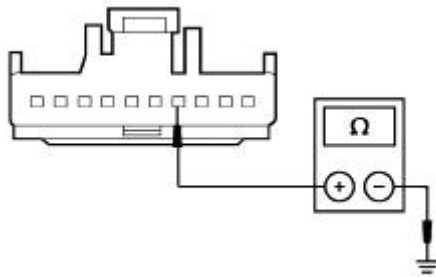


DDM C501d

3



4



A0002458

4 Measure the resistance between exterior rear view mirror control C204 pin 4, circuit 33-AD12 (YE), harness side and ground.

• Is the resistance greater than 10,000 ohms?

→ Yes
INSTALL a new DDM. REFER to [Section 419-10](#). CLEAR the DTCs. REPEAT the self-test.

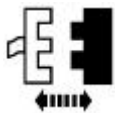
→ No
REPAIR the circuit. CLEAR the DTCs. REPEAT the self-test.

D7 CHECK CIRCUIT 33-AD12 (YE) FOR AN OPEN

1



2



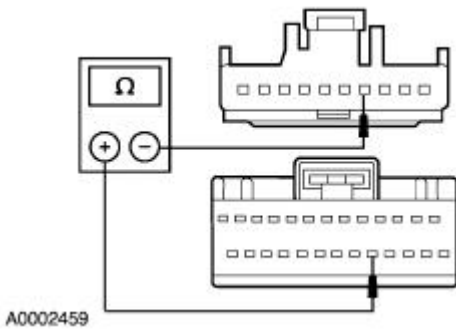
DDM C501d

3



4

4 Measure the resistance between exterior



rear view mirror control C204 pin 4, circuit 33-AD12 (YE), harness side and DDM C501d pin 18, circuit 33-AD12 (YE), harness side.

- Is the resistance less than 5 ohms?

→ **Yes**
GO to [D8](#).

→ **No**
REPAIR the circuit. CLEAR the DTCs. REPEAT the self-test.

D8 CHECK THE EXTERIOR REAR VIEW MIRROR CONTROL

1 Carry out the exterior rear view mirror control component test. Refer to Wiring Diagrams Section 700-09-00, Component Testing.

- Is the exterior rear view mirror control OK?

→ **Yes**
INSTALL a new DDM. REFER to [Section 419-10](#). CLEAR the DTCs. REPEAT the self-test.

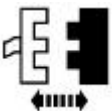
→ **No**
INSTALL a new exterior rear view mirror control. For additional information, REFER to [Switch—Exterior Rear View Mirror Control](#) in this section. CLEAR the DTCs. REPEAT the self test.

D9 CHECK THE EXTERIOR REAR VIEW MIRROR CONTROL

1



2



Exterior Rear View Mirror Control C204

3 Carry out the exterior rear view mirror control component test. Refer to Wiring Diagrams Section 700-09-00, Component Testing.

- Is the exterior rear view mirror control OK?

→ **Yes**
GO to [D10](#).

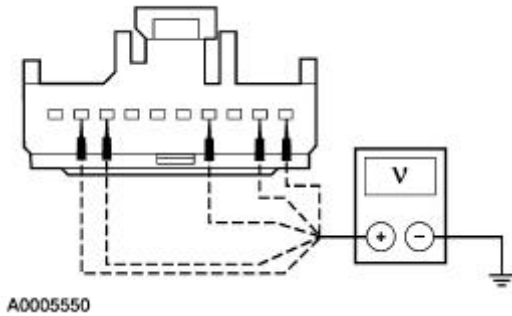
→ **No**
INSTALL a new exterior rear view mirror control. For additional information, REFER to [Switch—Exterior Rear View Mirror Control](#) in this section. CLEAR the DTCs. REPEAT the self test.

D10 CHECK EXTERIOR REAR VIEW MIRROR CONTROL CIRCUITS FOR VOLTAGE

1



2



2 Using the following table, measure the voltage between the exterior rear view mirror control C204 pins, harness side and ground:

Pin	Circuit
1	32-AD30 (WH/BK)
2	32-AD32 (WH/RD)
4	33-AD12 (YE)
8	34-AD31 (BU/WH)
9	34-AD29 (BU/OG)

- Is the voltage greater than 10 volts for any measurement?

→ **Yes**
GO to [D12](#).

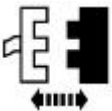
→ **No**
GO to [D11](#).

D11 CHECK EXTERIOR REAR VIEW MIRROR CONTROL CIRCUITS FOR SHORT TO GROUND

1



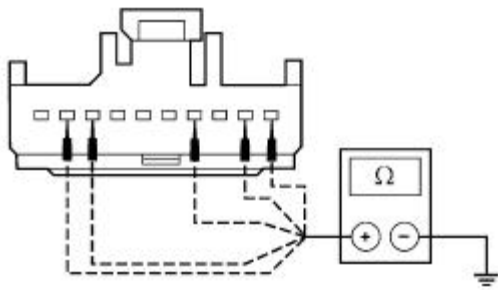
2



DDM C501d

3

3 Using the following table, measure the



A0005551

resistance between the exterior rear view mirror control C204 pins, harness side and ground:

Pin	Circuit
1	32-AD30 (WH/BK)
2	32-AD32 (WH/RD)
4	33-AD12 (YE)
8	34-AD31 (BU/WH)
9	34-AD29 (BU/OG)

- Is the resistance less than 5 ohms for any measurement?

→ **Yes**
 INSTALL a new DDM. REFER to [Section 419-10](#). CLEAR the DTCs. REPEAT the self-test.

→ **No**
 REPAIR the circuit in question. CLEAR the DTCs. REPEAT the self-test.

D12 CHECK EXTERIOR REAR VIEW MIRROR CONTROL CIRCUITS FOR SHORT TO VOLTAGE

1



2

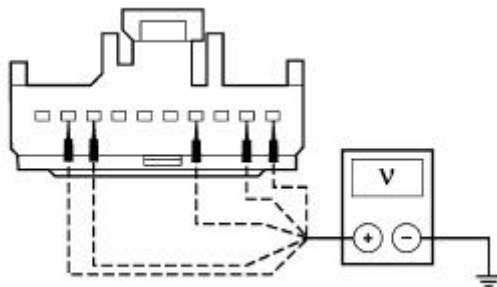


DDM C501d

3



4




A0005550

4 Using the following table, measure the voltage between the exterior rear view mirror control C204 pins, harness side and ground:

Pin	Circuit
1	32-AD30 (WH/BK)
2	32-AD32 (WH/RD)
4	33-AD12 (YE)
8	34-AD31 (BU/WH)
9	34-AD29 (BU/OG)

	<ul style="list-style-type: none"> ● Is voltage present for any measurement? <p>→ Yes REPAIR the circuit in question. CLEAR the DTCs. REPEAT the self-test.</p> <p>→ No INSTALL a new DDM. REFER to Section 419-10. CLEAR the DTCs. REPEAT the self-test.</p>
--	---

PINPOINT TEST E: A SINGLE MIRROR IS INOPERATIVE

CONDITIONS	DETAILS/RESULTS/ACTIONS
E1 CHECK THE DDM DTCS	
	<p>1 Use the recorded results from the DDM self-test.</p> <ul style="list-style-type: none"> ● Are any DTCs retrieved? <p>→ Yes For DTC B2336, GO to E30. For DTC B2320 or B2324, GO to E20. For all other DDM DTCs, REFER to the DDM Diagnostic Trouble Code (DTC) Index.</p> <p>→ No GO to E2.</p>
E2 CHECK THE FEM DTCS	
	<p>1 Use the recorded results from the FEM self-test.</p> <ul style="list-style-type: none"> ● Are any DTCs recorded? <p>→ Yes For DTC B2312 or B2316, GO to E5. For all other FEM DTCs, REFER to the FEM Diagnostic Trouble Code (DTC) Index.</p> <p>→ No GO to E3.</p>
E3 CHECK THE EXTERIOR REAR VIEW MIRROR CONTROL PIDS	
NOTE: Cycle the ignition switch from OFF to RUN to enable the switched system power feature.	
<p>1</p>  <p>2</p>	



3



3 Monitor the DDM PIDs MIRH_SW, MIRV_SW and MIR_SEL, while operating the exterior rear view mirror control in each direction

- **Did the DDM PID values agree with the exterior rear view mirror control positions?**

→ **Yes**
GO to [E4](#).

→ **No**
GO to [E18](#).

E4 IDENTIFY THE INOPERATIVE MIRROR

1 Operate the driver and passenger exterior rear view mirrors.

- **Is the passenger mirror inoperative?**

→ **Yes**
GO to [E5](#).

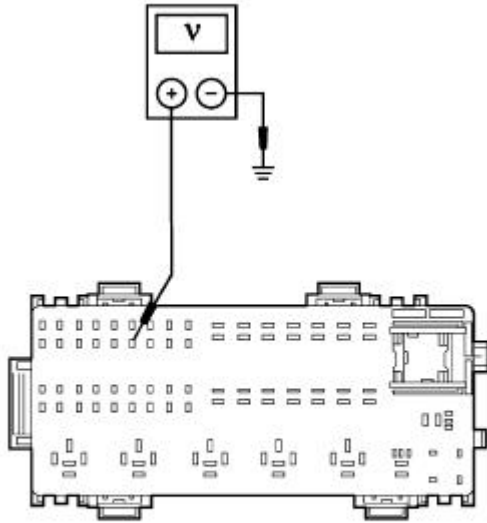
→ **No**
GO to [E20](#).

E5 CHECK BJB FUSE 406 (10A) FOR VOLTAGE

2

1 Remove BJB Fuse 406 (10A).

2 Measure the voltage between BJB Fuse 406 (10A) input side, circuit 30S-DB15 (RD/OG), harness side and ground.



A0002460

● Is the voltage greater than 10 volts?

→ **Yes**
GO to [E6](#).

→ **No**
REPAIR the power source to the fuse.
CLEAR the DTCs. REPEAT the self-test.

E6 CHECK CIRCUIT 29S-DK21 (OG/WH) AND 29S-LG1 (OG/YE) FOR AN OPEN

2



3



FEM C201a

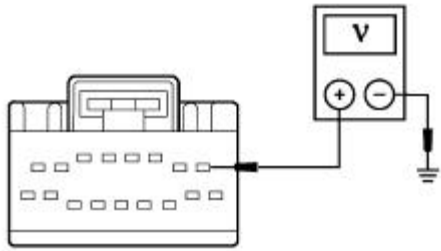
4



5

1 Reinstall Fuse 406 (10A).

5 Measure the voltage between FEM C201a pin 1, circuit 29S-DK21 (OG/WH), harness side and ground.



A0002461

- Is the voltage greater than 10 volts?

→ **Yes**
GO to [E7](#).

→ **No**
REPAIR the circuit. CLEAR the DTCs.
REPEAT the self-test.

E7 CHECK THE PASSENGER MIRROR ACTIVE COMMAND



1 Select the FEM active command menu
POWER MIRROR CONTROL.

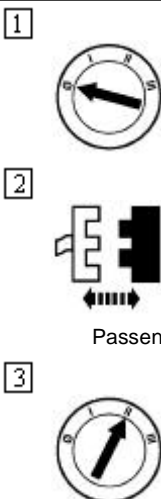
2 Trigger the FEM active commands PR
UP, PR DOWN, PR LEFT and PR
RIGHT ON and OFF.

- Did the passenger exterior rear view mirror function correctly?

→ **Yes**
GO to [E14](#).

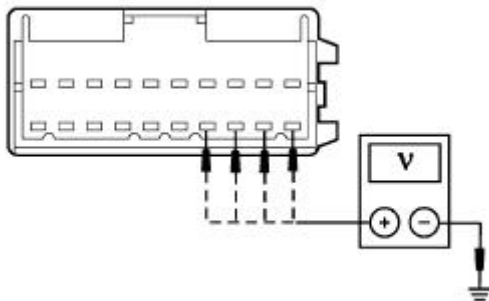
→ **No**
GO to [E8](#).

E8 CHECK FOR VOLTAGE AT THE PASSENGER MIRROR MOTOR



Passenger Exterior Rear View Mirror C601

4



A0002462

4

Using the following table, measure the voltage between the passenger exterior rear view mirror C601 pins, harness side and ground:

Pin	Circuit
4	33-AD10 (YE/BK)
2	32-AD10 (WH/BK)
6	35-AD11 (VT/WH)
8	34-AD11 (BU/OG)

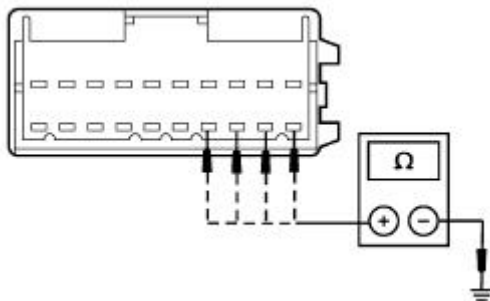
- Is the voltage greater than 10 volts for any measurement?

→ **Yes**
GO to [E12](#).

→ **No**
GO to [E9](#).

E9 CHECK FOR RESISTANCE AT THE PASSENGER EXTERIOR REAR VIEW MIRROR

1



A0002463

1

Using the following table, measure the resistance between passenger exterior rear view mirror C601 pins, harness side and ground:

Pin	Circuit
4	33-AD10 (YE/BK)
2	32-AD10 (WH/BK)
6	35-AD11 (VT/WH)
8	34-AD11 (BU/OG)

- Are the resistances less than 5 ohms?

→ **Yes**
GO to [E13](#).

→ **No**
GO to [E10](#).

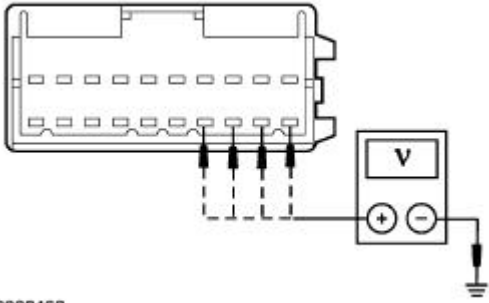
E10 CHECK FOR AN OPEN AT THE PASSENGER MIRROR ASSEMBLY

1

1

Using the following table, measure the voltage between passenger exterior rear view mirror C601 pins, harness side and ground, while moving the exterior rear view mirror control to the listed positions:

Pin	Circuit	Mirror Position
4	33-AD10 (YE/BK)	RIGHT



A0002462

2	32-AD10 (WH/BK)	LEFT
6	35-AD11 (VT/WH)	DOWN
8	34-AD11 (BU/OG)	UP

- Are the voltages greater than 10 volts for all measurements?

→ **Yes**
 INSTALL a new passenger rear view mirror motor. For additional information, REFER to [Mirror—Motor](#) in this section. CLEAR the DTCs. REPEAT the self-test.

→ **No**
 GO to [E11](#).

E11 CHECK CIRCUITS 33-AD10 (YE/BK), 32-AD10 (WH/BK), 35-AD11 (VT/WH) AND 34-AD11 (BU/OG) FOR AN OPEN

1



2

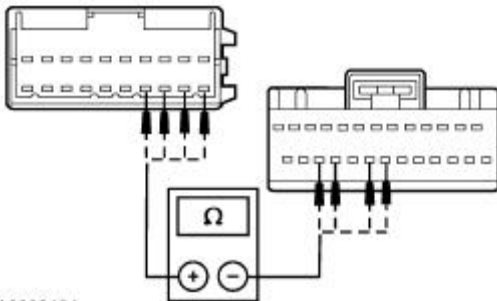


FEM C201e

3



4



A0002464

4 Using the following table, measure the resistance between FEM C201e pins, harness side and passenger exterior rear view mirror C601 pins, harness side:

Passenger Exterior Rear View Mirror Pin	Circuit	FEM C201e Pin
4	33-AD10 (YE/BK)	24
2	32-AD10 (WH/BK)	23
6	35-AD11	21

	(VT/WH)	
8	34-AD11 (BU/OG)	20

- Are the resistances less than 5 ohms?

→ **Yes**
INSTALL a new FEM. REFER to [Section 419-10](#). CLEAR the DTCs. REPEAT the self-test.

→ **No**
REPAIR the circuit in question. CLEAR the DTCs. REPEAT the self-test.

E12 CHECK CIRCUITS 33-AD10 (YE/BK), 32-AD10 (WH/BK), 35-AD11 (VT/WH) AND 34-AD11 (BU/OG) FOR A SHORT TO VOLTAGE

1



2

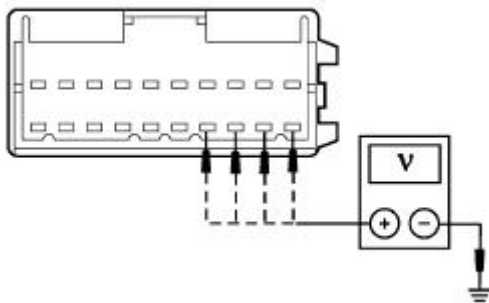


FEM C201e

3



4



A0002462

4 Using the following table, measure the voltage between the passenger exterior rear view mirror C601 pins, harness side and ground:

Pin	Circuit
4	33-AD10 (YE/BK)
2	32-AD10 (WH/BK)
6	35-AD11 (VT/WH)
8	34-AD11 (BU/OG)

- Is voltage present for any measurement?

→ **Yes**
REPAIR the circuit in question. CLEAR the DTCs. REPEAT the self-test.

→ **No**
INSTALL a new FEM. REFER to [Section](#)

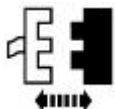
[419-10](#). CLEAR the DTCs. REPEAT the self-test.

E13 CHECK CIRCUITS 33-AD10 (YE/BK), 32-AD10 (WH/BK), 35-AD11 (VT/WH) AND 34-AD11 (BU/OG) FOR A SHORT TO GROUND

1



2

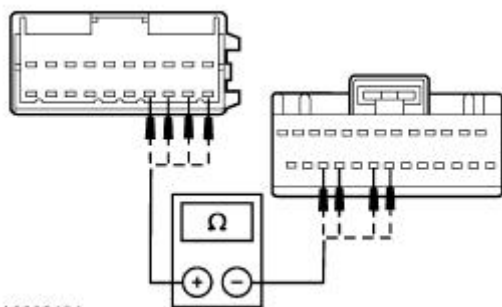


FEM C201e

3



4



4 Using the following table, measure the resistance between FEM C201e pins, harness side and passenger exterior rear view mirror C601 pins, harness side:

Passenger Exterior Rear View Mirror Pin	Circuit	FEM C201e Pin
4	33-AD10 (YE/BK)	24
2	32-AD10 (WH/BK)	23
6	35-AD11 (VT/WH)	21
8	34-AD11 (BU/OG)	20

● Are the resistances less than 5 ohms?

→ **Yes**
INSTALL a new FEM. REFER to [Section 419-10](#). CLEAR the DTCs. REPEAT the self-test.

→ **No**
REPAIR the circuit in question. CLEAR the DTCs. REPEAT the self-test.

E14 CHECK THE FEM FOR THE CORRECT OUTPUTS

1



2



3



2

Select FEM active command POWER MIRROR CONTROL.

3

Trigger the FEM active commands PR UP, PR DOWN, PR LEFT and PR RIGHT ON and OFF, while monitoring the FEM PIDs MIRH_SW and MIRV_SW.

Do the FEM PID values agree with the passenger exterior rear view mirror commanded positions?

→ Yes

INSTALL a new FEM. REFER to Section 419-10. CLEAR the DTCs. REPEAT the self-test.

→ No

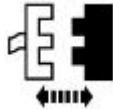
GO to E15.

E15 CHECK CIRCUITS 8-AD19 (WH/RD), 7-AD19 (YE/RD), 9-AD19 (BN/RD) AND 10-AD19 (GY/RD) FOR A SHORT TO VOLTAGE

1

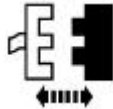


2



Passenger Exterior Rear View Mirror C601

3



FEM C201e

4

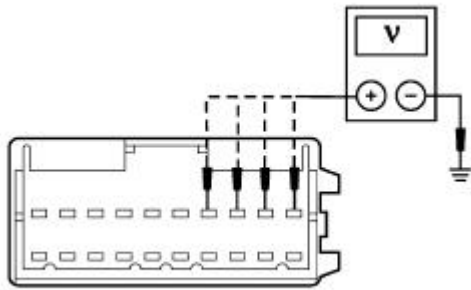


5

5

Using the following table, measure the voltage between the passenger exterior rear view mirror C601 pins, harness side and ground:

Pin	Circuit



A0002465

1	8-AD19 (WH/RD)
7	7-AD19 (YE/RD)
3	9-AD19 (BN/RD)
5	10-AD19 (GY/RD)

- **Is voltage present for any measurement?**

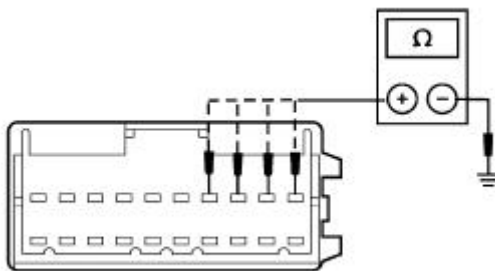
- **Yes**
REPAIR the circuit in question. CLEAR the DTCs. REPEAT the self-test.
- **No**
GO to [E16](#).

E16 CHECK CIRCUITS 8-AD19 (WH/RD), 7-AD19 (YE/RD), 9-AD19 (BN/RD) AND 10-AD19 (GY/RD) FOR A SHORT TO GROUND

1



2



A0002466

- 2 Using the following table, measure the resistance between passenger exterior rear view mirror C601 pins, harness side and ground:

Pin	Circuit
1	8-AD19 (WH/RD)
7	7-AD19 (YE/RD)
3	9-AD19 (BN/RD)
5	10-AD19 (GY/RD)

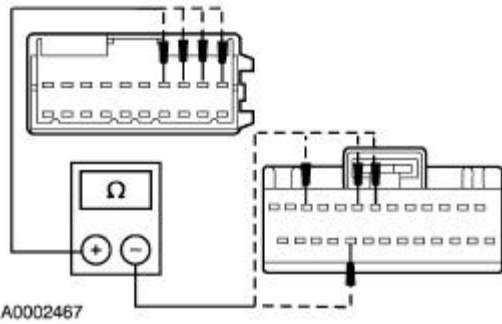
- **Are the resistances greater than 10,000 ohms?**

- **Yes**
GO to [E17](#).
- **No**
REPAIR the circuit in question. CLEAR the DTCs. REPEAT the self-test.

E17 CHECK CIRCUITS 8-AD19 (WH/RD), 7-AD19 (YE/RD), 9-AD19 (BN/RD) AND 10-AD19 (GY/RD) FOR AN OPEN

1

- 1 Using the following table, measure the resistance between FEM C201e pins, harness side and passenger exterior rear view mirror C601 pins, harness



side:

Passenger Exterior Rear View Mirror Pin	Circuit	FEM C201e Pin
1	8-AD19 (WH/RD)	7
7	7-AD19 (YE/RD)	8
3	9-AD19 (BN/RD)	22
5	10-AD19 (GY/RD)	11

- Are the resistances less than 5 ohms?

→ **Yes**
 INSTALL a new passenger exterior rear view mirror. CLEAR the DTCs. REPEAT the self-test.

→ **No**
 REPAIR the circuit in question. CLEAR the DTCs. REPEAT the self-test.

E18 CHECK THE EXTERIOR REAR VIEW MIRROR CONTROL

1 Carry out the exterior rear view mirror control component test. Refer to Wiring Diagrams Section 700-09-00, Component Testing.

- Did the exterior rear view mirror control pass?

→ **Yes**
 GO to [E19](#).

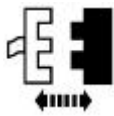
→ **No**
 INSTALL a new exterior rear view mirror control. For additional information, REFER to [Switch—Exterior Rear View Mirror Control](#) in this section. CLEAR the DTCs. REPEAT the self-test.

E19 CHECK THE EXTERIOR REAR VIEW MIRROR CONTROL CIRCUITS FOR AN OPEN

1



2



Exterior Rear View Mirror Control C204

3

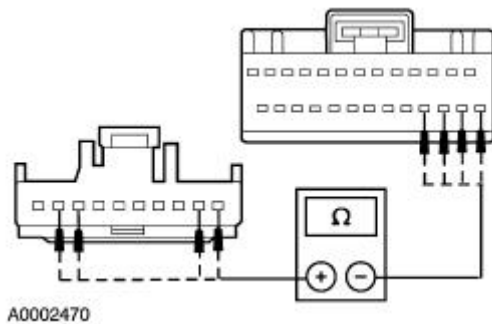


DDM C501d

4



5



5 Using the following table, measure the resistance between the following exterior rear view mirror control C204 pins, harness side and DDM C501d pins, harness side:

Exterior Rear View Mirror Control Pins	Circuit	DDM Pins
1	32-AD30 (WH/BK)	15
2	32-AD32 (WH/RD)	17
9	34-AD29 (BU/OG)	14
8	34-AD31 (BU/WH)	16

• Are the resistances less than 5 ohms?

→ **Yes**
INSTALL a new DDM. REFER to [Section 419-10](#). CLEAR the DTCs. REPEAT the self-test.

→ **No**
REPAIR the circuit in question. CLEAR the DTCs. REPEAT the self-test.

E20 CHECK CJB FUSE 222 (10A) FOR VOLTAGE

- 1 Remove CJB Fuse 222 (10A).
- 2 Measure the voltage between CJB Fuse 222 (10A) input side and ground.

• Is the voltage greater than 10 volts?

→ **Yes**
GO to [E21](#).

→ **No**
REPAIR the power source to Fuse 222 (10A). CLEAR the DTCs. REPEAT the self-test.

E21 CHECK CIRCUIT 29S-AJ86 FOR AN OPEN

2



3

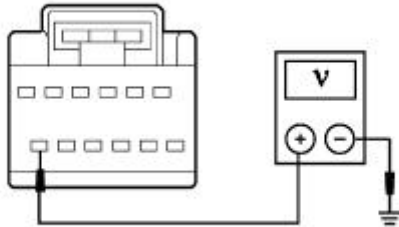


DDM C501a

4



5



A0002471

1 Reinstall Fuse 222 (10A).

5 Measure the voltage between DDM C501a pin 12, circuit 29S-AJ86 (OG/BU), harness side and ground.

● Is the voltage greater than 10 volts?

→ **Yes**
GO to [E22](#).

→ **No**
REPAIR the circuit. CLEAR the DTCs. REPEAT the self-test.

E22 CHECK THE DRIVER EXTERIOR REAR VIEW MIRROR ACTIVE COMMANDS

1



2



1 Select DDM active command menu POWER MIRROR CONTROL.

2 Trigger the DDM active command DR UP, DR DOWN, DR LEFT and DR RIGHT.

- Did the driver exterior rear view mirror operate correctly?

→ Yes
GO to [E27](#).

→ No
GO to [E23](#).

E23 CHECK FOR VOLTAGE AT THE DRIVER MIRROR MOTOR

1



2

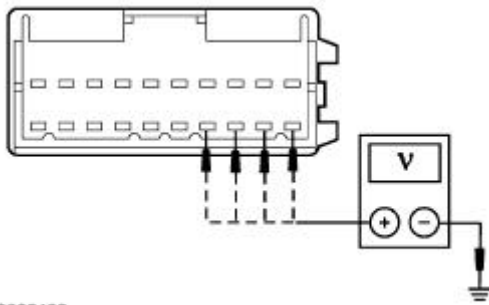


Driver Exterior Rear View Mirror C520

3



4



A0002462

4 Using the following table, measure the voltage between driver exterior rear view mirror C520 pins, harness side and ground:

Pin	Circuit
4	33-AD7 (YE/RD)
2	32-AD7 (WH/RD)
6	35-AD8 (VT)
8	34-AD8 (BU/WH)

- Is any voltage greater than 10 volts?

→ Yes
GO to [E31](#).

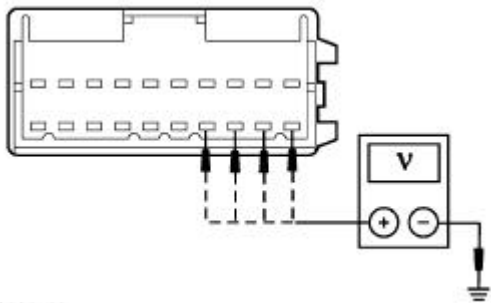
→ No
GO to [E24](#).

E24 CHECK FOR OPENS AT THE DRIVER MIRROR ASSEMBLY

1

1 Using the following table, measure the voltage between driver exterior rear view mirror C520 pins, harness side and ground, while moving the exterior rear view mirror control through the listed positions.

	Mirror



A0002462

Pin	Circuit	Position
4	33-AD7 (YE/RD)	RIGHT
2	32-AD7 (WH/RD)	LEFT
6	35-AD8 (VT)	DOWN
8	34-AD8 (BU/WH)	UP

- Are the voltages greater than 10 volts?

→ **Yes**
 INSTALL a new driver rear view mirror motor. For additional information, REFER to [Mirror—Motor](#). CLEAR the DTCs. REPEAT the self-test.

→ **No**
 GO to [E25](#).

E25 CHECK FOR RESISTANCE AT THE DRIVER EXTERIOR REAR VIEW MIRROR

1



2

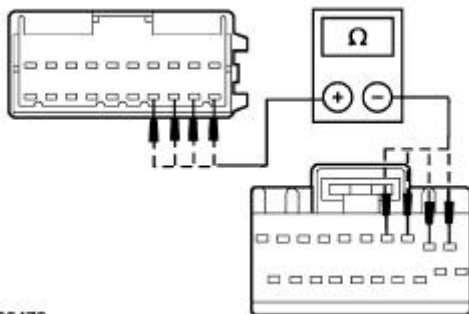


DDM C501c

3



4



A0002472

- 4 Using the following table, measure the resistance between DDM C501c pins, harness side and driver exterior rear view mirror C520 pins, harness side.

Driver Exterior Rear View Mirror Pin	Circuit	DDM Pin
2	32-AD7 (WH/RD)	1
4	33-AD7 (YE/RD)	2
6	35-AD8 (VT)	4
8	34-AD8	3

(BU/WH)

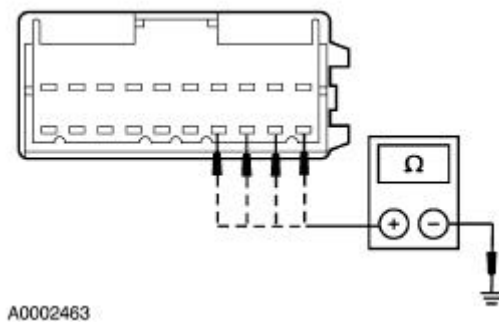
- Are the resistances less than 5 ohms?

→ **Yes**
GO to [E26](#).

→ **No**
REPAIR the circuit in question. CLEAR the DTCs. REPEAT the self-test.

E26 CHECK CIRCUITS 32-AD7 (WH/RD), 33-AD7 (YE/RD), 34-AD8 (BU/WH) AND 35-AD8 (VT) FOR A SHORT TO GROUND

1



1 Using the following table, measure the resistance between driver exterior rear view mirror C520 pins, harness side and ground.

Pin	Circuit
2	32-AD7 (WH/RD)
4	33-AD7 (YE/RD)
6	35-AD8 (VT)
8	34-AD8 (BU/WH)

- Are the resistances greater than 10,000 ohms?

→ **Yes**
INSTALL a new DDM. REFER to [Section 419-10](#). CLEAR the DTCs. REPEAT the self-test.

→ **No**
REPAIR the circuit in question. CLEAR the DTCs. REPEAT the self-test.

E27 CHECK THE DDM FOR THE CORRECT OUTPUTS

1



2



3



2 Select DDM active command menu POWER MIRROR CONTROL.

3 Trigger the DDM active command DR UP, DR DOWN, DR LEFT and DR RIGHT ON and OFF while monitoring the DDM PIDs MIRH_SW and MIRV_SW.

- Do the PID values agree with the

**driver exterior rear view mirror
commanded positions?**

- **Yes**
INSTALL a new DDM. REFER to [Section 419-10](#). CLEAR the DTCs. REPEAT the self-test.
- **No**
GO to [E28](#).

E28 CHECK CIRCUITS 8-AD18 (WH/BK), 7-AD18 (YE/BK), 9-AD18 (BN/YE) AND 10-AD18 (GY/BK) FOR A SHORT TO VOLTAGE

1

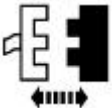


2



Driver Exterior Rear View Mirror C520

3

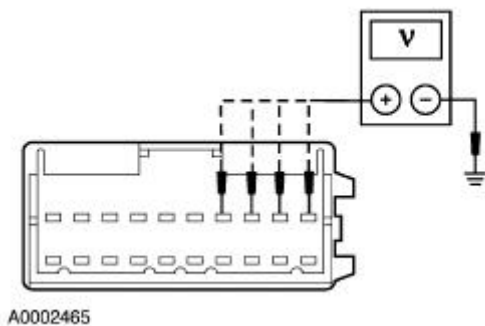


DDM C501c

4



5



- 5 Using the following table, measure the voltage between driver exterior rear view mirror C520 pins, harness side and ground.

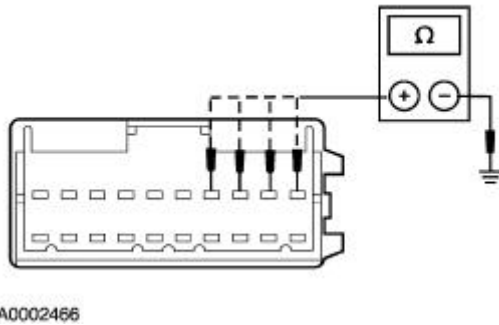
Pin	Circuit
1	8-AD18 (WH/BK)
7	7-AD18 (YE/BK)
3	9-AD18 (BN/YE)
5	10-AD18 (GY/BK)

• Is voltage present for any measurement?

- **Yes**
REPAIR the circuit in question. CLEAR the DTCs. REPEAT the self-test.
- **No**
GO to [E29](#).

E29 CHECK CIRCUITS 8-AD18 (WH/BK), 7-AD18 (YE/BK), 9-AD18 (BN/YE) AND 10-AD18 (GY/BK) FOR A SHORT TO GROUND

1



A0002466

1

Using the following table, measure the resistance between driver exterior rear view mirror C520 pins, harness side and ground.

Pin	Circuit
1	8-AD18 (WH/BK)
7	7-AD18 (YE/BK)
3	9-AD18 (BN/YE)
5	10-AD18 (GY/BK)

• Are the resistances greater than 10,000 ohms?

→ **Yes**
GO to [E30](#).

→ **No**
REPAIR the circuit in question. CLEAR the DTCs. REPEAT the self-test.

E30 CHECK CIRCUITS 8-AD18 (WH/BK), 7-AD18 (YE/BK), 9-AD18 (BN/YE) AND 10-AD18 (GY/BK) FOR AN OPEN

1



2



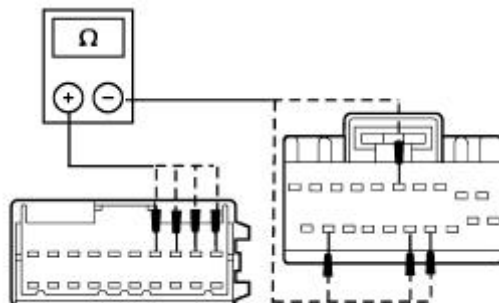
Driver Exterior Rear View Mirror C520

3



DDM C501c

4



A0002473

4

Using the following table, measure the resistance between DDM C501c pins, harness side and driver exterior rear view mirror C520 pins, harness side.

Driver Exterior Rear View Mirror Pin	Circuit	DDM Pin
1	8-AD18 (WH/BK)	14
7	7-AD18 (YE/BK)	5

3	9-AD18 (BN/YE)	19
5	10-AD18 (GY/BK)	15

- Are the resistances less than 5 ohms?

→ **Yes**
 INSTALL a new driver exterior rear view mirror. For additional information, REFER to [Mirror—Exterior Rear View](#). CLEAR the DTCs. REPEAT the self-test.

→ **No**
 REPAIR the circuit in question. CLEAR the DTCs. REPEAT the self-test.

E31 CHECK FOR VOLTAGE AT THE DRIVER EXTERIOR REAR VIEW MIRROR ASSEMBLY

1



2



Driver Exterior Rear View Mirror C520

3

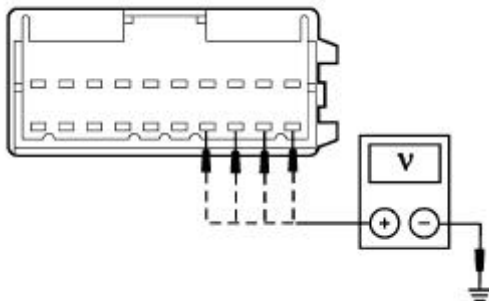


DDM C501c

4



5



A0002462



5 Using the following table, measure the voltage between driver exterior rear view mirror C520 pins, harness side and ground.

Pin	Circuit
2	32-AD7 (WH/RD)
4	33-AD7 (YE/RD)
8	34-AD8 (BU/WH)
6	35-AD8 (VT)

- Are any of the voltages greater than 10 volts?

	<p>→ Yes REPAIR the circuit in question. CLEAR the DTCs. REPEAT the self-test.</p> <p>→ No INSTALL a new DDM. REFER to Section 419-10. CLEAR the DTCs. REPEAT the self-test.</p>
--	--

PINPOINT TEST F: THE AUTO DIMMING MIRROR DOES NOT OPERATE CORRECTLY

CONDITIONS	DETAILS/RESULTS/ACTIONS
F1 CHECK FOR REM RETRIEVED DIAGNOSTIC TROUBLE CODES	
	<p>1 Use the recorded results from the REM self-test.</p> <ul style="list-style-type: none"> • Are any DTCs retrieved? <p>→ Yes REFER to the REM Diagnostic Trouble Code (DTC) Index.</p> <p>→ No GO to F2.</p>
F2 CHECK POWER TO CJB FUSE 216 (5A)	
<p>1</p>  <p>CJB Fuse 216 (5A)</p> <p>2</p> 	<p>3 Measure the voltage between CJB Fuse 216 (5A) input terminal and ground.</p> <ul style="list-style-type: none"> • Is the voltage greater than 10 volts? <p>→ Yes GO to F3.</p> <p>→ No REPAIR the power supply to the fuse. CLEAR the DTCs. REPEAT the self-test.</p>
F3 CHECK CIRCUIT 640 (RD/YE) FOR AN OPEN	
1	

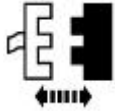


2



CJB Fuse 216 (5A)

3

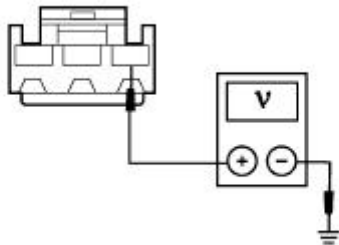


Interior Rear View Mirror C911

4



5



A0002474

5 Measure the voltage between interior rear view mirror C911, pin 1 circuit 20-AD15 (PK), harness side and ground.

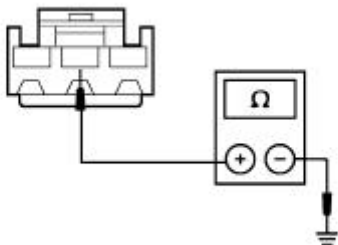
• Is the voltage greater than 10 volts?

→ Yes
GO to [F4](#).

→ No
REPAIR the circuit. CLEAR the DTCs.
REPEAT the self-test.

F4 CHECK CIRCUIT 31-AD15 (BK) FOR AN OPEN

1



A0002475

1 Measure the resistance between interior rear view mirror C911, pin 2 circuit 31-AD15 (BK), harness side and ground.

• Is the resistance less than 5 ohms?

→ **Yes**
GO to [F5](#).

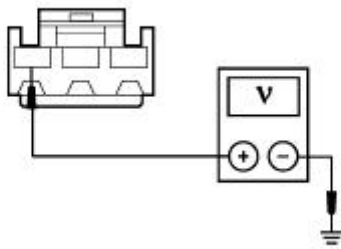
→ **No**
REPAIR the circuit. CLEAR the DTCs.
REPEAT the self-test.

F5 CHECK THE REM OUTPUT


1



3



A0002476

2  **CAUTION: Make sure the engine is not running. The ignition switch should be in the RUN position with the engine OFF.**

Engage the parking brake and shift the transmission to the REVERSE position.

3 Measure the voltage between interior rear view mirror C911, pin 3 circuit 8-AD15 (WH/BU), harness side and ground.

• Is the voltage greater than 10 volts?

→ **Yes**
GO to [F8](#).

→ **No**
GO to [F6](#).

F6 CHECK CIRCUIT 8-AD15 (WH/BU) FOR AN OPEN

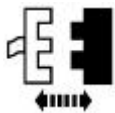
1



2

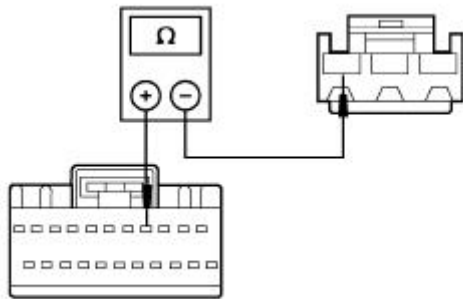


3



REM C420b

4



A0002477

4

Measure the resistance between interior rear view mirror C911, pin 3 circuit 8-AD15 (WH/BU), harness side and REM C420b pin 4, circuit 8-AD15 (WH/BU), harness side.

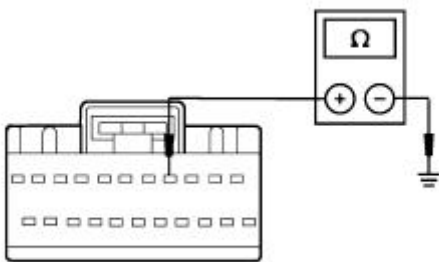
• Is the resistance less than 5 ohms?

→ **Yes**
GO to [F7](#).

→ **No**
REPAIR the circuit. CLEAR the DTCs.
REPEAT the self-test.

F7 CHECK CIRCUIT 8-AD15 (WH/BU) FOR A SHORT TO GROUND

1



A0002478

1

Measure the resistance between REM C420b pin 4, circuit 8-AD15 (WH/BU), harness side and ground.

• Is the resistance greater than 10,000 ohms?

→ **Yes**
INSTALL a new REM. REFER to [Section 419-10](#). CLEAR the DTCs. REPEAT the self-test.

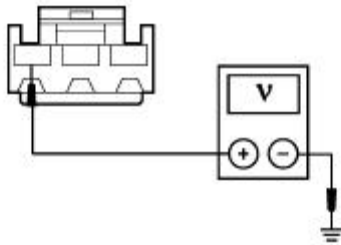
→ **No**
REPAIR the circuit. CLEAR the DTCs.
REPEAT the self-test.

F8 CHECK FOR THE CORRECT OUTPUT TO THE MIRROR

1

PRND
↑

2



A0002476

2

Measure the voltage between interior rear view mirror C911, pin 3 circuit 8-AD15 (WH/BU), harness side and ground.

● Is the voltage greater than 10 volts?

→ **Yes**
GO to [F9](#).

→ **No**
INSTALL a new interior rear view mirror. For additional information, REFER to [Mirror—Interior Rear View](#). CLEAR the DTCs. REPEAT the self-test. If the auto dimming feature continues to function incorrectly, INSTALL a new REM. REFER to [Section 419-10](#). CLEAR the DTCs. REPEAT the self-test.

F9 CHECK CIRCUIT 8-AD15 (WH/BU) FOR A SHORT TO VOLTAGE

1



2



REM C420b

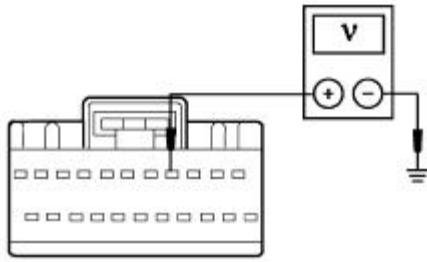
3



4

4

Measure the voltage between REM C420b pin 4, circuit 8-AD15 (WH/BU), harness side and ground.




A0002479

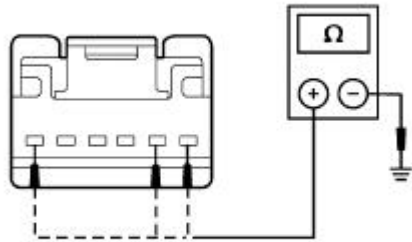
● **Is voltage present?**

→ **Yes**
REPAIR the circuit. CLEAR the DTCs.
REPEAT the self-test.

→ **No**
INSTALL a new REM. REFER to [Section 419-10](#). CLEAR the DTCs. REPEAT the self-test.

PINPOINT TEST G: THE MEMORY MIRROR IS INOPERATIVE

CONDITIONS	DETAILS/RESULTS/ACTIONS						
G1 CHECK FOR DDM DTCS							
	<p>1 Use the recorded results from the DDM self-test.</p> <p>● Was DTC B1534, B1538 or B1530 retrieved?</p> <p>→ Yes GO to G2.</p> <p>→ No GO to G4.</p>						
G2 CHECK THE MEMORY SET SWITCH FOR A SHORT TO GROUND							
<p>1</p>  <p>Memory Set Switch C503</p> <p>2</p>	<p>2 Using the following table, measure the resistance between memory set switch C503 pins, harness side and ground.</p> <table border="1"> <thead> <tr> <th>Pin</th> <th>Circuit</th> </tr> </thead> <tbody> <tr> <td>2</td> <td>8-AH27 (WH)</td> </tr> <tr> <td>6</td> <td>8-AH31 (WH/RD)</td> </tr> </tbody> </table>	Pin	Circuit	2	8-AH27 (WH)	6	8-AH31 (WH/RD)
Pin	Circuit						
2	8-AH27 (WH)						
6	8-AH31 (WH/RD)						



A0002480

1 | 8-AH32 (WH/BU)

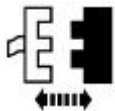
- Are the resistances greater than 10,000 ohms?

→ **Yes**
 INSTALL a new memory set switch.
 CLEAR the DTCs. REPEAT the self-test.

→ **No**
 GO to [G3](#).

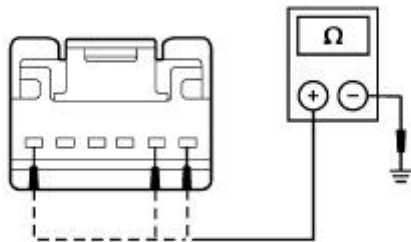
G3 CHECK CIRCUIT 8-AH27 (WH), 8-AH31 (WH/RD) AND 8-AH32 (WH/BU) FOR A SHORT TO GROUND

1



DDM C501c

2



A0002480

2 Using the following table, measure the resistance between memory set switch C503 pins, harness side and ground.

Pin	Circuit
2	8-AH27 (WH)
6	8-AH31 (WH/RD)
1	8-AH32 (WH/BU)

- Are the resistances greater than 10,000 ohms?

→ **Yes**
 INSTALL a new DDM. REFER to [Section 419-10](#). CLEAR the DTCs. REPEAT the self-test.

→ **No**
 REPAIR the circuit. CLEAR the DTCs. REPEAT the self-test.

G4 CHECK THE MEMORY SET SWITCH USING DDM PIDS

1

1 Monitor the DDM PIDs MEMS_SW, MEM1_SW and MEM2_SW, while



actuating the memory set switch buttons.

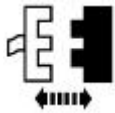
- Did the DDM PID values agree with the memory set switch positions?

→ **Yes**
 INSTALL a new DDM. REFER to [Section 419-10](#). CLEAR the DTCs. REPEAT the self-test.

→ **No**
 GO to [G5](#).

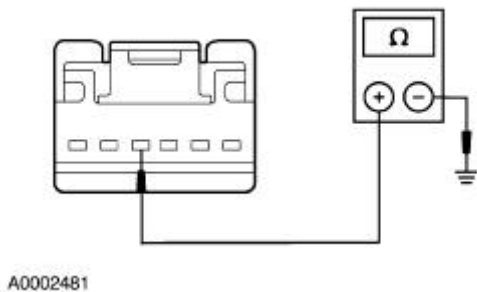
G5 CHECK CIRCUIT 31-AH27 (BK) FOR AN OPEN

1



Memory Set Switch C503

2



2 Measure the resistance between memory set switch C503 pin 4, circuit 31-AH27 (BK), harness side and ground.

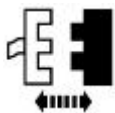
- Is the resistance less than 5 ohms?

→ **Yes**
 GO to [G6](#).

→ **No**
 REPAIR the circuit. CLEAR the DTCs. REPEAT the self-test.

G6 CHECK FOR AN OPEN CIRCUIT BETWEEN THE DDM AND MEMORY SET SWITCH

1

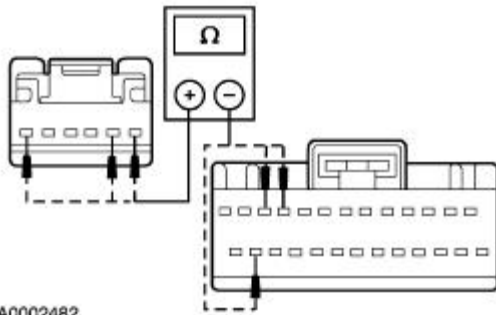


DDM C501c

2

2 Using the following table, measure the resistance between DDM C501d pins, harness side and memory set switch C503 pins, harness side.

DDM	Memory Set
-----	------------



A0002482

Pin	Circuit	Switch Pin
25	8-AH27 (WH)	2
10	8-AH31 (WH/RD)	6
11	8-AH32 (WH/BU)	1

- Are the resistances less than 5 ohms?

→ **Yes**
GO to [G7](#).

→ **No**
REPAIR the circuit. CLEAR the DTCs. REPEAT the self-test.

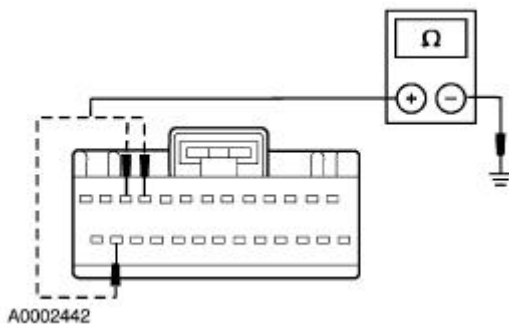
G7 CHECK THE MEMORY SET SWITCH FOR AN OPEN

1



Memory Set Switch C503

2



A0002442

- 2 Using the following table, measure the resistance between DDM C501d pins, harness side and ground, while activating the indicated memory set switch button.

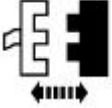
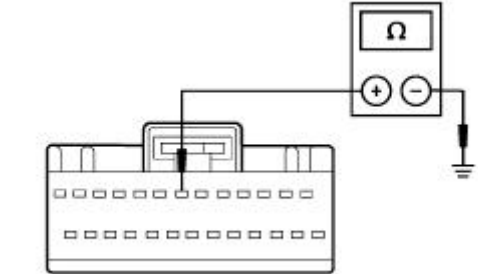
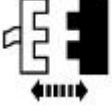
DDM Pin	Circuit	Memory Set Switch Button
25	8-AH27 (WH)	SET
10	8-AH31 (WH/RD)	MEMORY 1
11	8-AH32 (WH/BU)	MEMORY 2

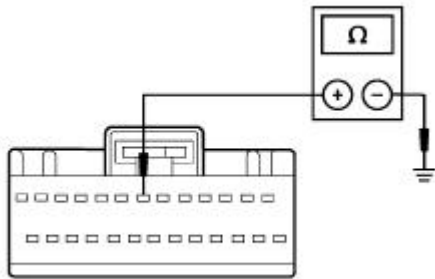
- Is the resistance less than 5 ohms when each button is pressed?

→ **Yes**
INSTALL a new DDM. REFER to [Section 419-10](#). CLEAR the DTCs. REPEAT the self-test.

→ **No**
INSTALL a new memory set switch. CLEAR the DTCs. REPEAT the self-test.

PINPOINT TEST H: THE MEMORY MIRROR IS INOPERATIVE — MEMORY SET SWITCH LED

CONDITIONS	DETAILS/RESULTS/ACTIONS
H1 CHECK THE MEMORY SWITCH LED	
	<p>1 Operate the memory set switch.</p> <ul style="list-style-type: none"> ● Is the memory set switch LED always ON? <p>→ Yes GO to H6.</p> <p>→ No GO to H2.</p>
H2 CHECK CIRCUIT 7S-AH27 (YE) FOR RESISTANCE	
<p>1</p>  <p>DDM C501c</p> <p>2</p>  <p>A0002483</p>	<p>2 Measure the resistance between DDM C501d pin 7, circuit 7S-AH27 (YE), harness side and ground.</p> <ul style="list-style-type: none"> ● Is the resistance greater than 10,000 ohms? <p>→ Yes GO to H4.</p> <p>→ No GO to H3.</p>
H3 CHECK CIRCUIT 7S-AH27 (YE) FOR A SHORT TO GROUND	
<p>1</p>  <p>Memory Set Switch C503</p> <p>2</p>	<p>2 Measure the resistance between DDM C501d pin 7, circuit 7S-AH27 (YE), harness side and ground.</p>



A0002483

- Is the resistance greater than 10,000 ohms?

- **Yes**
 INSTALL a new memory set switch.
 CLEAR the DTCs. REPEAT the self-test.
- **No**
 REPAIR the circuit. CLEAR the DTCs.
 REPEAT the self-test.

H4 CHECK THE DDM

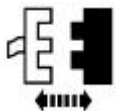
- 1 Connect a 5A fused jumper wire between DDM C501c pin 7, circuit 7S-AH27 (YE), harness side and battery voltage.

- Did the memory set switch LED illuminate?

- **Yes**
 INSTALL a new DDM. REFER to [Section 419-10](#). CLEAR the DTCs. REPEAT the self-test.
- **No**
 GO to [H5](#).

H5 CHECK CIRCUIT 7S-AH27 (YE) FOR AN OPEN

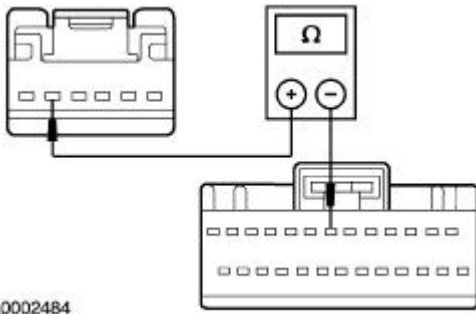
1



Memory Set Switch C503

2

- 2 Measure the resistance between memory set switch C503 pin 5, circuit 7S-AH27 (YE), harness side and DDM C501d pin 7, circuit 7S-AH27 (YE), harness side.



● Is the resistance less than 5 ohms?

- **Yes**
 INSTALL a new memory set switch.
 CLEAR the DTCs. REPEAT the self-test.
- **No**
 REPAIR the circuit. CLEAR the DTCs.
 REPEAT the self-test.

H6 CHECK THE DDM FOR AN INTERNAL SHORT TO VOLTAGE

1



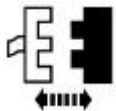
DDM C501c

● Did the memory set switch LED turn OFF?

- **Yes**
 INSTALL a new DDM. REFER to [Section 419-10](#). CLEAR the DTCs. REPEAT the self-test.
- **No**
 GO to [H7](#).

H7 CHECK CIRCUIT 7S-AH27 (YE) FOR A SHORT TO VOLTAGE

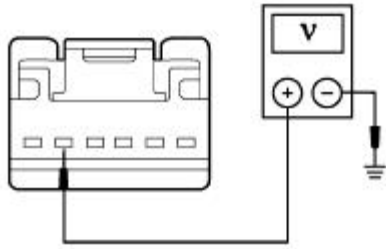
1



Memory Set Switch C503

2

- 2 Measure the voltage between memory set switch C503 pin 5, circuit 7S-AH27 (YE), harness side and ground.





A0002485

● **Is voltage present?**

→ **Yes**
REPAIR the circuit. CLEAR the DTCs.
REPEAT the self-test.

→ **No**
INSTALL a new memory set switch.
CLEAR the DTCs. REPEAT the self-test.

PINPOINT TEST I: THE HEATED EXTERIOR MIRROR DOES NOT DEFROST

CONDITIONS	DETAILS/RESULTS/ACTIONS
I1 CHECK THE REAR WINDOW DEFROST OPERATION	
<p>1</p>  <p>2</p> 	<p>3</p> <p>Depress the rear window defrost switch to ON.</p> <p>● Does the rear window defrost or warm up?</p> <p>→ Yes GO to I2.</p> <p>→ No REFER to Section 501-11 to diagnose the rear window defrost system.</p>
I2 CHECK THE HEATED FUNCTION OF THE EXTERIOR REAR VIEW MIRRORS	
	<p>1</p> <p>Check the heated function of the exterior rear view mirrors.</p>

- Is the heated function of both exterior rear view mirrors inoperative?

→ **Yes**
GO to [13](#).

→ **No**
For the driver side exterior rear view mirror, GO to [14](#).

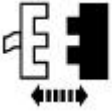
For the passenger side exterior rear view mirror, GO to [16](#).

13 CHECK CIRCUIT 15S-DC1 (GN/YE) FOR VOLTAGE

1



2

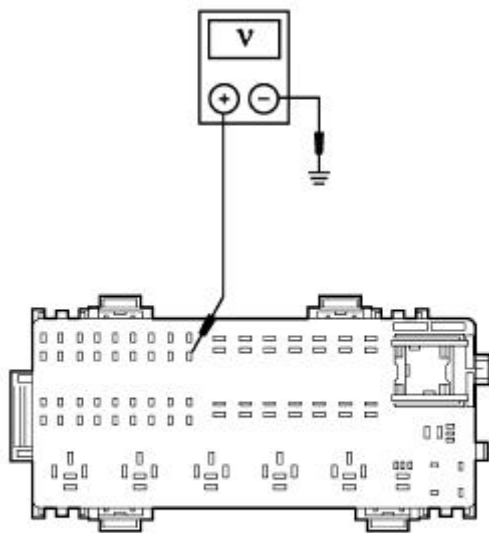


BJB Fuse 409 (5A)

3



5



4 Depress the rear window defrost switch to ON.

5 Measure the voltage between BJB Fuse 409 (5A) input pin, circuit 15S-DC1 (GN/YE), and ground.

● Is the voltage greater than 10 volts?

→ **Yes**
REPAIR circuit 29S-HB1 (OG/YE). TEST the system for normal operation.

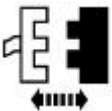
→ **No**
REPAIR circuit 15S-DC1 (GN/YE). TEST the system for normal operation.

I4 CHECK CIRCUIT 29S-HB1 (OG/YE) FOR OPEN

1

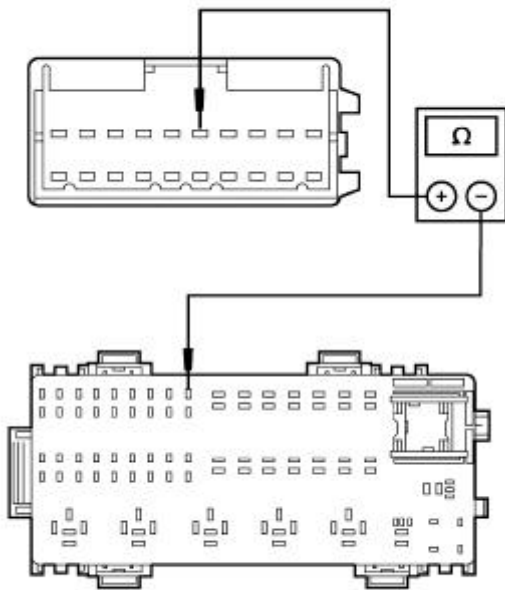


2



Driver Exterior Rear View Mirror C520

3



A0002488

3 Measure the resistance between BJB Fuse 409 (5A) output terminal, circuit 29S-HB1 (OG/YE) and driver exterior rear view mirror C520 pin 9, circuit 29-HB35 (OG/BK), harness side.

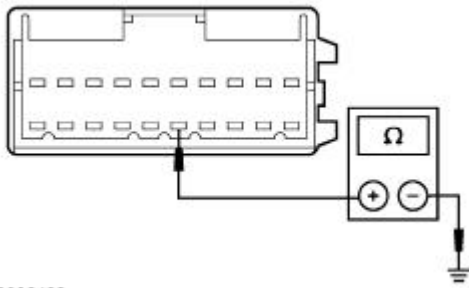
● Is the resistance less than 5 ohms?

→ **Yes**
GO to [15](#).

→ **No**
REPAIR circuit 29-HB35 (OG/BK). TEST the system for normal operation.

I5 CHECK CIRCUIT 31-HB35 (BK) FOR OPEN

1



A0002489

- 1 Measure the resistance between driver exterior rear view mirror C520 pin 10, circuit 31-HB35 (BK), harness side and ground.

● Is the resistance less than 5 ohms?

→ **Yes**
 INSTALL a new driver exterior rear view mirror. For additional information, REFER to [Mirror—Exterior Rear View](#) in this section. TEST the system for normal operation.

→ **No**
 REPAIR circuit 31-HB35 (BK). TEST the system for normal operation.

I6 CHECK CIRCUIT 29-HB36 (OG/GN) FOR OPEN

1



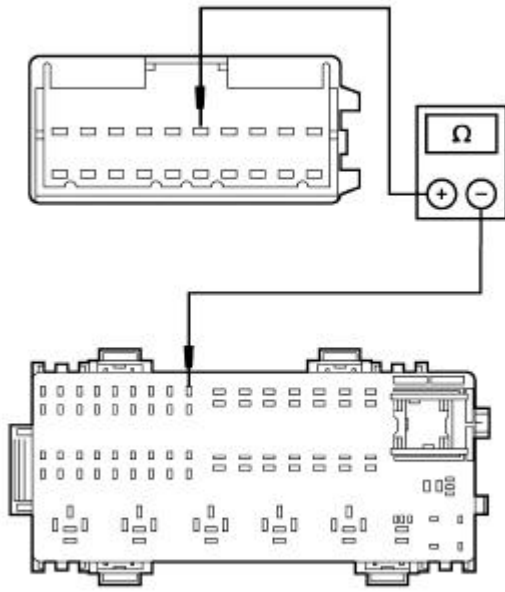
2



Passenger Exterior Rear View Mirror C601

3

- 3 Measure the resistance between BJB Fuse 409 (5A) output terminal, circuit 29S-HB1 (OG/YE) and passenger exterior rear view mirror C601 pin 9, circuit 29-HB36 (OG/GN), harness side.



A0002488

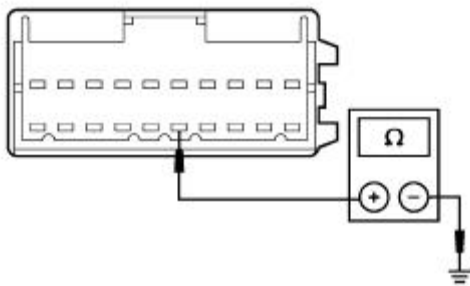
● Is the resistance less than 5 ohms?

→ **Yes**
GO to [I7](#).

→ **No**
REPAIR circuit 29-HB36 (OG/GN). TEST the system for normal operation.

I7 CHECK CIRCUIT 31-HB36 (BK) FOR OPEN

1



A0002489

1

Measure the resistance between passenger exterior rear view mirror C601 pin 10, circuit 31-HB36 (BK), harness side and ground.

● Is the resistance less than 5 ohms?

→ **Yes**
INSTALL a new passenger exterior rear view mirror. For additional information, REFER to [Mirror—Exterior Rear View](#) in this section. TEST the system for normal operation.

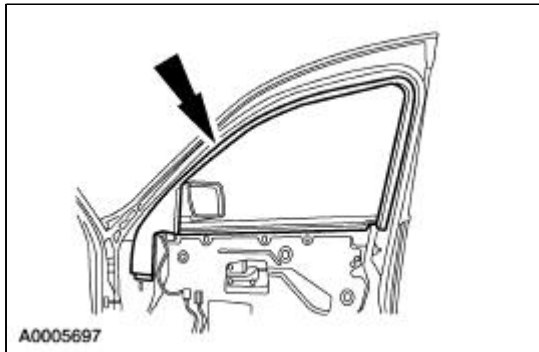
→ **No**

REPAIR circuit 31-HB36 (BK). TEST the system for normal operation.

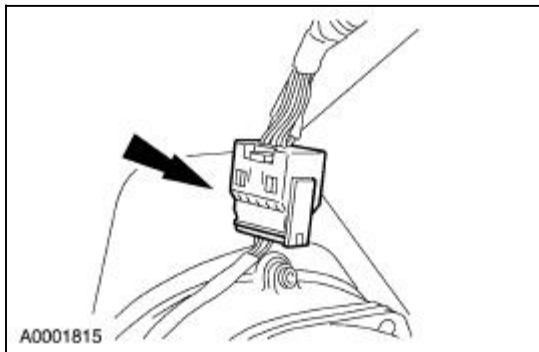
Mirror —Exterior Rear View

Removal and Installation

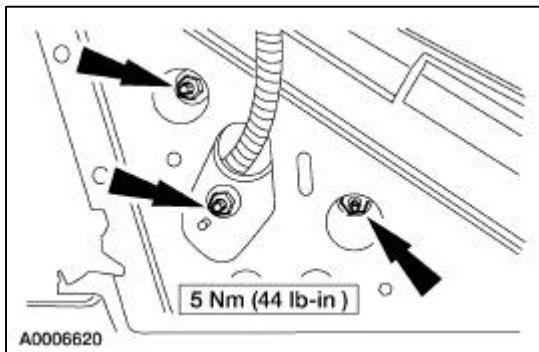
1. Remove the front door trim panel. For additional information, refer to [Section 501-05](#).
2. Remove the interior garnish moulding.



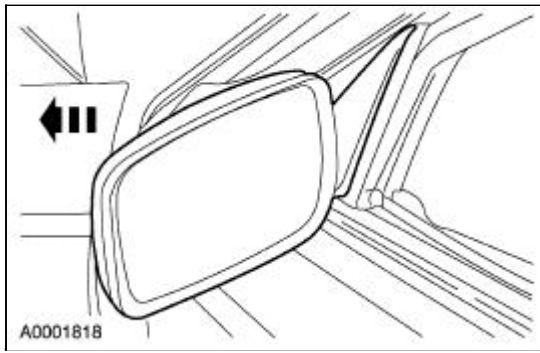
3. Disconnect the electrical connector.



4. Remove the exterior rear view mirror nuts.



5. Remove the exterior rear view mirror.

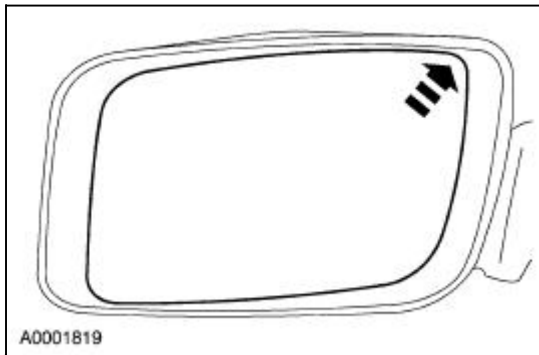


6. To install, reverse the removal procedure.

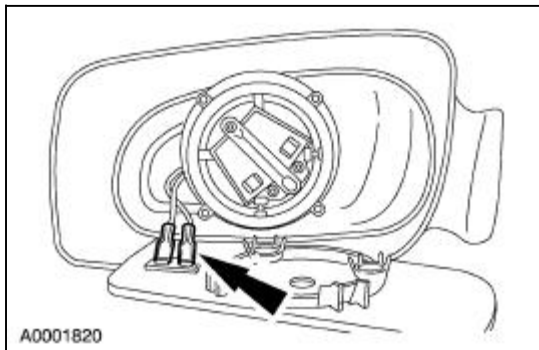
Mirror —Glass

Removal and Installation

1. Push in the upper edge of the mirror glass to the maximum travel.



2. Grasp the bottom of the mirror glass and pull outward.
3. Disconnect the electrical connectors and remove the mirror glass.



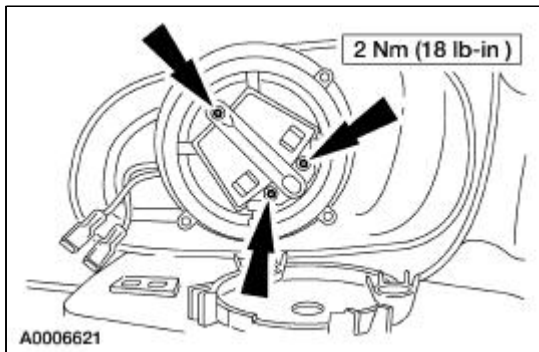
4. **NOTE:** When installing the mirror glass, make sure it snaps into the mirror motor.

To install, reverse the removal procedure.

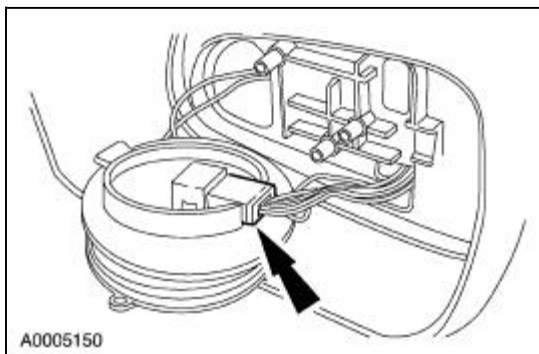
Mirror —Motor

Removal and Installation

1. Remove the exterior rear view mirror glass. For additional information, refer to [Mirror—Glass](#).
2. Remove the mirror motor screws.



3. Disconnect the electrical connector and remove the mirror motor.

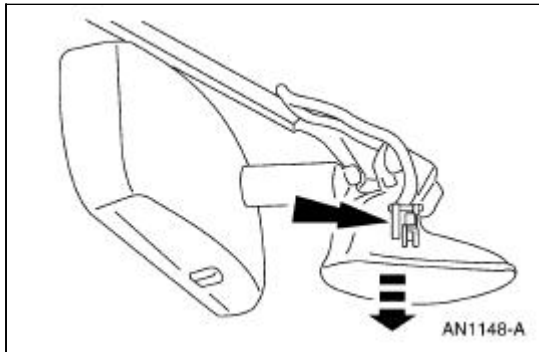


4. To install, reverse the removal procedure.

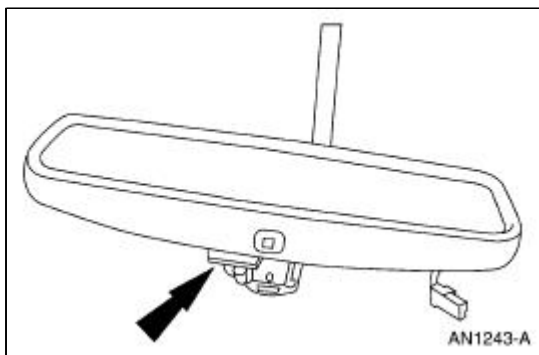
Mirror —Interior Rear View

Removal

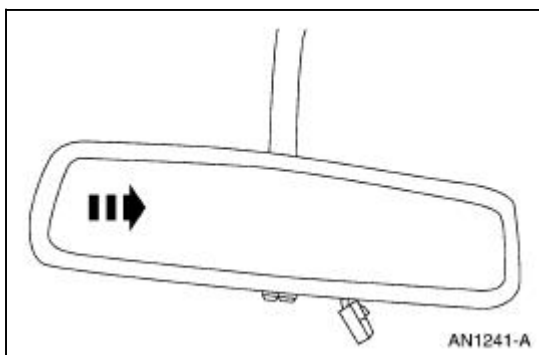
1. Remove the compass module.
 - Disconnect the connector.
 - Remove the screws.
 - Remove the compass connector.



2. Disconnect the mirror connector.

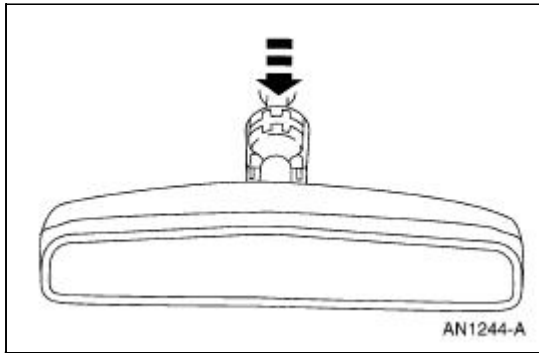


3. Support the mirror with one hand against the windshield and pull towards the passenger side with the other hand.

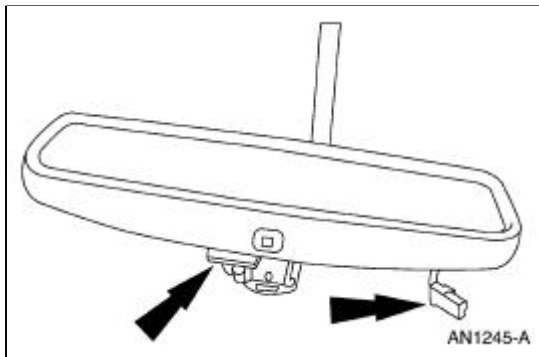


Installation

1. Push the mirror down on the clip until an audible click is heard and the mirror snaps into place.



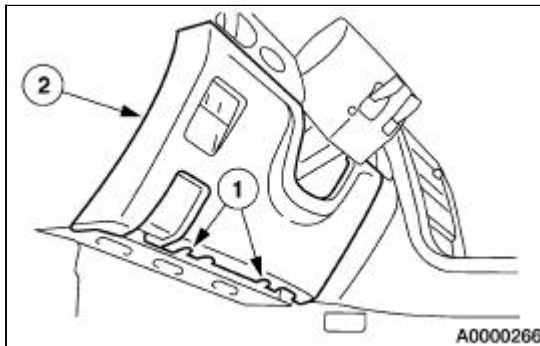
2. Install the mirror connector and compass module.
 - Install the mirror connector.
 - Install the compass module connector.



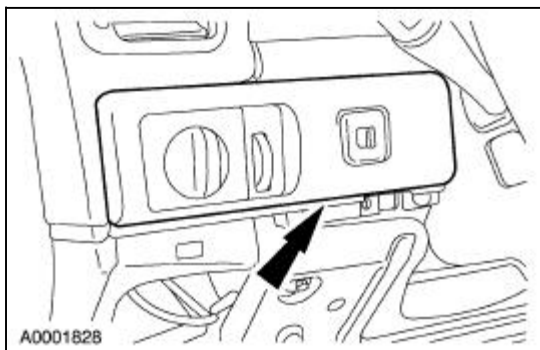
Switch —Exterior Rear View Mirror Control

Removal and Installation

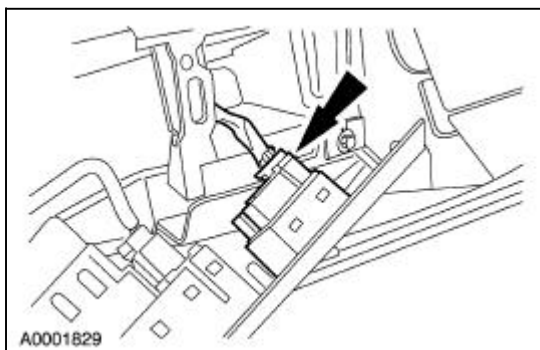
1. Remove the instrument panel steering column cover.
 1. Remove the screws.
 2. Remove the instrument panel steering column cover.
 - Disconnect the electrical connectors.



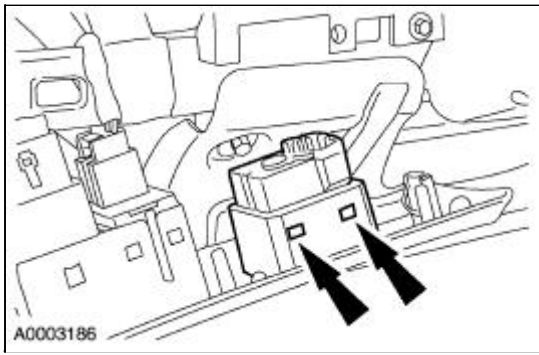
2. Remove the upper finish panel.



3. Disconnect the interior rear view mirror control switch electrical connector.



4. Remove the interior rear view mirror control switch.



5. To install, reverse the removal procedure.

Torque Specifications

Description	Nm	lb-ft	lb-in
Rear seat bolster nut	11	8	—
Front seat track to floor bolts	25	18	—
Front seat track to floor nuts	25	18	—
Front safety belt to nut	40	30	—
Front seat backrest bolts	25	18	—
Front seat safety belt buckle bolt	40	30	—
Side air bag nuts	7	—	62
Rear seat backrest nuts	48	35	—
Front seat track nuts	20	15	—
Rear center safety belt anchor nut	48	35	—

Seats

Seats — Front

The front seats have the following features:

- memory set (optional)
- power lumbar (optional)
- manual lumbar
- horizontal, vertical and front and rear tilt adjustments
- power recline
- heat (optional)

Adjustment of the seat may be accomplished with the seat regulator control switch located on the side of the seat.

Seats — Rear

The rear seat has the following features:

- fold down seat backrest
- removable cushion retained by two latches located at the front of the cushion
- two rear bolsters on each side of the rear seat backrest

Fold down the rear seat backrest by releasing the two levers in the luggage compartment.

Seats — Power Recliner

The power recliner tilts the seat backrest rearward or forward and is controlled by the seat regulator control switch.

The power recliner cannot be repaired separately. If the power recliner needs to be repaired, an entirely new front seat backrest latch must be installed.

Seats — Power Lumbar Support

The seat has electro-mechanical front seat backrest pad adjuster. The lumbar switch adjustment is on the side of the seat.

Seats — Manual Lumbar Support

The manual front seat backrest lumbar is adjusted by a knob (57620) mounted on the front of the seat cushion.

Seats — Memory Set

This system allows automatic positioning of the driver seat, outside rearview mirrors, and power adjusted tilt/telescope steering column to two programmable positions.

The memory seat control is located on the driver door.

Seats — Heated

Each heated front seat is controlled by a switch on the instrument panel.

The heated seat system will only operate with the ignition switch in the RUN position.

Side Air Bag

Driver and passenger side air bags (611A08) are attached to the seat backrest frame. For diagnostic information or if the side air bag has been deployed, refer to [Section 501-20B](#).

The front seat backrest trim covers cannot be repaired. If the front seat backrest covers need to be repaired, an entirely new cover must be installed. Cleaning the front seat backrest cover is permissible.

If a side air bag deployment took place, a new seat back pad, trim cover and side air bag module must be installed. Install a new seat backrest frame if necessary.

Seats — Driver Seat Module

The driver seat module is attached to the driver seat track. For additional information, refer to [Section 419-10](#) for removal and installation procedures.




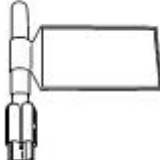
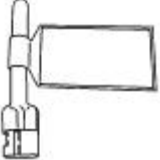
Seats

Refer to Wiring Diagrams Section [501-10](#), Climate Controlled Seats for schematic and connector information.

Refer to Wiring Diagrams Section [501-10](#), Power Seats for schematic and connector information.

Refer to Wiring Diagrams Section [501-10](#), Memory Seats for schematic and connector information.

Special Tool(s)

 ST1137-A	73III Automotive Meter 105-R0057 or equivalent
 ST2332-A	Worldwide Diagnostic System (WDS) 418-F224 New Generation Star (NGS) Tester 418-F052 (007-00500) or equivalent scan tool
 ST2502-A	Diagnostic Tool, Restraint System (2 Required) 418-F395
 ST2506-A	Diagnostic Tool, Restraint System (2 Required) 418-F088
 ST2507-A	Diagnostic Tool, Restraint System (2 Required) 418-133

Restraint System Diagnostic Tool Warning

 **WARNING:** The Restraint System Diagnostic Tools are for restraint system service only. Remove from vehicle prior to road use. Failure to remove could result in injury and possible violation of vehicle safety standards.

Principles of Operation

Driver Power Seat

The driver power seat is controlled by the driver seat module (DSM). The DSM does not need to be configured, however the drive seat does need to be calibrated when the DSM is installed. The driver seat regulator control switch provides voltage to the DSM when activated. The neutral position of each driver seat regulator control switch position is a ground state through the seat regulator control switch contacts. A voltage input causes the DSM to power the appropriate motor until the input is removed. Ground is the normal state of the motor circuits through the DSM and is not switched to control the motors. The DSM internally switches the appropriate line from ground to power to adjust the motors.

As the seat is adjusted, the DSM constantly monitors the motor position sensors to record the current seat position. The DSM will remove power from the motor upon termination of the seat regulator control switch input or if the DSM does not see movement from the motor by monitoring the position sensor. The DSM must be calibrated to the seat track it is controlling. For additional information, refer to Seat Calibration. Once the DSM is calibrated to the seat track, it will only allow movement within the calibrated range.

Seat Calibration

The DSM is calibrated using a scan tool. The calibration procedure automatically powers the driver power seat through its full range of motion and records the full stop positions by monitoring the motor position sensors. Once the full stop positions or range of the seat have been recorded, the DSM will only operate within the calibrated range. Any input attempting to drive the seat beyond the calibrated range will be ignored. This calibration is used for all seat control functions including manual switch control and memory recall positioning. During the seat calibration, the DSM may identify a function that is inoperative, such as a position sensor not changing. If the DSM identifies a concern that has a related diagnostic trouble code (DTC), the DSM will set the related DTC at the end of the validation procedure.

The calibration procedure powers the seat track adjustments to the end of their travel, which is determined by the DSM seeing a change of state in the motor position sensors. If there is a concern with the seat track or motor position sensor that limits the travel, the DSM will interpret the stopping point as the end of travel and store the position. The DSM is not able to determine if the seat has moved to its full travel position. It is only capable of monitoring and storing the amount of travel seen by the position sensor changing states.

For additional information on carrying out the power seat calibration procedure, refer to the scan tool operating manual.

Memory Seat

Memory seat positioning can be recalled with the memory switches on the driver door panel or a programmed remote keyless entry transmitter. In either case, the DSM receives a memory recall 1 or 2 command from the driver door module (DDM) over the SCP communication network. The memory recall switches are a hardwired input to the DDM. The DDM also receives the remote keyless entry transmitter signals. Once a valid memory recall command is received from the DDM, the DSM moves the drivers seat to the position stored in memory by powering the appropriate motors and monitoring the motor position sensors until the position is reached.

Easy Exit/Easy Entry

The easy exit function moves the seat backwards about two inches when the ignition key is removed from the ignition switch. The DSM receives a key out command over the SCP communication network and powers the driver seat rearward. This function will not operate if the seat is less than the travel distance to the end of the track, or the function has been deactivated at the message center driver

personality settings. The DSM will also cancel this operation if a valid input command is received, such as the seat regulator control switch or memory recall request.

The DSM will record the current seat position before powering the seat for a easy exit function. This recorded position will be used to return the seat to this position on the easy entry operation. During easy entry operation, the seat is returned to the position previous to the easy exit operation. Easy entry operation will be cancelled if a valid input command is received by the DSM.

Passenger Power Seat

The passenger power seat motors are hardwired to the passenger seat regulator control switch. The circuits are normally at ground through the seat regulator control switch. The individual circuit is switched to power when the specific adjustment position is selected.

Heated Seats

The driver and passenger heated seats share a common battery and ignition feed. A separate shared ignition source supplies the heated seat switches. When the heated seat switch is pressed with the ignition switch in RUN, a momentary voltage signal is sent to the heated seat module. The heated seat module then supplies power to the heating element circuit. The cushion element and seat backrest element are wired in series and powered by the same output. The heated seat module also will ground the separate indicator circuit at the heated seat switch to indicate an ON state. The heated seat module will remain on until the heated seat switch is pressed and a momentary voltage signal is received, or until 10 minutes expire. If the ignition source is removed from the module, the heated seat module will enter an off state and will not return to ON until the switch is once again pressed with the ignition switch in RUN. The heated seat module is designed to heat the seat to 37.5°C (99.5°F) and maintain the temperature until time-out or switched off. This temperature is maintained by the heated seat module monitoring the temperature sensor located in the seat cushion element, and adjusting the current flow to the heating elements.

Inspection and Verification

1. Verify the customer concern by operating the system.
2. Visually inspect for obvious signs of mechanical or electrical damage.

Visual Inspection Chart

Mechanical	Electrical
<ul style="list-style-type: none"> ● Front seat track motors. ● Front seat track binding or obstructed. ● Front seat backrest power recline. ● Lumbar motor. 	<ul style="list-style-type: none"> ● BJB Fuses 411 (15A), 421 (20A), 425 (40A), 428 (20A) ● CJB Fuses 205 (5A), 216 (5A), 207 (5A) ● Seat regulator control switch. ● Memory set switch. ● Lumbar seat control switch.

3. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
4. If the concern remains after the inspection, connect the scan tool to the data link connector (DLC) located beneath the instrument panel. Then select the vehicle to be tested from the scan tool menu. If the scan tool does not communicate with the vehicle:
 - Check that the program card is correctly installed.
 - Check the connections to the vehicle.
 - Check the ignition switch position.

5. If the scan tool still does not communicate with the vehicle, refer to the scan tool manual.
6. Carry out the DATA LINK DIAGNOSTICS test. If the scan tool responds with:
 - CKT 914, CKT 915 or CKT70 = ALL ECUS NO RESP/NOT EQUIP, refer to [Section 418-00](#).
 - NO RESP/NOT EQUIP for DSM, [Go To Pinpoint Test A](#).
 - NO RESP/NOT EQUIP for DDM, [Go To Pinpoint Test B](#).
 - System passed, retrieve and record the continuous diagnostic trouble codes (DTCs), erase the continuous DTCs and carry out self test diagnostics for the DSM and the DDM.
7. If the DSM DTCs retrieved are related to the concern, go to the DSM Diagnostic Trouble Code (DTC) Index.
8. If the DDM DTCs retrieved are related to the concern, go to the DDM Diagnostic Trouble Code (DTC) Index.
9. If no DTCs related to the concern are retrieved, GO to [Symptom Chart](#) to continue the diagnostics.

DSM Diagnostic Trouble Code (DTC) Index

DTC	Description	Source	Action
B1342	ECU Is Defective	DSM	REPEAT the DSM self-test. If DTC B1342 is retrieved again, INSTALL a new DSM. REFER to Section 419-10 . CLEAR the DTCs. REPEAT the self test.
B1676	Battery Pack Voltage Out of Range	DSM	Go To Pinpoint Test M .
B1703	Seat Driver Recline Forward Switch Circuit Short to Battery	DSM	Go To Pinpoint Test E .
B1707	Seat Driver Recline Rearward Switch Circuit Short to Battery	DSM	Go To Pinpoint Test E .
B1711	Seat Driver Front Up Switch Circuit Short to Battery	DSM	Go To Pinpoint Test E .
B1715	Seat Driver Front Down Switch Circuit Short to Battery	DSM	Go To Pinpoint Test E .
B1719	Seat Driver Forward Switch Circuit Short to Battery	DSM	Go To Pinpoint Test E .
B1723	Seat Driver Rearward Switch Circuit Short to Battery	DSM	Go To Pinpoint Test E .
B1727	Seat Driver Rear Up Switch Circuit Short to Battery	DSM	Go To Pinpoint Test E .
B1731	Seat Driver Rear Down Switch Circuit Short to Battery	DSM	Go To Pinpoint Test E .

B1757	Seat Driver Rear Down Circuit Failure	DSM	Go To Pinpoint Test E .
B1761	Seat Driver Front Down Circuit Failure	DSM	Go To Pinpoint Test E .
B1765	Seat Driver Forward Circuit Failure	DSM	Go To Pinpoint Test E .
B1769	Seat Driver Backward Circuit Failure	DSM	Go To Pinpoint Test E .
B2143	NVM Memory Failure	DSM	CARRY OUT seat calibration of the DSM. CLEAR the DTCs. REPEAT the self test. IF the DTC resets, INSTALL a new DSM. REFER to Section 419-10 . CARRY OUT seat calibration of the new DSM.
B2146	Seat Recline Motor Position Out of Range	DSM	Go To Pinpoint Test E .
B2149	Seat Front Vertical Motor Position Out of Range	DSM	Go To Pinpoint Test E .
B2152	Seat Rear Vertical Motor Position Out of Range	DSM	Go To Pinpoint Test E .
B2155	Seat Horizontal Motor Position Out of Range	DSM	Go To Pinpoint Test E .
B2158	Seat Recline Motor Memory Position Out of Range	DSM	Go To Pinpoint Test G .
B2161	Seat Front Vertical Motor Memory Position Out of Range	DSM	Go To Pinpoint Test G .
B2164	Seat Rear Vertical Motor Memory Position Out of Range	DSM	Go To Pinpoint Test G .
B2167	Seat Horizontal Motor Memory Position Out of Range	DSM	Go To Pinpoint Test G .

DDM Diagnostic Trouble Code (DTC) Index

DTC	Description	Source	Action
B1309	Power Door Lock Circuit Short to Ground	DDM	REFER to Section 501-14B .
B1341	Power Door Unlock Circuit Short to Ground	DDM	REFER to Section 501-14B .
B1342	ECU Is Defective	DDM	CLEAR the DTC. REPEAT the DDM self-test. If DTC B1342 is retrieved, INSTALL a new DDM. REFER to Section 419-10 . CLEAR the DTCs. REPEAT the self-test.
B1400	Driver Power Window One Touch Window Relay Circuit Short to Battery	DDM	REFER to Section 501-11 .
B1405	Driver Power Window Down	DDM	REFER to Section 501-11 .

	Circuit Short to Battery		
B1408	Driver Power Window Up Circuit Short to Battery	DDM	REFER to Section 501-11 .
B1416	Power Window LR Motor Circuit Short to Battery	DDM	REFER to Section 501-11 .
B1420	Passenger Power Window Motor Circuit Short to Battery	DDM	REFER to Section 501-11 .
B1424	Power Window RR Motor Circuit Short to Battery	DDM	REFER to Section 501-11 .
B1530	Memory Set Switch Circuit Short to Ground	DDM	REFER to Section 501-09 .
B1534	Memory 1 Switch Circuit Short to Ground	DDM	REFER to Section 501-09 .
B1538	Memory 2 Switch Circuit Short to Ground	DDM	REFER to Section 501-09 .
B1676	Battery Pack Voltage Out of Range	DDM	REFER to Section 419-10 .
B2112	Door Driver Set Switch Stuck Failure	DDM	REFER to Section 501-14B .
B2116	Door Driver Reset Switch Stuck Failure	DDM	REFER to Section 501-14B .
B2320	Mirror Driver Horizontal Feedback Potentiometer Circuit Failure	DDM	REFER to Section 501-09 .
B2324	Mirror Driver Vertical Feedback Potentiometer Circuit Failure	DDM	REFER to Section 501-09 .
B2336	Mirror Switch Assembly Circuit Failure	DDM	REFER to Section 501-09 .
B2425	Remote Keyless Entry Out of Synchronization	DDM	REFER to Section 501-14B .
B2477	Module Configuration Failure	DDM	REFER to Section 418-01 .
U1041	SCP (J1850) Invalid or Missing Data for Vehicle Speed	ABS	CARRY OUT the ABS self-test. REFER to Section 206-09B .
U1059	SCP (J1850) Invalid or Missing Data for Transmission / Transaxle / PRNDL	PCM	CARRY OUT the PCM self-test. REFER to Powertrain Control/Emissions Diagnosis (PC/ED) manual.

Symptom Chart

Symptom Chart


Condition	Possible Sources	Action
<ul style="list-style-type: none"> No communication with the driver seat module (DSM) 	<ul style="list-style-type: none"> DSM. BJB fuse 421 (20A). CJB fuse 207 	<ul style="list-style-type: none"> Go To Pinpoint Test A.

	<ul style="list-style-type: none"> (5A). ● Circuitry. 	
<ul style="list-style-type: none"> ● No communication with the driver door module (DDM) 	<ul style="list-style-type: none"> ● DDM. ● BJB fuse 420 (20A). ● CJB fuse 207 (5A). ● Circuitry. 	<ul style="list-style-type: none"> ● Go To Pinpoint Test B .
<ul style="list-style-type: none"> ● The power seat is inoperative — driver 	<ul style="list-style-type: none"> ● BJB fuse 421 (20A). ● Circuitry. ● Driver seat regulator control switch. 	<ul style="list-style-type: none"> ● Go To Pinpoint Test C .
<ul style="list-style-type: none"> ● The power seat is inoperative — passenger 	<ul style="list-style-type: none"> ● BJB fuse 428 (20A). ● Passenger seat regulator control switch. ● Circuitry. 	<ul style="list-style-type: none"> ● Go To Pinpoint Test D .
<ul style="list-style-type: none"> ● The memory seat does not move horizontally/vertically — driver 	<ul style="list-style-type: none"> ● Seat regulator control switch. ● Front seat track. ● Seat backrest power recline. ● Circuitry. 	<ul style="list-style-type: none"> ● Go To Pinpoint Test E .
<ul style="list-style-type: none"> ● The power seat does not move horizontally/vertically — passenger 	<ul style="list-style-type: none"> ● Passenger front seat track. ● Passenger seat regulator control switch. ● Circuitry. 	<ul style="list-style-type: none"> ● Go To Pinpoint Test F .
<ul style="list-style-type: none"> ● The memory seat is inoperative 	<ul style="list-style-type: none"> ● DSM. ● DDM. ● Circuitry. 	<ul style="list-style-type: none"> ● Go To Pinpoint Test G .
<ul style="list-style-type: none"> ● Easy exit/easy entry is inoperative 	<ul style="list-style-type: none"> ● Message center. ● DSM. 	<ul style="list-style-type: none"> ● CHECK the message center driver personality function to make sure the easy exit/easy entry function is not disabled. ● CHECK for any DSM DTCs. REFER to the DSM Diagnostic Trouble Code (DTC) Index.
<ul style="list-style-type: none"> ● The heated seat is inoperative — driver 	<ul style="list-style-type: none"> ● Driver heated seat switch. ● BJB fuse 411 (15A). ● Circuitry. ● Heated seat control module. ● Heated backrest element. 	<ul style="list-style-type: none"> ● Go To Pinpoint Test H .
<ul style="list-style-type: none"> ● The heated seat is 	<ul style="list-style-type: none"> ● Driver heated 	<ul style="list-style-type: none"> ● Go To Pinpoint Test I .

inoperative — passenger	<ul style="list-style-type: none"> ● seat switch. ● BJB fuse 411 (15A). ● Circuitry. ● Heated seat control module. ● Heated backrest element. 	
<ul style="list-style-type: none"> ● The heated seats are inoperative 	<ul style="list-style-type: none"> ● CJB fuse 216 (5A), 205 (5A). ● BJB fuse 411 (15A). ● Driver heated seat control module. ● Passenger heated seat control module. ● Circuitry. 	<ul style="list-style-type: none"> ● Go To Pinpoint Test J.
<ul style="list-style-type: none"> ● The power lumbar is inoperative — driver 	<ul style="list-style-type: none"> ● Driver seat lumbar motor. ● BJB fuse 421 (20A). ● Driver seat lumbar control switch. ● Circuitry. 	<ul style="list-style-type: none"> ● Go To Pinpoint Test K.
<ul style="list-style-type: none"> ● The power lumbar is inoperative — passenger 	<ul style="list-style-type: none"> ● Passenger seat lumbar motor. ● BJB fuse 428 (20A). ● Passenger seat lumbar control switch. ● Circuitry. 	<ul style="list-style-type: none"> ● Go To Pinpoint Test L.
<ul style="list-style-type: none"> ● The power seat does not move horizontally/vertically — driver 	<ul style="list-style-type: none"> ● Seat regulator control switch. ● Front seat track. ● Seat backrest power recline. ● Circuitry. 	<ul style="list-style-type: none"> ● Go To Pinpoint Test N.

Pinpoint Tests

PINPOINT TEST A: NO COMMUNICATION WITH THE DRIVER SEAT MODULE (DSM)

CONDITIONS	DETAILS/RESULTS/ACTIONS
A1 CHECK NGS TESTER COMMUNICATION TO THE DDM	
 WARNING: The restraint system diagnostic tool is for restraint system service only.	

Remove from vehicle prior to road use. Failure to remove could result in injury and possible violation of vehicle safety standards.

NOTE: If a seat equipped with a seat mounted side air bag and/or a safety belt pretensioner (if equipped) system is being serviced, **the air bag system must be deactivated.** Refer to [Supplemental Restraint System \(SRS\) Deactivation and Reactivation](#) in the General Procedures portion of this section.

NOTE: Restraint system diagnostic tools **MUST** be installed under the seats in the seat side air bag (if equipped) and safety belt pretensioner (if equipped) to floor connectors.

NOTE: Diagnostics or repairs are not to be performed on a seat equipped with a seat side air bag with the seat in the vehicle. Prior to attempting to diagnose or repair a seat concern when equipped with a seat side air bag, the seat must be removed from the vehicle and the restraint system diagnostic tools must be installed in the seat side air bag electrical connectors. **The restraint system diagnostic tools must be removed prior to operating the vehicle over the road.**

NOTE: After diagnosing or repairing a seat system, **the restraint system diagnostic tools must be removed before operating the vehicle over the road.**

NOTE: Diagnostics may be performed on seat systems other than the side air bag or the safety belt buckle pretensioner system (lumbar, climate controlled, heated, power seat track) with the seat installed in the vehicle as long as the restraint system diagnostic tools are installed under the seats in the side air bag and safety belt buckle pretensioner to floor connectors.

NOTE: The SRS must be fully operational and free of faults before releasing the vehicle to the customer.

1 Using the results from the DATA LINK DIAGNOSTICS test, check for communication to the DDM.

- Does the NGS Tester communicate with the DDM?

→ Yes
GO to [A2](#).

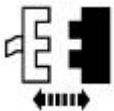
→ No
[Go To Pinpoint Test B](#).

A2 CHECK CIRCUITS 29-AH80 (OG/WH) AND 30-AH80 (RD) FOR VOLTAGE

1

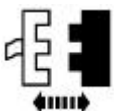


2



DSM C341b

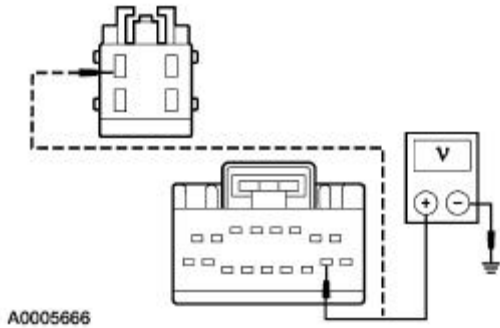
4



DSM C341c

3 Deactivate the supplemental restraint system (SRS). Refer to [Section 501-20B](#).

5



A0005666

5

Measure the voltage between DSM C341c pin 10, circuit 29-AH80 (OG/WH), harness side and ground; and between DSM C341b pin 4, circuit 30-AH80 (RD), harness side and ground

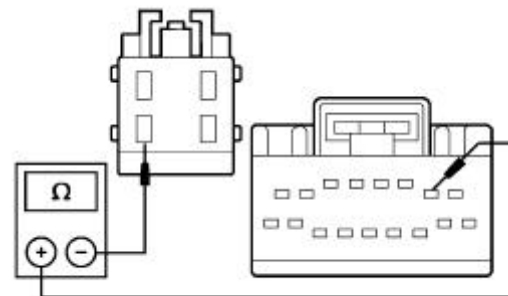
- Are the voltages greater than 10 volts?

→ **Yes**
GO to [A3](#).

→ **No**
REPAIR the circuit in question. TEST the system for normal operation. REACTIVATE the supplemental restraint system (SRS). PROVE OUT the supplemental restraint system (SRS). REFER to [Section 501-20B](#).

A3 CHECK CIRCUIT 31-AH80 (BK) AND 91-AH80 (BK) FOR AN OPEN

1



A0003054

1


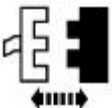

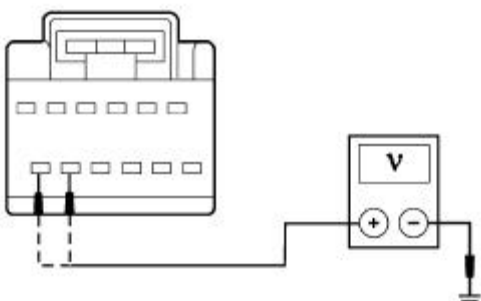
Measure the resistance between the DSM C341b pin 3, circuit 31-AH80 (BK), harness side and ground; and between DSM C341c pin 2, circuit 91-AH80 (BK), harness side and ground.

- Are the resistances less than 5 ohms?

→ **Yes**
REFER to [Section 418-00](#).

→ **No**
REPAIR the circuit. TEST the system for normal operation. REACTIVATE the supplemental restraint system (SRS). PROVE OUT the supplemental restraint system (SRS). REFER to [Section 501-20B](#).

PINPOINT TEST B: NO COMMUNICATION WITH THE DRIVER DOOR MODULE (DDM)

CONDITIONS	DETAILS/RESULTS/ACTIONS
<p>B1 CHECK CIRCUITS 29-AJ80 (OG) AND 29S-AJ86 (OG/BU) FOR VOLTAGE</p>	
<p>⚠ WARNING: The restraint system diagnostic tool is for restraint system service only. Remove from vehicle prior to road use. Failure to remove could result in injury and possible violation of vehicle safety standards.</p> <p>NOTE: If a seat equipped with a seat mounted side air bag and/or a safety belt pretensioner (if equipped) system is being serviced, the air bag system must be deactivated. Refer to Supplemental Restraint System (SRS) Deactivation and Reactivation in the General Procedures portion of this section.</p> <p>NOTE: Restraint system diagnostic tools MUST be installed under the seats in the seat side air bag (if equipped) and safety belt pretensioner (if equipped) to floor connectors.</p> <p>NOTE: Diagnostics or repairs are not to be performed on a seat equipped with a seat side air bag with the seat in the vehicle. Prior to attempting to diagnose or repair a seat concern when equipped with a seat side air bag, the seat must be removed from the vehicle and the restraint system diagnostic tools must be installed in the seat side air bag electrical connectors. The restraint system diagnostic tools must be removed prior to operating the vehicle over the road.</p> <p>NOTE: After diagnosing or repairing a seat system, the restraint system diagnostic tools must be removed before operating the vehicle over the road.</p> <p>NOTE: Diagnostics may be performed on seat systems other than the side air bag or the safety belt buckle pretensioner system (lumbar, climate controlled, heated, power seat track) with the seat installed in the vehicle as long as the restraint system diagnostic tools are installed under the seats in the side air bag and safety belt buckle pretensioner to floor connectors.</p> <p>NOTE: The SRS must be fully operational and free of faults before releasing the vehicle to the customer.</p>	
<p>1 </p> <p>3  DDM C501a</p> <p>4 </p> <p>5 </p> <p>A0006301</p>	<p>2 Deactivate the supplemental restraint system (SRS). Refer to Section 501-20B.</p> <p>5 Measure the voltage between DDM C501a pin 11, circuit 29-AJ80 (OG), harness side and ground; and between DDM C501a pin 12, circuit 29S-AJ86 (OG/BU), harness side and ground.</p>

● Is the voltage greater than 10 volts?

→ **Yes**
GO to [B2](#).

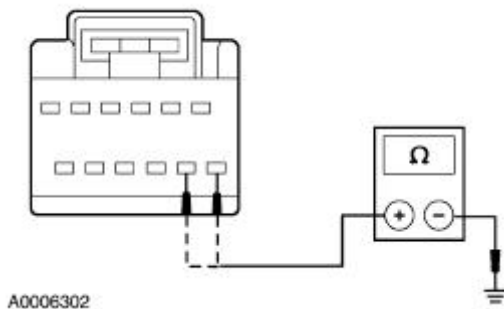
→ **No**
REPAIR the circuit in question Test the system for normal operation. REACTIVATE the supplemental restraint system (SRS). PROVE OUT the supplemental restraint system (SRS). REFER to [Section 501-20B](#).

B2 CHECK CIRCUITS 31-AJ80 (BK/OG) AND 91-AJ80 (BN/BU) FOR OPENS

1



2



2


Measure the resistance between DDM C501a pin 7, circuit 91-AJ80 (BN/BU), harness side and ground; and between DDM C501a pin 8, circuit 31-AJ80B (BK/OG), harness side and ground.

● Is the resistance less than 5 ohms?

→ **Yes**
REFER to [Section 418-00](#).

→ **No**
REPAIR the circuit(s) in question. Test the system for normal operation. REACTIVATE the supplemental restraint system (SRS). PROVE OUT the supplemental restraint system (SRS). REFER to [Section 501-20B](#).

PINPOINT TEST C: THE POWER SEAT IS INOPERATIVE — DRIVER

CONDITIONS	DETAILS/RESULTS/ACTIONS
C1 CHECK CIRCUIT 30-AH35 (RD) FOR VOLTAGE	
<p> WARNING: The restraint system diagnostic tool is for restraint system service only. Remove from vehicle prior to road use. Failure to remove could result in injury and possible violation of vehicle safety standards.</p>	

NOTE: If a seat equipped with a seat mounted side air bag and/or a safety belt pretensioner (if equipped) system is being serviced, **the air bag system must be deactivated.** Refer to [Supplemental Restraint System \(SRS\) Deactivation and Reactivation](#) in the General Procedures portion of this section.

NOTE: Restraint system diagnostic tools **MUST** be installed under the seats in the seat side air bag (if equipped) and safety belt pretensioner (if equipped) to floor connectors.

NOTE: Diagnostics or repairs are not to be performed on a seat equipped with a seat side air bag with the seat in the vehicle. Prior to attempting to diagnose or repair a seat concern when equipped with a seat side air bag, the seat must be removed from the vehicle and the restraint system diagnostic tools must be installed in the seat side air bag electrical connectors. **The restraint system diagnostic tools must be removed prior to operating the vehicle over the road.**

NOTE: After diagnosing or repairing a seat system, **the restraint system diagnostic tools must be removed before operating the vehicle over the road.**

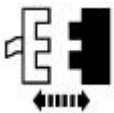
NOTE: Diagnostics may be performed on seat systems other than the side air bag or the safety belt buckle pretensioner system (lumbar, climate controlled, heated, power seat track) with the seat installed in the vehicle as long as the restraint system diagnostic tools are installed under the seats in the side air bag and safety belt buckle pretensioner to floor connectors.

NOTE: The SRS must be fully operational and free of faults before releasing the vehicle to the customer.

1

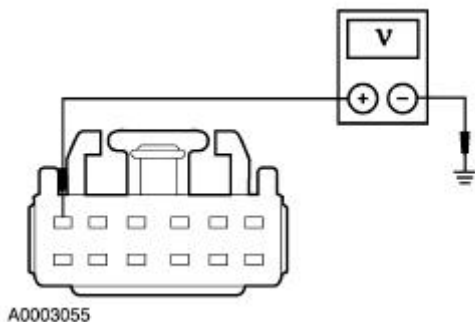


3



Driver Seat Regulator Control Switch C360

4



2

Deactivate the supplemental restraint system (SRS). Refer to [Section 501-20B](#).

4

Measure the voltage between driver seat regulator control switch C360 pin 6, circuit 30-AH35 (RD), harness side and ground.

● Is the voltage greater than 10 volts?

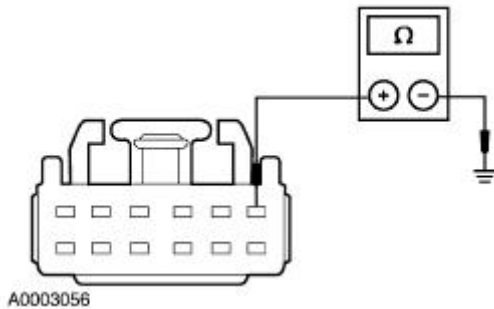
→ **Yes**
GO to [C2](#).

→ **No**
REPAIR the circuit. TEST the system for normal operation. REACTIVATE the supplemental restraint system (SRS).

PROVE OUT the supplemental restraint system (SRS). REFER to [Section 501-20B](#).

C2 CHECK CIRCUIT 31-AH35 (BK) FOR AN OPEN

1



1

Measure the resistance between driver seat regulator control switch C360 pin 1, circuit 31-AH35 (BK), harness side and ground.

- Is the resistance less than 5 ohms?

→ **Yes**

INSTALL a new driver seat regulator control switch. REFER to [Seat Control Switch](#). TEST the system for normal operation. REACTIVATE the supplemental restraint system (SRS). PROVE OUT the supplemental restraint system (SRS). REFER to [Section 501-20B](#).

→ **No**

REPAIR the circuit. TEST the system for normal operation. REACTIVATE the supplemental restraint system (SRS). PROVE OUT the supplemental restraint system (SRS). REFER to [Section 501-20B](#).

PINPOINT TEST D: THE POWER SEAT IS INOPERATIVE—PASSENGER

CONDITIONS	DETAILS/RESULTS/ACTIONS
D1 CHECK FOR POWER TO THE PASSENGER SEAT REGULATOR CONTROL SWITCH	<p>⚠ WARNING: The restraint system diagnostic tool is for restraint system service only. Remove from vehicle prior to road use. Failure to remove could result in injury and possible violation of vehicle safety standards.</p> <p>NOTE: If a seat equipped with a seat mounted side air bag and/or a safety belt pretensioner (if equipped) system is being serviced, the air bag system must be deactivated. Refer to Supplemental Restraint System (SRS) Deactivation and Reactivation in the General Procedures portion of this section.</p> <p>NOTE: Restraint system diagnostic tools MUST be installed under the seats in the seat side air bag (if equipped) and safety belt pretensioner (if equipped) to floor connectors.</p> <p>NOTE: Diagnostics or repairs are not to be performed on a seat equipped with a seat side air bag with the seat in the vehicle. Prior to attempting to diagnose or repair a seat concern when</p>

equipped with a seat side air bag, the seat must be removed from the vehicle and the restraint system diagnostic tools must be installed in the seat side air bag electrical connectors. **The restraint system diagnostic tools must be removed prior to operating the vehicle over the road.**

NOTE: After diagnosing or repairing a seat system, **the restraint system diagnostic tools must be removed before operating the vehicle over the road.**

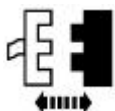
NOTE: Diagnostics may be performed on seat systems other than the side air bag or the safety belt buckle pretensioner system (lumbar, climate controlled, heated, power seat track) with the seat installed in the vehicle as long as the restraint system diagnostic tools are installed under the seats in the side air bag and safety belt buckle pretensioner to floor connectors.

NOTE: The SRS must be fully operational and free of faults before releasing the vehicle to the customer.

1

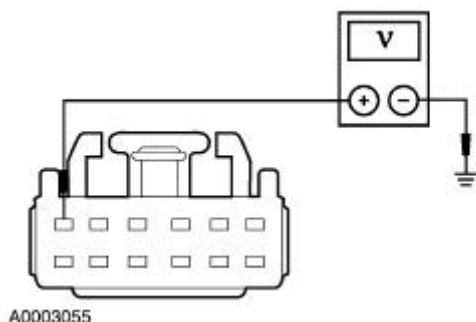


3



Passenger Seat Regulator Control Switch C330

4



2

Deactivate the supplemental restraint system (SRS). Refer to [Section 501-20B](#).

4

Measure the voltage between passenger seat regulator control switch C330 pin 6, circuit 30-AH42 (RD), harness side and ground.

● **Is the voltage greater than 10 volts?**

→ **Yes**
GO to [D2](#).

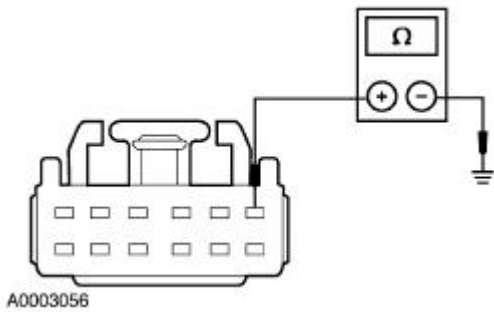
→ **No**
REPAIR the circuit. TEST the system for normal operation. REACTIVATE the supplemental restraint system (SRS). PROVE OUT the supplemental restraint system (SRS). REFER to [Section 501-20B](#).

D2 CHECK CIRCUIT 31-AH42 (BK) FOR AN OPEN

1

1

Measure the resistance between passenger seat regulator control switch C330 pin 1, circuit 31-AH42 (BK),



harness side and ground.

- Is the resistance less than 5 ohms?

→ **Yes**

INSTALL a new passenger seat regulator control switch. REFER to [Seat Control Switch](#). TEST the system for normal operation. REACTIVATE the supplemental restraint system (SRS). PROVE OUT the supplemental restraint system (SRS). REFER to [Section 501-20B](#).

→ **No**

REPAIR the circuit. TEST the system for normal operation. REACTIVATE the supplemental restraint system (SRS). PROVE OUT the supplemental restraint system (SRS). REFER to [Section 501-20B](#).

PINPOINT TEST E: THE MEMORY SEAT DOES NOT MOVE HORIZONTALLY/VERTICALLY — DRIVER

CONDITIONS	DETAILS/RESULTS/ACTIONS
E1 RETRIEVE THE RECORDED DSM DTCS FROM BOTH CONTINUOUS AND ON-DEMAND SELF-TESTS	<p>⚠ WARNING: The restraint system diagnostic tool is for restraint system service only. Remove from vehicle prior to road use. Failure to remove could result in injury and possible violation of vehicle safety standards.</p> <p>NOTE: If a seat equipped with a seat mounted side air bag and/or a safety belt pretensioner (if equipped) system is being serviced, the air bag system must be deactivated. Refer to Supplemental Restraint System (SRS) Deactivation and Reactivation in the General Procedures portion of this section.</p> <p>NOTE: Restraint system diagnostic tools MUST be installed under the seats in the seat side air bag (if equipped) and safety belt pretensioner (if equipped) to floor connectors.</p> <p>NOTE: Diagnostics or repairs are not to be performed on a seat equipped with a seat side air bag with the seat in the vehicle. Prior to attempting to diagnose or repair a seat concern when equipped with a seat side air bag, the seat must be removed from the vehicle and the restraint system diagnostic tools must be installed in the seat side air bag electrical connectors. The restraint system diagnostic tools must be removed prior to operating the vehicle over the road.</p> <p>NOTE: After diagnosing or repairing a seat system, the restraint system diagnostic tools</p>

must be removed before operating the vehicle over the road.

NOTE: Diagnostics may be performed on seat systems other than the side air bag or the safety belt buckle pretensioner system (lumbar, climate controlled, heated, power seat track) with the seat installed in the vehicle as long as the restraint system diagnostic tools are installed under the seats in the side air bag and safety belt buckle pretensioner to floor connectors.

NOTE: The SRS must be fully operational and free of faults before releasing the vehicle to the customer.

1



- 2 Deactivate the supplemental restraint system (SRS). Refer to [Section 501-20B](#).
- 3 Use the results recorded from the DSM continuous and on-demand self-tests.

● **Are any DSM DTCs recorded?**

→ **Yes**

If DTC B1703, B1707, B1711, B1715, B1719, B1723, B1727 or B1731 was retrieved, GO to [E2](#).

If any combination of DTC B1757, B1761, B1765, B1769, B2146, B2149, B2152, or B2155 are retrieved, GO to [E4](#).

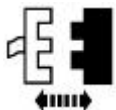
If only a combination of DTC B2146, B2149, B2152 or B2155 are retrieved, GO to [E43](#).

→ **No**

GO to [E45](#).

E2 CHECK FOR A SHORT TO BATTERY

1



DSM C341c

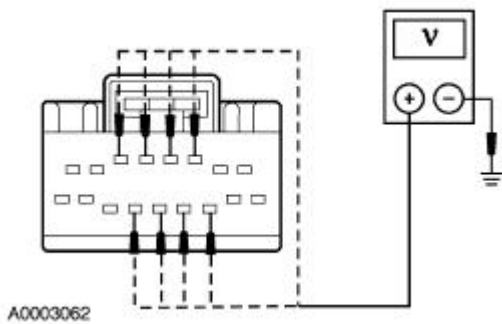
2



3

- 3 Using the following table, measure the voltage between DSM C341c pins, harness side and ground.

DSM C341c Pin	Circuit
3	10-AH83 (GY/OG)
4	10-AH82 (GY/RD)



5	8-AH84 (WH/BK)
6	10-AH85 (WH/GN)
11	8-AH83 (WH/GN)
12	8-AH82 (WH/RD)
13	10-AH84 (GY/BK)
14	8-AH85 (WH/VT)

● Are any of the voltages greater than 10 volts?

→ **Yes**
GO to [E3](#).

→ **No**
CLEAR the DSM DTCs. REPEAT the DSM self-test. If DTC B1703, B1707, B1711, B1715, B1719, B1723, B1727 or B1731 is retrieved, INSTALL a new DSM. REFER to [Section 419-10](#). CALIBRATE the driver seat, REFER to Seat Calibration in Principles of Operation.

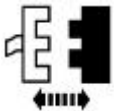
If any other DTCs are retrieved refer the DSM Diagnostic Trouble Code (DTC) Index. REACTIVATE the supplemental restraint system (SRS). PROVE OUT the supplemental restraint system (SRS). REFER to [Section 501-20B](#).

E3 CHECK THE DRIVER SEAT REGULATOR CONTROL SWITCH FOR A SHORT TO BATTERY

1



2



Driver Seat Regulator Control Switch C360

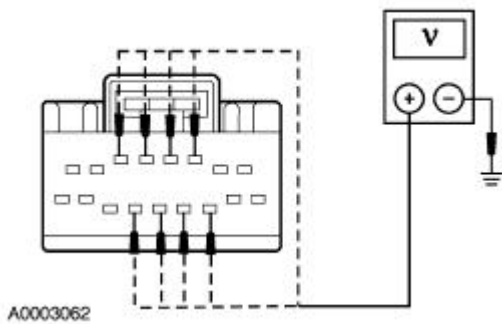
3



4

4 Using the following table, measure the voltage between DSM C341c pins, harness side and ground.

DSM C341c Pin	Circuit
3	10-AH83 (GY/OG)



4	10-AH82 (GY/RD)
5	8-AH84 (WH/BK)
6	10-AH85 (WH/GN)
11	8-AH83 (WH/GN)
12	8-AH82 (WH/RD)
13	10-AH84 (GY/BK)
14	8-AH85 (WH/VT)

- Are any of the voltages greater than 10 volts?

→ **Yes**

REPAIR the circuit in question. REPEAT the DSM self-test. TEST the system for normal operation. REACTIVATE the supplemental restraint system (SRS). PROVE OUT the supplemental restraint system (SRS). REFER to [Section 501-20B](#).

→ **No**

INSTALL a new driver seat regulator control switch. REFER to [Seat Control Switch](#). REPEAT the DSM self-test. TEST the system for normal operation. REACTIVATE the supplemental restraint system (SRS). PROVE OUT the supplemental restraint system (SRS). REFER to [Section 501-20B](#).

E4 CHECK FOR MULTIPLE DSM DTCS

1 Use the results recorded from the DSM continuous and on-demand self-tests.

- Are the DSM DTCS B1757, B1761 and B1765 all retrieved?

→ **Yes**

GO to [E5](#).

→ **No**

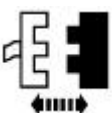
GO to [E10](#).

E5 CHECK THE HORIZONTAL POSITION SENSOR COMMON RETURN

1

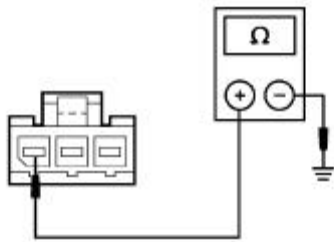


2



Horizontal Position Sensor C372

3



A0003063

3

Measure the resistance between horizontal position sensor C372 pin 3, circuit 7-AH26 (YE/RD), harness side and ground.

● Is the resistance less than 180 ohms?

→ **Yes**
GO to [E7](#).

→ **No**
GO to [E6](#).

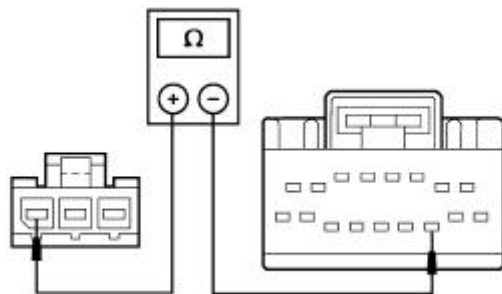
E6 CHECK CIRCUIT 9-AH26 (BN/RD) FOR AN OPEN

1



DSM C341a

2



A0003064

2

Measure the resistance between horizontal position sensor C372 pin 1, circuit 9-AH26 (BN/RD), harness side and DSM C341a pin 11, circuit 9-AH80 (BN/WH), harness side.

● Is the resistance less than 5 ohms?

→ **Yes**
INSTALL a new DSM. REFER to [Section 419-10](#). CALIBRATE the driver seat, REFER to Seat Calibration in Principles of Operation. TEST the system for normal operation. REACTIVATE the supplemental restraint system (SRS). PROVE OUT the supplemental restraint system (SRS). REFER to [Section 501-20B](#).

→ **No**
REPAIR the circuit. CLEAR the DTCs. REPEAT the self test. REACTIVATE the

supplemental restraint system (SRS).
PROVE OUT the supplemental restraint
system (SRS). REFER to [Section 501-
20B](#).

E7 CHECK THE POSITION SENSOR COMMON FEED

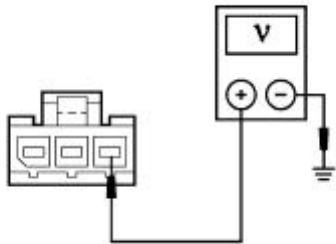
1



2



3



A0003065

3 Measure the voltage between horizontal
position sensor C372 pin 3, circuit 7-
AH26 (YE/RD), harness side and
ground.

● Is the voltage greater than 10 volts?

→ Yes
GO to [E10](#).

→ No
GO to [E8](#).

E8 CHECK CIRCUIT 7-AH26 (YE/RD) FOR A SHORT TO GROUND

1



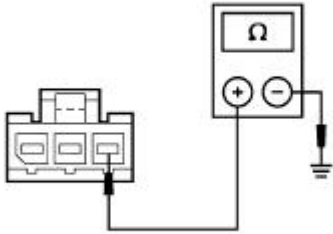
2



DSM C341a

3

3 Measure the resistance between
horizontal position sensor C372 pin 3,
circuit 7-AH26 (YE/RD), harness side
and ground.



A0003066

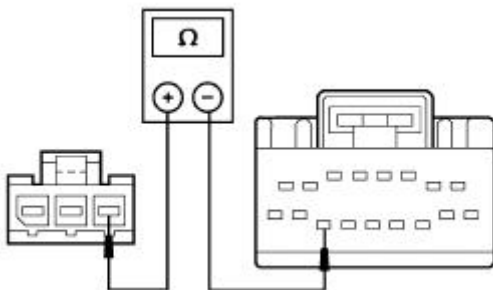
- Is the resistance greater than 10,000 ohms?

→ **Yes**
GO to [E9](#).

→ **No**
REPAIR the circuit. CLEAR the DTCs. REPEAT the self test. REACTIVATE the supplemental restraint system (SRS). PROVE OUT the supplemental restraint system (SRS). REFER to [Section 501-20B](#).

E9 CHECK CIRCUIT 7-AH26 (YE/RD) OR 7-AH80 (YE/VT) FOR AN OPEN

1



A0003067

1

Measure the resistance between horizontal position sensor C372 pin 3, circuit 7-AH26 (YE/RD), harness side and DSM C341a pin 15, circuit 7-AH80 (YE/VT), harness side.

- Is the resistance less than 5 ohms?

→ **Yes**
INSTALL a new DSM. REFER to [Section 419-10](#). CALIBRATE the driver seat, REFER to Seat Calibration in Principles of Operation. CLEAR the DTCs. REPEAT the self test. REACTIVATE the supplemental restraint system (SRS). PROVE OUT the supplemental restraint system (SRS). REFER to [Section 501-20B](#).

→ **No**
REPAIR the circuit. CLEAR the DTCs. REPEAT the self test. REACTIVATE the supplemental restraint system (SRS). PROVE OUT the supplemental restraint system (SRS). REFER to [Section 501-](#)

[20B.](#)

E10 CHECK FOR SINGLE DTCS

1 Using the recorded results from the DSM self-test.

- Was DTC B1757, B1761, B1765 or B1769 retrieved?

→ Yes

For DTC B1757 GO to [E11.](#)

For DTC B1761 GO to [E19.](#)

For DTC B1765 GO to [E27.](#)

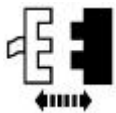
For DTC B1769 GO to [E35.](#)

→ No

GO to [E43.](#)

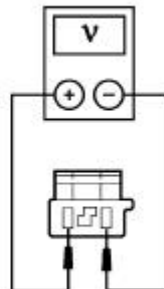
E11 CHECK VOLTAGE TO THE DRIVER SEAT REAR HEIGHT MOTOR

1



Driver Seat Rear Height Motor C382

2



A0003068

2

Measure the voltage between driver seat rear height motor C382, circuit 33-AH41 (YE/VT), harness side and driver seat rear height motor C382, circuit 32-AH41 (WH/VT), harness side.

3

Operate the driver seat regulator control switch to the rear up and rear down position.

- Is the voltage greater than 10 volts in both directions?

→ Yes

GO to [E15.](#)

→ No

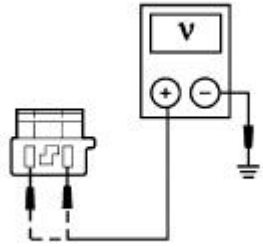
GO to [E12.](#)

E12 CHECK THE DSM DRIVER SIDE REAR HEIGHT MOTOR CONTROL

1

1

Measure the voltage between driver seat rear height motor C382, circuit 33-AH41 (YE/VT), harness side and ground while operating the driver seat regulator



A0003069

control switch to the rear down position; and between driver seat rear height motor C382, circuit 32-AH41 (WH/VT), harness side and ground while operating the driver seat regulator control switch to the rear up position.

- Is the voltage greater than 10 volts in both directions?

→ Yes

INSTALL a new DSM. REFER to [Section 419-10](#). CALIBRATE the driver seat, REFER to Seat Calibration in Principles of Operation. CLEAR the DTCs. REPEAT the self test. REACTIVATE the supplemental restraint system (SRS). PROVE OUT the supplemental restraint system (SRS). REFER to [Section 501-20B](#).

→ No

GO to [E13](#).

E13 CHECK CIRCUIT 33-AH41 (YE/VT) AND 32-AH41 (WH/VT) FOR A SHORT TO GROUND

1

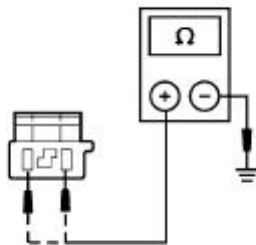


2



DSM C341a

3



A0003070

3

Measure the resistance between driver seat rear height motor C382, circuit 33-AH41 (YE/VT), harness side and ground; and between driver seat rear height motor C382, circuit 32-AH41 (WH/VT), harness side and ground.

- Are the resistances greater than 10,000 ohms?

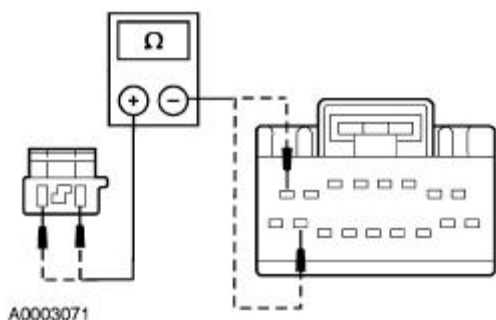
→ Yes

GO to [E14](#).

→ **No**
REPAIR the circuit. CLEAR the DTCs. REPEAT the self test. REACTIVATE the supplemental restraint system (SRS). PROVE OUT the supplemental restraint system (SRS). REFER to [Section 501-20B](#).

E14 CHECK CIRCUIT 33-AH41 (YE/VT) AND 32-AH41 (WH/VT) FOR AN OPEN

1



1 Measure the resistance between driver seat rear height motor C382, circuit 33-AH41 (YE/VT), harness side and DSM C341a pin 8, circuit 33-AH41 (YE/VT), harness side; and between driver seat rear height motor C382, circuit 32-AH41 (WH/VT), harness side and DSM C341a pin 16, circuit 32-AH41 (WH/VT), harness side.

● Are the resistances less than 5 ohms?

→ **Yes**
INSTALL a new DSM. REFER to [Section 419-10](#). CALIBRATE the driver seat, REFER to Seat Calibration in Principles of Operation. CLEAR the DTCs. REPEAT the self test. REACTIVATE the supplemental restraint system (SRS). PROVE OUT the supplemental restraint system (SRS). REFER to [Section 501-20B](#).

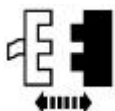
→ **No**
REPAIR the circuit. REPEAT the DSM self-test. CLEAR the DTCs. REPEAT the self test. REACTIVATE the supplemental restraint system (SRS). PROVE OUT the supplemental restraint system (SRS). REFER to [Section 501-20B](#).

E15 CHECK CIRCUIT 9-AH25 (BN/GN) FOR AN OPEN

1



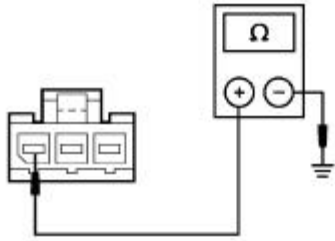
2



Rear Height Motor Position Sensor C383

3

3 Measure the resistance between rear height motor position sensor C383 pin 3,



A0003063

circuit 9-AH25 (BN/GN), harness side and ground.

- Is the resistance less than 5 ohms?

→ **Yes**
GO to [E16](#).

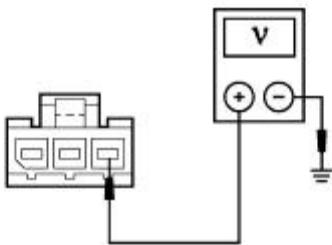
→ **No**
REPAIR the circuit. CLEAR the DTCs. REPEAT the self test. REACTIVATE the supplemental restraint system (SRS). PROVE OUT the supplemental restraint system (SRS). REFER to [Section 501-20B](#).

E16 CHECK CIRCUIT 7-AH25 (YE/GN) FOR AN OPEN

1



2



A0003065

2 Measure the voltage between rear height motor position sensor C383 pin 1, circuit 7-AH25 (YE/GN), harness side and ground.

- Is the voltage approximately 5 volts?

→ **Yes**
GO to [E17](#).

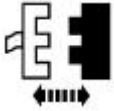
→ **No**
REPAIR the circuit. CLEAR the DTCs. REPEAT the self test. REACTIVATE the supplemental restraint system (SRS). PROVE OUT the supplemental restraint system (SRS). REFER to [Section 501-20B](#).

E17 CHECK CIRCUIT 8-AH25 (WH/GN) FOR A SHORT TO GROUND

1

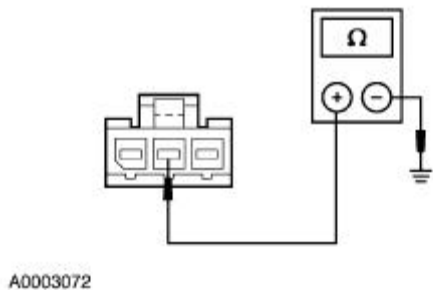


2



DSM C341a

3



3

Measure the resistance between rear height motor position sensor C383 pin 2, circuit 8-AH25 (WH/GN), harness side and ground.

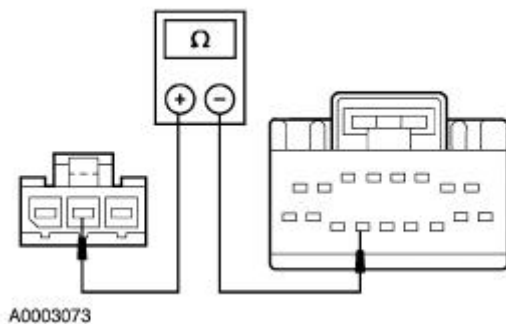
● Is the resistance greater than 10,000 ohms?

→ **Yes**
GO to [E18](#).

→ **No**
REPAIR the circuit. CLEAR the DTCs. REPEAT the self test. REACTIVATE the supplemental restraint system (SRS). PROVE OUT the supplemental restraint system (SRS). REFER to [Section 501-20B](#).

E18 CHECK CIRCUIT 8-AH25 (WH/GN) FOR AN OPEN

1



1

Measure the resistance between rear height motor position sensor C383 pin 2, circuit 8-AH25 (WH/GN), harness side and DSM C341a pin 14, circuit 8-AH25 (WH/GN), harness side.

● Is the resistance less than 5 ohms?

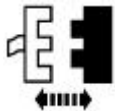
→ **Yes**
INSTALL a new seat track. REFER to [Seat Track](#) in this section. CALIBRATE the driver seat. REFER to Principles of

Operation. REPEAT the DSM self-test. If DTC B1757 is retrieved, INSTALL a new DSM. REFER to [Section 419-10](#). CALIBRATE the driver seat. REFER to Principles of Operation. CLEAR the DTCs. REPEAT the self test. REACTIVATE the supplemental restraint system (SRS). PROVE OUT the supplemental restraint system (SRS). REFER to [Section 501-20B](#).

→ **No**
REPAIR the circuit. CLEAR the DTCs. REPEAT the self test. REACTIVATE the supplemental restraint system (SRS). PROVE OUT the supplemental restraint system (SRS). REFER to [Section 501-20B](#).

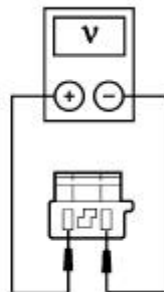
E19 CHECK THE DRIVER SEAT FRONT HEIGHT MOTOR SUPPLY

1



Driver Seat Front Height Motor C363

2



A0003068

2 Measure the voltage between driver seat front height motor C363, circuit 33-AH38 (YE/BK), harness side and driver seat front height motor C363, circuit 32-AH38 (WH/BK), harness side.

3 Operate the driver seat regulator control switch to the front up and front down position.

- **Is the voltage greater than 10 volts in both directions?**

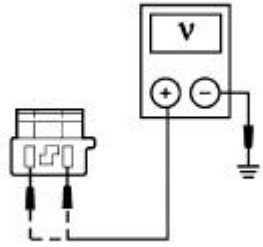
→ **Yes**
GO to [E23](#).

→ **No**
GO to [E20](#).

E20 CHECK THE DSM DRIVER SEAT FRONT HEIGHT MOTOR CONTROL

1

1 Measure the voltage between driver seat front height motor C363, circuit 33-AH38 (YE/BK), harness side and ground while operating the driver seat regulator control switch to the front down position; and between driver seat front height motor C363, circuit 32-AH38 (WH/BK),



A0003069

harness side and ground, while operating the driver seat regulator control switch to the front up position.

- Is the voltage greater than 10 volts in both directions?

→ **Yes**

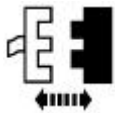
INSTALL a new DSM. REFER to [Section 419-10](#). CALIBRATE the driver seat, REFER to Seat Calibration in Principles of Operation. CLEAR the DTCs. REPEAT the self test. REACTIVATE the supplemental restraint system (SRS). PROVE OUT the supplemental restraint system (SRS). REFER to [Section 501-20B](#).

→ **No**

GO to [E21](#).

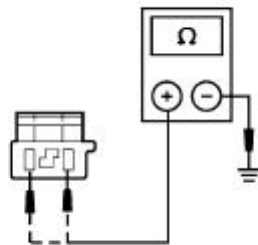
E21 CHECK CIRCUIT 33-AH38 (YE/BK) AND 32-AH38 (WH/BK) FOR A SHORT TO GROUND

1



DSM C341a

2



A0003070

2

Measure the resistance between driver seat front height motor C363, circuit 33-AH38 (YE/BK), harness side and ground; and between driver seat front height motor C363, circuit 32-AH38 (WH/BK), harness side and ground.

- Are the resistances greater than 10,000 ohms?

→ **Yes**

GO to [E22](#).

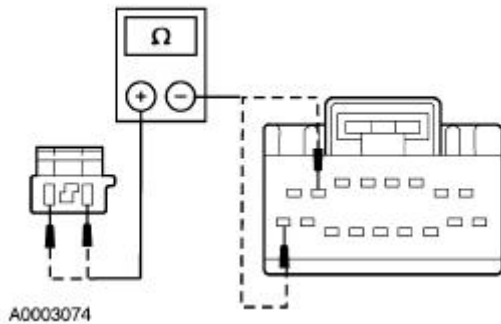
→ **No**

REPAIR the circuit. CLEAR the DTCs. REPEAT the self test. REACTIVATE the supplemental restraint system (SRS).

PROVE OUT the supplemental restraint system (SRS). REFER to [Section 501-20B](#).

E22 CHECK CIRCUIT 33-AH38 (YE/BK) AND 32-AH38 (WH/BK) FOR AN OPEN

1



1

Measure the resistance between driver seat front height motor C363, circuit 33-AH38 (YE/BK), harness side and DSM C341a pin 7, circuit 33-AH38 (YE/BK), harness side; and between driver seat front height motor C363, circuit 32-AH38 (WH/BK), harness side and DSM C341a pin 17, circuit 32-AH38 (WH/BK), harness side.

- Are the resistances less than 5 ohms?

→ Yes

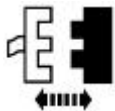
INSTALL a new DSM. REFER to [Section 419-10](#). CALIBRATE the driver seat, REFER to Seat Calibration in Principles of Operation. CLEAR the DTCs. REPEAT the self test. REACTIVATE the supplemental restraint system (SRS). PROVE OUT the supplemental restraint system (SRS). REFER to [Section 501-20B](#).

→ No

REPAIR the circuit. CLEAR the DTCs. REPEAT the self test. REACTIVATE the supplemental restraint system (SRS). PROVE OUT the supplemental restraint system (SRS). REFER to [Section 501-20B](#).

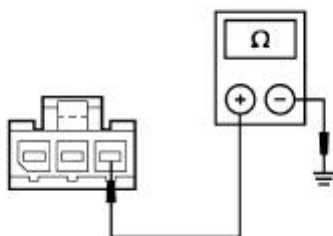
E23 CHECK CIRCUIT 9-AH24 (BN/YE) FOR AN OPEN

1



Front Height Motor Position Sensor C373

2



A0003066

2

Measure the resistance between front height motor position sensor C373 pin 3, circuit 9-AH24 (BN/YE), harness side and ground.

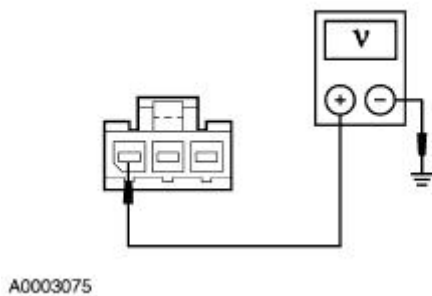
● Is the resistance less than 5 ohms?

→ **Yes**
GO to [E24](#).

→ **No**
REPAIR the circuit. CLEAR the DTCs.
REPEAT the self test. REACTIVATE the supplemental restraint system (SRS).
PROVE OUT the supplemental restraint system (SRS). REFER to [Section 501-20B](#).

E24 CHECK CIRCUIT 7-AH24 (YE/BK) FOR AN OPEN

1



1 Measure the voltage between front height motor position sensor C373 pin 3, circuit 7-AH24 (YE/BK), harness side and ground.

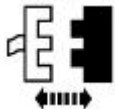
● Is the voltage approximately 5 volts?

→ **Yes**
GO to [E25](#).

→ **No**
REPAIR the circuit. CLEAR the DTCs.
REPEAT the self test. REACTIVATE the supplemental restraint system (SRS).
PROVE OUT the supplemental restraint system (SRS). REFER to [Section 501-20B](#).

E25 CHECK CIRCUIT 8-AH24 (WH/BK) FOR A SHORT TO GROUND

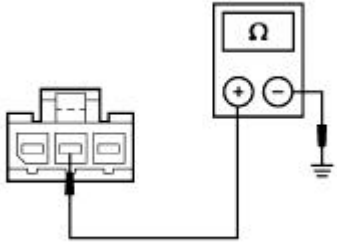
1



DSM C341a

2

2 Measure the resistance between front height motor position sensor C373 pin 2, circuit 8-AH24 (WH/BK), harness side and ground.



A0003072

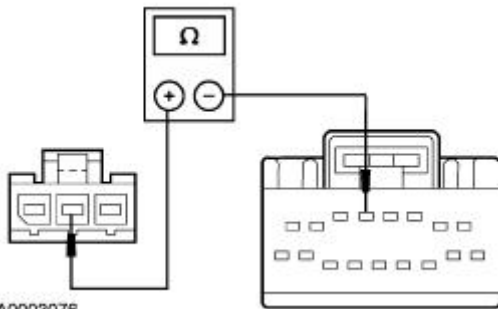
- Is the resistance greater than 10,000 ohms?

→ **Yes**
GO to [E26](#).

→ **No**
REPAIR the circuit. CLEAR the DTCs. REPEAT the self test. REACTIVATE the supplemental restraint system (SRS). PROVE OUT the supplemental restraint system (SRS). REFER to [Section 501-20B](#).

E26 CHECK CIRCUIT 8-AH24 (WH/BK) FOR AN OPEN

1



A0003076

1

Measure the resistance between front height motor position sensor C373 pin 2, circuit 8-AH24 (WH/BK), harness side and DSM C341a pin 5, circuit 8-AH24 (WH/BK), harness side.

- Is the resistance less than 5 ohms?

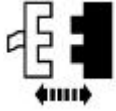
→ **Yes**
INSTALL a new seat track. REFER to [Seat Track](#). CALIBRATE the driver seat. REFER to Principles of Operation. REPEAT the DSM self-test. If DTC B1761 is retrieved, INSTALL a new DSM. REFER to [Section 419-10](#). CALIBRATE the driver seat. REFER to Principles of Operation. CLEAR the DTCs. REPEAT the self test. REACTIVATE the supplemental restraint system (SRS). PROVE OUT the supplemental restraint system (SRS). REFER to [Section 501-20B](#).

→ **No**
REPAIR the circuit. REPEAT the DSM

self-test. CLEAR the DTCs. REPEAT the self test. REACTIVATE the supplemental restraint system (SRS). PROVE OUT the supplemental restraint system (SRS). REFER to [Section 501-20B](#).

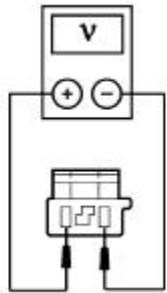
E27 CHECK THE VOLTAGE TO THE DRIVER SEAT FORWARD/REARWARD MOTOR

1



Driver Seat Forward/Rearward Motor C362

2



A0003068

2

Measure the voltage between driver side forward/rearward motor C362, circuit 33-AH37 (WH/GN), harness side and driver side forward/rearward motor C362, circuit 32-AH37 (YE/GN), harness side.

3

Operate the driver seat regulator control switch to the forward and rearward position.

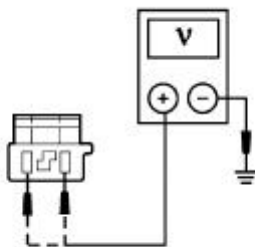
● **Is the voltage greater than 10 volts in both directions?**

→ **Yes**
GO to [E31](#).

→ **No**
GO to [E28](#).

E28 CHECK THE DSM FORWARD/REARWARD MOTOR CONTROL

1



A0003069

1

Measure the voltage between driver side forward/rearward motor C362, circuit 33-AH37 (WH/GN), harness side and ground while operating the driver seat regulator control switch to the rearward position; and between driver side forward/rearward motor C362, circuit 32-AH37 (YE/GN), harness side and ground while operating the driver seat regulator control switch to the forward position.

● **Is the voltage greater than 10 volts in both directions?**

→ **Yes**
INSTALL a new DSM. REFER to [Section 419-10](#). CALIBRATE the driver seat,

REFER to Seat Calibration in Principles of Operation. CLEAR the DTCs. REPEAT the self test. REACTIVATE the supplemental restraint system (SRS). PROVE OUT the supplemental restraint system (SRS). REFER to [Section 501-20B](#).

→ **No**
GO to [E29](#).

E29 CHECK CIRCUIT 33-AH37 (WH/GN) AND 32-AH37 (YE/GN) FOR A SHORT TO GROUND

1

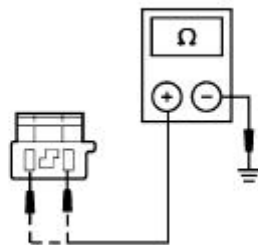


2



DSM C341

3



A0003070

3 Measure the resistance between driver side forward/rearward motor C362, circuit 33-AH37 (WH/GN), harness side and ground; and between driver side forward/rearward motor C362, circuit 32-AH37 (YE/GN), harness side and ground.

- Are the resistances greater than 10,000 ohms?

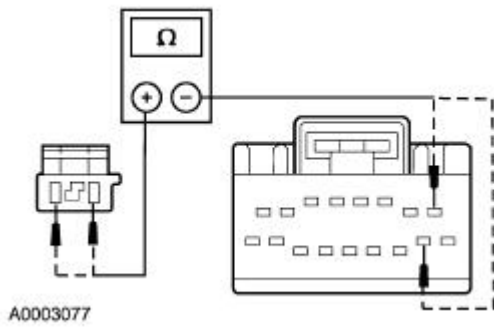
→ **Yes**
GO to [E30](#).

→ **No**
REPAIR the circuit. CLEAR the DTCs. REPEAT the self test. REACTIVATE the supplemental restraint system (SRS). PROVE OUT the supplemental restraint system (SRS). REFER to [Section 501-20B](#).

E30 CHECK CIRCUIT 33-AH37 (WH/GN) AND 32-AH37 (YE/GN) FOR AN OPEN

1

1 Measure the resistance between driver side forward/rearward motor C362, circuit 33-AH37 (WH/GN), harness side and DSM C341a pin 1, circuit 33-AH37 (YE/GN), harness side; and between driver side forward/rearward motor C362, circuit 32-AH37 (YE/GN), harness



side and DSM C341a pin 10, circuit 32-AH9 (YE/GN), harness side.

- Are the resistances less than 5 ohms?

→ **Yes**

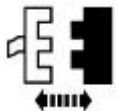
INSTALL a new DSM. REFER to [Section 419-10](#). CALIBRATE the driver seat, REFER to Seat Calibration in Principles of Operation. CLEAR the DTCs. REPEAT the self test. REACTIVATE the supplemental restraint system (SRS). PROVE OUT the supplemental restraint system (SRS). REFER to [Section 501-20B](#).

→ **No**

REPAIR the circuit. CLEAR the DTCs. REPEAT the self test. REACTIVATE the supplemental restraint system (SRS). PROVE OUT the supplemental restraint system (SRS). REFER to [Section 501-20B](#).

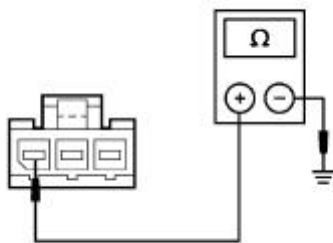
E31 CHECK CIRCUIT 9-AH26 (BN/RD) FOR AN OPEN

1



Forward/Rearward Motor Position Sensor C372

2



2

Measure the resistance between forward/rearward motor position sensor C372 pin 1, circuit 9-AH26 (BN/RD), harness side and ground.

- Is the resistance less than 5 ohms?

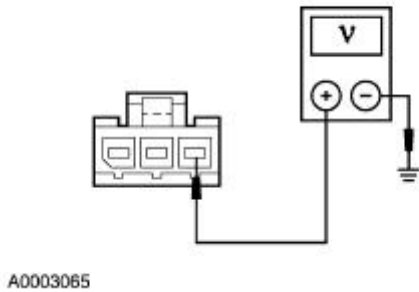
→ **Yes**

GO to [E32](#).

→ **No**
REPAIR the circuit. CLEAR the DTCs. REPEAT the self test. REACTIVATE the supplemental restraint system (SRS). PROVE OUT the supplemental restraint system (SRS). REFER to [Section 501-20B](#).

E32 CHECK CIRCUIT 7-AH26 (YE/RD) FOR AN OPEN

1



1 Measure the voltage between forward/rearward motor position sensor C372 pin 3, circuit 7-AH26 (YE/RD), harness side and ground.

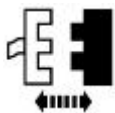
- Is the voltage approximately 5 volts?

→ **Yes**
GO to [E33](#).

→ **No**
REPAIR the circuit. REPEAT the DSM self-test. CLEAR the DTCs. REPEAT the self test. REACTIVATE the supplemental restraint system (SRS). PROVE OUT the supplemental restraint system (SRS). REFER to [Section 501-20B](#).

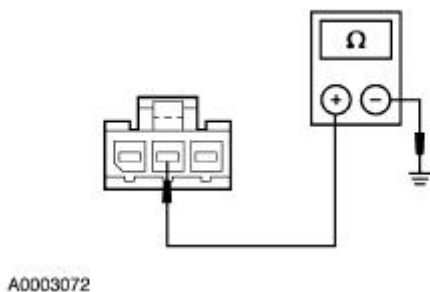
E33 CHECK CIRCUIT 8-AH26 (WH/RD) FOR A SHORT TO GROUND

1



DSM C341a

2



2 Measure the resistance between forward/rearward motor position sensor C372 pin 2, circuit 8-AH26 (WH/RD), harness side and ground.

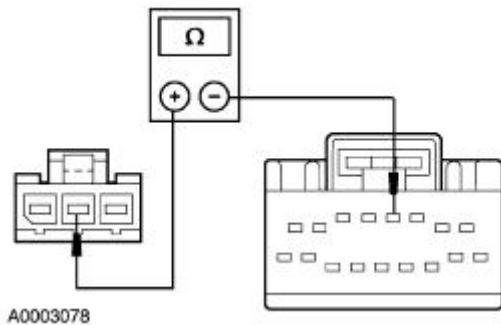
- Is the resistance greater than 10,000 ohms?

→ **Yes**
GO to [E34](#).

→ **No**
REPAIR the circuit. CLEAR the DTCs. REPEAT the self test. REACTIVATE the supplemental restraint system (SRS). PROVE OUT the supplemental restraint system (SRS). REFER to [Section 501-20B](#).

E34 CHECK CIRCUIT 8-AH26 (WH/RD) FOR AN OPEN

1



1 Measure the resistance between forward/rearward motor position sensor C372 pin 2, circuit 8-AH26 (WH/RD), harness side and DSM C341a pin 4, circuit 8-AH26 (WH/RD), harness side.

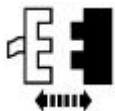
● **Is the resistance less than 5 ohms?**

→ **Yes**
INSTALL a new seat track. REFER to [Seat Track](#). CALIBRATE the driver seat. REFER to Principles of Operation. REPEAT the DSM self-test. If DTC B1765 is retrieved, INSTALL a new DSM. REFER to [Section 419-10](#). CALIBRATE the driver seat. REFER to Principles of Operation. CLEAR the DTCs. REPEAT the self test. REACTIVATE the supplemental restraint system (SRS). PROVE OUT the supplemental restraint system (SRS). REFER to [Section 501-20B](#).

→ **No**
REPAIR the circuit. CLEAR the DTCs. REPEAT the self test. REACTIVATE the supplemental restraint system (SRS). PROVE OUT the supplemental restraint system (SRS). REFER to [Section 501-20B](#).

E35 CHECK THE DRIVER SEAT BACKREST MOTOR SUPPLY

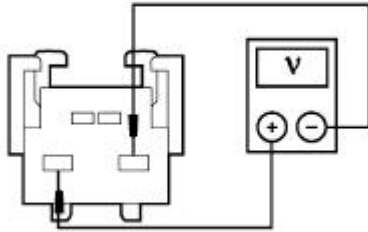
1



Driver Seat Backrest Motor C368

2

2 Measure the voltage between driver seat backrest motor C368, circuit 33-AH36 (YE/RD), harness side and driver seat



A0003079

backrest motor C368, circuit 32-AH36 (WH/RD), harness side, while operating the driver seat regulator control switch to the recline forward and recline rearward position.

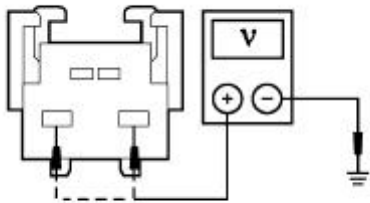
- Is the voltage greater than 10 volts in both directions?

→ **Yes**
GO to [E39](#).

→ **No**
GO to [E36](#).

E36 CHECK THE DSM BACKREST MOTOR CONTROL

1



A0003080

1

Measure the voltage between driver seat backrest motor C368, circuit 33-AH36 (YE/RD), harness side and ground while operating the driver seat regulator control switch to the backrest forward position; and between driver seat backrest motor C368, circuit 32-AH36 (WH/RD), harness side and ground while operating the driver seat regulator control switch to the backrest rearward position.

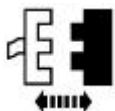
- Is the voltage greater than 10 volts in both directions?

→ **Yes**
INSTALL a new DSM. REFER to [Section 419-10](#). CALIBRATE the driver seat, REFER to Seat Calibration in Principles of Operation. CLEAR the DTCs. REPEAT the self test. REACTIVATE the supplemental restraint system (SRS). PROVE OUT the supplemental restraint system (SRS). REFER to [Section 501-20B](#).

→ **No**
GO to [E37](#).

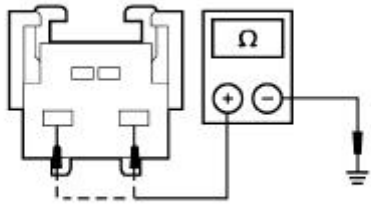
E37 CHECK CIRCUIT 33-AH36 (YE/RD) AND 32-AH36 (WH/RD) FOR A SHORT TO GROUND

1



DSM C341a

2



A0003081

2

Measure the resistance between driver seat backrest motor C368, circuit 33-AH36 (YE/RD), harness side and ground; and between driver seat backrest motor C368, circuit 32-AH36 (WH/RD), harness side and ground.

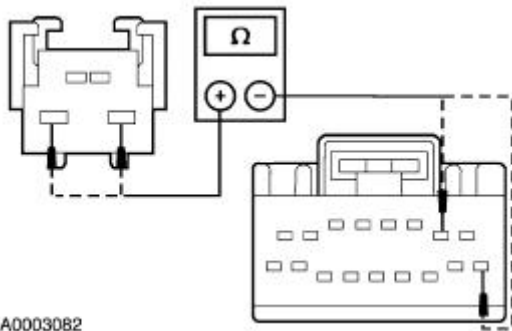
- Are the resistances greater than 10,000 ohms?

→ **Yes**
GO to [E38](#).

→ **No**
REPAIR the circuit. CLEAR the DTCs. REPEAT the self test. REACTIVATE the supplemental restraint system (SRS). PROVE OUT the supplemental restraint system (SRS). REFER to [Section 501-20B](#).

E38 CHECK CIRCUIT 33-AH36 (YE/RD), 33-AH36 (YE/RD), 32-AH36 (WH/RD) AND 32-AH36 (WH/RD) FOR AN OPEN

1



A0003082

1

Measure the resistance between driver seat backrest motor C368, circuit 33-AH36 (YE/RD), harness side and DSM C341a pin 9, circuit 33-AH36 (YE/RD), harness side; and between driver seat backrest motor C368, circuit 32-AH36 (WH/RD), harness side and DSM C341a pin 2, circuit 32-AH36 (WH/RD), harness side.

- Are the resistances less than 5 ohms?

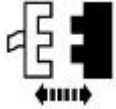
→ **Yes**
INSTALL a new DSM. REFER to [Section 419-10](#). CALIBRATE the driver seat, REFER to Seat Calibration in Principles of Operation. CLEAR the DTCs. REPEAT the self test. REACTIVATE the supplemental restraint system (SRS). PROVE OUT the supplemental restraint system (SRS). REFER to [Section 501-20B](#).

→ **No**
REPAIR the circuit. CLEAR the DTCs.

REPEAT the self test. REACTIVATE the supplemental restraint system (SRS). PROVE OUT the supplemental restraint system (SRS). REFER to [Section 501-20B](#)

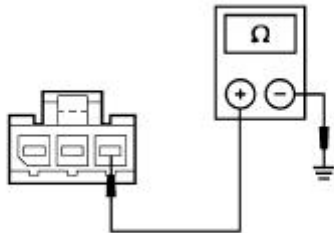
E39 CHECK CIRCUIT 9-AH30 (BN/BU) FOR AN OPEN

1



Backrest Motor Position Sensor C376

2



A0003066

2

Measure the resistance between backrest motor position sensor C376 pin 3, circuit 9-AH30 (BN/BU), harness side and ground.

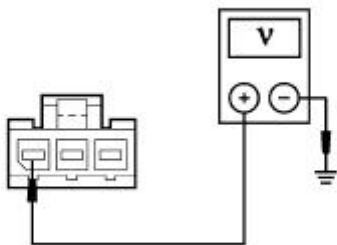
● Is the resistance less than 5 ohms?

→ **Yes**
GO to [E40](#).

→ **No**
REPAIR the circuit. CLEAR the DTCs. REPEAT the self test. REACTIVATE the supplemental restraint system (SRS). PROVE OUT the supplemental restraint system (SRS). REFER to [Section 501-20B](#).

E40 CHECK CIRCUIT 7-AH30 (YE/BU) FOR AN OPEN

1



A0003075

1

Measure the voltage between backrest motor position sensor C376 pin 1, circuit 7-AH30 (YE/BU), harness side and ground.

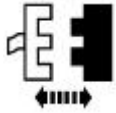
● Is the voltage approximately 5 volts?

→ **Yes**
GO to [E41](#).

→ **No**
REPAIR the circuit. CLEAR the DTCs.
REPEAT the self test. REACTIVATE the
supplemental restraint system (SRS).
PROVE OUT the supplemental restraint
system (SRS). REFER to [Section 501-
20B](#).

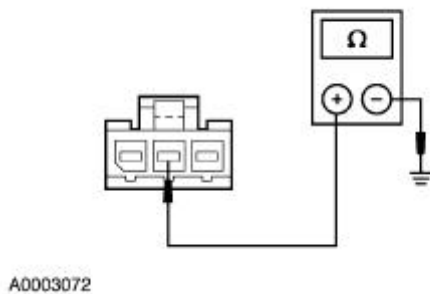
E41 CHECK CIRCUIT 8-AH30 (WH/BU) FOR A SHORT TO GROUND

1



DSM C341a

2



2 Measure the resistance between
backrest motor position sensor C376 pin
2, circuit 8-AH30 (WH/BU), harness side
and ground.

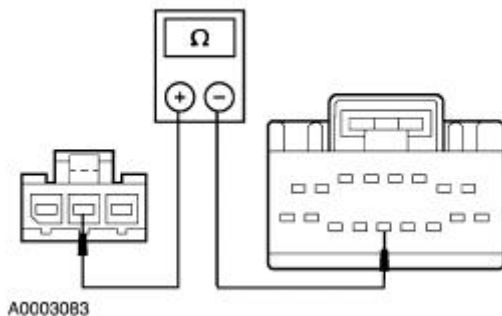
- Is the resistance greater than
10,000 ohms?

→ **Yes**
GO to [E42](#).

→ **No**
REPAIR the circuit. CLEAR the DTCs.
REPEAT the self test. REACTIVATE the
supplemental restraint system (SRS).
PROVE OUT the supplemental restraint
system (SRS). REFER to [Section 501-
20B](#).

E42 CHECK CIRCUIT 8-AH30 (WH/BU) FOR AN OPEN

1



1 Measure the resistance between
backrest motor position sensor C376 pin
2, circuit 8-AH30 (WH/BU), harness side
and DSM C341a pin 13, circuit 8-AH30
(WH/BU), harness side.

- Is the resistance less than 5 ohms?

→ **Yes**

INSTALL a new seat track. REFER to [Seat Track](#). CALIBRATE the driver seat. REFER to Principles of Operation. REPEAT the DSM self-test. If DTC B1769 is retrieved, INSTALL a new DSM. REFER to [Section 419-10](#). CALIBRATE the driver seat. REFER to Principles of Operation. CLEAR the DTCs. REPEAT the self test. REACTIVATE the supplemental restraint system (SRS). PROVE OUT the supplemental restraint system (SRS). REFER to [Section 501-20B](#).

→ **No**
REPAIR the circuit. CLEAR the DTCs. REPEAT the self test. REACTIVATE the supplemental restraint system (SRS). PROVE OUT the supplemental restraint system (SRS). REFER to [Section 501-20B](#).

E43 CHECK FOR HESITATION OR JOGGING

1



2



3



2 Clear all DSM DTCs.

3 Operate the driver seat regulator control switch through all positions while monitoring DSM PIDs SFNT_MT, SREARMT, SFWD_MT and SRCL_MT, while watching seat movement.

- **Did the driver seat stop or hesitate, or did any of the DSM PIDs read inconsistently?**

→ **Yes**
INSTALL a new seat track. REFER to [Seat Track](#). CALIBRATE the driver seat. REFER to Principles of Operation. CLEAR the DTCs. REPEAT the self test. REACTIVATE the supplemental restraint system (SRS). PROVE OUT the supplemental restraint system (SRS). REFER to [Section 501-20B](#).

→ **No**
GO to [E44](#).

E44 CHECK FOR AN INTERMITTENT CONCERN

1

1 Clear all DSM DTCs.



3



DSM Self-Test

- 2 Operate the driver power seat. Wiggle the harness and connectors. Inspect for any visual concerns.

- **Were any DTCs retrieved?**

→ **Yes**

If DTC B2146, B2149, B2152 or B2155 is retrieved, INSTALL a new seat track. REFER to [Seat Track](#). CALIBRATE the driver seat. REFER to Principles of Operation. CLEAR the DTCs. REPEAT the self test. REACTIVATE the supplemental restraint system (SRS). PROVE OUT the supplemental restraint system (SRS). REFER to [Section 501-20B](#).

→ **No**

CALIBRATE the driver seat. REFER to Principles of Operation. CLEAR the DTCs. REPEAT the self test. REACTIVATE the supplemental restraint system (SRS). PROVE OUT the supplemental restraint system (SRS). REFER to [Section 501-20B](#).

E45 CHECK THE DRIVER SEAT REGULATOR CONTROL SWITCH PIDS

1



- 1 Operate the driver seat regulator control seat switch through all positions while monitoring the DSM PIDs SFNT_SW, SFWD_SW, SREARSW and SRCL_SW.

- **Do the DSM PIDs accurately represent the seat regulator control switch positions?**

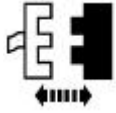
→ **Yes**

INSTALL a new DSM. REFER to [Section 419-10](#). CALIBRATE the driver seat, REFER to Seat Calibration in Principles of Operation. CLEAR the DTCs. REPEAT the self test. REACTIVATE the supplemental restraint system (SRS). PROVE OUT the supplemental restraint system (SRS). REFER to [Section 501-20B](#).

→ **No**
GO to [E46](#).

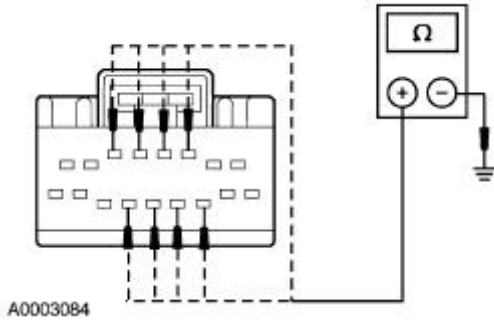
E46 CHECK THE DRIVER SEAT REGULATOR CONTROL SWITCH CIRCUITS FOR AN OPEN

1



DSM C341c

2



2 Using the following table, measure the resistance between DSM C341c pins, harness side and ground.

DSM C341c Pin	Circuit
3	10-AH83 (GY/OG)
4	10-AH82 (GY/RD)
5	8-AH84 (WH/BK)
6	10-AH85 (WH/GN)
11	8-AH83 (WH/GN)
12	8-AH82 (WH/RD)
13	10-AH84 (GY/BK)
14	8-AH85 (WH/VT)

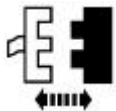
• Are the resistances less than 5 ohms?

→ **Yes**
GO to [E47](#).

→ **No**
REPAIR the circuit. CLEAR the DTCs. REPEAT the self test. REACTIVATE the supplemental restraint system (SRS). PROVE OUT the supplemental restraint system (SRS). REFER to [Section 501-20B](#).

E47 CHECK THE DRIVER SEAT REGULATOR CONTROL SWITCH CIRCUITS FOR A SHORT TO GROUND

1

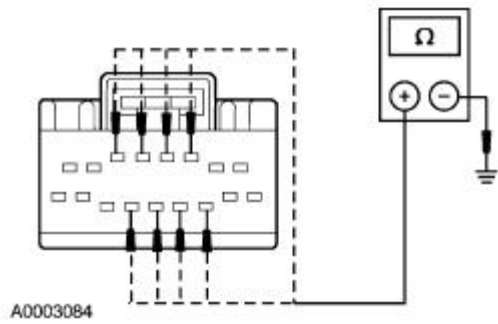


Driver Seat Regulator Control Switch C360

2

2 Using the following table, measure the resistance between DSM C341c pins, harness side and ground.

DSM C341c Pin	Circuit
3	10-AH83 (GY/OG)



4	10-AH82 (GY/RD)
5	8-AH84 (WH/BK)
6	10-AH85 (WH/GN)
11	8-AH83 (WH/GN)
12	8-AH82 (WH/RD)
13	10-AH84 (GY/BK)
14	8-AH85 (WH/VT)

- Are the resistances greater than 10,000 ohms?

→ **Yes**

INSTALL a new driver seat regulator control switch. REFER to [Seat Track](#). CLEAR the DTCs. REPEAT the self test. REACTIVATE the supplemental restraint system (SRS). PROVE OUT the supplemental restraint system (SRS). REFER to [Section 501-20B](#).

→ **No**

REPAIR the circuit. CLEAR the DTCs. REPEAT the self test. REACTIVATE the supplemental restraint system (SRS). PROVE OUT the supplemental restraint system (SRS). REFER to [Section 501-20B](#).

PINPOINT TEST F: THE POWER SEAT DOES NOT MOVE HORIZONTALLY/VERTICALLY —PASSENGER

CONDITIONS	DETAILS/RESULTS/ACTIONS
F1 CHECK THE PASSENGER SEAT MOTOR OPERATION	<p>⚠ WARNING: The restraint system diagnostic tool is for restraint system service only. Remove from vehicle prior to road use. Failure to remove could result in injury and possible violation of vehicle safety standards.</p> <p>NOTE: If a seat equipped with a seat mounted side air bag and/or a safety belt pretensioner (if equipped) system is being serviced, the air bag system must be deactivated. Refer to Supplemental Restraint System (SRS) Deactivation and Reactivation in the General Procedures portion of this section.</p> <p>NOTE: Restraint system diagnostic tools MUST be installed under the seats in the seat side air bag (if equipped) and safety belt pretensioner (if equipped) to floor connectors.</p> <p>NOTE: Diagnostics or repairs are not to be performed on a seat equipped with a seat side air bag with the seat in the vehicle. Prior to attempting to diagnose or repair a seat concern when equipped with a seat side air bag, the seat must be removed from the vehicle and the restraint system diagnostic tools must be installed in the seat side air bag electrical connectors. The restraint system diagnostic tools must be removed prior to operating the vehicle over the road.</p> <p>NOTE: After diagnosing or repairing a seat system, the restraint system diagnostic tools must be removed before operating the vehicle over the road.</p>

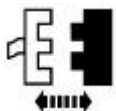
NOTE: Diagnostics may be performed on seat systems other than the side air bag or the safety belt buckle pretensioner system (lumbar, climate controlled, heated, power seat track) with the seat installed in the vehicle as long as the restraint system diagnostic tools are installed under the seats in the side air bag and safety belt buckle pretensioner to floor connectors.

NOTE: The SRS must be fully operational and free of faults before releasing the vehicle to the customer.

1



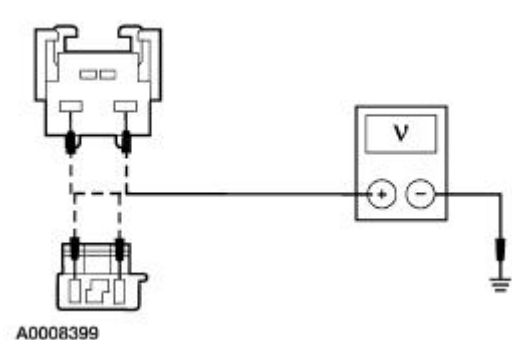
3



4



5



2 Deactivate the supplemental restraint system (SRS). Refer to [Section 501-20B](#).

3 Disconnect the passenger seat motor connector in question: (forward/rearward motor C332, seat height motor C333, or seat backrest motor C338).

5 Using the following table, measure the voltage between the inoperative passenger seat motor connector, harness side and ground, while moving the seat regulator control switch in the indicated direction:

Motor Connector	Pin	Circuit	Direction of Control Switch
Forward/Reverse Motor C332	1	32-AH44 (WH/GN)	Forward
Forward/Reverse Motor C332	2	33-AH44 (YE/GN)	Reverse
Height Motor C333	1	32-AH34 (WH/BK)	Up
Height Motor C333	2	33-AH34 (YE/BK)	Down
Backrest Motor C338	1	32-AH15 (WH/RD)	Tilt Up
Backrest Motor C338	2	33-AH15 (YE/RD)	Tilt Down

- Are the voltages greater than 10 volts in the inoperative directions?

→ Yes

INSTALL a new passenger seat track or the backrest assembly. REFER to [Seat Track](#) or [Front Seat Backrest](#). TEST the system for normal operation.

REACTIVATE the supplemental restraint system (SRS). PROVE OUT the supplemental restraint system (SRS). REFER to [Section 501-20B](#).

→ No

GO to [F2](#).

F2 CHECK THE PASSENGER SEAT MOTOR CIRCUITS FOR A SHORT TO GROUND

1

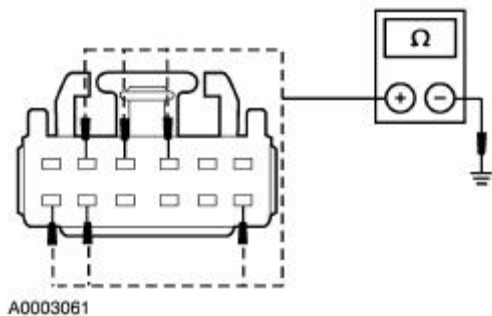


2



Passenger Seat Regulator Control Switch C330

3



3

Using the following table, measure the resistance between passenger seat regulator control switch C330 pins, harness side and ground:

Pin	Circuit	Inoperative Motor
12	32-AH43 (WH/RD)	Backrest
7	33-AH43 (YE/RD)	Backrest
4	32-AH34 (WH/BK)	Height
5	33-AH34 (YE/BK)	Height
3	32-AH44 (WH/GN)	Forward/Rearward
11	33-AH44 (YE/GN)	Forward/Rearward

- Are the resistances greater than 10,000 ohms?

→ Yes

GO to [F3](#).

→ No

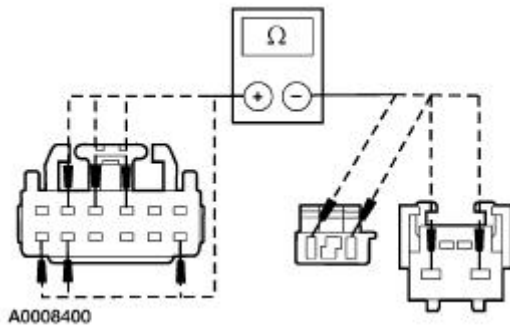
REPAIR the circuit in question. TEST the system for normal operation. REACTIVATE the supplemental restraint system (SRS). PROVE OUT the supplemental restraint system (SRS). REFER to [Section 501-20B](#).

F3 CHECK FOR AN OPEN CIRCUIT

1



2



2

Measure the resistance between the passenger seat regulator control switch C330 pins, harness side and the inoperative motor connector, harness side:

C330 Pin	Circuit	Motor Connector
Height Motor		
4	32-AH34 (WH/BK)	C333 pin 1
5	33-AH34 (YE/BK)	C333 pin 2
Forward/Reverse Motor		
3	32-AH44 (WH/GN)	C332 pin 1
11	33-AH44 (YE/GN)	C332 pin 2
Backrest Motor		
12	32-AH43, 32-AH15 (WH/RD)	C338 pin 1
7	33-AH43, 33-AH15 (YE/RD)	C338 pin 2

- Are all resistance readings less than 5 ohms?

→ **Yes**


INSTALL a new passenger seat regulator control switch. REFER to [Seat Control Switch](#). TEST the system for normal operation. REACTIVATE the supplemental restraint system (SRS). PROVE OUT the supplemental restraint system (SRS). REFER to [Section 501-20B](#).

→ **No**

REPAIR the circuit in question. TEST the system for normal operation. REACTIVATE the supplemental restraint system (SRS). PROVE OUT the

supplemental restraint system (SRS).
REFER to [Section 501-20B](#).

PINPOINT TEST G: THE MEMORY SEAT IS INOPERATIVE

CONDITIONS	DETAILS/RESULTS/ACTIONS
G1 CHECK THE MEMORY MIRROR OPERATION	
<p> WARNING: The restraint system diagnostic tool is for restraint system service only. Remove from vehicle prior to road use. Failure to remove could result in injury and possible violation of vehicle safety standards.</p> <p>NOTE: If a seat equipped with a seat mounted side air bag and/or a safety belt pretensioner (if equipped) system is being serviced, the air bag system must be deactivated. Refer to Supplemental Restraint System (SRS) Deactivation and Reactivation in the General Procedures portion of this section.</p> <p>NOTE: Restraint system diagnostic tools MUST be installed under the seats in the seat side air bag (if equipped) and safety belt pretensioner (if equipped) to floor connectors.</p> <p>NOTE: Diagnostics or repairs are not to be performed on a seat equipped with a seat side air bag with the seat in the vehicle. Prior to attempting to diagnose or repair a seat concern when equipped with a seat side air bag, the seat must be removed from the vehicle and the restraint system diagnostic tools must be installed in the seat side air bag electrical connectors. The restraint system diagnostic tools must be removed prior to operating the vehicle over the road.</p> <p>NOTE: After diagnosing or repairing a seat system, the restraint system diagnostic tools must be removed before operating the vehicle over the road.</p> <p>NOTE: Diagnostics may be performed on seat systems other than the side air bag or the safety belt buckle pretensioner system (lumbar, climate controlled, heated, power seat track) with the seat installed in the vehicle as long as the restraint system diagnostic tools are installed under the seats in the side air bag and safety belt buckle pretensioner to floor connectors.</p> <p>NOTE: The SRS must be fully operational and free of faults before releasing the vehicle to the customer.</p>	
	<p>1 Carry out a memory recall for the exterior rear view mirrors.</p> <ul style="list-style-type: none">● Did the memory mirrors operate correctly? <p>→ Yes GO to G2.</p> <p>→ No REFER to Section 501-09.</p>
G2 CHECK THE DTCS FROM THE DSM	
	<p>1 Using the recorded results from DSM self-test.</p> <ul style="list-style-type: none">● Was DSM DTC B1342 retrieved? <p>→ Yes CLEAR the DSM DTCS. REPEAT the DSM self-test. If DTC B1342 is retrieved, INSTALL a new DSM. REFER to Section 419-10. CALIBRATE the driver seat, REFER to Seat Calibration in Principles of Operation. CLEAR the DTCS. REPEAT the self test. REACTIVATE the supplemental restraint system (SRS). PROVE OUT the supplemental restraint system (SRS). REFER to Section 501-20B.</p>

→ **No**
GO to [G3](#).

G3 CHECK THE POWER SEAT CALIBRATION

1



2 Calibrate the driver seat. Refer to Seat Calibration in Principles of Operation.

● **Were any DSM DTCs retrieved from calibration?**

→ **Yes**
REFER to the DSM Diagnostic Trouble Code (DTC) Index.

→ **No**
GO to [G4](#).

G4 CHECK THE MEMORY RECALL OPERATION

1 Set a new memory seat position for driver 1 and driver 2.

2 Activate the memory recall for driver position 1 and driver position 2 from the memory set switch.

● **Do the memory recall functions operate correctly?**

→ **Yes**
The driver power seat is operating correctly. REVERIFY symptom.

→ **No**
INSTALL a new DSM. REFER to [Section 419-10](#). CALIBRATE the driver seat, REFER to Seat Calibration in Principles of Operation. GO to [G5](#).

G5 CHECK THE MEMORY RECALL OPERATION

1 Set a new memory seat position for driver 1 and driver 2.

2 Activate the memory recall for driver position 1 and driver position 2 from the memory set switch.


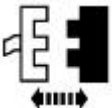
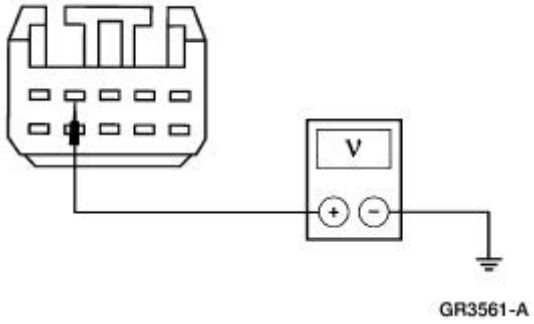
● **Do the memory recall functions operate correctly?**

→ **Yes**
The driver power seat is operating correctly. REVERIFY symptom.

→ **No**
CHECK the DDM for any memory function related DTCs. REPAIR as necessary. REFER to the DDM Diagnostic Trouble Code (DTC) Index.

CHECK for any DSM DTCs. REPAIR as necessary. REFER to the DSM Diagnostic Trouble Code (DTC) Index. REACTIVATE the supplemental restraint system (SRS). PROVE OUT the supplemental restraint system (SRS). REFER to [Section 501-20B](#).

PINPOINT TEST H: THE HEATED SEAT IS INOPERATIVE — DRIVER

CONDITIONS	DETAILS/RESULTS/ACTIONS
<p>H1 CHECK FOR VOLTAGE TO THE HEATED SEAT MODULE — CIRCUIT 30-HC21 (RD)</p> <p>⚠ WARNING: The restraint system diagnostic tool is for restraint system service only. Remove from vehicle prior to road use. Failure to remove could result in injury and possible violation of vehicle safety standards.</p> <p>NOTE: If a seat equipped with a seat mounted side air bag and/or a safety belt pretensioner (if equipped) system is being serviced, the air bag system must be deactivated. Refer to Supplemental Restraint System (SRS) Deactivation and Reactivation in the General Procedures portion of this section.</p> <p>NOTE: Restraint system diagnostic tools MUST be installed under the seats in the seat side air bag (if equipped) and safety belt pretensioner (if equipped) to floor connectors.</p> <p>NOTE: Diagnostics or repairs are not to be performed on a seat equipped with a seat side air bag with the seat in the vehicle. Prior to attempting to diagnose or repair a seat concern when equipped with a seat side air bag, the seat must be removed from the vehicle and the restraint system diagnostic tools must be installed in the seat side air bag electrical connectors. The restraint system diagnostic tools must be removed prior to operating the vehicle over the road.</p> <p>NOTE: After diagnosing or repairing a seat system, the restraint system diagnostic tools must be removed before operating the vehicle over the road.</p> <p>NOTE: Diagnostics may be performed on seat systems other than the side air bag or the safety belt buckle pretensioner system (lumbar, climate controlled, heated, power seat track) with the seat installed in the vehicle as long as the restraint system diagnostic tools are installed under the seats in the side air bag and safety belt buckle pretensioner to floor connectors.</p> <p>NOTE: The SRS must be fully operational and free of faults before releasing the vehicle to the customer.</p>	
<p>2</p>  <p>3</p>  <p>Driver Heated Seat Module C359</p> <p>4</p>  <p>GR3561-A</p>	<p>1 Deactivate the supplemental restraint system (SRS). Refer to Section 501-20B.</p> <p>4 Measure the voltage between driver heated seat module C359 pin 4, circuit 30-HC21 (RD), harness side and ground.</p> <ul style="list-style-type: none"> ● Is the voltage greater than 10

volts?

→ **Yes**
GO to [H2](#).

→ **No**
REPAIR circuit 30-HC21 (RD). TEST the system for normal operation. REACTIVATE the supplemental restraint system (SRS). PROVE OUT the supplemental restraint system (SRS). REFER to [Section 501-20B](#).

H2 CHECK FOR VOLTAGE TO THE HEATED SEAT SWITCH — CIRCUIT 20-HC6 (OG/GN)

1



2

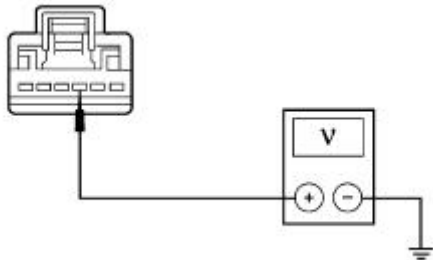


Driver Heated Seat Switch C344

3



4



A0005661

4 Measure the voltage between driver heated seat switch C344 pin 3, circuit 20-HC6 (OG/GN), harness side and ground.

● **Is the voltage greater than 10 volts?**

→ **Yes**
GO to [H3](#).

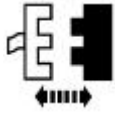
→ **No**
REPAIR circuit 20-HC6 (OG/GN). TEST the system for normal operation. REACTIVATE the supplemental restraint system (SRS). PROVE OUT the supplemental restraint system (SRS). REFER to [Section 501-20B](#).

H3 CHECK FOR VOLTAGE TO THE HEATED SEAT MODULE — CIRCUIT 15-HC21 (GN/BK)

1



2

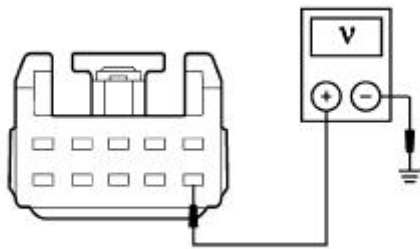


Driver Heated Seat Module C359

3



4



A0003088

4 Measure the voltage between heated seat module C359 pin 6, circuit 15-HC21 (GN/BK), harness side and ground.

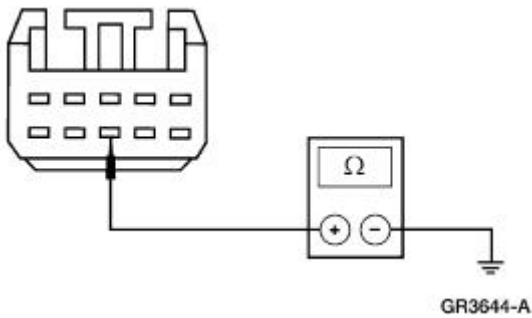
● Is the voltage greater than 10 volts?

→ Yes
GO to [H4](#).

→ No
REPAIR circuit 15-HC21 (GN/BK). TEST the system for normal operation. REACTIVATE the supplemental restraint system (SRS). PROVE OUT the supplemental restraint system (SRS). REFER to [Section 501-20B](#).

H4 CHECK DRIVER HEATED SEAT MODULE GROUND — CIRCUIT 31-HC21 (BK)

1



GR3644-A

1 Measure the resistance between driver heated seat module C359 pin 8, circuit 31-HC21 (BK), harness side and ground.

● Is the resistance less than 5 ohms?

→ **Yes**
GO to [H5](#).

→ **No**
REPAIR circuit 31-HC21 (BK). TEST the system for normal operation. REACTIVATE the supplemental restraint system (SRS). PROVE OUT the supplemental restraint system (SRS). REFER to [Section 501-20B](#).

H5 CHECK FOR VOLTAGE TO THE HEATED SEAT MODULE

1



2

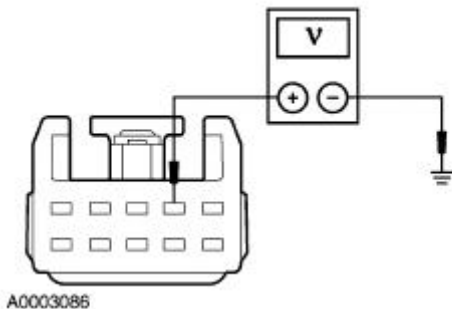


Driver Heated Seat Module C359

3



4



4 Measure the voltage between driver heated seat module C359 pin 2, circuit 20S-HC21 (PK/BK), harness side and ground while pressing and holding the heated seat switch.

● Is the voltage greater than 10 volts?

→ **Yes**
GO to [H7](#).

→ **No**
GO to [H6](#).

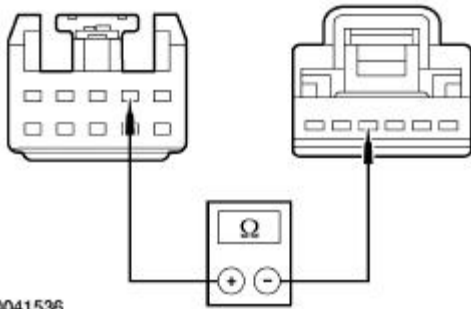
H6 CHECK CIRCUIT 20S-HC21 (PK/BK) FOR OPEN

1



2

2 Measure the resistance between driver heated seat module C359 pin 2, circuit



A0041536

20S-HC21 (PK/BK), and driver heated seat switch C344 pin 4, circuit 20S-HC21 (PK/BK), harness side.

- Is the resistance less than 5 ohms?

→ **Yes**
 INSTALL a new heated seat switch.
 TEST the system for normal operation.
 REACTIVATE the supplemental restraint system (SRS). PROVE OUT the supplemental restraint system (SRS).
 REFER to [Section 501-20B](#).

→ **No**
 REPAIR circuit 20S-HC21 (PK/BK).
 TEST the system for normal operation.
 REACTIVATE the supplemental restraint system (SRS). PROVE OUT the supplemental restraint system (SRS).
 REFER to [Section 501-20B](#).

H7 CHECK THE HEATED SEAT CIRCUITRY FOR OPEN AND SHORT TO GROUND

1

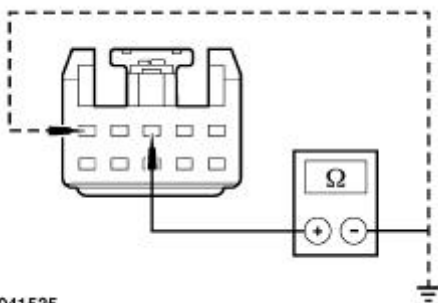


2



Driver Heated Seat Module 359

3



A0041535

3 Measure the resistance between heated seat module C359 pin 3, circuit 20S-HC17 (PK), and heated seat module C359 pin 5, circuit 31S-HC16 (BK/BU); and between heated seat module C359 pin 5, circuit 20S-HC17 (PK), harness side and ground.

- Is the resistance less than 5 ohms between the two connectors and greater than 10,000 ohms between

the heated seat module connector and ground?

→ **Yes**

INSTALL a new heated seat module. REFER to [Heated Seat Module](#) in this section. TEST the system for normal operation. REACTIVATE the supplemental restraint system (SRS). PROVE OUT the supplemental restraint system (SRS). REFER to [Section 501-20B](#).

→ **No**

GO to [H8](#).

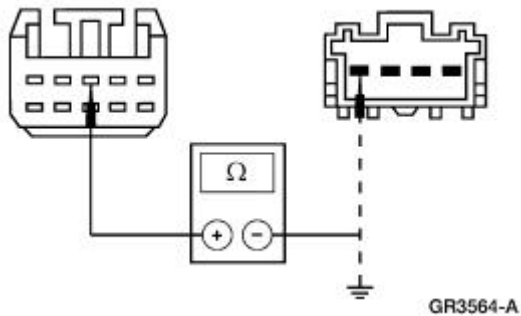
H8 CHECK CIRCUIT 20S-HC17 (PK) FOR OPEN AND SHORT TO GROUND

1



Driver Heated Seat Cushion C364

2



2

Measure the resistance between heated seat module C359 pin 3, circuit 20S-HC17 (PK), and heated seat cushion C364 pin 1, circuit 20S-HC17 (PK); and between heated seat module C359 pin 3, circuit 20S-HC17 (PK), harness side and ground.

● Is the resistance less than 5 ohms between the two connectors and greater than 10,000 ohms between the seat module connector and ground?

→ **Yes**

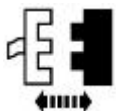
GO to [H9](#).

→ **No**

REPAIR circuit 20S-HC17 (PK). TEST the system for normal operation. REACTIVATE the supplemental restraint system (SRS). PROVE OUT the supplemental restraint system (SRS). REFER to [Section 501-20B](#).

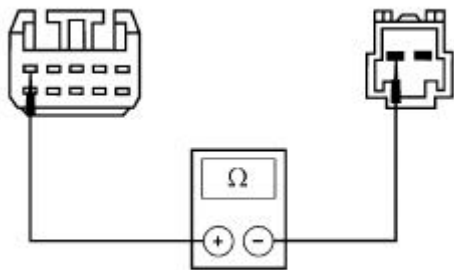
H9 CHECK CIRCUIT 31S-HC16 (BK/BU) FOR OPEN

1



Driver Heated Seat Backrest C365

2



GR3565-A

2

Measure the resistance between heated seat module C359 pin 5, circuit 31S-HC16 (BK/BU), and heated seat backrest C365 pin 2, circuit 31S-HC16 (BK/BU), harness side.

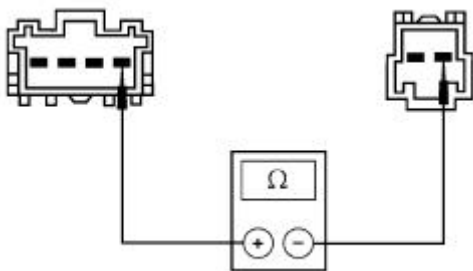
- Is the resistance less than 5 ohms?

→ **Yes**
GO to [H10](#).

→ **No**
REPAIR circuit 31S-HC16 (BK/BU).
TEST the system for normal operation.
REACTIVATE the supplemental restraint system (SRS). PROVE OUT the supplemental restraint system (SRS).
REFER to [Section 501-20B](#).

H10 CHECK CIRCUIT 20S-HC16 (PK/BU) FOR OPEN

1



GR3566-A

1

Measure the resistance between heated seat backrest C365 pin 1, circuit 20S-HC16 (PK/BU), and heated seat cushion C364 pin 4, circuit 20S-HC16 (PK/BU), harness side.

- Is the resistance less than 5 ohms?

→ **Yes**
GO to [H11](#).

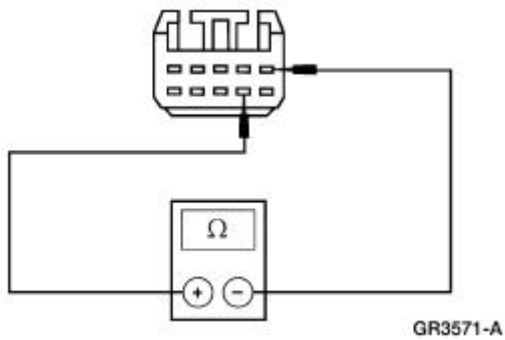
→ **No**
REPAIR circuit 20S-HC16 (PK/BU).
TEST the system for normal operation.
REACTIVATE the supplemental restraint system (SRS). PROVE OUT the supplemental restraint system (SRS).
REFER to [Section 501-20B](#).

H11 CHECK THE HEATED SEAT TEMPERATURE SENSOR CIRCUITRY FOR CONTINUITY

1



2



2

Measure the resistance between heated seat module C359 pin 7, circuit 8-HC23 (WH/BK), and heated seat module C359 pin 1, circuit 9-HC23 (BN/YE), harness side.

- Is the resistance less than 300,000 ohms and greater than 50 ohms?

→ Yes

INSTALL a new heated seat module. REFER to [Heated Seat Module](#) in this section. TEST the system for normal operation. REACTIVATE the supplemental restraint system (SRS). PROVE OUT the supplemental restraint system (SRS). REFER to [Section 501-20B](#).

→ No

GO to [H12](#).

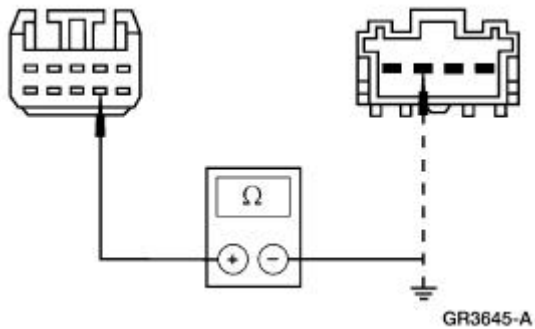
H12 CHECK CIRCUIT 8-HC23 (WH/BK) FOR OPEN AND SHORT TO GROUND

1



Driver Heated Seat Cushion C364

2



2

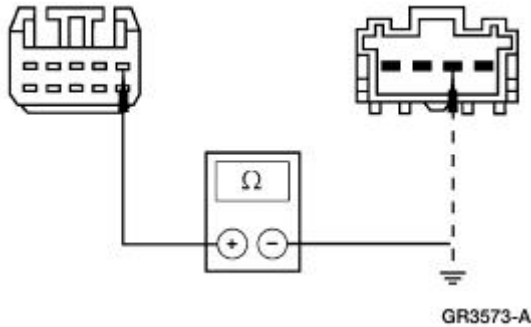
Measure the resistance between heated seat module C359 pin 7, circuit 8-HC23 (WH/BK), and heated seat cushion C364 pin 2, circuit 8-HC23 (WH/BK); and between heated seat module C359 pin 7, circuit 8-HC23 (WH/BK), harness side and ground.

- Is the resistance less than 5 ohms between the two connectors and greater than 10,000 ohms between the heated seat module connector and ground?

- **Yes**
GO to [H13](#).
- **No**
REPAIR circuit 8-HC23 (WH/BK). TEST the system for normal operation. REACTIVATE the supplemental restraint system (SRS). PROVE OUT the supplemental restraint system (SRS). REFER to [Section 501-20B](#).

H13 CHECK CIRCUIT 9-HC23 (BN/YE) FOR OPEN AND SHORT TO GROUND

1



1


Measure the resistance between heated seat module C359 pin 1, circuit 9-HC23 (BN/YE), and heated seat cushion C364 pin 3, circuit 9-HC23 (BN/YE); and between heated seat module C359 pin 1, circuit 9-HC23 (BN/YE), harness side and ground.

- **Is the resistance less than 5 ohms between the two connectors and greater than 10,000 ohms between the heated seat module connector and ground?**

- **Yes**
INSTALL a new heated seat cushion. TEST the system for normal operation. REACTIVATE the supplemental restraint system (SRS). PROVE OUT the supplemental restraint system (SRS). REFER to [Section 501-20B](#).

- **No**
REPAIR circuit 9-HC23 (BN/YE). TEST the system for normal operation. REACTIVATE the supplemental restraint system (SRS). PROVE OUT the supplemental restraint system (SRS). REFER to [Section 501-20B](#).

PINPOINT TEST I: THE HEATED SEAT IS INOPERATIVE — PASSENGER

CONDITIONS	DETAILS/RESULTS/ACTIONS
I1 CHECK FOR VOLTAGE TO THE HEATED SEAT MODULE — CIRCUIT 30-HC22 (RD)	
 WARNING: The restraint system diagnostic tool is for restraint system service only. Remove from vehicle prior to road use. Failure to remove could result in injury and possible violation of vehicle safety standards.	

NOTE: If a seat equipped with a seat mounted side air bag and/or a safety belt pretensioner (if equipped) system is being serviced, **the air bag system must be deactivated.** Refer to [Supplemental Restraint System \(SRS\) Deactivation and Reactivation](#) in the General Procedures portion of this section.

NOTE: Restraint system diagnostic tools **MUST** be installed under the seats in the seat side air bag (if equipped) and safety belt pretensioner (if equipped) to floor connectors.

NOTE: Diagnostics or repairs are not to be performed on a seat equipped with a seat side air bag with the seat in the vehicle. Prior to attempting to diagnose or repair a seat concern when equipped with a seat side air bag, the seat must be removed from the vehicle and the restraint system diagnostic tools must be installed in the seat side air bag electrical connectors. **The restraint system diagnostic tools must be removed prior to operating the vehicle over the road.**

NOTE: After diagnosing or repairing a seat system, **the restraint system diagnostic tools must be removed before operating the vehicle over the road.**

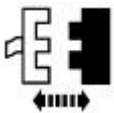
NOTE: Diagnostics may be performed on seat systems other than the side air bag or the safety belt buckle pretensioner system (lumbar, climate controlled, heated, power seat track) with the seat installed in the vehicle as long as the restraint system diagnostic tools are installed under the seats in the side air bag and safety belt buckle pretensioner to floor connectors.

NOTE: The SRS must be fully operational and free of faults before releasing the vehicle to the customer.

2

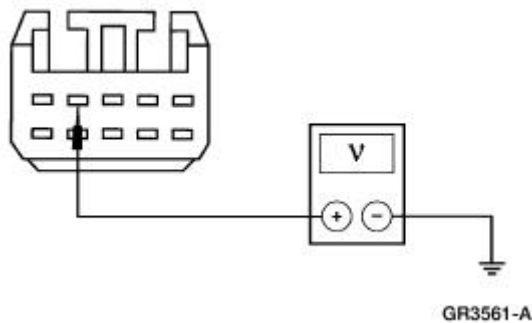


3



Passenger Heated Seat Module C329

4



1 Deactivate the supplemental restraint system (SRS). Refer to [Section 501-20B](#).

4 Measure the voltage between passenger heated seat module C329 pin 4, circuit 30-HC22 (RD), harness side and ground.

● Is the voltage greater than 10 volts?

→ Yes
GO to [12](#).

→ No
REPAIR circuit 30-HC22 (RD). TEST the system for normal operation.
REACTIVATE the supplemental restraint

system (SRS). PROVE OUT the supplemental restraint system (SRS). REFER to [Section 501-20B](#).

I2 CHECK FOR VOLTAGE TO THE HEATED SEAT SWITCH — CIRCUIT 20-HC9 (PK/BK)

1



2

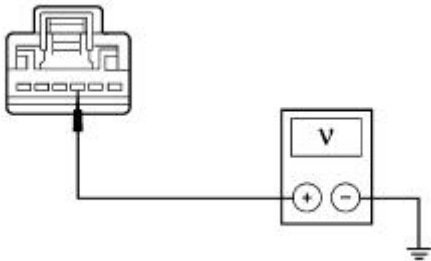


Passenger Heated Seat Switch C342

3



4



A0005661

- 4 Measure the voltage between the passenger heated seat switch C342 pin 3, circuit 20-HC9 (PK/BK), harness side and ground.

- Is the voltage greater than 10 volts?

→ **Yes**
GO to [I3](#).

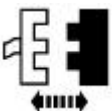
→ **No**
REPAIR circuit 20-HC9 (PK/BK). TEST the system for normal operation. REACTIVATE the supplemental restraint system (SRS). PROVE OUT the supplemental restraint system (SRS). REFER to [Section 501-20B](#).

I3 CHECK FOR VOLTAGE TO THE HEATED SEAT MODULE — CIRCUIT 15-HC22 (GN/YE)

1



2

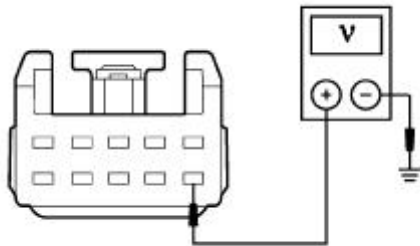


Passenger Heated Seat Module C329

3



4



A0003088

- 4 Measure the voltage between heated seat module C329 pin 6, circuit 15-HC22 (GN/YE), harness side and ground.

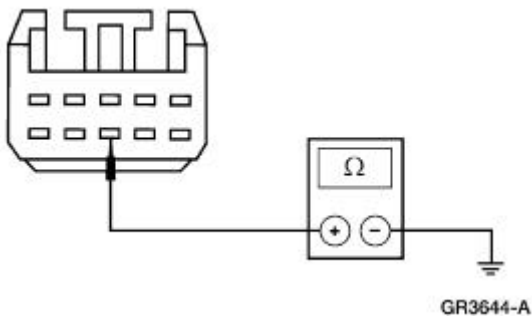
● Is the voltage greater than 10 volts?

→ **Yes**
GO to [14](#).

→ **No**
REPAIR circuit 15-HC22 (GN/YE). TEST the system for normal operation. REACTIVATE the supplemental restraint system (SRS). PROVE OUT the supplemental restraint system (SRS). REFER to [Section 501-20B](#).

I4 CHECK PASSENGER HEATED SEAT MODULE GROUND — CIRCUIT 31-HC22 (BK)

1



- 1 Measure the resistance between heated seat module C329 pin 8, circuit 31-HC22 (BK), harness side and ground.

● Is the resistance less than 5 ohms?

→ **Yes**
GO to [15](#).

→ **No**
REPAIR circuit 31-HC22 (BK). TEST the system for normal operation. REACTIVATE the supplemental restraint system (SRS). PROVE OUT the

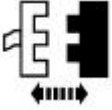
supplemental restraint system (SRS).
REFER to [Section 501-20B](#).

I5 CHECK FOR VOLTAGE TO THE HEATED SEAT MODULE

1



2

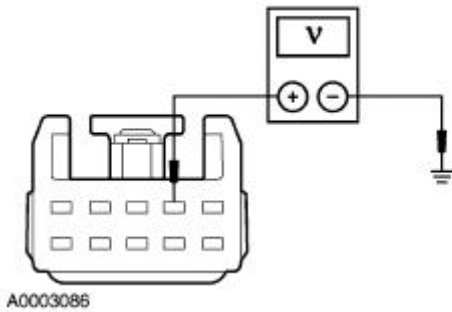


Passenger Heated Seat Module C329

3



4



- 4 Measure the voltage between heated seat module C329 pin 2, circuit 20S-HC22 (PK/YE), harness side and ground while pressing and holding the heated seat switch.

- Is the voltage greater than 10 volts?

→ **Yes**
GO to [17](#).

→ **No**
GO to [16](#).

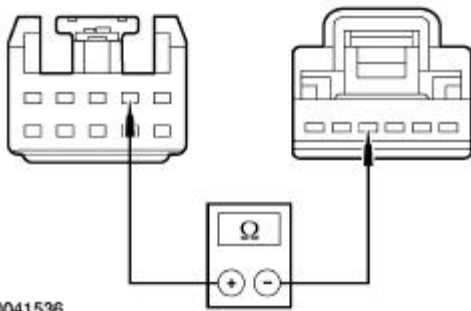
I6 CHECK CIRCUIT 20S-HC22 (PK/YE) FOR OPEN

1



2

- 2 Measure the resistance between passenger heated seat module C329 pin 2, circuit 20S-HC22 (PK/YE), and passenger heated seat switch C342 pin 4, circuit 20S-HC22 (PK/YE), harness side.



A0041536

- Is the resistance less than 5 ohms?

→ **Yes**

INSTALL a new heated seat switch.
TEST the system for normal operation.
REACTIVATE the supplemental restraint system (SRS). PROVE OUT the supplemental restraint system (SRS).
REFER to [Section 501-20B](#).

→ **No**

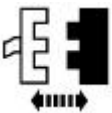
REPAIR circuit 20S-HC22 (PK/YE).
TEST the system for normal operation.
REACTIVATE the supplemental restraint system (SRS). PROVE OUT the supplemental restraint system (SRS).
REFER to [Section 501-20B](#).

17 CHECK THE HEATED SEAT CIRCUITRY FOR OPEN AND SHORT TO GROUND

1

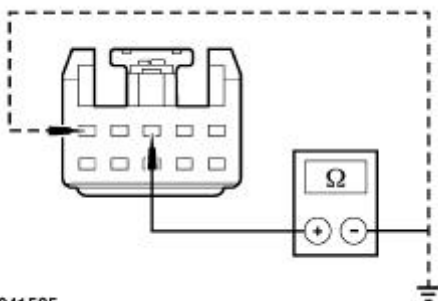


2



Passenger Heated Seat Module C329

3



A0041535

3

Measure the resistance between heated seat module C329 pin 3, circuit 20S-HC20 (PK/WH), and heated seat module C329 pin 5, circuit 31S-HC19 (BK/RD); and between heated seat module C329 pin 5, circuit 20S-HC20 (PK/WH), harness side and ground.

- Is the resistance less than 5 ohms between the two connectors and greater than 10,000 ohms between

the heated seat module connector and ground?

→ **Yes**

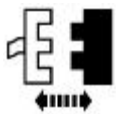
INSTALL a new heated seat module. REFER to [Heated Seat Module](#) in this section. TEST the system for normal operation. REACTIVATE the supplemental restraint system (SRS). PROVE OUT the supplemental restraint system (SRS). REFER to [Section 501-20B](#).

→ **No**

GO to [18](#).

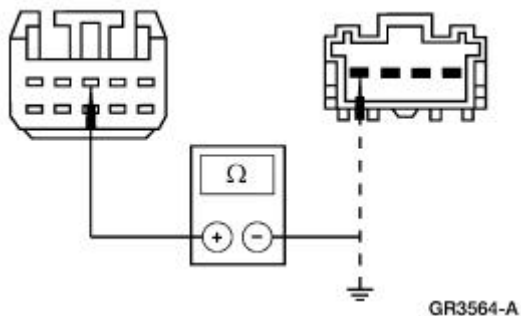
18 CHECK CIRCUIT 20S-HC20 (PK/WH) FOR OPEN AND SHORT TO GROUND

1



Passenger Heated Seat Cushion C334

2



2

Measure the resistance between heated seat module C329 pin 3, circuit 20S-HC20 (PK/WH), and heated seat cushion C334 pin 1, circuit 20S-HC20 (PK/WH), and between heated seat module C329 pin 3, circuit 20S-HC20 (PK/WH), harness side and ground.

- Is the resistance less than 5 ohms between the two connectors and greater than 10,000 ohms between the seat module connector and ground?

→ **Yes**

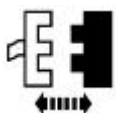
GO to [19](#).

→ **No**

REPAIR circuit 20S-HC20 (PK/WH). TEST the system for normal operation. REACTIVATE the supplemental restraint system (SRS). PROVE OUT the supplemental restraint system (SRS). REFER to [Section 501-20B](#).

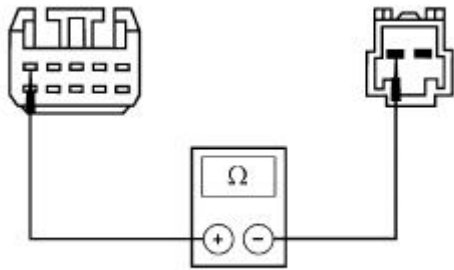
19 CHECK CIRCUIT 31S-HC19 (BK/RD) FOR OPEN

1



Passenger Heated Seat Backrest C335

2



GR3565-A

2

Measure the resistance between heated seat module C329 pin 5, circuit 31S-HC19 (BK/RD), and heated seat backrest C335 pin 2, circuit 31S-HC19 (BK/RD), harness side.

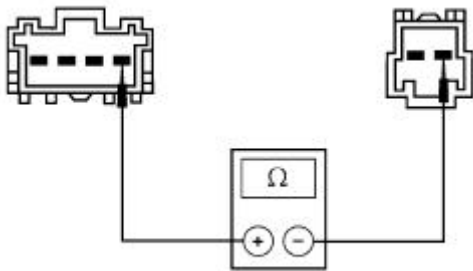
- Is the resistance less than 5 ohms?

→ **Yes**
GO to [I10](#).

→ **No**
REPAIR circuit 31S-HC19 (BK/RD).
TEST the system for normal operation.
REACTIVATE the supplemental restraint system (SRS). PROVE OUT the supplemental restraint system (SRS).
REFER to [Section 501-20B](#).

I10 CHECK CIRCUIT 20S-HC19 (PK/OG) FOR OPEN

1



GR3566-A

1

Measure the resistance between heated seat backrest C335 pin 1, circuit 20S-HC19 (PK/OG), and heated seat cushion C334 pin 4, circuit 20S-HC19 (PK/OG), harness side.

- Is the resistance less than 5 ohms?

→ **Yes**
GO to [I11](#).

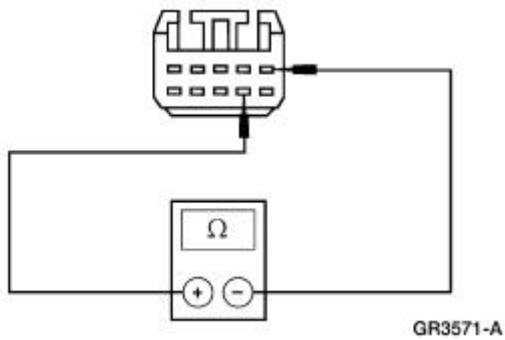
→ **No**
REPAIR circuit 20S-HC19 (PK/OG).
TEST the system for normal operation.
REACTIVATE the supplemental restraint system (SRS). PROVE OUT the supplemental restraint system (SRS).
REFER to [Section 501-20B](#).

I11 CHECK THE HEATED SEAT TEMPERATURE SENSOR CIRCUITRY FOR CONTINUITY

1



2



2

Measure the resistance between heated seat module C329 pin 7, circuit 8-HC24 (WH/RD), and heated seat module C329 pin 1, circuit 9-HC24 (BN/RD), harness side.

- Is the resistance less than 300,000 ohms and greater than 50 ohms?

→ Yes

INSTALL a new heated seat module. REFER to [Heated Seat Module](#) in this section. TEST the system for normal operation. REACTIVATE the supplemental restraint system (SRS). PROVE OUT the supplemental restraint system (SRS). REFER to [Section 501-20B](#).

→ No

GO to [112](#).

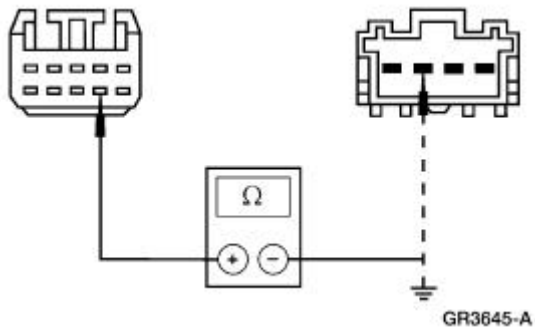
112 CHECK CIRCUIT 8-HC24 (WH/RD) FOR OPEN AND SHORT TO GROUND

1



Passenger Heated Seat Cushion C334

2



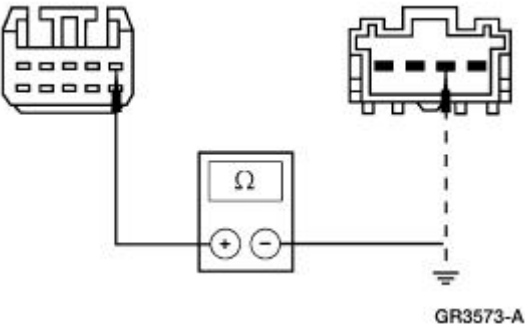
2

Measure the resistance between heated seat module C329 pin 7, circuit 8-HC24 (WH/RD), and heated seat cushion C334 pin 2, circuit 8-HC24 (WH/RD), and between heated seat module C329 pin 7, circuit 8-HC24 (WH/RD), harness side and ground.

- Is the resistance less than 5 ohms between the two connectors and greater than 10,000 ohms between the heated seat module connector and ground?

	<p>→ Yes GO to 113.</p> <p>→ No REPAIR circuit 8-HC24 (WH/RD). TEST the system for normal operation. REACTIVATE the supplemental restraint system (SRS). PROVE OUT the supplemental restraint system (SRS). REFER to Section 501-20B.</p>
--	---

113 CHECK CIRCUIT 9-HC24 (BN/RD) FOR OPEN AND SHORT TO GROUND

<p>1</p> 	<p>1</p> <p>Measure the resistance between heated seat module C329 pin 1, circuit 9-HC24 (BN/RD), and heated seat cushion C334 pin 3, circuit 9-HC24 (BN/RD), and between heated seat module C329 pin 1, circuit 9-HC24 (BN/RD), harness side and ground.</p> <ul style="list-style-type: none"> ● Is the resistance less than 5 ohms between the two connectors and greater than 10,000 ohms between the heated seat module connector and ground? <p>→ Yes INSTALL a new seat cushion heater. TEST the system for normal operation. REACTIVATE the supplemental restraint system (SRS). PROVE OUT the supplemental restraint system (SRS). REFER to Section 501-20B.</p> <p>→ No REPAIR circuit 9-HC24 (BN/RD). TEST the system for normal operation. REACTIVATE the supplemental restraint system (SRS). PROVE OUT the supplemental restraint system (SRS). REFER to Section 501-20B.</p>
--	---

PINPOINT TEST J: THE HEATED SEATS ARE INOPERATIVE

CONDITIONS	DETAILS/RESULTS/ACTIONS
<p>J1 CHECK THE IGNITION INPUT TO THE HEATED SEAT SWITCHES</p>	<p>⚠ WARNING: The restraint system diagnostic tool is for restraint system service only. Remove from vehicle prior to road use. Failure to remove could result in injury and possible violation of vehicle safety standards.</p> <p>NOTE: If a seat equipped with a seat mounted side air bag and/or a safety belt pretensioner (if equipped) system is being serviced, the air bag system must be deactivated. Refer to</p>

[Supplemental Restraint System \(SRS\) Deactivation and Reactivation](#) in the General Procedures portion of this section.

NOTE: Restraint system diagnostic tools **MUST** be installed under the seats in the seat side air bag (if equipped) and safety belt pretensioner (if equipped) to floor connectors.

NOTE: Diagnostics or repairs are not to be performed on a seat equipped with a seat side air bag with the seat in the vehicle. Prior to attempting to diagnose or repair a seat concern when equipped with a seat side air bag, the seat must be removed from the vehicle and the restraint system diagnostic tools must be installed in the seat side air bag electrical connectors. **The restraint system diagnostic tools must be removed prior to operating the vehicle over the road.**

NOTE: After diagnosing or repairing a seat system, **the restraint system diagnostic tools must be removed before operating the vehicle over the road.**

NOTE: Diagnostics may be performed on seat systems other than the side air bag or the safety belt buckle pretensioner system (lumbar, climate controlled, heated, power seat track) with the seat installed in the vehicle as long as the restraint system diagnostic tools are installed under the seats in the side air bag and safety belt buckle pretensioner to floor connectors.

NOTE: The SRS must be fully operational and free of faults before releasing the vehicle to the customer.

2



3

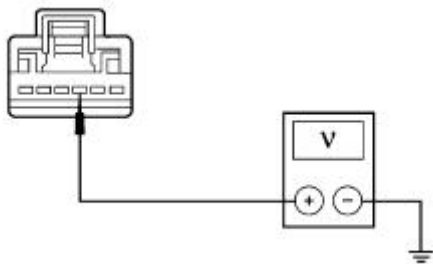


Driver Heated Seat Switch C344

4



5



A0005661

1 Deactivate the supplemental restraint system (SRS). Refer to [Section 501-20B](#).

5 Measure the voltage between driver heated seat switch C344 pin 3, circuit 20-HC6 (PK/YE), harness side and ground.

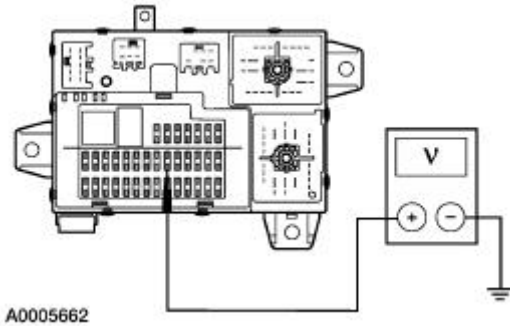
- Is the voltage greater than 10 volts?

→ Yes
GO to [J8](#).

→ **No**
GO to [J2](#).

J2 CHECK CIRCUIT 20-HC6 (PK/YE) FOR AN OPEN

1



1 Measure voltage between CJB fuse 216 (5A), output side and ground.

● **Is the voltage greater than 10 volts?**

→ **Yes**
REPAIR the circuit. TEST the system for normal operation. REACTIVATE the supplemental restraint system (SRS). PROVE OUT the supplemental restraint system (SRS). REFER to [Section 501-20B](#).

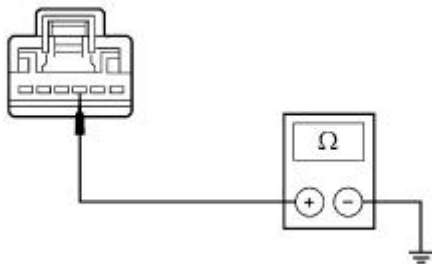
→ **No**
GO to [J3](#).

J3 CHECK CIRCUIT 20-HC6 (PK/YE) FOR A SHORT TO GROUND

1



2



2 Measure the resistance between driver heated seat switch C344 pin 3, circuit 20-HC6 (PK/YE), harness side and ground.

● **Is the resistance less than 5 ohms?**

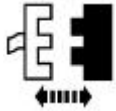
→ **Yes**
GO to [J4](#).

→ **No**
REPAIR the circuit. TEST the system for

normal operation. REACTIVATE the supplemental restraint system (SRS). PROVE OUT the supplemental restraint system (SRS). REFER to [Section 501-20B](#).

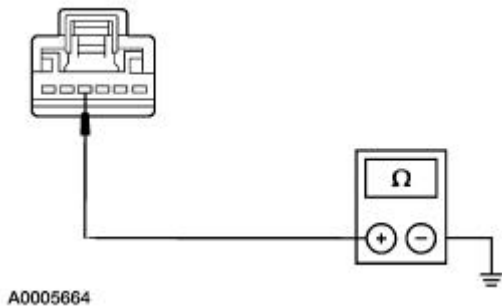
J4 CHECK CIRCUIT 20S-HC21 (PK/BK) FOR A SHORT TO GROUND

1



Driver Heated Seat Module C359

2



2

Measure the resistance between driver heated seat switch C344 pin 4, circuit 20S-HC21 (PK/BK), harness side and ground.

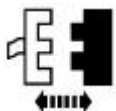
- Is the resistance greater than 10,000 ohms?

→ **Yes**
GO to [J5](#).

→ **No**
REPAIR the circuit. TEST the system for normal operation. REACTIVATE the supplemental restraint system (SRS). PROVE OUT the supplemental restraint system (SRS). REFER to [Section 501-20B](#).

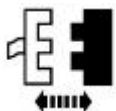
J5 CHECK CIRCUIT 20S-HC22 (PK/YE) FOR A SHORT TO GROUND

1



Passenger Heated Seat Module C329

2

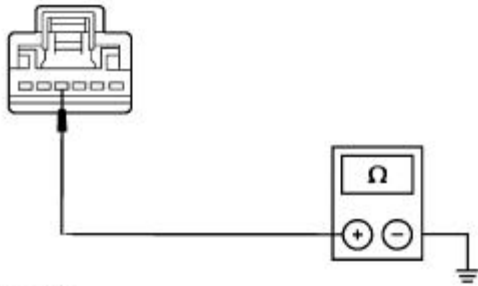


Passenger Heated Seat Switch C342

3

3

Measure the resistance between passenger heated seat switch C342 pin 4, circuit 20S-HC22 (PK/YE), harness side and ground.



A0005664

- Is the resistance greater than 10,000 ohms?

→ **Yes**

GO to [J6](#).

→ **Yes**

REPAIR the circuit. TEST the system for normal operation. REACTIVATE the supplemental restraint system (SRS). PROVE OUT the supplemental restraint system (SRS). REFER to [Section 501-20B](#).

J6 CHECK THE PASSENGER HEATED SEAT MODULE FOR A SHORT

1



Passenger Heated Seat Switch C342

2



Passenger Heated Seat Module C329

4



- 3 Install a new CJB fuse 216 (5A).

- 5 Press the passenger heated seat switch to ON.

- Is CJB fuse 216 (5A) OK?

→ **Yes**

GO to [J7](#).

→ **No**

INSTALL a new passenger heated seat module. REFER to [Heated Seat Module](#). TEST the system for normal operation. REACTIVATE the

supplemental restraint system (SRS).
PROVE OUT the supplemental restraint
system (SRS). REFER to [Section 501-
20B](#).

J7 CHECK THE DRIVER HEATED SEAT MODULE FOR A SHORT

1



Driver Heated Seat Switch C344

2



Driver Heated Seat Module C359

3



4 Press the driver heated seat switch to ON.

● **Is CJB fuse 216 (5A) OK?**

→ **Yes**
CHECK the driver and passenger system for an intermittent short to ground. REVERIFY the symptom. GO to [Symptom Chart](#).

→ **No**
INSTALL a new driver heated seat module. REFER to [Heated Seat Module](#). TEST the system for normal operation. REACTIVATE the supplemental restraint system (SRS). PROVE OUT the supplemental restraint system (SRS). REFER to [Section 501-20B](#).

J8 CHECK THE ANTI-THEFT OPERATION

NOTE: The anti-theft system and heated seat system use a common fuse. CJB Fuse 205 (5A) supplies ignition power to both the anti-theft system and heated seat system.

1 Check the anti-theft system operation. Refer to [Section 419-01A](#).

● **Does the anti-theft system operate?**

→ **Yes**
GO to [J9](#).

→ **No**
REFER to [Section 419-01A](#) to repair the

anti-theft system operation. TEST the system for normal operation. REACTIVATE the supplemental restraint system (SRS). PROVE OUT the supplemental restraint system (SRS). REFER to [Section 501-20B](#)

J9 CHECK CIRCUIT 15-HC21 (GN/BK) FOR AN OPEN

1



2

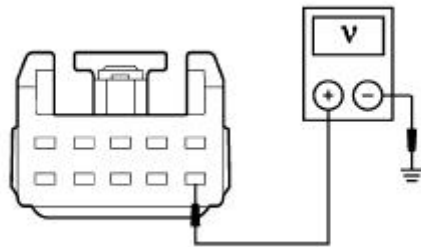


Driver Heated Seat Module C359

3



4



A0003088

4 Measure the voltage between driver heated seat module C359 pin 6, circuit 15-HC21 (GN/BK), harness side and ground.

● Is the voltage greater than 10 volts?

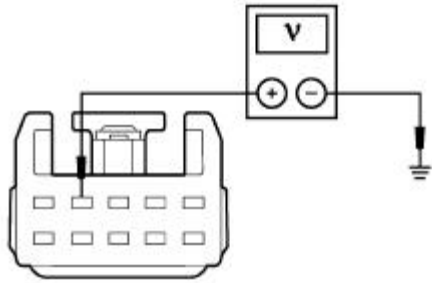
→ **Yes**
GO to [J10](#).

→ **No**
REPAIR the circuit. TEST the system for normal operation. REACTIVATE the supplemental restraint system (SRS). PROVE OUT the supplemental restraint system (SRS). REFER to [Section 501-20B](#).

J10 CHECK THE COMMON BATTERY SUPPLY

1

1 Measure the voltage between driver heated seat module C359 pin 4, circuit 30-HC21 (RD), harness side and ground.



A0003089

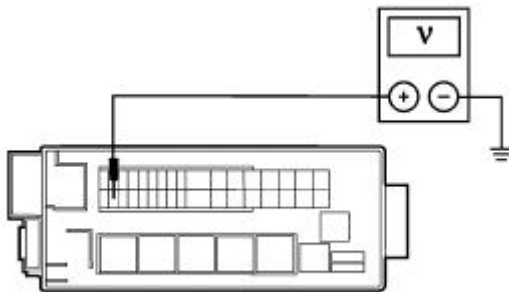
- Is the voltage greater than 10 volts?

→ **Yes**
The heated seat system is operating correctly. CHECK each system independently. REVERIFY the symptom. GO to [Symptom Chart](#).

→ **No**
GO to [J11](#).

J11 CHECK CIRCUIT 30-HC21 (RD) FOR AN OPEN

1



A0005665

1 Measure voltage between BJB fuse 411 (15A) and ground.

- Is the voltage greater than 10 volts?

→ **Yes**
REPAIR the circuit. TEST the system for normal operation. REACTIVATE the supplemental restraint system (SRS). PROVE OUT the supplemental restraint system (SRS). REFER to [Section 501-20B](#).

→ **No**
GO to [J12](#).

J12 CHECK CIRCUIT 30-HC21 (RD) FOR A SHORT TO GROUND

1

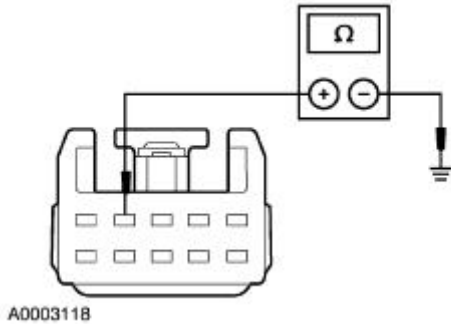


2



Passenger Heated Seat Module C329

3



3

Measure the resistance between driver heated seat module C359 pin 4, circuit 30-HC21 (RD), harness side and ground.

● Is the resistance greater than 10,000 ohms?

→ Yes
GO to [J13](#).

→ No
REPAIR the circuit. TEST the system for normal operation. REACTIVATE the supplemental restraint system (SRS). PROVE OUT the supplemental restraint system (SRS). REFER to [Section 501-20B](#).

J13 CHECK FOR A SHORTED PASSENGER HEATED SEAT SYSTEM

1



Passenger Heated Seat Module C329

3



2

Install a new BJB fuse 411 (15A).

4

Press the passenger heated seat switch to ON.

● Is rear BJB fuse 411 (15A) OK?

→ Yes
GO to [J15](#).

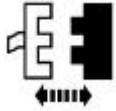
→ No
GO to [J14](#).

J14 CHECK FOR A SHORTED PASSENGER HEATING ELEMENT CIRCUIT

1

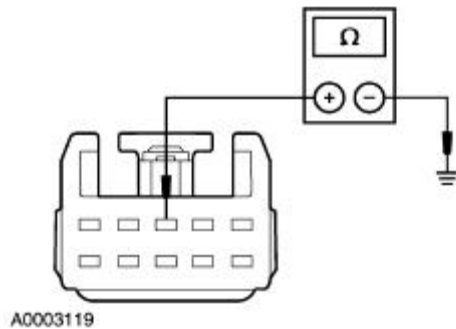


2



Passenger Heated Seat Module C329

3



3

Measure the resistance between passenger heated seat module C329 pin 3, circuit 20S-HC20 (PK/WH), harness side and ground.

- Is the resistance greater than 10,000 ohms?

→ **Yes**

INSTALL a new passenger heated seat module. REFER to [Heated Seat Module](#). TEST the system for normal operation. REACTIVATE the supplemental restraint system (SRS). PROVE OUT the supplemental restraint system (SRS). REFER to [Section 501-20B](#).

→ **No**

REPAIR the circuit. TEST the system for normal operation. REACTIVATE the supplemental restraint system (SRS). PROVE OUT the supplemental restraint system (SRS). REFER to [Section 501-20B](#).

J15 CHECK FOR A SHORTED DRIVER HEATED SEAT SYSTEM

1



Driver Heated Seat Module C359

2



3

Press the driver heated seat switch to ON.

- Is rear BJB fuse 411 (15A) OK?

→ **Yes**

The heated seat system is operating correctly. CHECK each system independently. REVERIFY the symptom. GO to [Symptom Chart](#) .

→ **No**

GO to [J16](#) .

J16 CHECK FOR A SHORTED DRIVER HEATING ELEMENT CIRCUIT

1

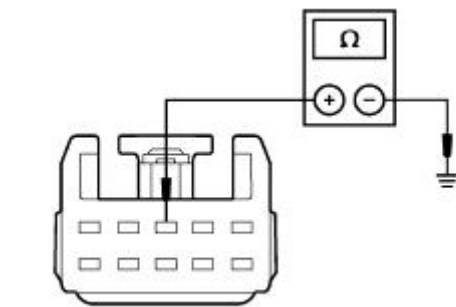


2



Driver Heated Seat Module C359

3



A0003119

3

Measure the resistance between driver heated seat module C359 pin 3, circuit 20S-HC17 (BK), harness side and ground.

- Is the resistance greater than 10,000 ohms?



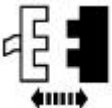
→ **Yes**

INSTALL a new driver heated seat module. REFER to [Heated Seat Module](#) . TEST the system for normal operation. REACTIVATE the supplemental restraint system (SRS). PROVE OUT the supplemental restraint system (SRS). REFER to [Section 501-20B](#) .

→ **No**

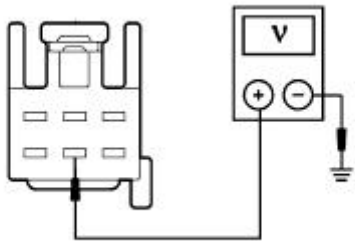
REPAIR the circuit. TEST the system for normal operation. REACTIVATE the supplemental restraint system (SRS). PROVE OUT the supplemental restraint system (SRS). REFER to [Section 501-20B](#) .

PINPOINT TEST K: THE POWER LUMBAR IS INOPERATIVE — DRIVER

CONDITIONS	DETAILS/RESULTS/ACTIONS
K1 CHECK THE DRIVER POWER SEAT OPERATION	
<p> WARNING: The restraint system diagnostic tool is for restraint system service only. Remove from vehicle prior to road use. Failure to remove could result in injury and possible violation of vehicle safety standards.</p> <p>NOTE: If a seat equipped with a seat mounted side air bag and/or a safety belt pretensioner (if equipped) system is being serviced, the air bag system must be deactivated. Refer to Supplemental Restraint System (SRS) Deactivation and Reactivation in the General Procedures portion of this section.</p> <p>NOTE: Restraint system diagnostic tools MUST be installed under the seats in the seat side air bag (if equipped) and safety belt pretensioner (if equipped) to floor connectors.</p> <p>NOTE: Diagnostics or repairs are not to be performed on a seat equipped with a seat side air bag with the seat in the vehicle. Prior to attempting to diagnose or repair a seat concern when equipped with a seat side air bag, the seat must be removed from the vehicle and the restraint system diagnostic tools must be installed in the seat side air bag electrical connectors. The restraint system diagnostic tools must be removed prior to operating the vehicle over the road.</p> <p>NOTE: After diagnosing or repairing a seat system, the restraint system diagnostic tools must be removed before operating the vehicle over the road.</p> <p>NOTE: Diagnostics may be performed on seat systems other than the side air bag or the safety belt buckle pretensioner system (lumbar, climate controlled, heated, power seat track) with the seat installed in the vehicle as long as the restraint system diagnostic tools are installed under the seats in the side air bag and safety belt buckle pretensioner to floor connectors.</p> <p>NOTE: The SRS must be fully operational and free of faults before releasing the vehicle to the customer.</p>	
	<p>1 Operate the driver power seat.</p> <ul style="list-style-type: none"> ● Does the power seat operate? <p>→ Yes GO to K2.</p> <p>→ No Go To Pinpoint Test C.</p>
K2 CHECK CIRCUIT 30-AH40 (RD) FOR AN OPEN	
<p>2</p>  <p>3</p>  <p>Driver Seat Lumbar Control Switch C361</p> <p>4</p>	<p>1 Deactivate the supplemental restraint system (SRS). Refer to Section 501-20B.</p>



5



A0003120

5 Measure the voltage between the driver seat lumbar control switch C361 pin 5, circuit 30-AH40 (RD), harness side and ground.

• Is the voltage greater than 10 volts?

→ Yes
GO to [K3](#).

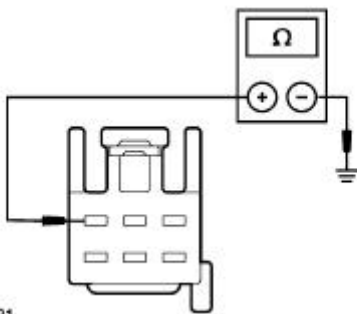
→ No
REPAIR the circuit. TEST the system for normal operation. REACTIVATE the supplemental restraint system (SRS). PROVE OUT the supplemental restraint system (SRS). REFER to [Section 501-20B](#).

K3 CHECK CIRCUIT 31-AH40 (BK) FOR AN OPEN

1



2



A0003121

2 Measure the resistance between driver seat lumbar control switch C361 pin 3, circuit 31-AH40 (BK), harness side and ground.

• Is the resistance less than 5 ohms?

→ Yes
GO to [K4](#).

→ No
REPAIR the circuit. TEST the system for

normal operation. REACTIVATE the supplemental restraint system (SRS). PROVE OUT the supplemental restraint system (SRS). REFER to [Section 501-20B](#).

K4 CHECK THE DRIVER SEAT LUMBAR MOTOR

1



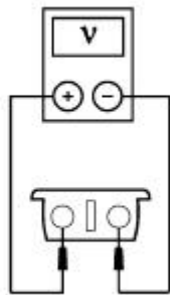
Driver Seat Lumbar Control Switch C361

2



Driver Seat Lumbar Motor C366

3



A0003122

3 Measure the voltage between driver seat lumbar motor C366, circuit 32-AH39 (WH/BU), harness side and driver seat lumbar motor C366, circuit 33-AH39 (YE/BU), harness side.

4 Operate the driver seat lumbar control switch in both directions.

- Is the voltage greater than 10 volts?

→ **Yes**
INSTALL a new driver seat lumbar motor. REFER to [Motor—Front Seat Lumbar](#). TEST the system for normal operation. REACTIVATE the supplemental restraint system (SRS). PROVE OUT the supplemental restraint system (SRS). REFER to [Section 501-20B](#).

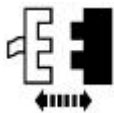
→ **No**
GO to [K5](#).

K5 CHECK CIRCUIT 32-AH39 (WH/BU) AND 33-AH39 (YE/BU) FOR A SHORT TO GROUND

1

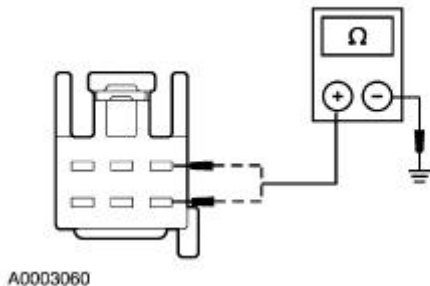


2



Driver Seat Lumbar Control Switch C361

3



3

Measure the resistance between driver seat lumbar control switch C361 pin 1, circuit 32-AH39 (WH/BU), harness side and ground; and between driver seat lumbar control switch C361 pin 4, circuit 33-AH39 (YE/BU), harness side and ground.

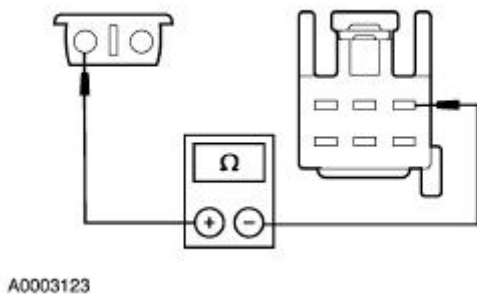
- Are the resistances greater than 10,000 ohms?

→ **Yes**
GO to [K6](#).

→ **No**
REPAIR the circuit. TEST the system for normal operation. REACTIVATE the supplemental restraint system (SRS). PROVE OUT the supplemental restraint system (SRS). REFER to [Section 501-20B](#).

K6 CHECK CIRCUIT 32-AH39 (WH/BU) FOR AN OPEN

1



1

Measure the resistance between driver seat lumbar control switch C361 pin 1, circuit 32-AH39 (WH/BU), harness side and driver seat lumbar motor C366, circuit 32-AH39 (WH/BU), harness side.

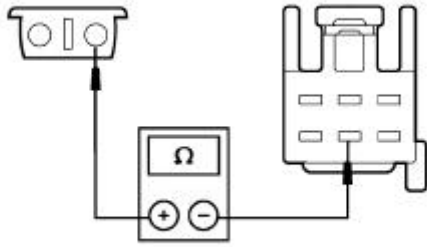
- Is the resistance less than 5 ohms?

→ **Yes**
GO to [K7](#).

→ **No**
REPAIR the circuit. TEST the system for normal operation. REACTIVATE the supplemental restraint system (SRS). PROVE OUT the supplemental restraint system (SRS). REFER to [Section 501-](#)

K7 CHECK CIRCUIT 33-AH39 (YE/BU) FOR AN OPEN

1



A0003124

1

Measure the resistance between driver seat lumbar control switch C361 pin 4, circuit 33-AH39 (YE/BU), harness side and driver seat lumbar motor C366, circuit 33-AH39 (YE/BU), harness side.

- Is the resistance less than 5 ohms?

→ **Yes**

INSTALL a new driver seat lumbar control switch. REFER to [Lumbar Control Switch](#). TEST the system for normal operation. REACTIVATE the supplemental restraint system (SRS). PROVE OUT the supplemental restraint system (SRS). REFER to [Section 501-20B](#).

→ **No**

REPAIR the circuit. TEST the system for normal operation. REACTIVATE the supplemental restraint system (SRS). PROVE OUT the supplemental restraint system (SRS). REFER to [Section 501-20B](#).

PINPOINT TEST L: THE POWER LUMBAR IS INOPERATIVE — PASSENGER

CONDITIONS	DETAILS/RESULTS/ACTIONS
L1 CHECK THE PASSENGER POWER SEAT OPERATION	
<p>⚠ WARNING: The restraint system diagnostic tool is for restraint system service only. Remove from vehicle prior to road use. Failure to remove could result in injury and possible violation of vehicle safety standards.</p> <p>NOTE: If a seat equipped with a seat mounted side air bag and/or a safety belt pretensioner (if equipped) system is being serviced, the air bag system must be deactivated. Refer to Supplemental Restraint System (SRS) Deactivation and Reactivation in the General Procedures portion of this section.</p> <p>NOTE: Restraint system diagnostic tools MUST be installed under the seats in the seat side air bag (if equipped) and safety belt pretensioner (if equipped) to floor connectors.</p> <p>NOTE: Diagnostics or repairs are not to be performed on a seat equipped with a seat side air bag with the seat in the vehicle. Prior to attempting to diagnose or repair a seat concern when equipped with a seat side air bag, the seat must be removed from the vehicle and the restraint system diagnostic tools must be installed in the seat side air bag electrical connectors. The</p>	

restraint system diagnostic tools must be removed prior to operating the vehicle over the road.

NOTE: After diagnosing or repairing a seat system, **the restraint system diagnostic tools must be removed before operating the vehicle over the road.**

NOTE: Diagnostics may be performed on seat systems other than the side air bag or the safety belt buckle pretensioner system (lumbar, climate controlled, heated, power seat track) with the seat installed in the vehicle as long as the restraint system diagnostic tools are installed under the seats in the side air bag and safety belt buckle pretensioner to floor connectors.

NOTE: The SRS must be fully operational and free of faults before releasing the vehicle to the customer.

1 Operate the passenger power seat.

● Does the power seat operate?

→ **Yes**
GO to [L2](#).

→ **No**
[Go To Pinpoint Test D](#).

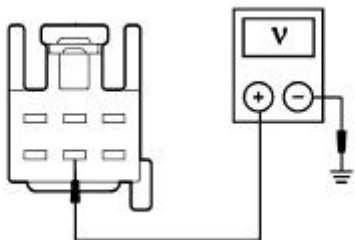
L2 CHECK CIRCUIT 30-AH46 (RD) FOR AN OPEN

1



Passenger Seat Lumbar Control Switch C331

2



A0003120

1 Deactivate the supplemental restraint system (SRS). Refer to [Section 501-20B](#).

2 Measure the voltage between the passenger seat lumbar control switch C331 pin 5, circuit 30-AH46 (RD), harness side and ground.

● Is the voltage greater than 10 volts?

→ **Yes**
GO to [L3](#).

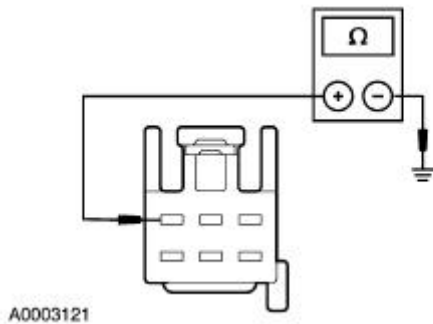
→ **No**
REPAIR the circuit. TEST the system for normal operation. REACTIVATE the supplemental restraint system (SRS). PROVE OUT the supplemental restraint system (SRS). REFER to [Section 501-20B](#).

L3 CHECK CIRCUIT 31-XL20 (BK) FOR AN OPEN

1



2



A0003121

2

Measure the resistance between passenger seat lumbar control switch C331 pin 3, circuit 31-AH46 (BK), harness side and ground.

- Is the resistance less than 5 ohms?

→ **Yes**
GO to [L4](#).

→ **No**
REPAIR the circuit. TEST the system for normal operation. REACTIVATE the supplemental restraint system (SRS). PROVE OUT the supplemental restraint system (SRS). REFER to [Section 501-20B](#).

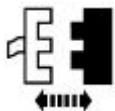
L4 CHECK THE PASSENGER SEAT LUMBAR MOTOR

1



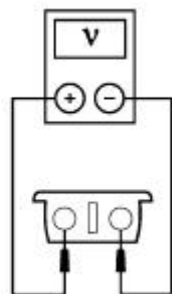
Passenger Seat Lumbar Control Switch C331

2



Passenger Seat Lumbar Motor C336

3



A0003122

3

Measure the voltage between passenger seat lumbar motor C336, circuit 32-AH23 (WH/BU), harness side and passenger seat lumbar motor C336, circuit 33-AH23 (YE/BU), harness side.

4

Operate the passenger seat lumbar control switch in both directions.

- Is the voltage greater than 10 volts?

→ **Yes**

INSTALL a new driver seat lumbar motor. REFER to [Motor—Front Seat Lumbar](#) . TEST the system for normal operation. REACTIVATE the supplemental restraint system (SRS). PROVE OUT the supplemental restraint system (SRS). REFER to [Section 501-20B](#) .

→ **No**

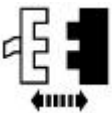
GO to [L5](#) .

L5 CHECK CIRCUIT 32-AH45 (WH/BU) AND 33-AH45 (YE/BU) FOR A SHORT TO GROUND

1

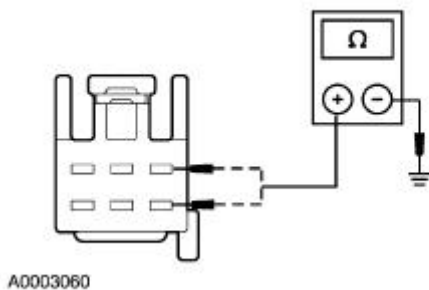


2



Passenger Seat Lumbar Control Switch C331

3



3

Measure the resistance between passenger seat lumbar control switch C331 pin 1, circuit 32-AH45 (WH/BU), harness side and ground; and between passenger seat lumbar control switch C331 pin 4, circuit 33-AH45 (YE/BU), harness side and ground.

- Are the resistances greater than 10,000 ohms?

→ **Yes**

GO to [L6](#) .

→ **No**

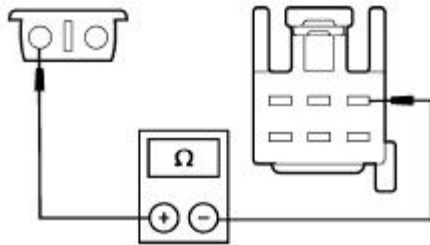
REPAIR the circuit. TEST the system for normal operation. REACTIVATE the supplemental restraint system (SRS). PROVE OUT the supplemental restraint system (SRS). REFER to [Section 501-20B](#) .

L6 CHECK CIRCUIT 32-AH45 (WH/BU) FOR AN OPEN

1

1

Measure the resistance between passenger seat lumbar control switch



A0003123

C331 pin 1, circuit 32-AH45 (WH/BU), harness side and passenger seat lumbar motor C336, circuit 32-AH45 (WH/BU), harness side.

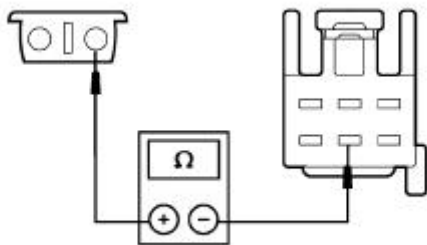
- Is the resistance less than 5 ohms?

→ **Yes**
GO to [L7](#).

→ **No**
REPAIR the circuit. TEST the system for normal operation. REACTIVATE the supplemental restraint system (SRS). PROVE OUT the supplemental restraint system (SRS). REFER to [Section 501-20B](#).

L7 CHECK CIRCUIT 33-AH45 (YE/BU) FOR AN OPEN

1



A0003124

1



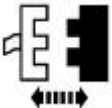

Measure the resistance between passenger seat lumbar control switch C331 pin 4, circuit 33-AH45 (YE/BU), harness side and passenger seat lumbar motor C336, circuit 33-AH23 (YE/BU), harness side.

- Is the resistance less than 5 ohms?

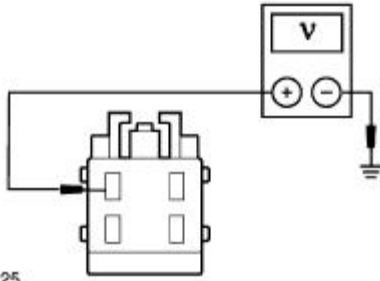
→ **Yes**
INSTALL a new passenger seat lumbar control switch. REFER to [Lumbar Control Switch](#). TEST the system for normal operation. REACTIVATE the supplemental restraint system (SRS). PROVE OUT the supplemental restraint system (SRS). REFER to [Section 501-20B](#).

→ **No**
REPAIR the circuit. TEST the system for normal operation. REACTIVATE the supplemental restraint system (SRS). PROVE OUT the supplemental restraint system (SRS). REFER to [Section 501-](#)

PINPOINT TEST M: DTC B1676 BATTERY PACK VOLTAGE OUT OF RANGE

CONDITIONS	DETAILS/RESULTS/ACTIONS
M1 CHECK FOR VOLTAGE AT THE DSM	
<p> WARNING: The restraint system diagnostic tool is for restraint system service only. Remove from vehicle prior to road use. Failure to remove could result in injury and possible violation of vehicle safety standards.</p> <p>NOTE: If a seat equipped with a seat mounted side air bag and/or a safety belt pretensioner (if equipped) system is being serviced, the air bag system must be deactivated. Refer to Supplemental Restraint System (SRS) Deactivation and Reactivation in the General Procedures portion of this section.</p> <p>NOTE: Restraint system diagnostic tools MUST be installed under the seats in the seat side air bag (if equipped) and safety belt pretensioner (if equipped) to floor connectors.</p> <p>NOTE: Diagnostics or repairs are not to be performed on a seat equipped with a seat side air bag with the seat in the vehicle. Prior to attempting to diagnose or repair a seat concern when equipped with a seat side air bag, the seat must be removed from the vehicle and the restraint system diagnostic tools must be installed in the seat side air bag electrical connectors. The restraint system diagnostic tools must be removed prior to operating the vehicle over the road.</p> <p>NOTE: After diagnosing or repairing a seat system, the restraint system diagnostic tools must be removed before operating the vehicle over the road.</p> <p>NOTE: Diagnostics may be performed on seat systems other than the side air bag or the safety belt buckle pretensioner system (lumbar, climate controlled, heated, power seat track) with the seat installed in the vehicle as long as the restraint system diagnostic tools are installed under the seats in the side air bag and safety belt buckle pretensioner to floor connectors.</p> <p>NOTE: The SRS must be fully operational and free of faults before releasing the vehicle to the customer.</p>	
<p>1 </p> <p>3  DSM C341b</p> <p>4 </p> <p>5</p>	<p>2 Deactivate the supplemental restraint system (SRS). Refer to Section 501-20B.</p> <p>5 Measure the voltage between DSM C341b pin 4, circuit 30-AH80 (RD), harness side and ground.</p>

A0003125



- Is the voltage between 11.5 and 16 volts?

→ **Yes**

CLEAR the DTC. REPEAT the DSM self-test. If DTC B1676 is retrieved, INSTALL a new DSM. REFER to [Section 419-10](#). REACTIVATE the supplemental restraint system (SRS). PROVE OUT the supplemental restraint system (SRS). REFER to [Section 501-20B](#).



→ **No**

REFER to [Section 414-00](#) for battery and charging system repair.

PINPOINT TEST N: THE POWER SEAT DOES NOT MOVE HORIZONTALLY/VERTICALLY — DRIVER

CONDITIONS	DETAILS/RESULTS/ACTIONS
N1 CHECK HORIZONTAL DIRECTION MOTOR FOR CORRECT OPERATION	
<p>⚠ WARNING: The restraint system diagnostic tool is for restraint system service only. Remove from vehicle prior to road use. Failure to remove could result in injury and possible violation of vehicle safety standards.</p> <p>NOTE: If a seat equipped with a seat mounted side air bag and/or a safety belt pretensioner (if equipped) system is being serviced, the air bag system must be deactivated. Refer to Supplemental Restraint System (SRS) Deactivation and Reactivation in the General Procedures portion of this section.</p> <p>NOTE: Restraint system diagnostic tools MUST be installed under the seats in the seat side air bag (if equipped) and safety belt pretensioner (if equipped) to floor connectors.</p> <p>NOTE: Diagnostics or repairs are not to be performed on a seat equipped with a seat side air bag with the seat in the vehicle. Prior to attempting to diagnose or repair a seat concern when equipped with a seat side air bag, the seat must be removed from the vehicle and the restraint system diagnostic tools must be installed in the seat side air bag electrical connectors. The restraint system diagnostic tools must be removed prior to operating the vehicle over the road.</p> <p>NOTE: After diagnosing or repairing a seat system, the restraint system diagnostic tools must be removed before operating the vehicle over the road.</p> <p>NOTE: Diagnostics may be performed on seat systems other than the side air bag or the safety belt buckle pretensioner system (lumbar, climate controlled, heated, power seat track) with the seat installed in the vehicle as long as the restraint system diagnostic tools are installed under the seats in the side air bag and safety belt buckle pretensioner to floor connectors.</p>	

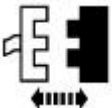
NOTE: The SRS must be fully operational and free of faults before releasing the vehicle to the customer.

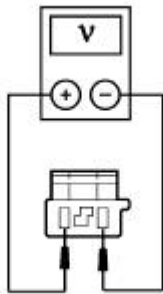
<p>1</p>  <p>3</p> 	<p>2</p> <p>Deactivate the supplemental restraint system (SRS). Refer to Section 501-20B.</p> <p>4</p> <p>Operate the driver power seat forward and rearward.</p> <ul style="list-style-type: none">● Will the seat move horizontally? <p>→ Yes GO to N2.</p> <p>→ No GO to N3.</p>
---	--

N2 CHECK BACKREST MOTOR FOR CORRECT OPERATION

	<p>1</p> <p>Operate the driver power seat backrest up and down.</p> <ul style="list-style-type: none">● Will the seat backrest move up and down? <p>→ Yes GO to N6.</p> <p>→ No GO to N13.</p>
--	---

N3 CHECK THE VOLTAGE TO THE DRIVER SEAT FORWARD/REVERSE MOTOR

<p>1</p>  <p>Driver Seat Forward/Reverse Motor C362</p> <p>2</p>	<p>2</p> <p>Measure the voltage between driver seat forward/reverse motor C362 pin 1, circuit 32-AH37 (YE/GN), harness side and C362 pin 2, circuit 33-AH37 (WH/GN), harness side, while pushing the driver seat regulator control switch forward and rearward.</p>
---	---



A0003068

- Is the voltage greater than 10 volts when the switch is pushed forward, greater than -10 volts when the switch is pushed rearward, and 0 volts when the switch is in a rest position?

→ **Yes**
 INSTALL a new driver seat forward/reverse motor. REFER to [Seat Track](#). TEST the system for normal operation. REACTIVATE the supplemental restraint system (SRS). PROVE OUT the supplemental restraint system (SRS). REFER to [Section 501-20B](#).

→ **No**
 GO to [N4](#).

N4 CHECK CIRCUIT 32-AH37 (WH/GN) FOR AN OPEN AND SHORT TO GROUND

1

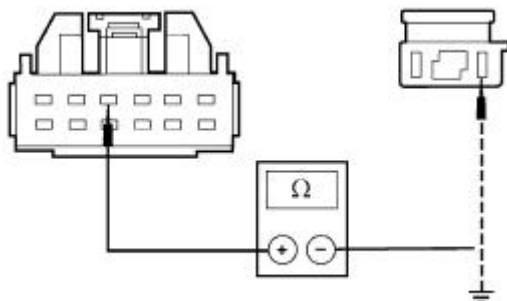


2



Driver Seat Forward/Reverse Motor C362

3



A0005668

3 Measure the resistance between driver seat regulator control switch C360 pin 3, circuit 32-AH37 (WH/GN), harness side and driver seat forward/reverse motor C362 pin 2, circuit 32-AH37 (WH/GN), harness side; and between driver seat regulator control switch C360 pin 3, circuit 32-AH37 (WH/GN), harness side and ground.

- Is the resistance less than 5 ohms between the driver seat

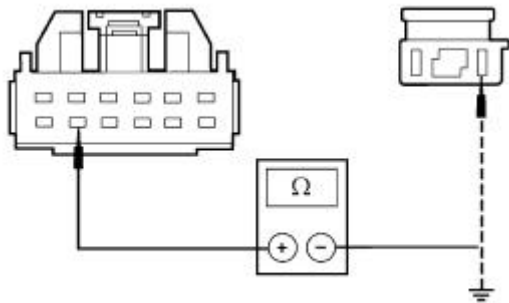
forward/reverse motor and the driver seat regulator control switch, and greater than 10,000 ohms between the driver seat regulator control switch and ground?

→ **Yes**
GO to [N5](#).

→ **No**
REPAIR the circuit. TEST the system for normal operation. REACTIVATE the supplemental restraint system (SRS). PROVE OUT the supplemental restraint system (SRS). REFER to [Section 501-20B](#).

N5 CHECK CIRCUIT 33-AH37 (YE/GN) FOR AN OPEN AND SHORT TO GROUND

1



1

Measure the resistance between driver seat regulator control switch C360 pin 11, circuit 33-AH37 (YE/GN), harness side and driver seat forward/reverse motor C362 pin 2, circuit 33-AH37 (YE/GN), harness side; and between driver seat regulator control switch C360 pin 11, circuit 33-AH37 (YE/GN), harness side and ground.

● **Is the resistance less than 5 ohms between the driver seat forward/reverse motor and the driver seat regulator control switch, and greater than 10,000 ohms between the driver seat regulator control switch and ground?**

→ **Yes**
INSTALL a new driver seat regulator control switch. REFER to [Seat Control Switch](#). TEST the system for normal operation. REACTIVATE the supplemental restraint system (SRS). PROVE OUT the supplemental restraint system (SRS). REFER to [Section 501-20B](#).

→ **No**
REPAIR the circuit. TEST the system for normal operation. REACTIVATE the supplemental restraint system (SRS). PROVE OUT the supplemental restraint system (SRS). REFER to [Section 501-20B](#).

N6 DETERMINE SEAT TILTING FAILURE

1 Determine seat tilting failure.

- **Can the seat be tilted forward or backward?**

→ **Yes**

If only forward tilting operates, GO to [N7](#).

If only rear tilting operates, GO to [N10](#).

→ **No**

INSTALL a new driver seat regulator control switch. REFER to [Seat Control Switch](#). TEST the system for normal operation. REACTIVATE the supplemental restraint system (SRS). PROVE OUT the supplemental restraint system (SRS). REFER to [Section 501-20B](#).

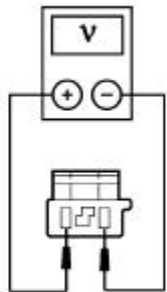
N7 CHECK THE VOLTAGE TO THE DRIVER SEAT REAR HEIGHT MOTOR

1



Driver Seat Rear Height Motor C382

2



A0003068

2

Measure the voltage between driver seat rear height motor C382 pin 1, circuit 32-AH41 (WH/VT), harness side and C382 pin 2, circuit 33-AH41 (WH/VT), harness side, while depressing the rear tilt switch up and down.

- **Is the voltage greater than +10 volts when the rear tilt switch is pressed down, greater than -10 volts when the rear tilt switch is pressed up and 0 volts when the switch is in the rest position?**

→ **Yes**

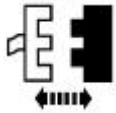
INSTALL a new the driver seat rear height motor. REFER to [Seat Track](#). TEST the system for normal operation. REACTIVATE the supplemental restraint system (SRS). PROVE OUT the supplemental restraint system (SRS). REFER to [Section 501-20B](#).

→ **No**

GO to [N8](#).

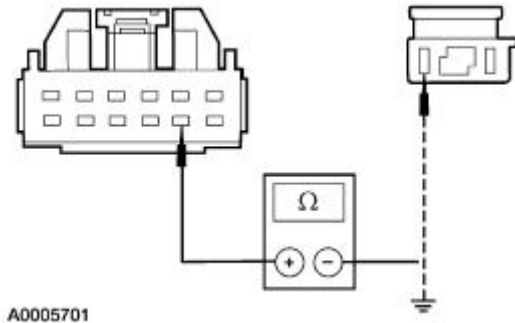
N8 CHECK CIRCUIT 32-AH41 (WH/VT) FOR OPEN AND SHORT TO GROUND

1



Driver Seat Regulator Control Switch C360

2



2

Measure the resistance between driver seat regulator control switch C360 pin 8, circuit 32-AH41 (WH/VT), harness side and driver seat rear height motor C382 pin 1, circuit 32-AH41 (WH/VT), harness side; and between driver seat regulator control switch C360 pin 8, circuit 32-AH41 (WH/VT), and ground.

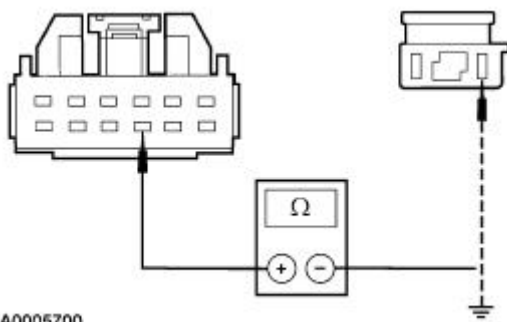
- Is the resistance less than 5 ohms between the driver seat rear height motor and the driver seat regulator control switch, and greater than 10,000 ohms between the driver seat regulator control switch and ground?

→ **Yes**
GO to [N9](#).

→ **No**
REPAIR the circuit. TEST the system for normal operation. REACTIVATE the supplemental restraint system (SRS). PROVE OUT the supplemental restraint system (SRS). REFER to [Section 501-20B](#).

N9 CHECK CIRCUIT 33-AH41 (WH/VT) FOR OPEN AND SHORT TO GROUND

1



1

Measure the resistance between driver seat regulator control switch C360 pin 9, circuit 33-AH41 (WH/VT), harness side and driver seat rear height motor C382 pin 2, circuit 33-AH41 (WH/VT), harness side; and between driver seat regulator control switch C360 pin 9, circuit 33-AH41 (WH/VT), harness side and ground.

- Is the resistance less than 5 ohms between the driver seat rear height motor and the driver seat regulator control switch, and greater than 10,000 ohms between the driver seat regulator control switch and

ground?

→ **Yes**

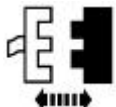
INSTALL a new driver seat regulator control switch. REFER to [Seat Control Switch](#). TEST the system for normal operation. REACTIVATE the supplemental restraint system (SRS). PROVE OUT the supplemental restraint system (SRS). REFER to [Section 501-20B](#).

→ **No**

REPAIR the circuit. TEST the system for normal operation. REACTIVATE the supplemental restraint system (SRS). PROVE OUT the supplemental restraint system (SRS). REFER to [Section 501-20B](#).

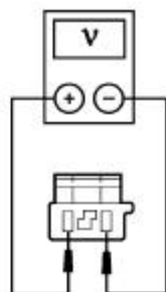
N10 CHECK THE VOLTAGE TO DRIVER SEAT FRONT HEIGHT MOTOR

1



Driver Seat Front Height Motor C363

2



A0003068

2

Measure the voltage between driver seat front height motor C363 pin 1, circuit 33-AH38 (YE/BK), harness side and C363 pin 2, circuit 32-AH38 (WH/BK), while pushing the rear tilting switch up and down.

- **Is the voltage greater than +10 volts when the front tilt switch is pressed down, greater than -10 volts when the front tilt switch is pressed up and 0 volts when the switch is in the rest position?**

→ **Yes**

INSTALL a new driver seat front height motor. REFER to [Seat Track](#). TEST the system for normal operation. REACTIVATE the supplemental restraint system (SRS). PROVE OUT the supplemental restraint system (SRS). REFER to [Section 501-20B](#).

→ **No**

GO to [N11](#).

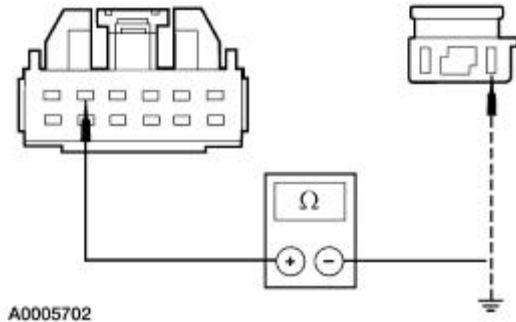
N11 CHECK CIRCUIT 32-AH38 (WH/BK) FOR OPEN AND SHORT TO GROUND

1



Driver Seat Regulator Control Switch C360

2



2

Measure the resistance between driver seat regulator control switch C360 pin 5, circuit 32-AH38 (WH/BK), harness side and driver seat front height motor C363 pin 2, circuit 32-AH38 (WH/BK), harness side; and between driver seat regulator control switch C360 pin 5, circuit 32-AH38 (WH/BK), harness side and ground.

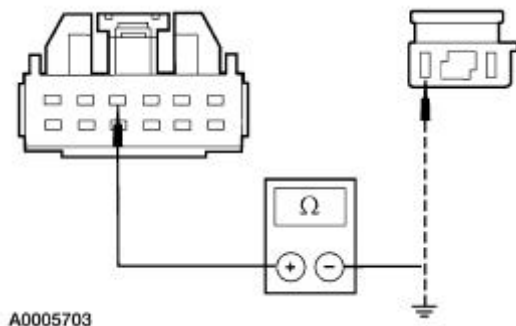
- Is the resistance less than 5 ohms between the driver seat front height motor and the driver seat regulator control switch, and greater than 10,000 ohms between the driver seat regulator control switch and ground?

→ **Yes**
GO to [N12](#).

→ **No**
REPAIR the circuit. TEST the system for normal operation. REACTIVATE the supplemental restraint system (SRS). REFER to [Section 501-20B](#). PROVE OUT the supplemental restraint system (SRS).

N12 CHECK CIRCUIT 33-AH38 (YE/BK) FOR OPEN

1



1

Measure the resistance between driver seat regulator control switch C360 pin 4, circuit 33-AH38 (YE/BK) harness side, and driver seat front height motor C363 pin 1, circuit 33-AH38 (YE/BK), harness side; and between driver seat regulator control switch C360 pin 4, circuit 33-AH38 (YE/BK), harness side and ground.

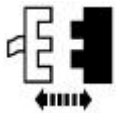
- Is the resistance less than 5 ohms between the driver seat front height motor and the driver seat regulator control switch, and greater than 10,000 ohms between the driver seat regulator control switch and ground?

→ **Yes**
INSTALL a new driver seat regulator control switch. REFER to [Seat Control Switch](#). TEST the system for normal operation. REACTIVATE the supplemental restraint system (SRS). PROVE OUT the supplemental restraint system (SRS). REFER to [Section 501-20B](#).

→ **No**
REPAIR the circuit. TEST the system for normal operation. REACTIVATE the supplemental restraint system (SRS). PROVE OUT the supplemental restraint system (SRS). REFER to [Section 501-20B](#).

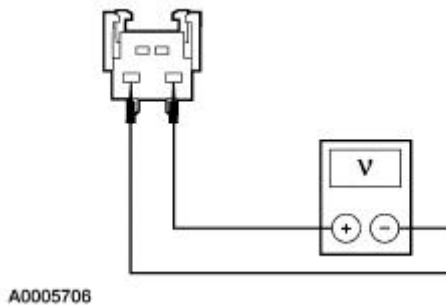
N13 CHECK THE VOLTAGE TO DRIVER SEAT BACKREST MOTOR

1



Driver Seat Backrest Motor C368

2



2 Measure the voltage between driver seat backrest motor C368 pin 1, circuit 32-AH36 (WH/RD), harness side and C363 pin 2, circuit 33-AH36 (YE/RD), while pushing the backrest switch forward and rearward.

- Is the voltage greater than 10 volts when the switch is pushed forward, greater than -10 volts when the switch is pushed rearward, and 0 volts when the switch is in a rest position?

→ **Yes**
INSTALL a new driver seat backrest motor. REFER to [Front Seat Backrest](#). TEST the system for normal operation. REACTIVATE the supplemental restraint system (SRS). PROVE OUT the supplemental restraint system (SRS). REFER to [Section 501-20B](#).

→ **No**
GO to [N14](#).

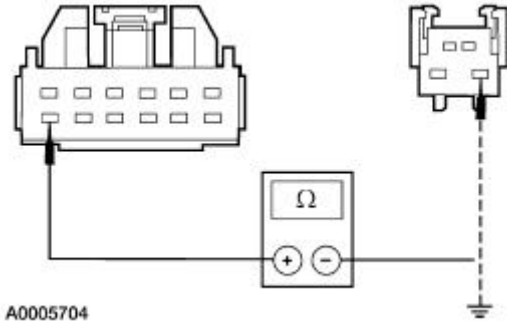
N14 CHECK CIRCUIT 32-AH36 (WH/RD) FOR OPEN AND SHORT TO GROUND

1



Driver Seat Regulator Control Switch C360

2



A0005704

2

Measure the resistance between driver seat regulator control switch C360 pin 12, circuit 32-AH36 (WH/RD), harness side and driver seat backrest motor C368 pin 1, circuit 32-AH36 (WH/RD), harness side; and between driver seat regulator control switch C360 pin 12, circuit 32-AH36 (WH/RD), harness side and ground.

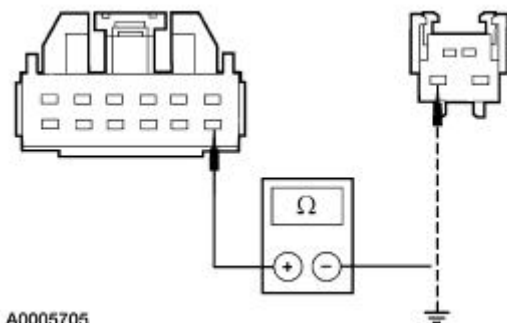
- **Is the resistance less than 5 ohms between the driver seat backrest motor and the driver seat regulator control switch, and greater than 10,000 ohms between the driver seat regulator control switch and ground?**

→ **Yes**
GO to [N15](#).

→ **No**
REPAIR the circuit. TEST the system for normal operation. REACTIVATE the supplemental restraint system (SRS). PROVE OUT the supplemental restraint system (SRS). REFER to [Section 501-20B](#).

N15 CHECK CIRCUIT 33-AH36 (YE/RD) FOR OPEN

1



A0005705

1

Measure the resistance between driver seat regulator control switch C360 pin 7, circuit 33-AH36 (YE/RD) harness side, and driver seat backrest motor C368 pin 2, circuit 33-AH36 (YE/RD), harness side; and between driver seat regulator control switch C360 pin 7, circuit 33-AH36 (YE/RD), harness side and ground.

- **Is the resistance less than 5 ohms between the driver seat backrest motor and the driver seat regulator control switch, and greater than 10,000 ohms between the seat regulator control switch and ground?**

→ **Yes**


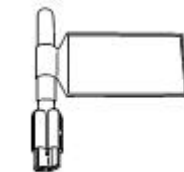
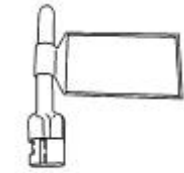
INSTALL a new driver seat regulator control switch. REFER to [Seat Control Switch](#). TEST the system for normal operation. REACTIVATE the supplemental restraint system (SRS). PROVE OUT the supplemental restraint system (SRS). REFER to [Section 501-20B](#).

→ **No**


REPAIR the circuit. TEST the system for normal operation. REACTIVATE the supplemental restraint system (SRS). PROVE OUT the supplemental restraint system (SRS). REFER to [Section 501-20B](#).


Supplemental Restraint System (SRS) Deactivation and Reactivation

Special Tool(s)


 ST2502-A	Diagnostic Tool, Restraint System (1 Req'd) 418-F395
 ST2506-A	Diagnostic Tool, Restraint System (3 Req'd) 418-F088 (105-R0012)
 ST2507-A	Diagnostic Tool, Restraint System (2 Req'd) 418-133 (40-009)

Deactivation


 **WARNING:** Always wear safety glasses when repairing an air bag supplemental restraint system (SRS) vehicle and when handling an air bag module. This will reduce the risk of injury in the event of an accidental deployment.

 **WARNING:** Carry a live air bag module with the air bag and trim cover pointed away from your body. This will reduce the risk of injury in the event of an accidental deployment.

 **WARNING:** Do not set a live air bag module down with the trim cover face down. This will reduce the risk of injury in the event of an accidental deployment.

 **WARNING:** After deployment, the air bag surface can contain deposits of sodium hydroxide, a product of the gas generant combustion that is irritating to the skin. Wash your hands with soap and water afterwards.

 **WARNING:** Never probe the connectors on the air bag module. Doing so can result in air bag deployment, which can result in personal injury.

 **WARNING:** The safety belt buckle pretensioner and safety belt retractor pretensioner are pyrotechnic devices. Never probe a pretensioner electrical connector. Doing so could result in pretensioner or air bag deployment and could result in personal injury.



WARNING: Vehicle sensor orientation is critical for proper system operation. If a vehicle equipped with an air bag supplemental restraint system (SRS) is involved in a collision, inspect the sensor mounting bracket and wiring pigtail for deformation. Replace and properly position the sensor or any other damaged supplemental restraint system (SRS) components whether or not the air bag is deployed.



WARNING: The restraint system diagnostic tool is for restraint system service only. Remove from vehicle prior to road use. Failure to remove could result in injury and possible violation of vehicle safety standards.

NOTE: If a seat equipped with a seat mounted side air bag and/or a safety belt pretensioner (if equipped) system is being serviced, **the air bag system must be deactivated.**

NOTE: Restraint system diagnostic tools **MUST** be installed under the seats in the seat side air bag (if equipped) and safety belt pretensioner (if equipped) to floor connectors.

NOTE: Diagnostics or repairs are not to be performed on a seat equipped with a seat side air bag with the seat in the vehicle. Prior to attempting to diagnose or repair a seat concern when equipped with a seat side air bag, the seat must be removed from the vehicle and the restraint system diagnostic tools must be installed in the seat side air bag electrical connectors. **The restraint system diagnostic tools must be removed prior to operating the vehicle over the road.**

NOTE: After diagnosing or repairing an SRS, **the restraint system diagnostic tools must be removed before operating the vehicle over the road.**

NOTE: After diagnosing or repairing a seat system, **the restraint system diagnostic tools must be removed before operating the vehicle over the road.**

NOTE: The SRS must be fully operational and free of faults before releasing the vehicle to the customer.



- WARNING:** To avoid accidental deployment and possible personal injury, the backup power supply must be depleted before repairing or replacing any front or side air bag supplemental restraint system (SRS) components and before servicing, replacing, adjusting or striking components near the front or side air bag sensors, such as doors, instrument panel, console, door latches, strikers, seats and hood latches.

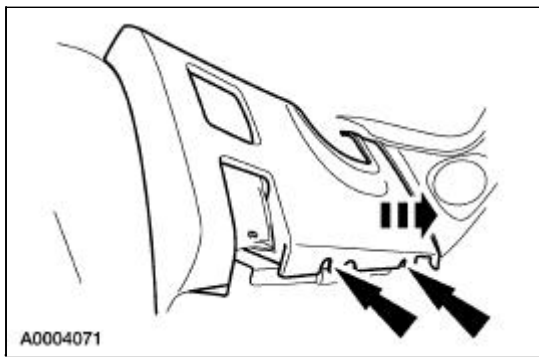
Please refer to the appropriate vehicle workshop manual to determine location of the front air bag sensors.

The side air bag sensors are located at or near the base of the B-pillar.

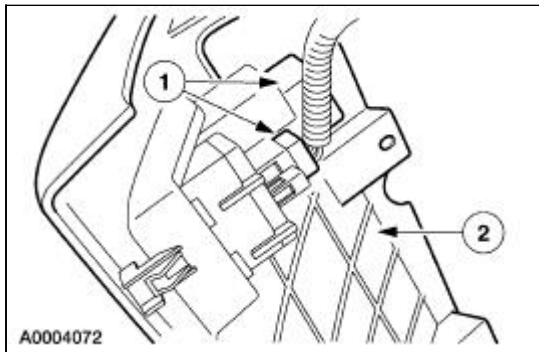
To deplete the backup power supply energy, Disconnect the battery ground cable and wait at least one minute to allow for the depletion of the restraint system backup power supply. Be sure to disconnect auxiliary batteries and power supplies (if equipped).

Disconnect the battery ground cable and wait at least one minute to allow for the depletion of the restraint system backup power supply. For additional information, refer to [Section 414-01](#).

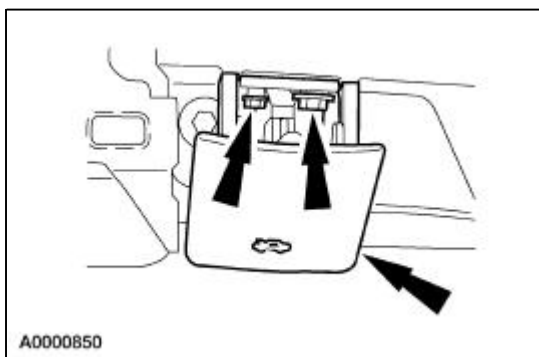
- Remove the two screws and pull out on the lower steering column opening finish panel enough to access the electrical connectors.



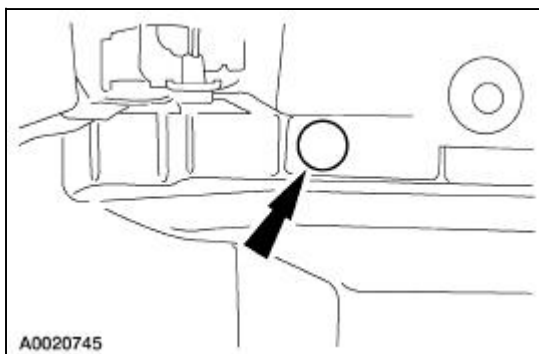
3. Remove the lower steering column opening finish panel.
 1. Disconnect the electrical connectors.
 2. Remove the lower steering column opening finish panel.



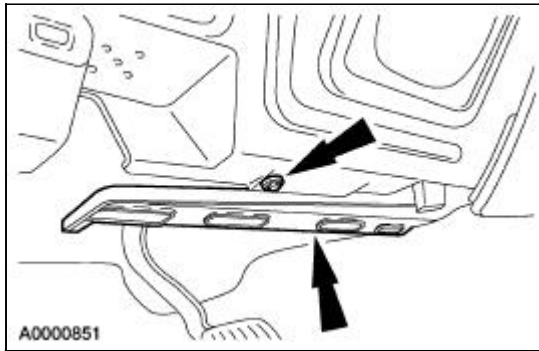
4. Remove the screws. Separate the hood latch release cable and handle assembly from the steering column opening reinforcement.



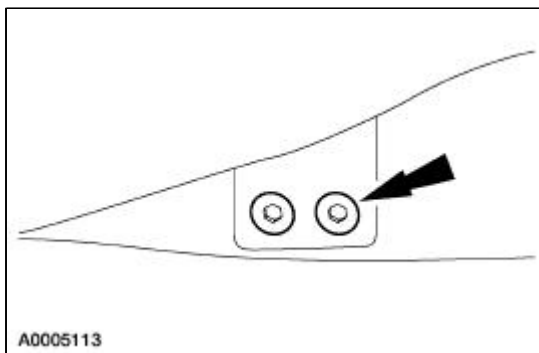
5. Remove the two pin-type retainers and the RH instrument panel insulator.
 - Disconnect the courtesy lamp.



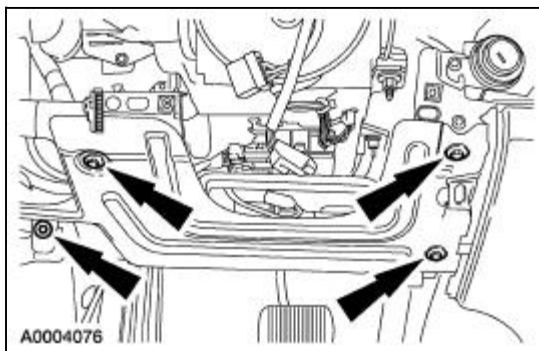
6. Remove the screw and the heater duct.



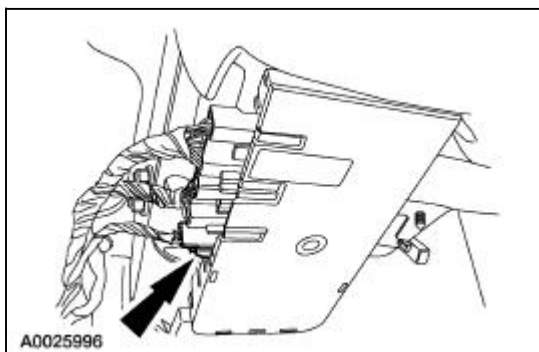
7. Loosen the two driver-side instrument panel tunnel brace bolts.
 - Position the carpet aside to gain access to the bolts.



8. Remove the screws and the steering column opening reinforcement.

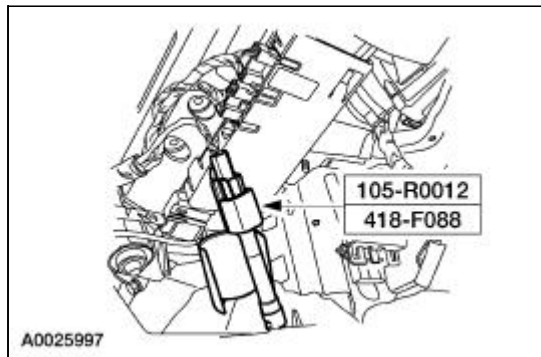


9. Disconnect the clockspring electrical connector at the base of the steering column.

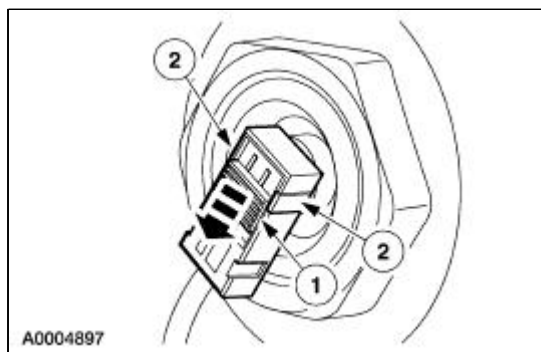


10. Attach the restraint system diagnostic tool to the vehicle harness side of the clockspring

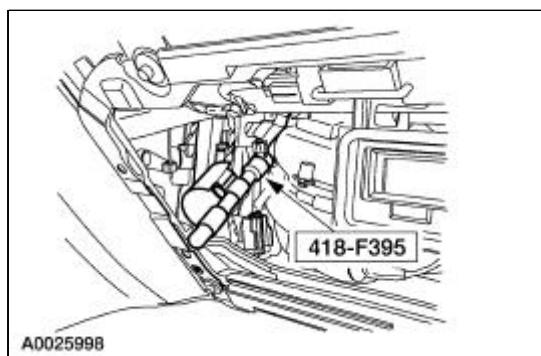
electrical connector.




11. Remove the glove compartment. For additional information, refer to [Section 501-12](#).
12. Disconnect the passenger air bag module electrical connector.
 1. Reaching into the glove box opening toward the center of the instrument panel, under the cross-car beam, slide and disengage the passenger air bag module electrical connector locking clip.
 2. Push in on the two release tabs and disconnect the passenger air bag module electrical connector.



13. Attach the restraint system diagnostic tool to the vehicle harness side of the passenger air bag electrical connector.



14. Connect the battery ground cable. For additional information, refer to [Section 414-01](#).
15. Move and tilt the front seats to their highest and most forward position.
16.  **WARNING:** To avoid accidental deployment and possible personal injury, the backup power supply must be depleted before repairing or replacing any front or side air bag supplemental restraint system (SRS) components and before servicing, replacing, adjusting or striking components near the front or side air bag sensors, such as doors,

instrument panel, console, door latches, strikers, seats and hood latches.

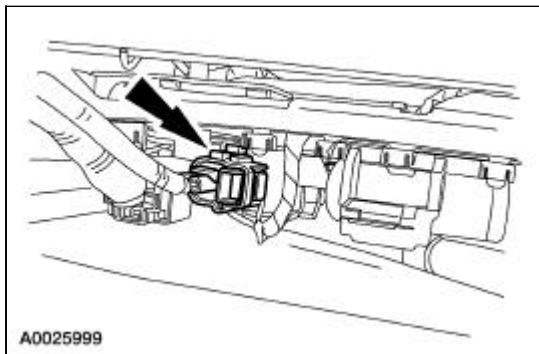
Please refer to the appropriate vehicle workshop manual to determine location of the front air bag sensors.

The side air bag sensors are located at or near the base of the B-pillar.

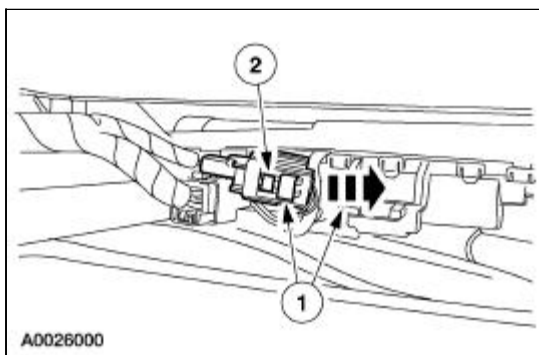
To deplete the backup power supply energy, Disconnect the battery ground cable and wait at least one minute to allow for the depletion of the restraint system backup power supply. Be sure to disconnect auxiliary batteries and power supplies (if equipped).

Disconnect the battery ground cable and wait at least one minute to allow for the depletion of the restraint system backup power supply. For additional information, refer to [Section 414-01](#).

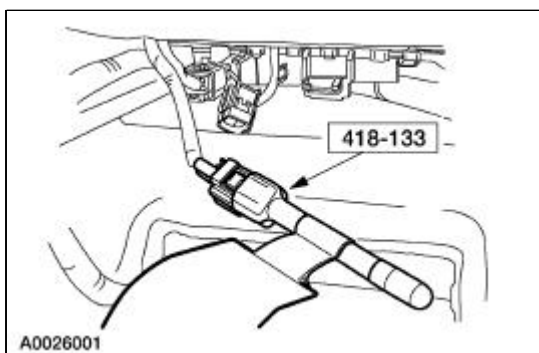
17. From under the passenger seat, release the tab on the connector bracket and remove the passenger seat side air bag electrical connector.



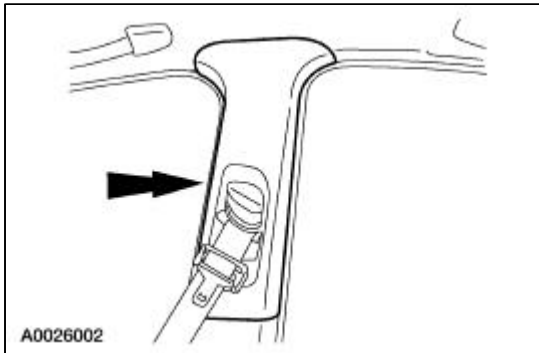
18. Disconnect the passenger seat side air bag electrical connector.
 1. Slide and disengage the passenger seat side air bag electrical connector locking clip.
 2. Push in to release the tab and disconnect the passenger seat side air bag electrical connector.



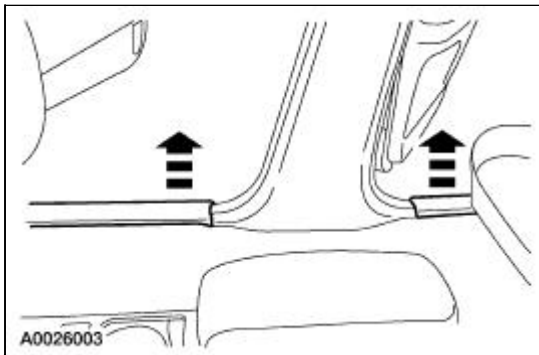
19. Attach the restraint system diagnostic tool to the passenger seat side air bag floor electrical connector.



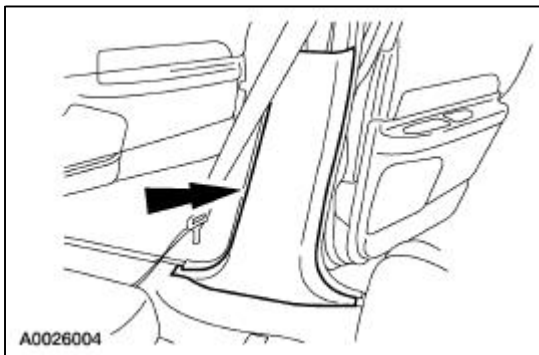
20. Remove the passenger side B-pillar weatherstripping.
21. Position the safety belt D-ring to its highest point.
22. Remove the passenger side B-pillar upper trim panel.



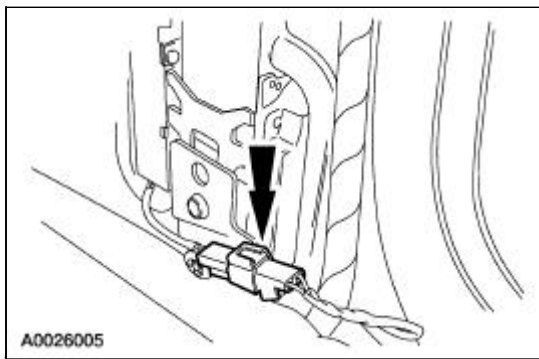
23. Remove the passenger side front and rear door scuff plates.



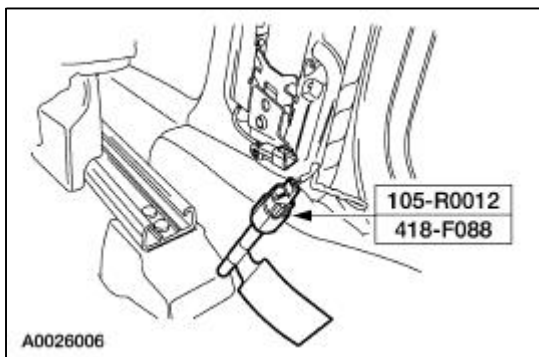
24. Remove the passenger side B-pillar lower trim panel.



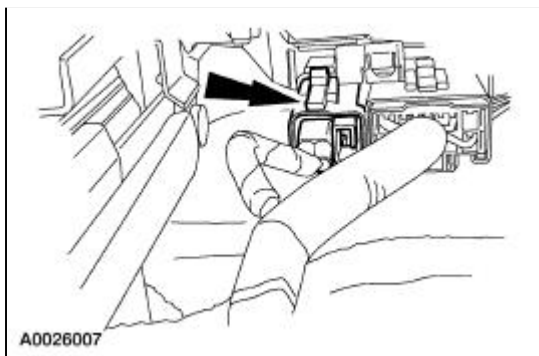
25. Disconnect the passenger side safety belt retractor pretensioner floor electrical connector.



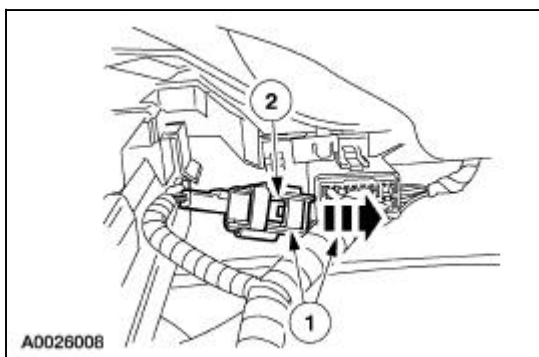
26. Attach the restraint system diagnostic tool to the passenger side safety belt retractor pretensioner floor electrical connector.



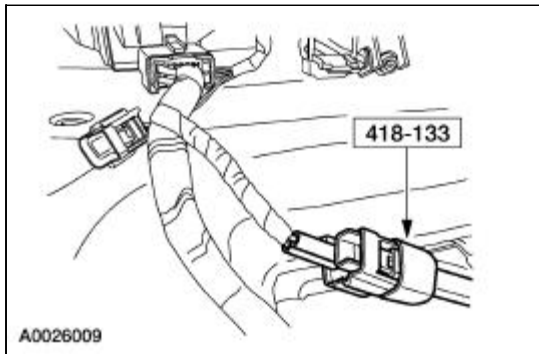
27. From under the driver seat, release the tab on the connector bracket and remove the driver seat side air bag electrical connector.



28. Disconnect the driver seat side air bag electrical connector.
1. Slide and disengage the driver seat side air bag electrical connector locking clip.
 2. Push down to release the tab and disconnect the driver seat side air bag electrical connector.



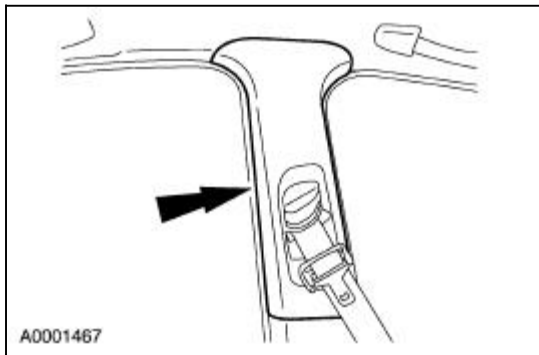
29. Attach the restraint system diagnostic tool to the driver seat side air bag floor electrical connector.



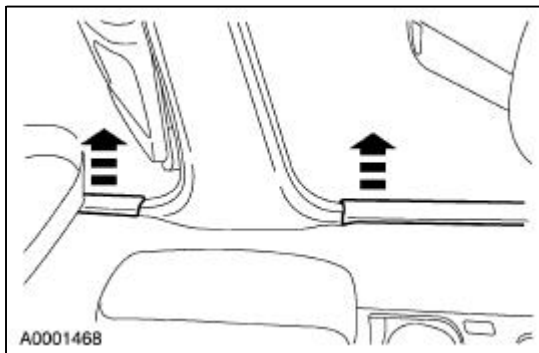
30. Remove the driver side B-pillar weatherstripping.

31. Position the safety belt D-ring to its highest point.

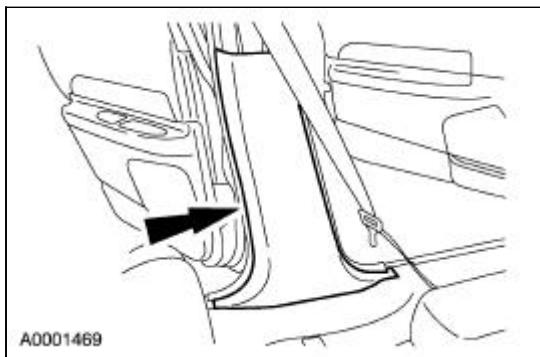
32. Remove the driver side B-pillar upper trim panel.



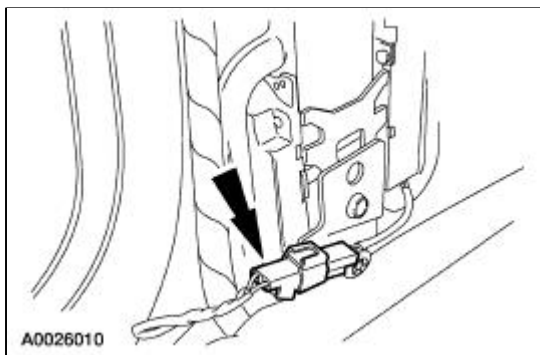
33. Remove the driver side front and rear door scuff plates.



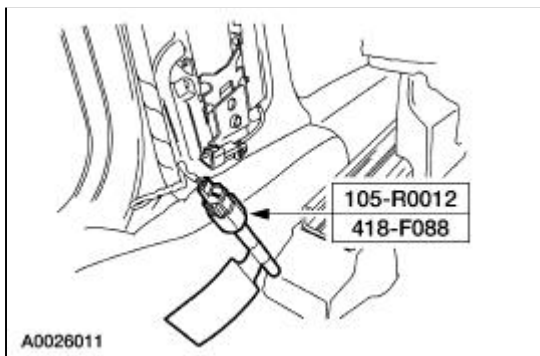
34. Remove the driver side B-pillar lower trim panel.



35. Disconnect the driver side safety belt retractor pretensioner electrical connector.



36. Attach the restraint system diagnostic tool to the driver side safety belt retractor pretensioner floor electrical connector.

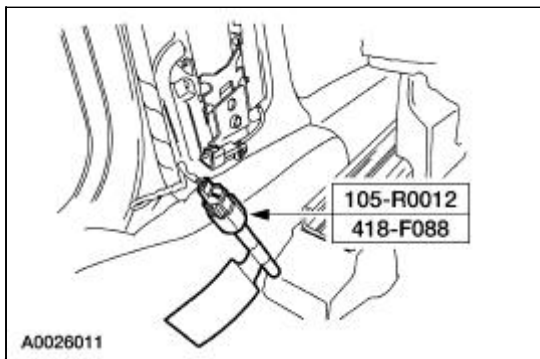


37. Connect the battery ground cable. For additional information, refer to [Section 414-01](#).
38. With the restraint system diagnostic tools installed at all deployable devices, prove out the supplemental restraint system (SRS). For additional information, refer to [Section 501-20B](#).
39. Disconnect the battery ground cable and wait at least one minute to allow for the depletion of the restraint system backup power supply. For additional information, refer to [Section 414-01](#).

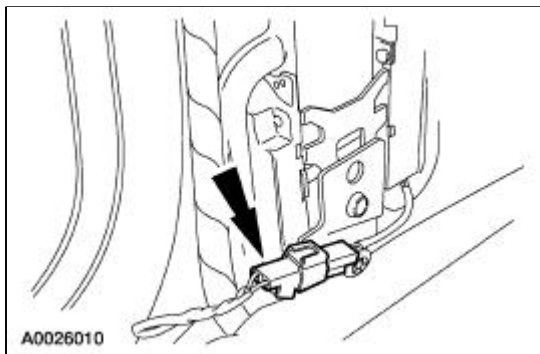
Reactivation

⚠️ WARNING: To reduce the risk of serious personal injury, read and follow all warnings and notes at the beginning of the deactivation procedure.

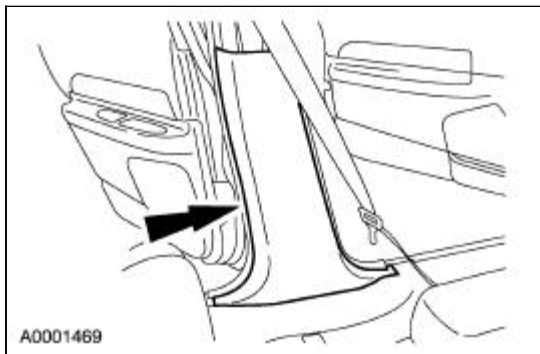
1. Remove the restraint system diagnostic tool from the driver side safety belt retractor pretensioner floor electrical connector.



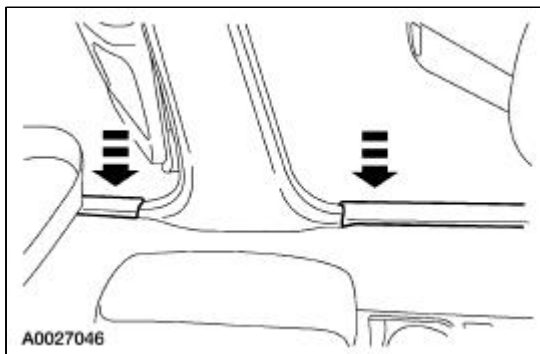
2. Connect the driver side safety belt retractor pretensioner electrical connector.



3. Install the driver side B-pillar lower trim panel.

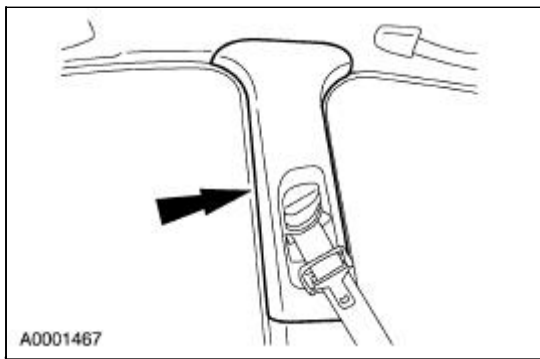


4. Install the driver side front and rear door scuff plates.

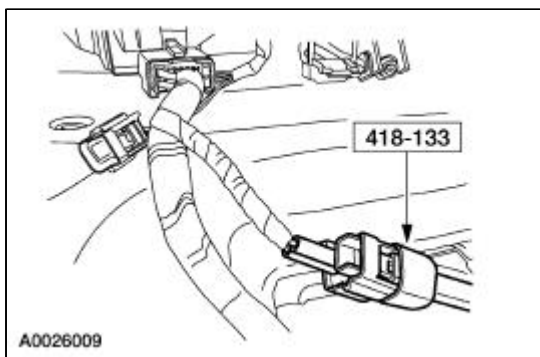


5. **NOTE:** Position the safety belt D-ring to its highest point.

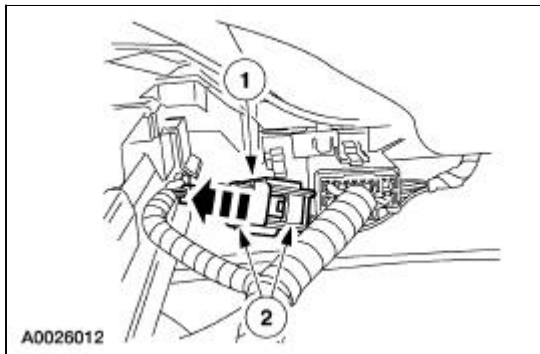
Install the driver side B-pillar upper trim panel.



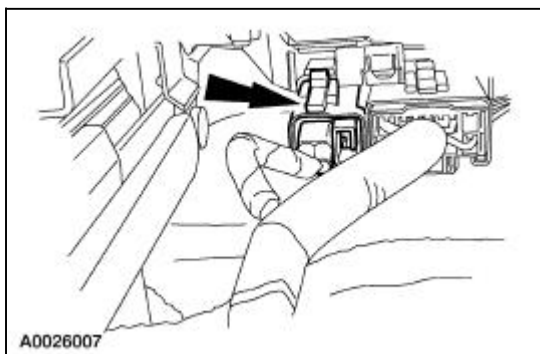
6. Install the driver side B-pillar weatherstripping.
7. Remove the restraint system diagnostic tool from the driver seat side air bag floor electrical connector.



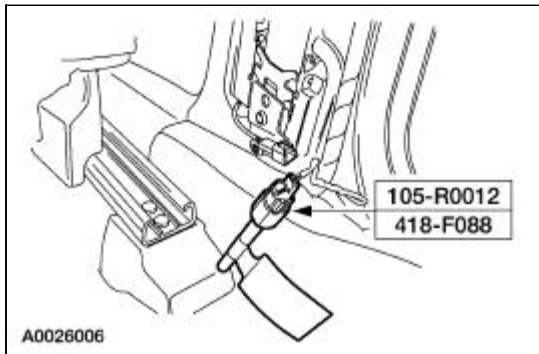
8. Connect the driver seat side air bag electrical connector.
 1. Connect the driver seat side air bag electrical connector.
 2. Slide and engage the driver seat side air bag electrical connector locking clip.



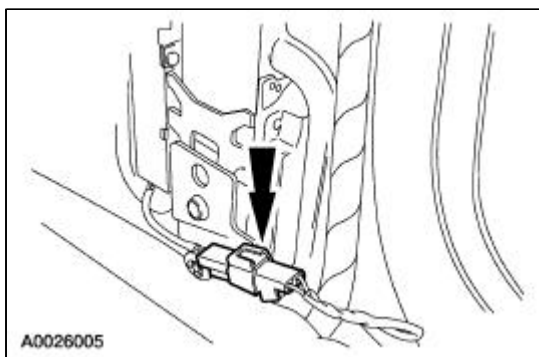
9. Install the driver seat side air bag electrical connector onto the connector bracket under the driver seat.



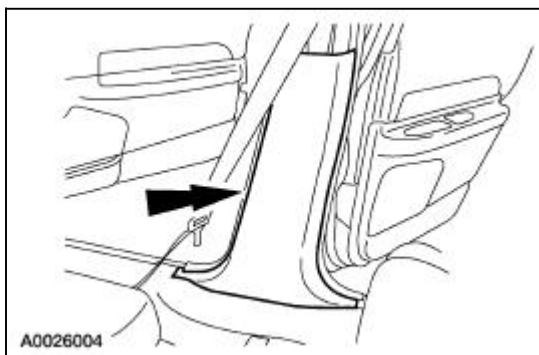
10. Remove the restraint system diagnostic tool from the passenger side safety belt retractor pretensioner electrical connector.



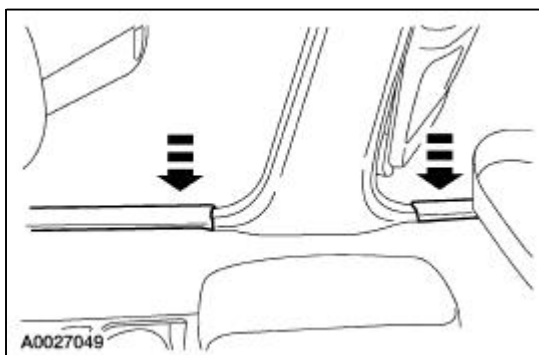
11. Connect the passenger side safety belt retractor pretensioner electrical connector.



12. Install the passenger side B-pillar lower trim panel.

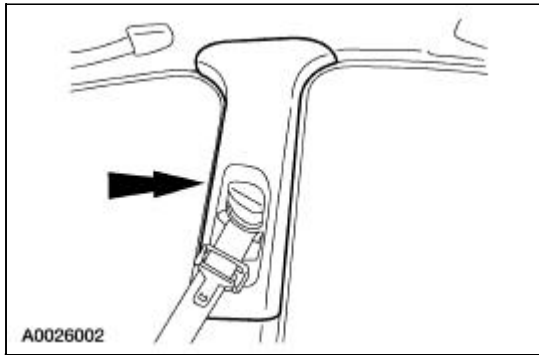


13. Install the passenger side front and rear door scuff plates.



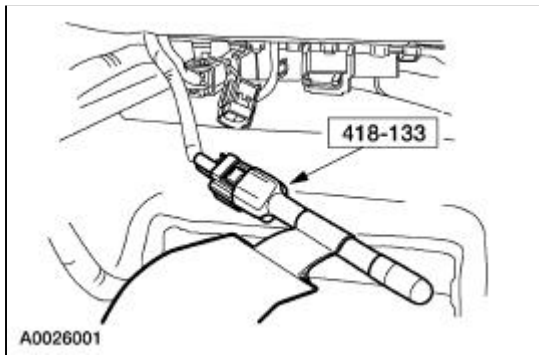
14. **NOTE:** Position the safety belt D-ring to its highest point.

Install the passenger side B-pillar upper trim panel.



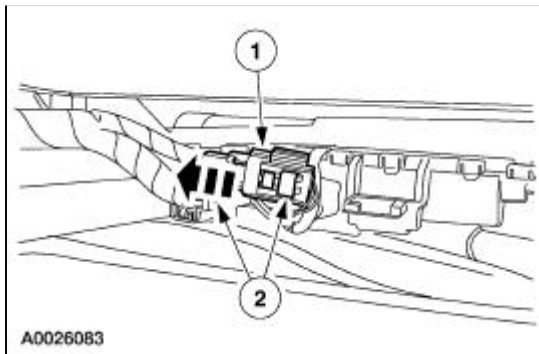
15. Install the passenger side B-pillar weatherstripping.

16. Remove the restraint system diagnostic tool from the passenger seat side air bag floor electrical connector.

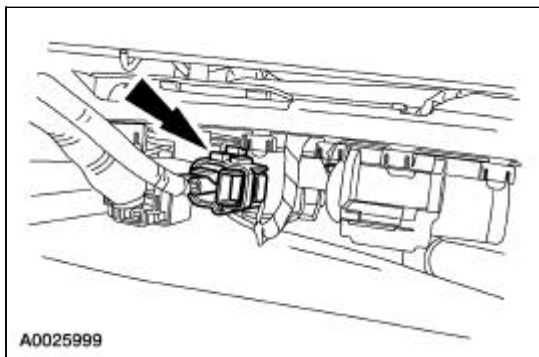


17. Connect the passenger seat side air bag electrical connector.

1. Connect the passenger seat side air bag electrical connector.
2. Slide and engage the passenger seat side air bag electrical connector locking clip.




18. Install the passenger seat side air bag electrical connector onto the connector bracket under the passenger seat.



19. Connect the battery ground cable. For additional information, refer to [Section 414-01](#).

20. Position the front seats rearward.

21.  **WARNING:** To avoid accidental deployment and possible personal injury, the backup power supply must be depleted before repairing or replacing any front or side air bag supplemental restraint system (SRS) components and before servicing, replacing, adjusting or striking components near the front or side air bag sensors, such as doors, instrument panel, console, door latches, strikers, seats and hood latches.

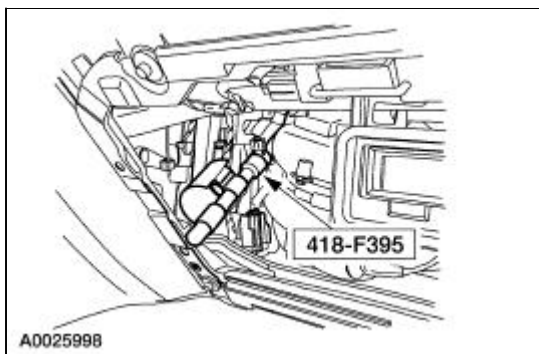
Please refer to the appropriate vehicle workshop manual to determine location of the front air bag sensors.

The side air bag sensors are located at or near the base of the B-pillar.

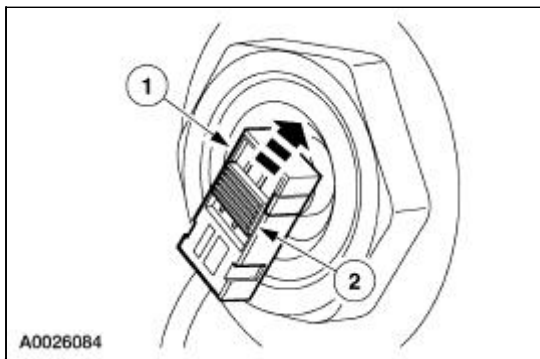
To deplete the backup power supply energy, Disconnect the battery ground cable and wait at least one minute to allow for the depletion of the restraint system backup power supply. Be sure to disconnect auxiliary batteries and power supplies (if equipped).

Disconnect the battery ground cable and wait at least one minute to allow for the depletion of the restraint system backup power supply. For additional information, refer to [Section 414-01](#).

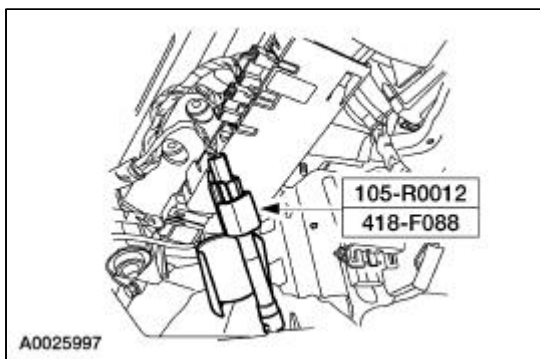
22. Remove the restraint system diagnostic tool from the vehicle harness side of the passenger air bag electrical connector.



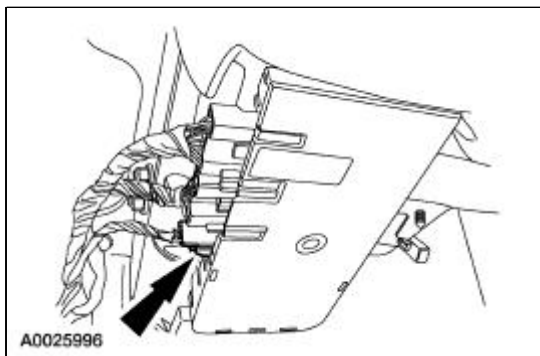
23. Connect the passenger air bag module electrical connector.
1. Reach into the glove box opening toward the center of the instrument panel, under the cross-car beam and connect the passenger air bag module electrical connector.
 2. Slide and engage the passenger air bag module electrical connector locking clip.



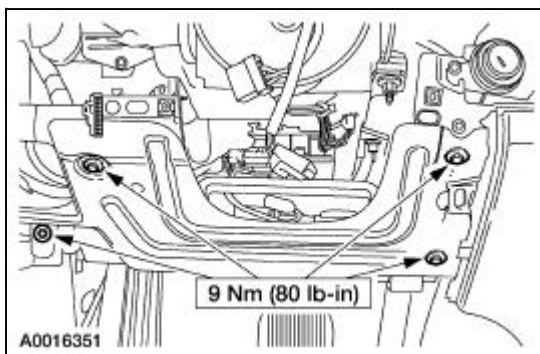
24. Install the glove compartment. For additional information, refer to [Section 501-12](#).
25. Remove the restraint system diagnostic tool from the vehicle harness side of the clockspring electrical connector.



26. Connect the clockspring electrical connector at the base of the steering column.

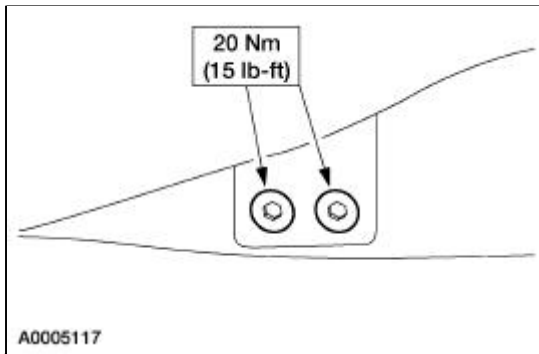


27. Position the steering column opening reinforcement and install the screws.

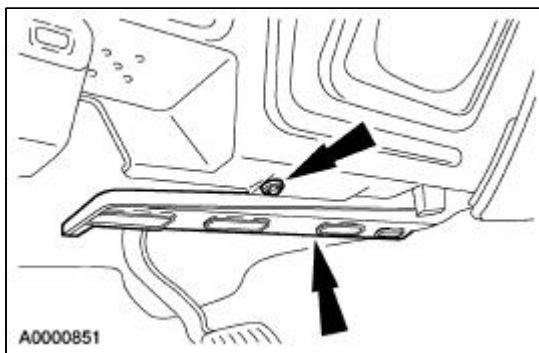


28. Tighten the two driver-side instrument panel tunnel brace bolts.

- Reposition the carpet.

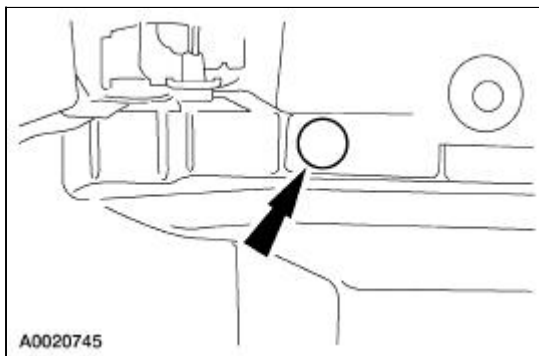


29. Position the heater duct and install the screw.

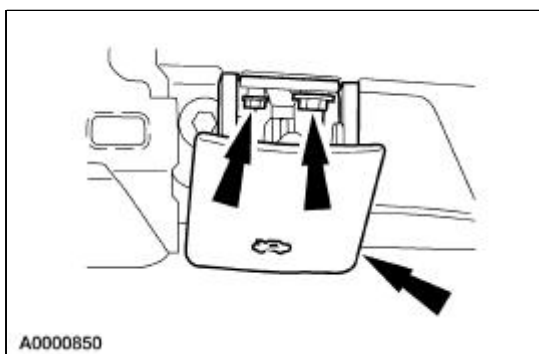


30. Install the RH instrument panel insulator and the two pin-type retainers.

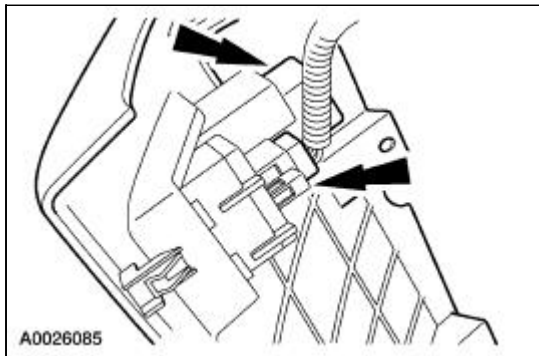
- Connect the courtesy lamp.



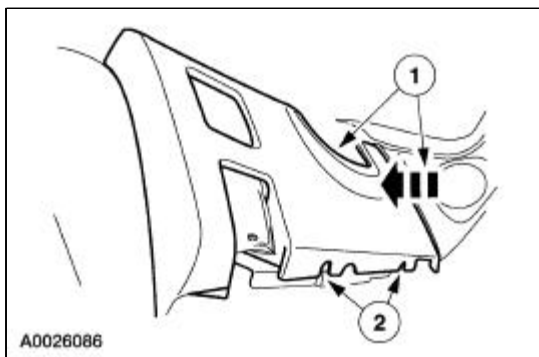
31. Position the hood latch release cable and handle assembly to the steering column opening reinforcement and install the screws.




32. Connect the electrical connectors to the switches in the lower steering column opening finish panel.



33. Install the lower steering column opening finish panel to the instrument panel.
1. Position the lower steering column opening finish panel to the instrument panel and push in, seating the retaining clips.
 2. Install the screws.



34. Connect the battery ground cable. For additional information, refer to [Section 414-01](#).


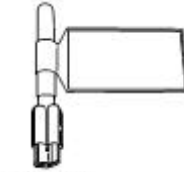
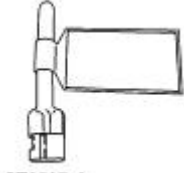
35.  **WARNING: The restraint system diagnostic tool is for restraint system service only. Remove from vehicle prior to road use. Failure to remove could result in injury and possible violation of vehicle safety standards.**

With all the restraint system diagnostic tools removed, prove out the supplemental restraint system (SRS). For additional information, refer to [Section 501-20B](#).


36. Check the active restraint system for correct operation. For additional information, refer to [Section 501-20A](#).
-


Seat Control Switch

Special Tool(s)

 ST2502-A	Diagnostic Tool, Restraint System (1 Req'd) 418-F395
 ST2506-A	Diagnostic Tool, Restraint System (3 Req'd) 418-F088 (105-R0012)
 ST2507-A	Diagnostic Tool, Restraint System (2 Req'd) 418-133 (40-009)

Removal


 **WARNING:** Always wear safety glasses when repairing a air bag supplemental restraint system (SRS) vehicle and when handling an airbag module. This will reduce the risk of injury in the event of an accidental deployment.

 **WARNING:** After deployment, the air bag surface can contain deposits of sodium hydroxide, a product of the gas generant combustion that is irritating to the skin. Wash your hands with soap and water afterwards.

 **WARNING:** Never probe the connectors on the air bag module. Doing so can result in air bag deployment, which can result in personal injury.

NOTE: The left side is shown, the right side is similar.

1. Prepare the vehicle for seat control switch removal.


-  **WARNING:** To avoid accidental deployment and possible personal injury, the backup power supply must be depleted before repairing or replacing any front or side air bag supplemental restraint system (SRS) components and before servicing, replacing, adjusting or striking components near the front or side air bag sensors, such as doors, instrument panel, console, door latches, strikers, seats and hood latches.

Please refer to the appropriate vehicle shop manual to determine location of the front air bag sensors.

The side air bag sensors are located at or near the base of the B-pillar.

To deplete the backup power supply energy, disconnect the battery ground cable and wait at least one minute.

Disconnect the battery ground cable (14301) and wait at least one minute. For additional information, refer to [Section 414-01](#).

2.  **WARNING:** To reduce the risk of serious personal injury, read and follow all warnings, notes, and instructions in the supplemental restraint system (SRS) deactivation and reactivation procedure.

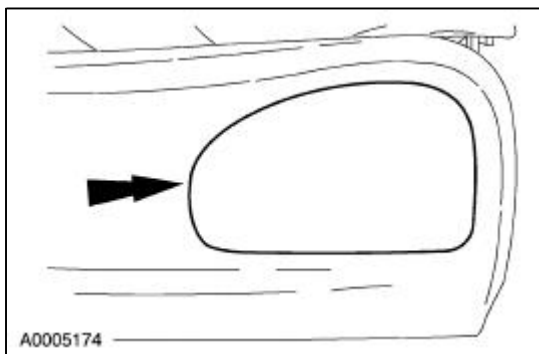
Deactivate the supplemental restraint system (SRS). For additional information, refer to [Supplemental Restraint System \(SRS\) Deactivation and Reactivation](#) in this section.

3.  **WARNING:** To reduce the risk of serious personal injury, read and follow all warnings, cautions, notes, and instructions in the seat removal and installation procedure.

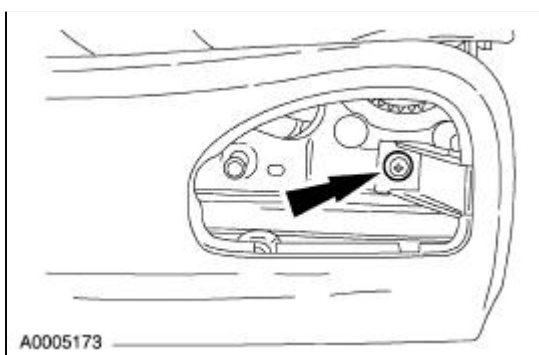
Remove the affected seat. For additional information, refer to [Front Seat](#) in this section.

2.  **CAUTION:** Do not use a screwdriver to remove the safety belt cover.

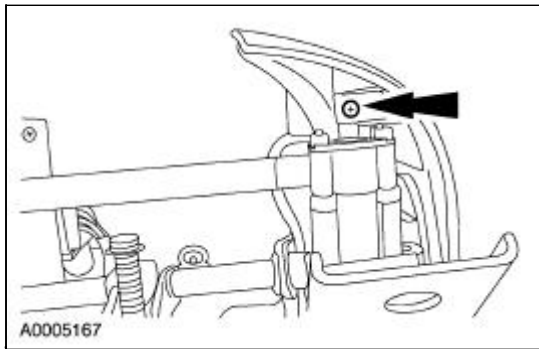
Remove the front safety belt cover by placing fingers behind the cover and pushing outward.



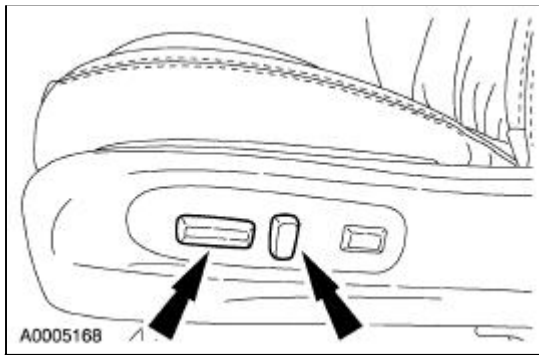
3. Remove the side trim panel screw.



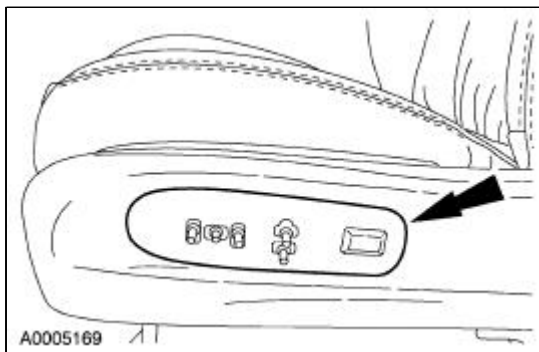
4. Remove the side trim panel screw.



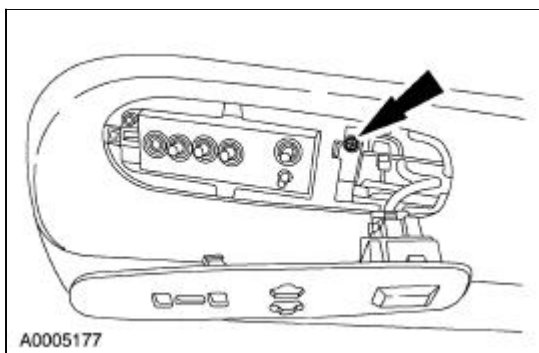
5. Remove the seat control knobs.



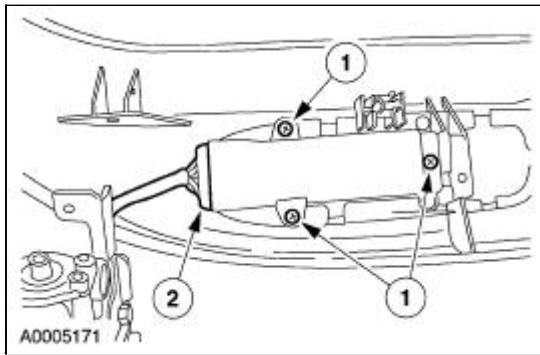
6. Position the seat regulator control switch plate aside.



7. Remove the screw and set aside the front cushion side shield.



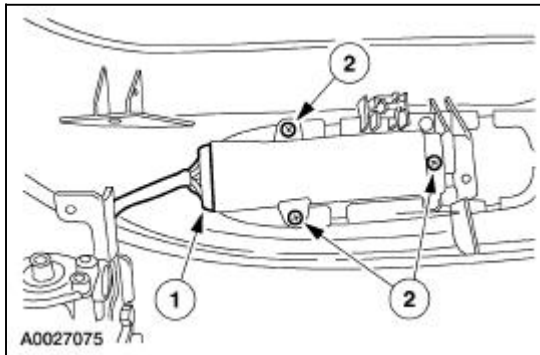
8. Remove the seat regulator control switch.
 1. Remove the screws.
 2. Disconnect the electrical connector.



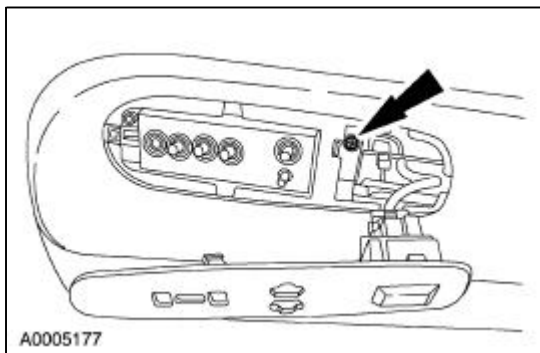
Installation

⚠ WARNING: To reduce the risk of serious personal injury, read and follow all warnings, cautions, and notes at the beginning of the removal procedure.

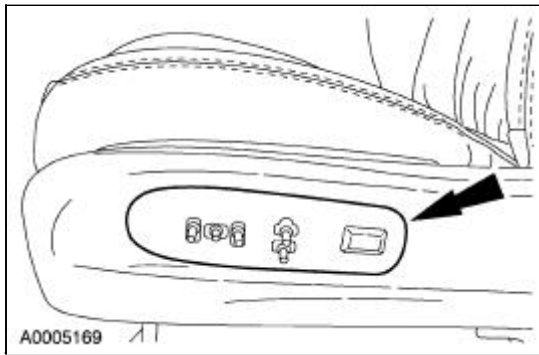
1. Install the seat regulator control switch.
 1. Connect the electrical connector.
 2. Install the screws.



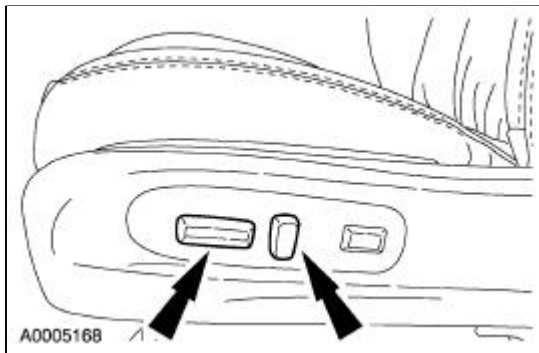
2. Position the front cushion side shield and install the screw.



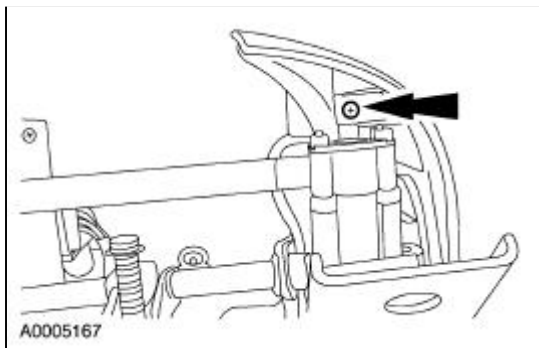
3. Install the seat regulator control switch plate.



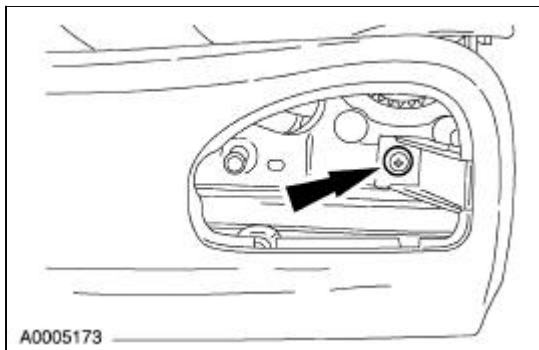
4. Install the seat control knobs.



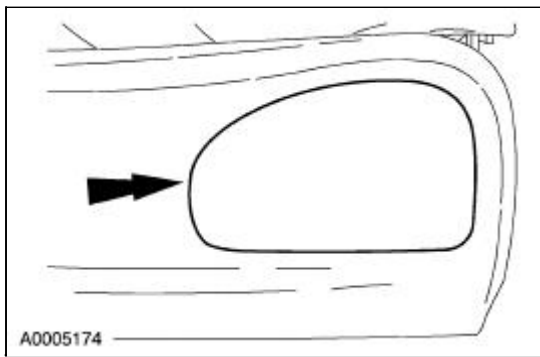
5. Install the side trim panel screw.




6. Install the side panel trim screw.




7. Install the front safety belt cover.




8. Restore the vehicle to operating condition.

1.  **WARNING: To reduce the risk of serious personal injury, read and follow all warnings, notes, and instructions in the seat removal and installation procedure.**

Install the affected seat. For additional information, refer to [Front Seat](#) in this section.

2.  **WARNING: To reduce the risk of serious personal injury, read and follow all warnings, notes, and instructions in the supplemental restraint system (SRS) deactivation and reactivation procedure.**

Reactivate the supplemental restraint system (SRS). For additional information, refer to [Supplemental Restraint System \(SRS\) Deactivation and Reactivation](#) in this section.

3.  **WARNING: The restraint system diagnostic tool is for restraint system service only. Remove from the vehicle prior to road use. Failure to remove could result in injury and possible violation of vehicle safety standards.**

With all the restraint system diagnostic tools removed, prove out the supplemental restraint system (SRS). For additional information, refer to [Section 501-20B](#).

4. Check the active restraint system for correct operation. For additional information, refer to [Section 501-20A](#).
-

Heated Seat Switch

Removal and Installation

All vehicles

1. Apply the parking brake.

Vehicles with manual transmission

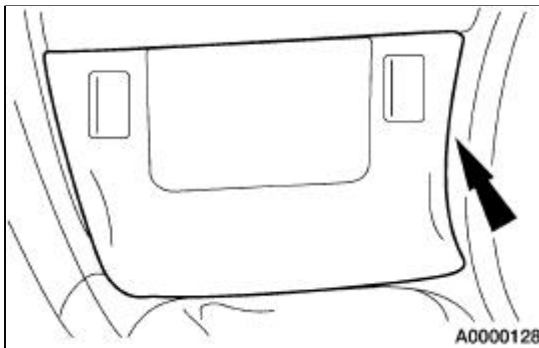
2. If equipped with a manual transmission, place the selector lever in fourth gear.

Vehicles with automatic transmission

3. If equipped with an automatic transmission, place the selector lever in NEUTRAL.

All vehicles


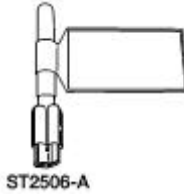
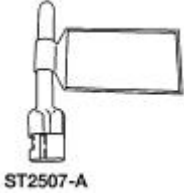
4. Disconnect the battery ground cable. For additional information, refer to [Section 414-01](#).
5. Remove the ashtray finish panel.




6. Remove the two screws and the ashtray assembly.
 - Disconnect the electrical connectors.
 7. Release the locking tabs and remove the heated seat switch.
 8. To install, reverse the removal procedure.
-


Lumbar Control Switch

Special Tool(s)

 ST2502-A	Diagnostic Tool, Restraint System (1 Req'd) 418-F395
 ST2506-A	Diagnostic Tool, Restraint System (3 Req'd) 418-F088 (105-R0012)
 ST2507-A	Diagnostic Tool, Restraint System (2 Req'd) 418-133 (40-009)

Removal


 **WARNING:** Always wear safety glasses when repairing a air bag supplemental restraint system (SRS) vehicle and when handling an airbag module. This will reduce the risk of injury in the event of an accidental deployment.

 **WARNING:** After deployment, the air bag surface can contain deposits of sodium hydroxide, a product of the gas generant combustion that is irritating to the skin. Wash your hands with soap and water afterwards.

 **WARNING:** Never probe the connectors on the air bag module. Doing so can result in air bag deployment, which can result in personal injury.

NOTE: The left side is shown, the right side is similar.

1. Prepare the vehicle for lumbar control switch removal.


1.  **WARNING:** To avoid accidental deployment and possible personal injury, the backup power supply must be depleted before repairing or replacing any front or side air bag supplemental restraint system (SRS) components and before servicing, replacing, adjusting or striking components near the front or side air bag sensors, such as doors, instrument panel, console, door latches, strikers, seats and hood latches.

Please refer to the appropriate vehicle shop manual to determine location of the front air bag sensors.

The side air bag sensors are located at or near the base of the B-pillar.

To deplete the backup power supply energy, disconnect the battery ground cable and wait at least one minute. Be sure to disconnect auxiliary batteries and power supplies (if equipped).

Disconnect the battery ground cable (14301) and wait at least one minute. For additional information, refer to [Section 414-01](#).

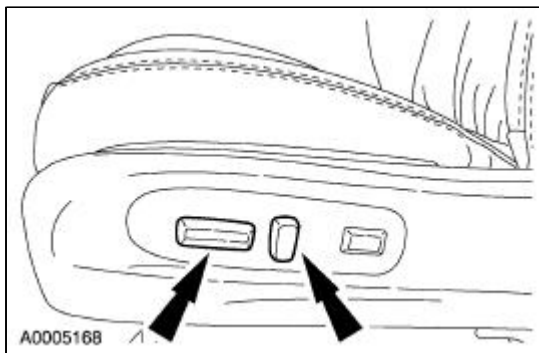
2.  **WARNING:** To reduce the risk of serious personal injury, read and follow all warnings, notes, and instructions in the supplemental restraint system (SRS) deactivation and reactivation procedure.

Deactivate the supplemental restraint system (SRS). For additional information, refer to [Supplemental Restraint System \(SRS\) Deactivation and Reactivation](#) in this section.

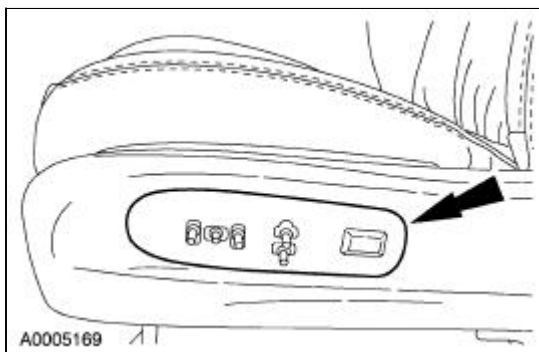
3.  **WARNING:** To reduce the risk of serious personal injury, read and follow all warnings, cautions, notes, and instructions in the seat removal and installation procedure.

Remove the affected seat. For additional information, refer to [Front Seat](#) in this section.

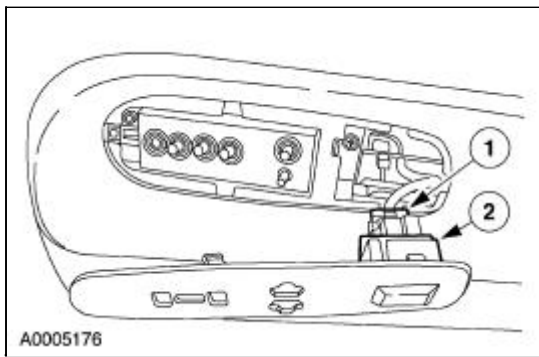
2. Remove the seat control knobs.



3. Position the seat regulator control switch plate aside.



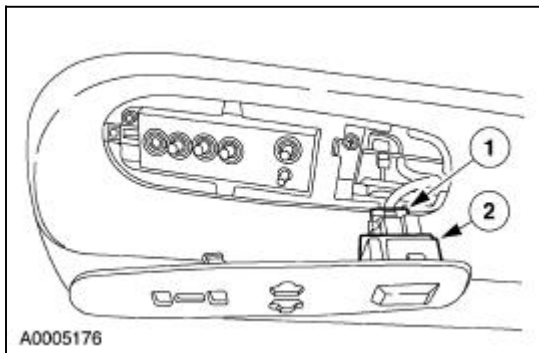
4. Remove the lumbar control switch.
 1. Disconnect the connector.
 2. Remove the lumbar control switch.



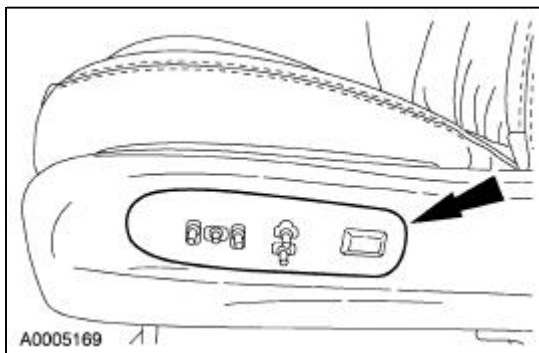
Installation

⚠ WARNING: To reduce the risk of serious personal injury, read and follow all warnings, cautions, and notes at the beginning of the removal procedure.

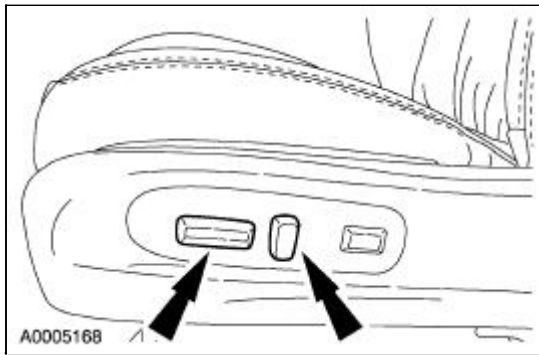
1. Install the lumbar control switch.
 1. Connect the electrical connector.
 2. Install the lumbar control switch.




2. Install the seat regulator control switch plate.




3. Install the seat control knobs.




4. Restore the vehicle to operating condition.

1.  **WARNING: To reduce the risk of serious personal injury, read and follow all warnings, notes, and instructions in the seat removal and installation procedure.**

Install the affected seat. For additional information, refer to [Front Seat](#) in this section.

2.  **WARNING: To reduce the risk of serious personal injury, read and follow all warnings, cautions, notes, and instructions in the supplemental restraint system (SRS) deactivation and reactivation procedure.**

Reactivate the supplemental restraint system (SRS). For additional information, refer to [Supplemental Restraint System \(SRS\) Deactivation and Reactivation](#) in this section.



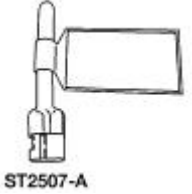
3.  **WARNING: The restraint system diagnostic tool is for restraint system service only. Remove from the vehicle prior to road use. Failure to remove could result in injury and possible violation of vehicle safety standards.**

With all the restraint system diagnostic tools removed, prove out the supplemental restraint system (SRS). For additional information, refer to [Section 501-20B](#).

4. Check the active restraint system for correct operation. For additional information, refer to [Section 501-20A](#).
-


Front Seat Backrest


Special Tool(s)

 ST2502-A	Diagnostic Tool, Restraint System (2 Req'd) 418-F395
 ST2506-A	Diagnostic Tool, Restraint System (3 Req'd) 418-F088 (105-R0012)
 ST2507-A	Diagnostic Tool, Restraint System (2 Req'd) 418-133 (40-009)

Removal

All seats

 **WARNING:** Always wear safety glasses when repairing a air bag supplemental restraint system (SRS) vehicle and when handling an airbag module. This will reduce the risk of injury in the event of an accidental deployment.


 **WARNING:** After deployment, the air bag surface can contain deposits of sodium hydroxide, a product of the gas generant combustion that is irritating to the skin. Wash your hands with soap and water afterwards.

 **WARNING:** Never probe the connectors on the air bag module. Doing so can result in air bag deployment, which can result in personal injury.

NOTE: If a side air bag deployment took place the seatback pad, trim cover, and side air bag module must be replaced. The seatback frame should be replaced if necessary.

NOTE: The left side is shown, the right side is similar.

1. Prepare the vehicle for front seat backrest removal.

1.  **WARNING:** To avoid accidental deployment and possible personal injury, the backup power supply must be depleted before repairing or replacing any front or side air bag supplemental restraint system (SRS) components and before servicing, replacing, adjusting or striking components near the front or side air


bag sensors, such as doors, instrument panel, console, door latches, strikers, seats and hood latches.

Please refer to the appropriate vehicle shop manual to determine location of the front air bag sensors.

The side air bag sensors are located at or near the base of the B-pillar.

To deplete the backup power supply energy, disconnect the battery ground cable and wait at least one minute. Be sure to disconnect auxiliary batteries and power supplies (if equipped).

Disconnect the battery ground cable (14301) and wait at least one minute. For additional information, refer to [Section 414-01](#).

2.  **WARNING:** To reduce the risk of serious personal injury, read and follow all warnings, notes, and instructions in the supplemental restraint system (SRS) deactivation and reactivation procedure.


Deactivate the supplemental restraint system (SRS). For additional information, refer to [Supplemental Restraint System \(SRS\) Deactivation and Reactivation](#) in this section.

3.  **WARNING:** To reduce the risk of serious personal injury, read and follow all warnings, cautions, notes, and instructions in the seat removal and installation procedure.

Remove the affected seat. For additional information, refer to [Front Seat](#) in this section.

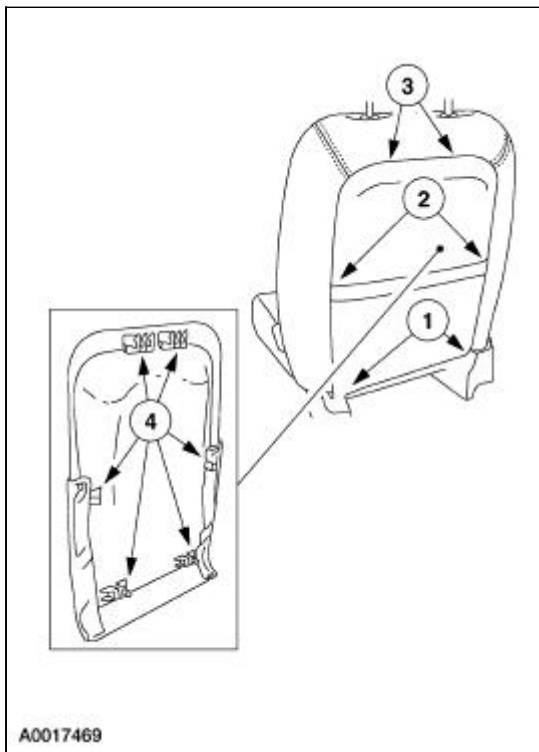
2.  **WARNING:** Front seat back trim covers installed on seats equipped with side air bags cannot be repaired, they are to be replaced (cleaning is permissible).

 **CAUTION:** When removing the seat backrest trim panel, be careful not to damage the J-hooks. If the seat backrest trim panel J-hooks are damaged, install a new seat backrest trim panel.

 **CAUTION:** When removing the seat backrest trim panel, be careful not to damage the pin-type retainers. Pulling towards you, use a smooth, controlled force to release the pin-type retainers.

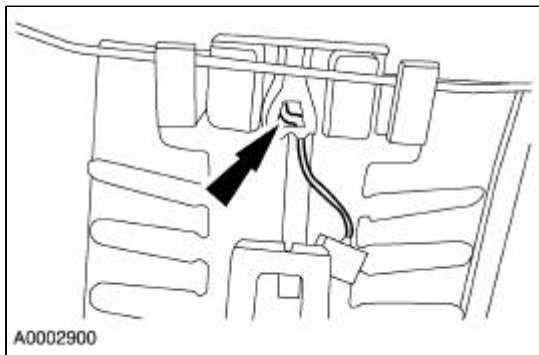
Remove the seat backrest trim panel.

1. Pull and release the pin-type retainers at the bottom of the seat backrest trim panel.
2. While holding the seat backrest trim panel at the bottom, push in on the left side of the panel at the lip of the map pocket and slide it to the right to disengage the J-hook. Repeat this process for the right side J-hook but slide the panel to the left to disengage the hook.
3. While pushing in at the top of the seat backrest trim panel, slide it down to disengage the top J-hooks.
4. Remove the seat backrest trim panel and inspect the J-hooks and pin-type retainers for damage.

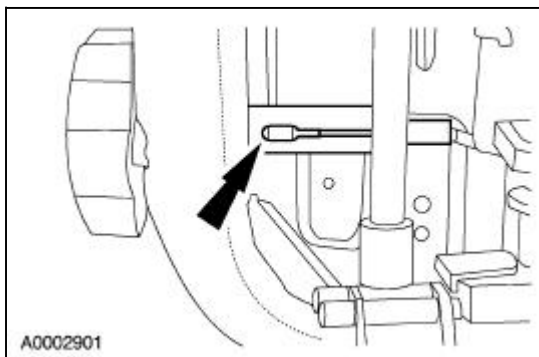


Seats with manual lumbar

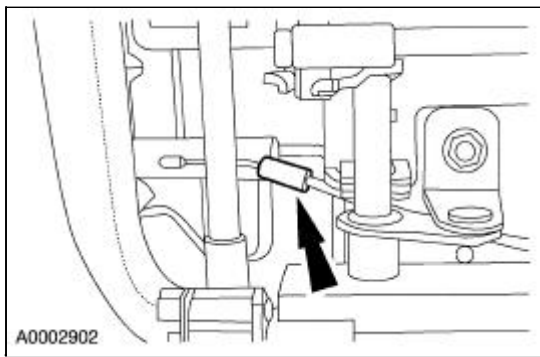
3. Remove the retaining hook.



4. Align the end of the adjusting cable in the slot.

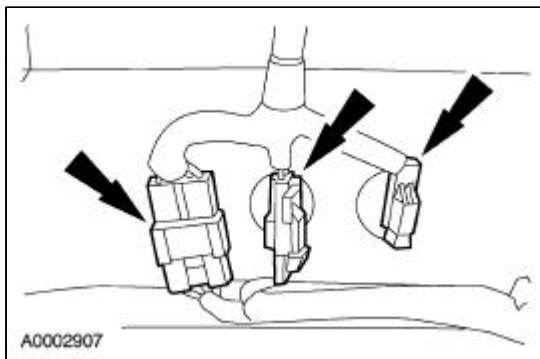


5. Release the adjusting cable.

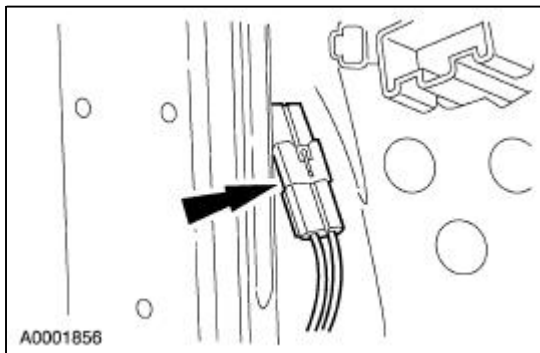


All seats

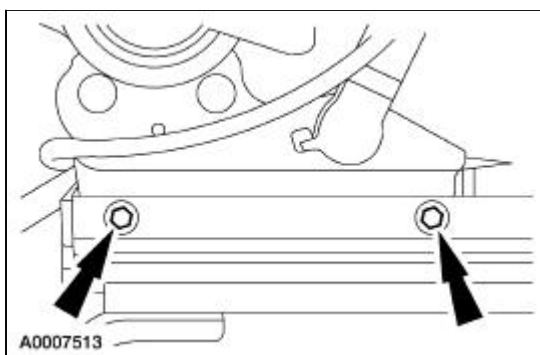
6. Disconnect the electrical connectors.




7. Disconnect the electrical connector.



8. Remove the front cushion side shield trim panel. For additional information, refer to [Seat—Front Cushion Side Shield](#) in this section.
9. Remove the two front seat backrest bolts on each side. Remove the front seat backrest.

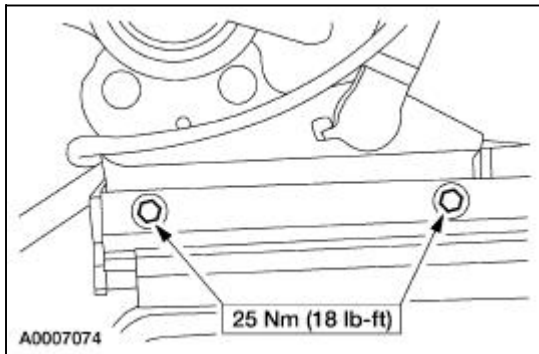


Installation

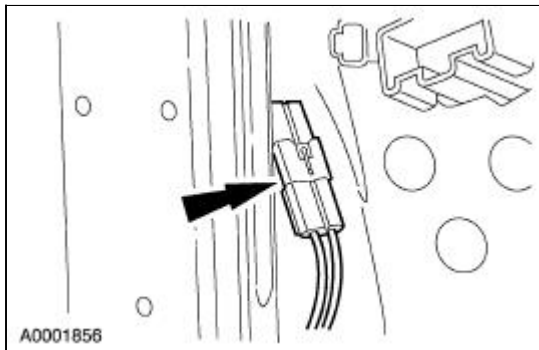
 **WARNING:** To reduce the risk of serious personal injury, read and follow all warnings and notes at the beginning of the removal procedure.

All seats

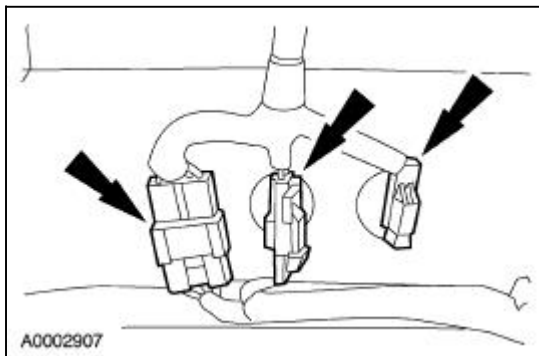
1. Position the front seat backrest and install two bolts on each side.



2. Install the front cushion side shield trim panel. For additional information, refer to [Seat—Front Cushion Side Shield](#) in this section.
3. Connect the electrical connector.

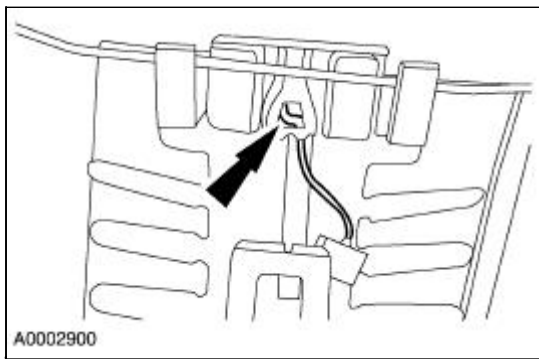


4. Connect the electrical connectors.

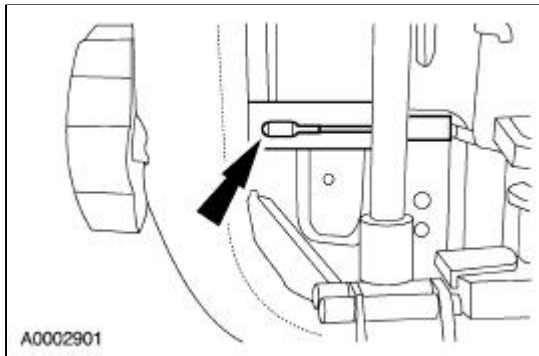


Seats with manual lumbar

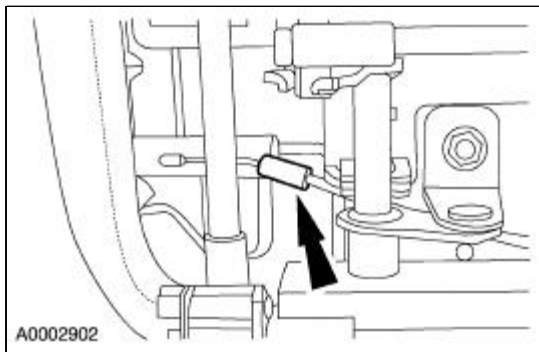
5. Install the retaining hook.



6. Align the end of the adjusting cable in the slot.



7. Install the adjusting cable.

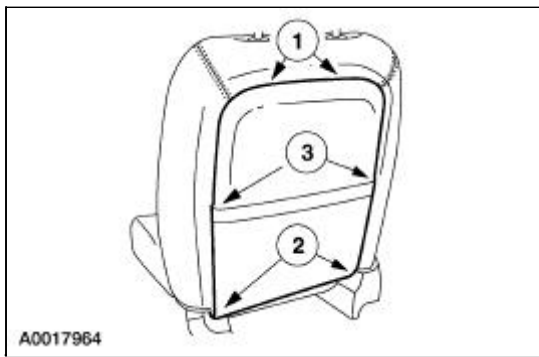


8.  **CAUTION: Inspect the seat backrest trim panel J-hooks for damage. If damaged, install a new seat backrest trim panel.**


NOTE: If re-installing the original seat backrest trim panel, install new pin-type retainers.

Install the seat backrest trim panel.


1. Angle the top of the seat backrest trim panel inward and up to engage the upper J-hooks to the seat backrest frame.
2. While holding the seat backrest trim panel up, align the pin-type retainers at the bottom of the seat backrest trim panel and install them into the seat backrest frame.
3. With the palm of your hand, install the J-clips by pushing down on the seat backrest trim panel and towards the center of the seat.
 - Check the retention of the seat backrest trim panel by lightly pulling on the bottom, sides, and top where the retainers are located.




9. Restore the vehicle to operating condition.

1.  **WARNING: To reduce the risk of serious personal injury, read and follow all warnings, notes, and instructions in the seat removal and installation procedure.**

Install the affected seat. For additional information, refer to [Front Seat](#) in this section.

2.  **WARNING: To reduce the risk of serious personal injury, read and follow all warnings, cautions, notes, and instructions in the supplemental restraint system (SRS) deactivation and reactivation procedure.**

Reactivate the supplemental restraint system (SRS). For additional information, refer to [Supplemental Restraint System \(SRS\) Deactivation and Reactivation](#) in this section.

3.  **WARNING: The restraint system diagnostic tool is for restraint system service only. Remove from the vehicle prior to road use. Failure to remove could result in injury and possible violation of vehicle safety standards.**

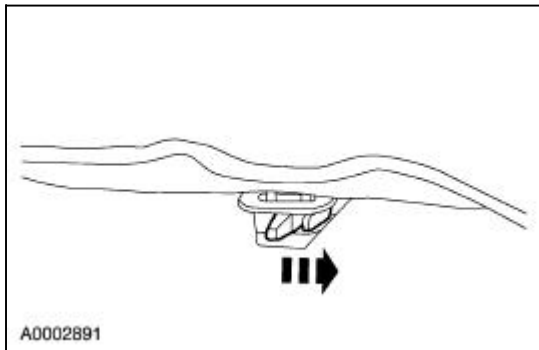
With all the restraint system diagnostic tools removed, prove out the supplemental restraint system (SRS). For additional information, refer to [Section 501-20B](#).

4. Check the active restraint system for correct operation. For additional information, refer to [Section 501-20A](#).
-

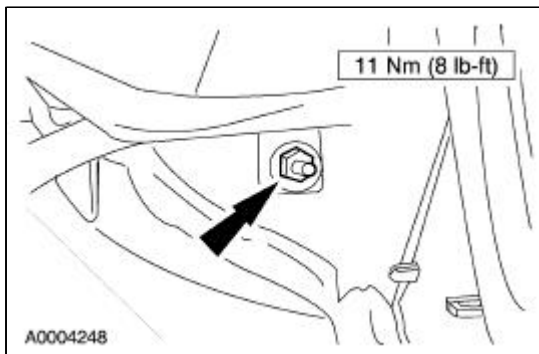
Seat Backrest —Rear Side Bolsters

Removal and Installation

1. Remove the rear seat cushions. For additional information, refer to [Seat—Rear Cushion](#).

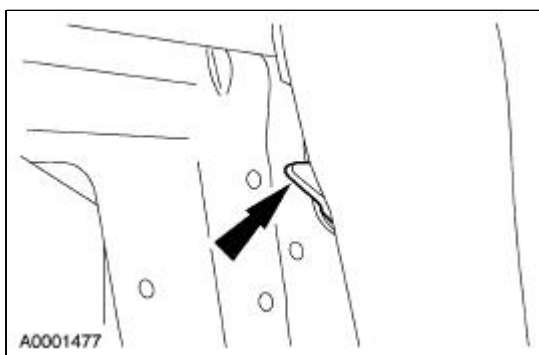


2. From the luggage compartment, release and fold down the seat backrest.
3. Remove the rear seat bolster nut.



4. **NOTE:** Pull down the lever to release the LH latch. Push up the lever to release the RH latch.



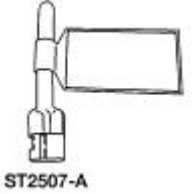
Release the latch and remove the rear seat bolster.




5. To install, reverse the removal procedure.


Front Seat

Special Tool(s)

 ST2502-A	Diagnostic Tool, Restraint System (2 Req'd) 418-F395
 ST2506-A	Diagnostic Tool, Restraint System (3 Req'd) 418-F088 (105-R0012)
 ST2507-A	Diagnostic Tool, Restraint System (2 Req'd) 418-133 (40-009)

Removal

 **WARNING:** Always wear safety glasses when repairing a air bag supplemental restraint system (SRS) vehicle and when handling an airbag module. This will reduce the risk of injury in the event of an accidental deployment.


 **WARNING:** After deployment, the air bag surface can contain deposits of sodium hydroxide, a product of the gas generant combustion that is irritating to the skin. Wash your hands with soap and water afterwards.

 **WARNING:** Never probe the connectors on the air bag module. Doing so can result in air bag deployment, which can result in personal injury.

NOTE: The driver seat is shown, the passenger seat is similar.

NOTE: If a side air bag deployment took place the seatback pad, trim cover, and side air bag module must be replaced. The seatback frame should be replaced if necessary.

1. Prepare the vehicle for seat removal.


1.  **WARNING:** To avoid accidental deployment and possible personal injury, the backup power supply must be depleted before repairing or replacing any front or side air bag supplemental restraint system (SRS) components and before servicing, replacing, adjusting or striking components near the front or side air bag sensors, such as doors, instrument panel, console, door latches, strikers, seats and hood latches.

Please refer to the appropriate vehicle shop manual to determine location of the front air bag sensors.

The side air bag sensors are located at or near the base of the B-pillar.

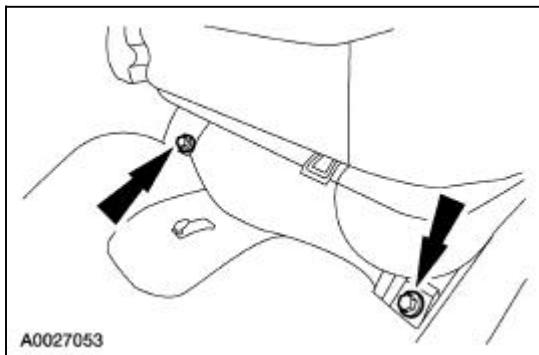
To deplete the backup power supply energy, disconnect the battery ground cable and wait at least one minute. Be sure to disconnect auxiliary batteries and power supplies (if equipped).

Disconnect the battery ground cable (14301) and wait at least one minute. For additional information, refer to [Section 414-01](#).

2.  **WARNING:** To reduce the risk of serious personal injury, read and follow all warnings, cautions, notes, and instructions in the supplemental restraint system (SRS) deactivation and reactivation procedure.

Deactivate the supplemental restraint system (SRS). For additional information, refer to [Supplemental Restraint System \(SRS\) Deactivation and Reactivation](#) in this section.

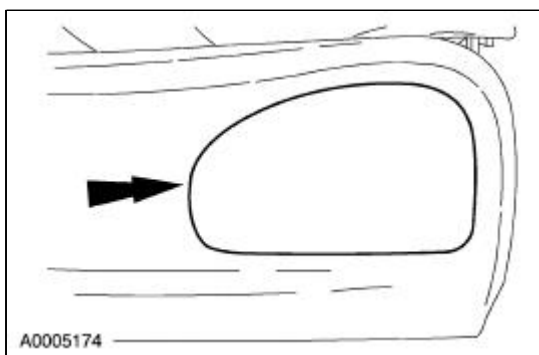
2. Reconnect the battery ground cable.
3. Move the seat rearward.
4. Remove the bolts.



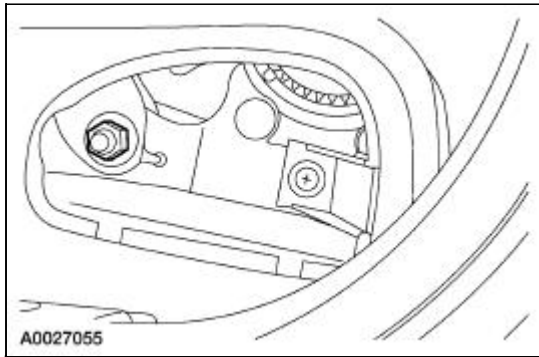
5. Position the seat forward.
6. Disconnect the battery ground cable (14301) and wait at least one minute. For additional information, refer to [Section 414-01](#).

7.  **CAUTION:** Do not use a screwdriver to remove the safety belt cover.

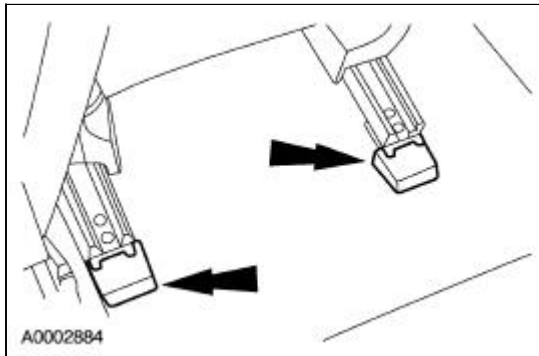
Remove the safety belt cover by placing fingers behind the cover and pushing outward.



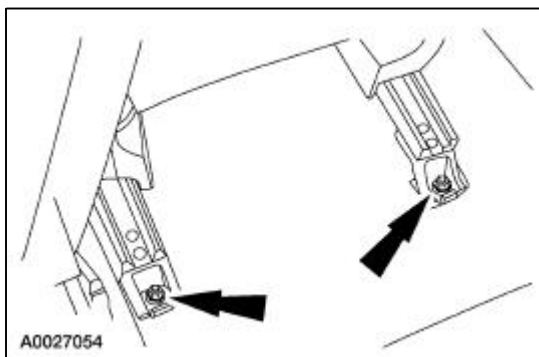
8. Remove the nut and the front safety belt.



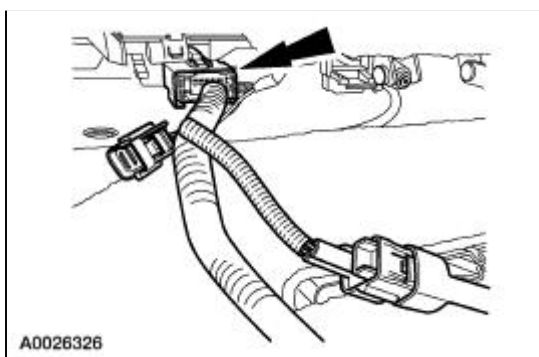
9. Remove the seat track rear covers.



10. Remove the nuts.




11. Disconnect the electrical connector.

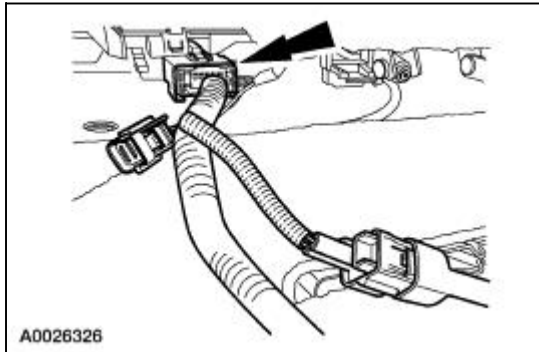


12. Remove the seat.

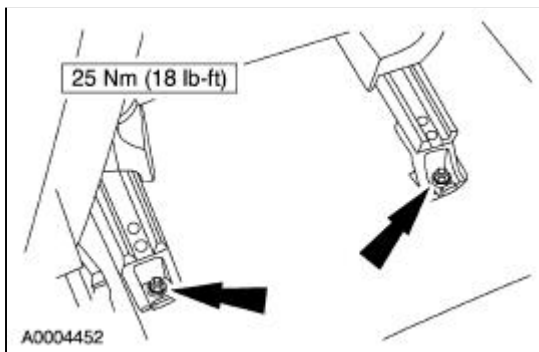
Installation

 **WARNING:** To reduce the risk of serious personal injury, read and follow all warnings, cautions, and notes at the beginning of the removal procedure.

1. Position the seat in the vehicle.
2. Connect the electrical connectors.

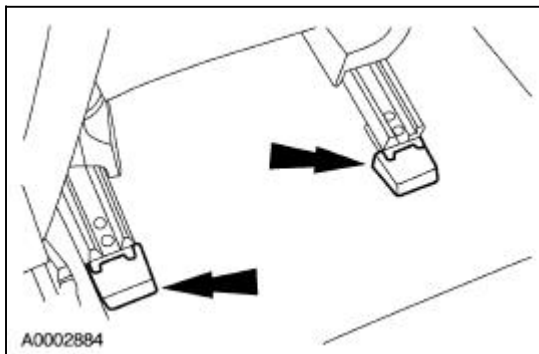


3. Install the nuts.

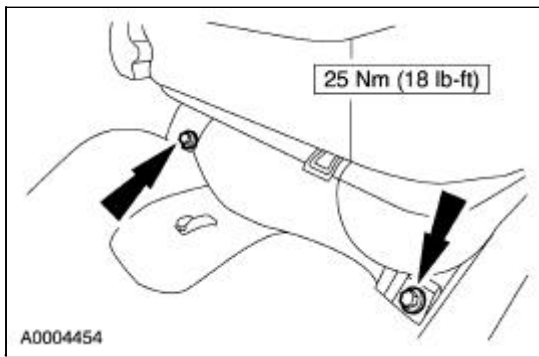


4. **NOTE:** Make sure the seat track covers are positioned below the level of the seat track rail to prevent damage to the cover during seat travel.

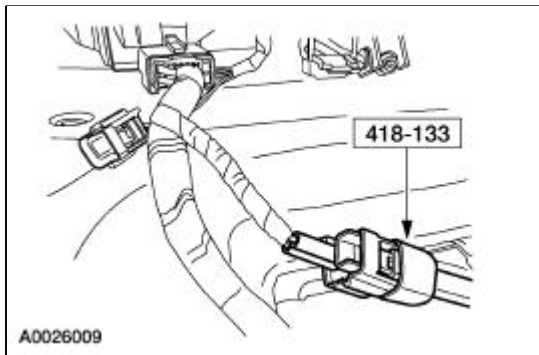
Install the seat track rear covers.



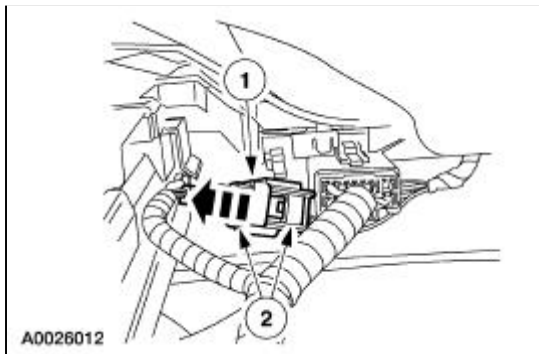
5. Connect the battery ground cable. For additional information, refer to [Section 414-01](#).
6. Position the seat rearward.
7. Install the bolts.



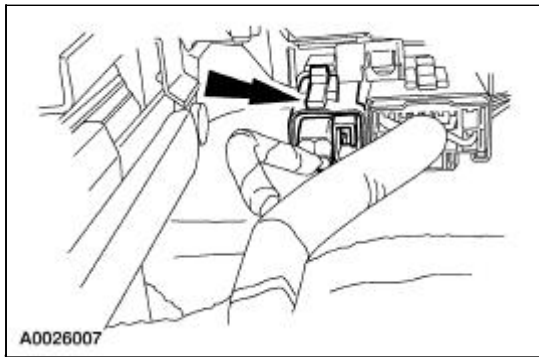
8. Position the seat forward.
9. Disconnect the battery ground cable. For additional information, refer to [Section 414-01](#).
10. Remove the restraint system diagnostic tool from the driver seat side air bag floor electrical connector.




11. Connect the driver seat side air bag electrical connector.
 1. Connect the driver seat side air bag electrical connector.
 2. Slide and engage the driver seat side air bag electrical connector locking clip.



12. Install the driver seat side air bag electrical connector onto the connector bracket under the driver seat.



13. Connect the battery ground cable. For additional information, refer to [Section 414-01](#).
14. With the restrain system diagnostic tools still installed at the remaining deployable devices, prove out the supplemental restraint system (SRS). For additional information, refer to [Section 501-20B](#).

15.  **WARNING:** To avoid accidental deployment and possible personal injury, the backup power supply must be depleted before repairing or replacing any front or side air bag supplemental restraint system (SRS) components and before servicing, replacing, adjusting or striking components near the front or side air bag sensors, such as doors, instrument panel, console, door latches, strikers, seats and hood latches.

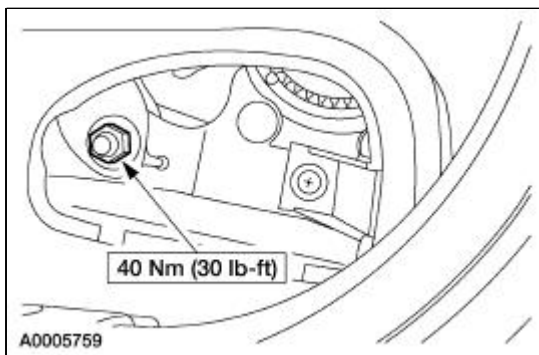
Please refer to the appropriate vehicle shop manual to determine location of the front air bag sensors.

The side air bag sensors are located at or near the base of the B-pillar.

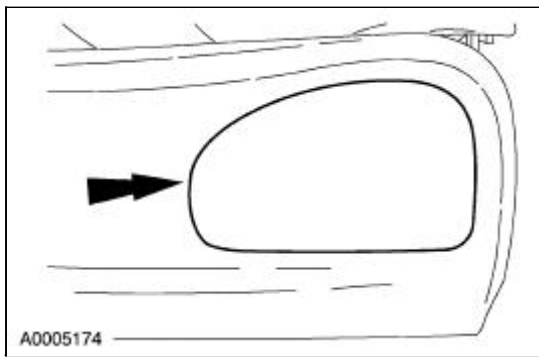
To deplete the backup power supply energy, disconnect the battery ground cable and wait at least one minute. Be sure to disconnect auxiliary batteries and power supplies (if equipped).

Disconnect the battery ground cable and wait at least one minute. For additional information, refer to [Section 414-01](#).


16. Install the front safety belt.
 1. Install the safety belt.
 2. Install the bolt.




17. Install the safety belt cover.



18. Restore the vehicle to operating condition.

1.  **WARNING: To reduce the risk of serious personal injury, read and follow all warnings, cautions, notes, and instructions in the supplemental restraint system (SRS) deactivation and reactivation procedure.**

Reactivate the supplemental restraint system (SRS). For additional information, refer to [Supplemental Restraint System \(SRS\) Deactivation and Reactivation](#) in this section.



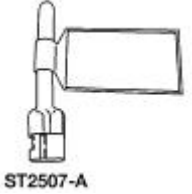
2.  **WARNING: The restraint system diagnostic tool is for restraint system service only. Remove from the vehicle prior to road use. Failure to remove could result in injury and possible violation of vehicle safety standards.**

With all the restraint system diagnostic tools removed, prove out the supplemental restraint system (SRS). For additional information, refer to [Section 501-20B](#).


3. Check the active restraint system for correct operation. For additional information, refer to [Section 501-20A](#).
-


Seat —Front Cushion Side Shield

Special Tool(s)

 ST2502-A	Diagnostic Tool, Restraint System (2 Req'd) 418-F395
 ST2506-A	Diagnostic Tool, Restraint System (3 Req'd) 418-F088 (105-R0012)
 ST2507-A	Diagnostic Tool, Restraint System (2 Req'd) 418-133 (40-009)

Removal and Installation


 **WARNING:** Always wear safety glasses when repairing a air bag supplemental restraint system (SRS) vehicle and when handling an airbag module. This will reduce the risk of injury in the event of an accidental deployment.

 **WARNING:** After deployment, the air bag surface can contain deposits of sodium hydroxide, a product of the gas generant combustion that is irritating to the skin. Wash your hands with soap and water afterwards.

 **WARNING:** Never probe the connectors on the air bag module. Doing so can result in air bag deployment, which can result in personal injury.

NOTE: The left side is shown, the right side is similar.

1. Prepare the vehicle for front cushion side shield removal.


-  **WARNING:** To avoid accidental deployment and possible personal injury, the backup power supply must be depleted before repairing or replacing any front or side air bag supplemental restraint system (SRS) components and before servicing, replacing, adjusting or striking components near the front or side air bag sensors, such as doors, instrument panel, console, door latches, strikers, seats and hood latches.

Please refer to the appropriate vehicle shop manual to determine location of the front air bag sensors.

The side air bag sensors are located at or near the base of the B-pillar.

To deplete the backup power supply energy, disconnect the battery ground cable and wait at least one minute. Be sure to disconnect auxiliary batteries and power supplies (if equipped).

Disconnect the battery ground cable (14301) and wait at least one minute. For additional information, refer to [Section 414-01](#).

2.  **WARNING:** To reduce the risk of serious personal injury, read and follow all warnings, notes, and instructions in the supplemental restraint system (SRS) deactivation and reactivation procedure.

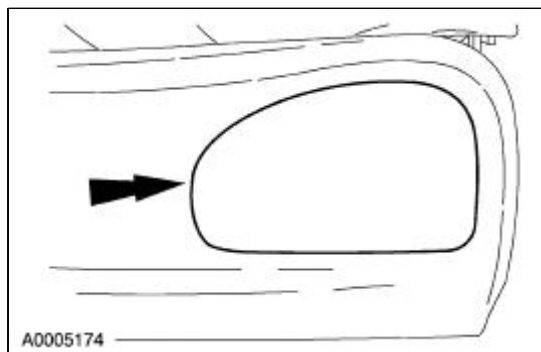
Deactivate the supplemental restraint system (SRS). For additional information, refer to [Supplemental Restraint System \(SRS\) Deactivation and Reactivation](#) in this section.

3.  **WARNING:** To reduce the risk of serious personal injury, read and follow all warnings, cautions, notes, and instructions in the seat removal and installation procedure.

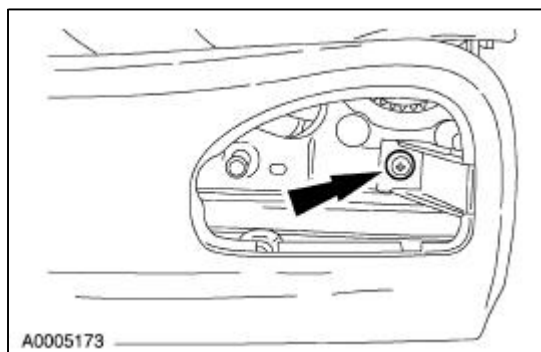
Remove the affected seat. For additional information, refer to [Front Seat](#) in this section.

2.  **CAUTION:** Do not use a screwdriver to remove the safety belt cover.

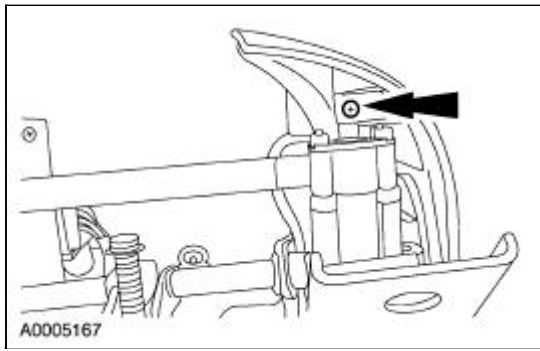
Remove the safety belt cover by placing fingers behind the cover and pushing outward.



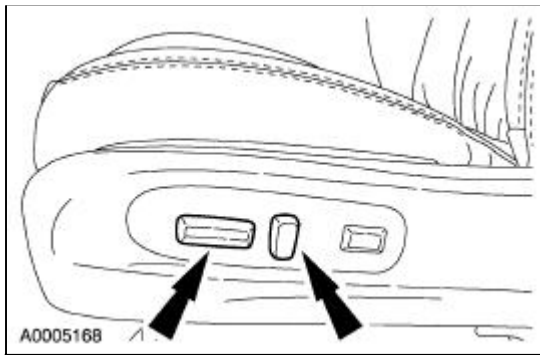
3. Remove the front cushion side shield screw.



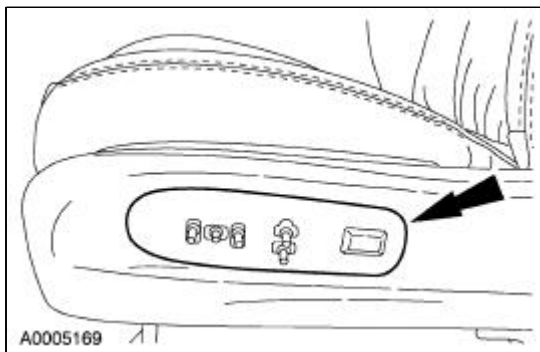
4. Remove the front cushion side shield screw.



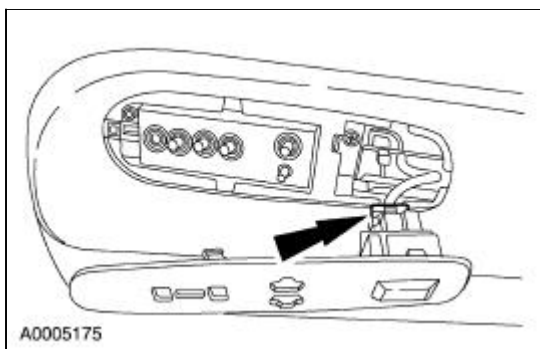
5. Remove the seat control switch knobs.



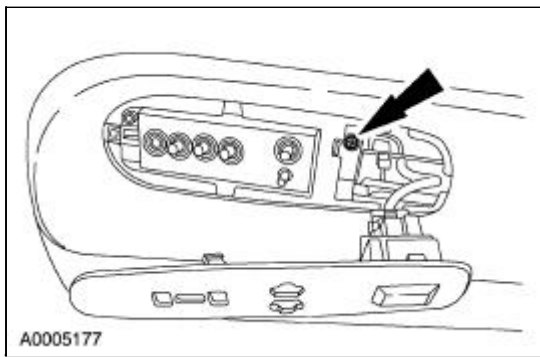
6. Position the seat control switch plate aside.



7. Disconnect the lumbar control switch electrical connector.



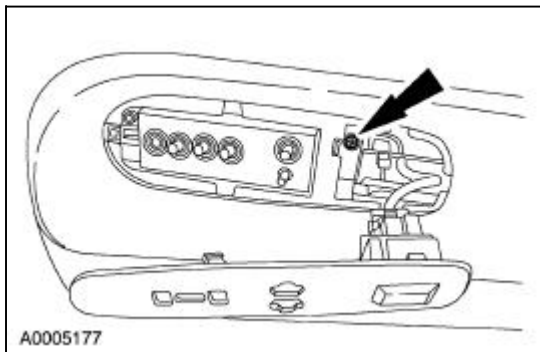
8. Remove the screw and the front cushion side shield.



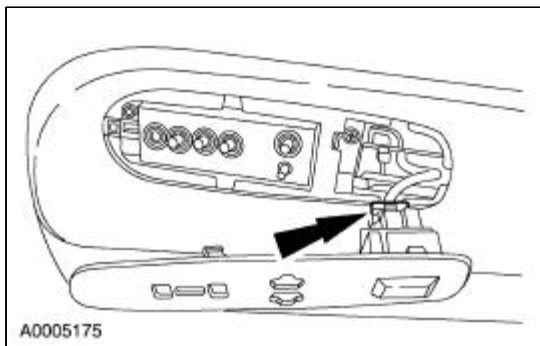
Installation

⚠ WARNING: To reduce the risk of serious personal injury, read and follow all warnings, cautions, and notes at the beginning of the removal procedure.

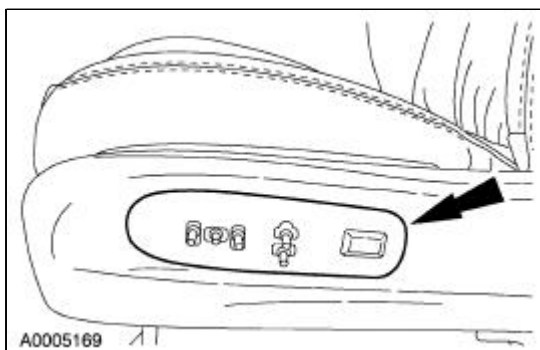
1. Install the front cushion side shield. Install the screw.



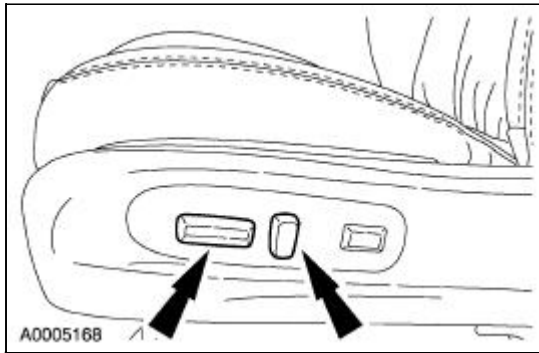
2. Connect the lumbar control switch electrical connector.



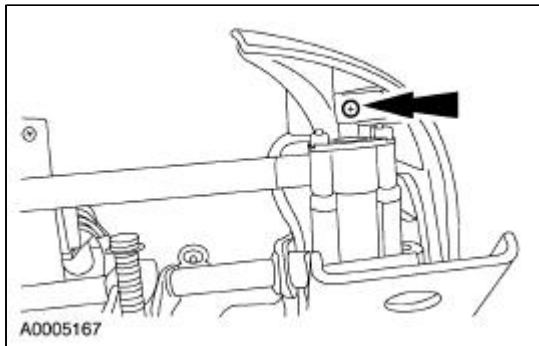
3. Install the seat regulator control switch plate.



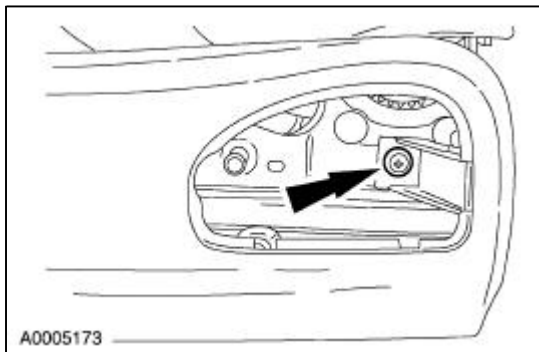
4. Install the seat control switch knobs.



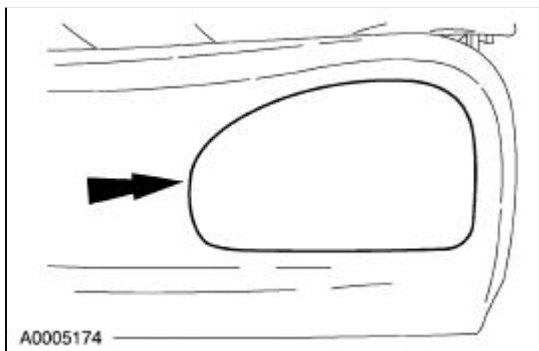
5. Install the front cushion side shield screw.



6. Install the front cushion side shield screw.



7. Install the safety belt cover.




8. Restore the vehicle to operating condition.


1.  **WARNING:** To reduce the risk of serious personal injury, read and follow all

warnings, notes, and instructions in the seat removal and installation procedure.

Install the affected seat. For additional information, refer to [Front Seat](#) in this section.

2.  **WARNING: To reduce the risk of serious personal injury, read and follow all warnings, cautions, notes, and instructions in the supplemental restraint system (SRS) deactivation and reactivation procedure.**

Reactivate the supplemental restraint system (SRS). For additional information, refer to [Supplemental Restraint System \(SRS\) Deactivation and Reactivation](#) in this section.

3.  **WARNING: The restraint system diagnostic tool is for restraint system service only. Remove from the vehicle prior to road use. Failure to remove could result in injury and possible violation of vehicle safety standards.**

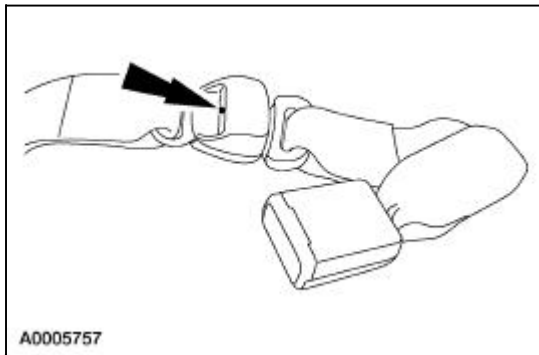
With all the restraint system diagnostic tools removed, prove out the supplemental restraint system (SRS). For additional information, refer to [Section 501-20B](#).

4. Check the active restraint system for correct operation. For additional information, refer to [Section 501-20A](#).
-

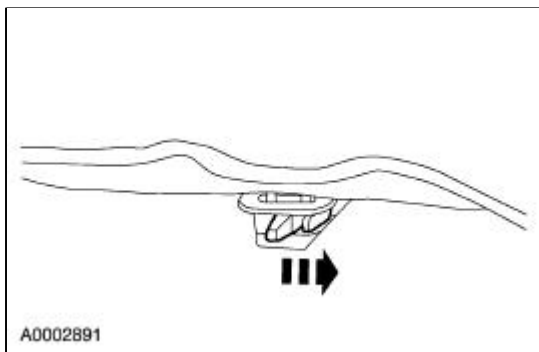
Seat —Rear Cushion

Removal and Installation

1. Using a suitable tool, release the mini-buckle.





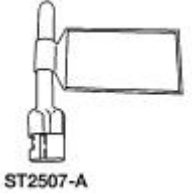
2. Release the two latches and remove the rear seat cushion.




3. To install, reverse the removal procedure.
 - Check the restraint system for correct operation.
-


Seat Track

Special Tool(s)


 ST2502-A	Diagnostic Tool, Restraint System (2 Req'd) 418-F395
 ST2506-A	Diagnostic Tool, Restraint System (3 Req'd) 418-F088 (105-R0012)
 ST2507-A	Diagnostic Tool, Restraint System (2 Req'd) 418-133 (40-009)

Removal

 **WARNING:** Always wear safety glasses when repairing a air bag supplemental restraint system (SRS) vehicle and when handling an airbag module. This will reduce the risk of injury in the event of an accidental deployment.


 **WARNING:** After deployment, the air bag surface can contain deposits of sodium hydroxide, a product of the gas generant combustion that is irritating to the skin. Wash your hands with soap and water afterwards.

 **WARNING:** Never probe the connectors on the air bag module. Doing so can result in air bag deployment, which can result in personal injury.

 **CAUTION:** Use care when handling the seat and track assembly. Dropping the assembly or sitting on a seat not secured in the vehicle may result in damaged components.

NOTE: The left side is shown, the right side is similar.

1. Prepare the vehicle for seat track removal.


-  **WARNING:** To avoid accidental deployment and possible personal injury, the backup power supply must be depleted before repairing or replacing any front or side air bag supplemental restraint system (SRS) components and before servicing, replacing, adjusting or striking components near the front or side air bag sensors, such as doors, instrument panel, console, door latches, strikers, seats and hood latches.

Please refer to the appropriate vehicle shop manual to determine location of the front air bag sensors.


The side air bag sensors are located at or near the base of the B-pillar.

To deplete the backup power supply energy, disconnect the battery ground cable and wait at least one minute. Be sure to disconnect auxiliary batteries and power supplies (if equipped).

Disconnect the battery ground cable (14301) and wait at least one minute. For additional information, refer to [Section 414-01](#).

2.  **WARNING:** To reduce the risk of serious personal injury, read and follow all warnings, cautions, notes, and instructions in the supplemental restraint system (SRS) deactivation and reactivation procedure.

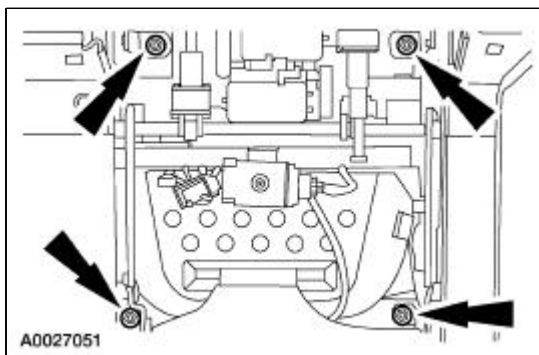
Deactivate the supplemental restraint system (SRS). For additional information, refer to [Supplemental Restraint System \(SRS\) Deactivation and Reactivation](#) in this section.

3.  **WARNING:** To reduce the risk of serious personal injury, read and follow all warnings, cautions, notes, and instructions in the seat removal and installation procedure.

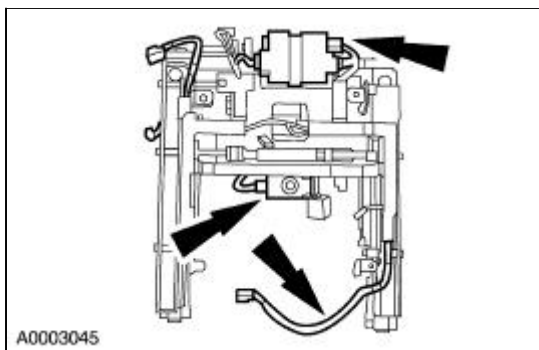
Remove the affected seat. For additional information, refer to [Front Seat](#) in this section.

4. Remove the front cushion side shield. For additional information, refer to [Seat—Front Cushion Side Shield](#) in this section.
5. Remove the seat backrest. For additional information, refer to [Front Seat Backrest](#) in this section.

2. Remove the nuts and the seat track.



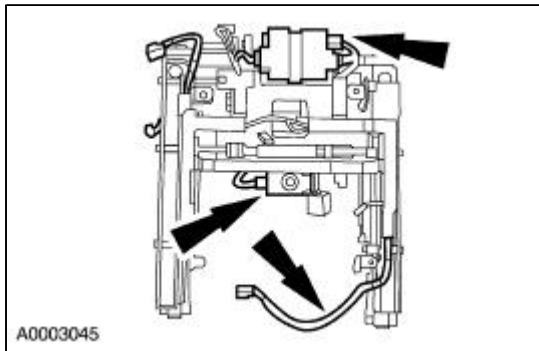
3. Remove the wiring harness, driver seat module, seat track trim panel, and if equipped, the heated seat module.



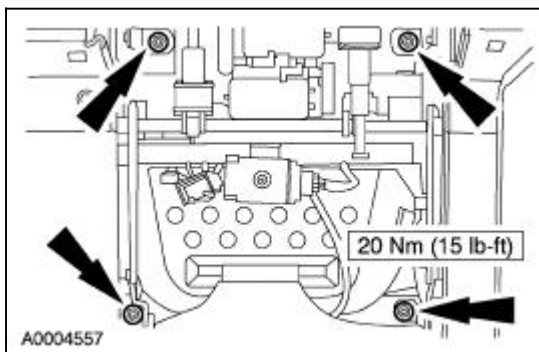
Installation

⚠ WARNING: To reduce the risk of serious personal injury, read and follow all warnings, cautions, and notes at the beginning of the removal procedure.

1. Install the wiring harness, driver seat module, seat track trim panel, and if equipped, the heated seat module.



2. Install the seat track and nuts.



3. Restore the vehicle to operating condition.
 1. Install the seat backrest. For additional information, refer to [Front Seat Backrest](#) in this section.
 2. Install the front cushion side shield. For additional information, refer to [Seat—Front Cushion Side Shield](#) in this section.
 3. **⚠ WARNING: To reduce the risk of serious personal injury, read and follow all warnings, notes, and instructions in the seat removal and installation procedure.**

Install the affected seat. For additional information, refer to [Front Seat](#) in this section.

4. **⚠ WARNING: To reduce the risk of serious personal injury, read and follow all warnings, cautions, notes, and instructions in the supplemental restraint system (SRS) deactivation and reactivation procedure.**

Reactivate the supplemental restraint system (SRS). For additional information, refer to [Supplemental Restraint System \(SRS\) Deactivation and Reactivation](#) in this section.

5. **⚠ WARNING: The restraint system diagnostic tool is for restraint system service only. Remove from the vehicle prior to road use. Failure to remove could result in injury and possible violation of vehicle safety standards.**

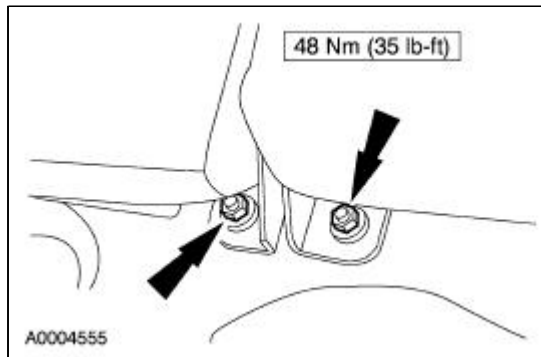
With all the restraint system diagnostic tools removed, prove out the supplemental restraint system (SRS). For additional information, refer to [Section 501-20B](#).

6. Check the active restraint system for correct operation. For additional information, refer to [Section 501-20A](#).

Seat —Rear Seatback

Removal and Installation



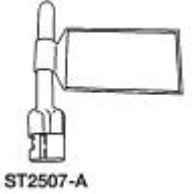
1. From the luggage compartment, release and fold down the seat backrest.
2. Remove the rear seat backrest nuts and remove the seat backrest.




3. To install, reverse the removal procedure.
-


Heated Seat Module

Special Tool(s)

 ST2502-A	Diagnostic Tool, Restraint System (2 Req'd) 418-F395
 ST2506-A	Diagnostic Tool, Restraint System (3 Req'd) 418-F088 (105-R0012)
 ST2507-A	Diagnostic Tool, Restraint System (2 Req'd) 418-133 (40-009)

Removal


 **WARNING:** Always wear safety glasses when repairing a air bag supplemental restraint system (SRS) vehicle and when handling an airbag module. This will reduce the risk of injury in the event of an accidental deployment.

 **WARNING:** After deployment, the air bag surface can contain deposits of sodium hydroxide, a product of the gas generant combustion that is irritating to the skin. Wash your hands with soap and water afterwards.

 **WARNING:** Never probe the connectors on the air bag module. Doing so can result in air bag deployment, which can result in personal injury.

NOTE: The left side is shown, the right side is similar.

1. Prepare the vehicle for heated seat module removal.


-  **WARNING:** To avoid accidental deployment and possible personal injury, the backup power supply must be depleted before repairing or replacing any front or side air bag supplemental restraint system (SRS) components and before servicing, replacing, adjusting or striking components near the front or side air bag sensors, such as doors, instrument panel, console, door latches, strikers, seats and hood latches.

Please refer to the appropriate vehicle shop manual to determine location of the front air bag sensors.

The side air bag sensors are located at or near the base of the B-pillar.

To deplete the backup power supply energy, disconnect the battery ground cable and wait at least one minute. Be sure to disconnect auxiliary batteries and power supplies (if equipped).

Disconnect the battery ground cable (14301) and wait at least one minute. For additional information, refer to [Section 414-01](#).

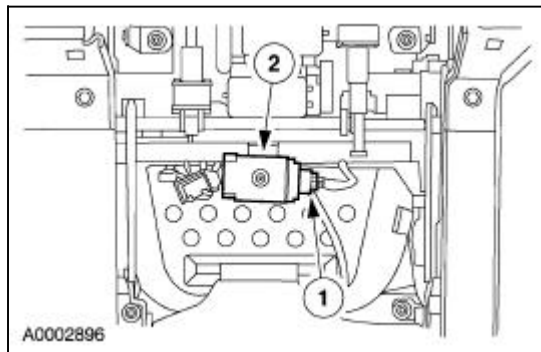
2.  **WARNING:** To reduce the risk of serious personal injury, read and follow all warnings, cautions, notes, and instructions in the supplemental restraint system (SRS) deactivation and reactivation procedure.

Deactivate the supplemental restraint system (SRS). For additional information, refer to [Supplemental Restraint System \(SRS\) Deactivation and Reactivation](#) in this section.

3.  **WARNING:** To reduce the risk of serious personal injury, read and follow all warnings, cautions, notes, and instructions in the seat removal and installation procedure.

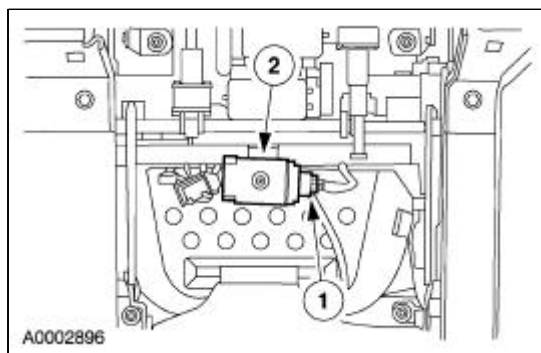
Remove the affected seat. For additional information, refer to [Front Seat](#) in this section.


2. Remove the heated seat module.
 1. Disconnect the electrical connector.
 2. Remove the module.




Installation

1. Install the heated seat module.
 1. Connect the electrical connector.
 2. Install the module.




2. Restore the vehicle to operating condition.
 1.  **WARNING:** To reduce the risk of serious personal injury, read and follow all warnings, notes, and instructions in the seat removal and installation procedure.

Install the affected seat. For additional information, refer to [Front Seat](#) in this section.

2.  **WARNING: To reduce the risk of serious personal injury, read and follow all warnings, cautions, notes, and instructions in the supplemental restraint system (SRS) deactivation and reactivation procedure.**

Reactivate the supplemental restraint system (SRS). For additional information, refer to [Supplemental Restraint System \(SRS\) Deactivation and Reactivation](#) in this section.



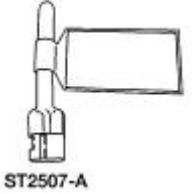
3.  **WARNING: The restraint system diagnostic tool is for restraint system service only. Remove from the vehicle prior to road use. Failure to remove could result in injury and possible violation of vehicle safety standards.**

With all the restraint system diagnostic tools removed, prove out the supplemental restraint system (SRS). For additional information, refer to [Section 501-20B](#).


4. Check the active restraint system for correct operation. For additional information, refer to [Section 501-20A](#).
-


Motor —Front Seat Lumbar

Special Tool(s)

 ST2502-A	Diagnostic Tool, Restraint System (2 Req'd) 418-F395
 ST2506-A	Diagnostic Tool, Restraint System (3 Req'd) 418-F088 (105-R0012)
 ST2507-A	Diagnostic Tool, Restraint System (2 Req'd) 418-133 (40-009)

Removal


 **WARNING:** Always wear safety glasses when repairing a air bag supplemental restraint system (SRS) vehicle and when handling an airbag module. This will reduce the risk of injury in the event of an accidental deployment.

 **WARNING:** After deployment, the air bag surface can contain deposits of sodium hydroxide, a product of the gas generant combustion that is irritating to the skin. Wash your hands with soap and water afterwards.

 **WARNING:** Never probe the connectors on the air bag module. Doing so can result in air bag deployment, which can result in personal injury.

NOTE: The left side is shown, the right side is similar.

1. Prepare the vehicle for front seat lumbar motor removal.


1.  **WARNING:** To avoid accidental deployment and possible personal injury, the backup power supply must be depleted before repairing or replacing any front or side air bag supplemental restraint system (SRS) components and before servicing, replacing, adjusting or striking components near the front or side air bag sensors, such as doors, instrument panel, console, door latches, strikers, seats and hood latches.

Please refer to the appropriate vehicle shop manual to determine location of the front air bag sensors.

The side air bag sensors are located at or near the base of the B-pillar.

To deplete the backup power supply energy, disconnect the battery ground cable and wait at least one minute. Be sure to disconnect auxiliary batteries and power supplies (if equipped).

Disconnect the battery ground cable (14301) and wait at least one minute. For additional information, refer to [Section 414-01](#).

2.  **WARNING: To reduce the risk of serious personal injury, read and follow all warnings, cautions, notes, and instructions in the supplemental restraint system (SRS) deactivation and reactivation procedure.**


Deactivate the supplemental restraint system (SRS). For additional information, refer to [Supplemental Restraint System \(SRS\) Deactivation and Reactivation](#) in this section.

3.  **WARNING: To reduce the risk of serious personal injury, read and follow all warnings, cautions, notes, and instructions in the seat removal and installation procedure.**

Remove the affected seat. For additional information, refer to [Front Seat](#) in this section.

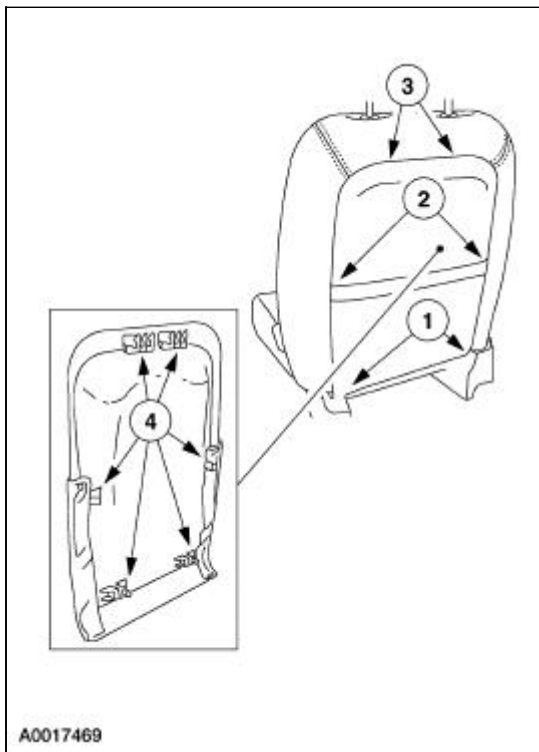
2.  **WARNING: Front seat back trim covers installed on seats equipped with side air bags cannot be repaired, they are to be replaced (cleaning is permissible).**

 **CAUTION: When removing the seat backrest trim panel, be careful not to damage the J-hooks. If the seat backrest trim panel J-hooks are damaged, install a new seat backrest trim panel.**

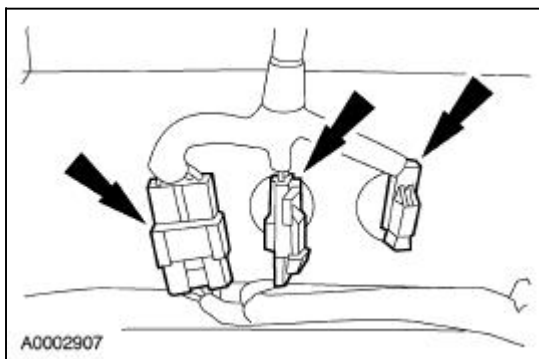
 **CAUTION: When removing the seat backrest trim panel, be careful not to damage the pin-type retainers. Pulling towards you, use a smooth, controlled force to release the pin-type retainers.**

Remove the seat backrest trim panel.

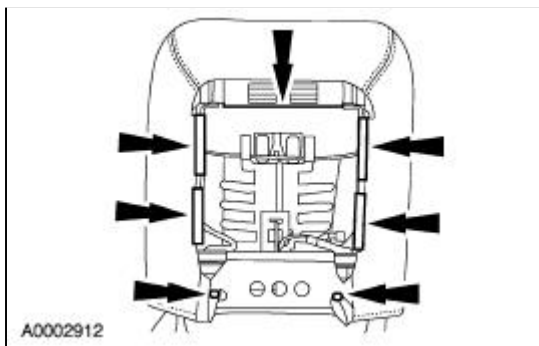
1. Pull and release the pin-type retainers at the bottom of the seat backrest trim panel.
2. While holding the seat backrest trim panel at the bottom, push in on the left side of the panel at the lip of the map pocket and slide it to the right to disengage the J-hook. Repeat this process for the right side J-hook but slide the panel to the left to disengage the J-hook.
3. While pushing in at the top of the seat backrest trim panel, slide it down to disengage the top J-hooks.
4. Remove the seat backrest trim panel and inspect the J-hooks and pin-type retainers for damage. Discard any damaged retainers and install new.



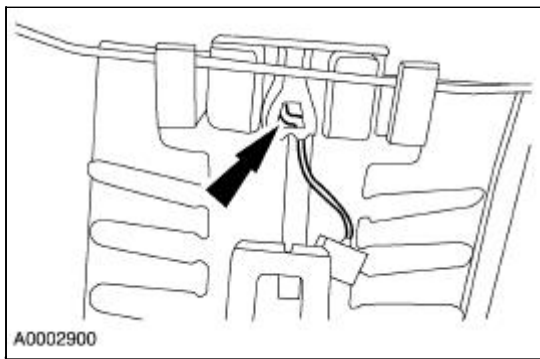
3. Disconnect the electrical connectors.
 - Release the electrical connector locators.



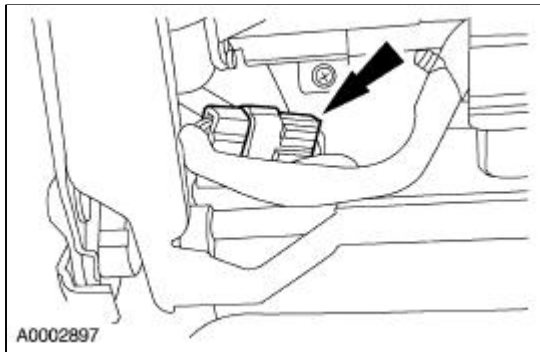
4. Release the J-retainers and pin-type retainers.



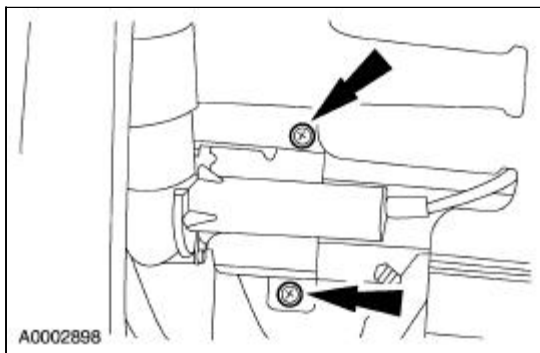
5. Remove the retaining hook.




6. Disconnect the lumbar motor electrical connector.



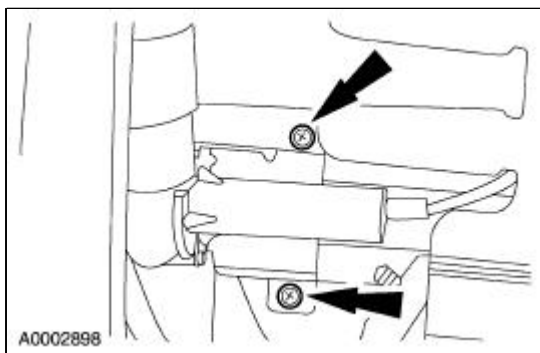
7. Remove the screws and the front seat lumbar motor.



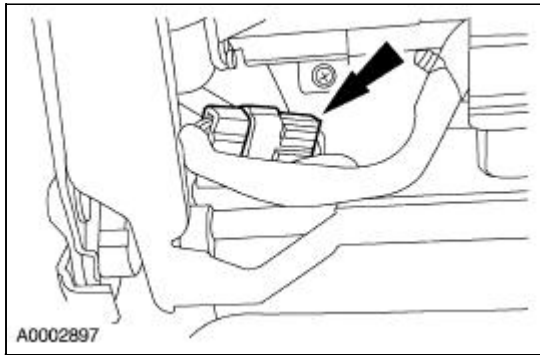
Installation

 **WARNING:** To reduce the risk of serious personal injury, read and follow all warnings and notes at the beginning of the removal procedure.

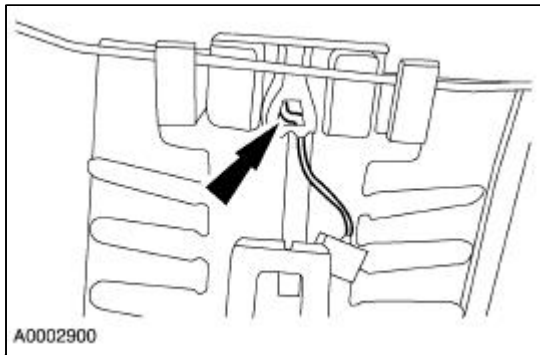
1. Install the front seat lumbar motor and the screws.



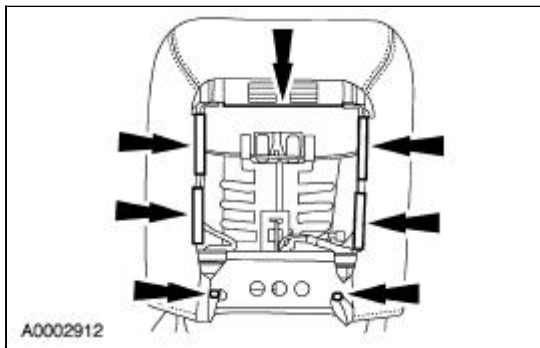
2. Connect the lumbar motor electrical connector.



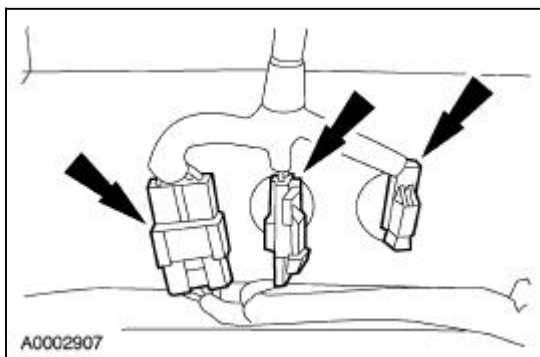
3. Install the retaining hook.




4. Install the J-retainers and pin-type retainers.



5. Connect the electrical connectors.
 - Install the electrical connector locators.

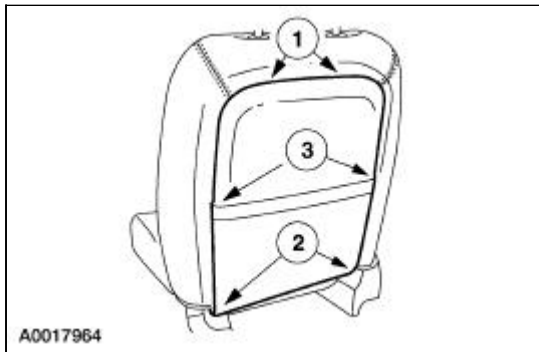


6.  **CAUTION: Inspect the seat backrest trim panel J-hooks for damage. If damaged, install a new seat backrest trim panel.**


NOTE: If re-installing the original seat backrest trim panel, install new pin-type retainers.

Install the seat backrest trim panel.


1. Angle the top of the seat backrest trim panel inward and up to engage the upper J-hooks to the seat backrest frame.
2. While holding the seat backrest trim panel up, align the new pin-type retainers at the bottom of the seat backrest trim panel and install them into the seat backrest frame.
3. With the palm of your hand, install the J-clips by pushing down on the seat backrest trim panel and towards the center of the seat.
 - Check the retention of the seat backrest trim panel by lightly pulling on the bottom, sides, and top where the retainers are located.




7. Restore the vehicle to operating condition.

1.  **WARNING: To reduce the risk of serious personal injury, read and follow all warnings, notes, and instructions in the seat removal and installation procedure.**

Install the affected seat. For additional information, refer to [Front Seat](#) in this section.

2.  **WARNING: To reduce the risk of serious personal injury, read and follow all warnings, cautions, notes, and instructions in the supplemental restraint system (SRS) deactivation and reactivation procedure.**

Reactivate the supplemental restraint system (SRS). For additional information, refer to [Supplemental Restraint System \(SRS\) Deactivation and Reactivation](#) in this section.


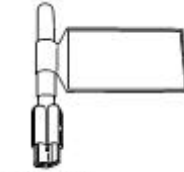
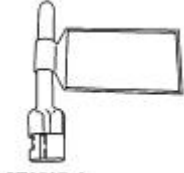
3.  **WARNING: The restraint system diagnostic tool is for restraint system service only. Remove from the vehicle prior to road use. Failure to remove could result in injury and possible violation of vehicle safety standards.**

With all the restraint system diagnostic tools removed, prove out the supplemental restraint system (SRS). For additional information, refer to [Section 501-20B](#).


4. Check the active restraint system for correct operation. For additional information, refer to [Section 501-20A](#).
-


Front Seat Cushion

Special Tool(s)

 ST2502-A	Diagnostic Tool, Restraint System (2 Req'd) 418-F395
 ST2506-A	Diagnostic Tool, Restraint System (3 Req'd) 418-F088 (105-R0012)
 ST2507-A	Diagnostic Tool, Restraint System (2 Req'd) 418-133 (40-009)

Disassembly

 **WARNING:** Always wear safety glasses when repairing a air bag supplemental restraint system (SRS) vehicle and when handling an airbag module. This will reduce the risk of injury in the event of an accidental deployment.

 **WARNING:** After deployment, the air bag surface can contain deposits of sodium hydroxide, a product of the gas generant combustion that is irritating to the skin. Wash your hands with soap and water afterwards.


 **WARNING:** Never probe the connectors on the air bag module. Doing so can result in air bag deployment, which can result in personal injury.

NOTE: The left side is shown, the right side is similar.

NOTE: If a side air bag deployment took place the seatback pad, trim cover, and side air bag module must be replaced. The seatback frame should be replaced if necessary.

All seats

1. Prepare the vehicle for front seat cushion disassembly.

1.  **WARNING:** To avoid accidental deployment and possible personal injury, the backup power supply must be depleted before repairing or replacing any front or side air bag supplemental restraint system (SRS) components and before servicing, replacing, adjusting or striking components near the front or side air


bag sensors, such as doors, instrument panel, console, door latches, strikers, seats and hood latches.

Please refer to the appropriate vehicle shop manual to determine location of the front air bag sensors.

The side air bag sensors are located at or near the base of the B-pillar.

To deplete the backup power supply energy, disconnect the battery ground cable and wait at least one minute. Be sure to disconnect auxiliary batteries and power supplies (if equipped).

Disconnect the battery ground cable (14301) and wait at least one minute. For additional information, refer to [Section 414-01](#).

2.  **WARNING:** To reduce the risk of serious personal injury, read and follow all warnings, cautions, notes, and instructions in the supplemental restraint system (SRS) deactivation and reactivation procedure.


Deactivate the supplemental restraint system (SRS). For additional information, refer to [Supplemental Restraint System \(SRS\) Deactivation and Reactivation](#) in this section.

3.  **WARNING:** To reduce the risk of serious personal injury, read and follow all warnings, cautions, notes, and instructions in the seat removal and installation procedure.

Remove the affected seat. For additional information, refer to [Front Seat](#) in this section.

2.  **WARNING:** Front seat back trim covers installed on seats equipped with side air bags cannot be repaired, they are to be replaced (cleaning is permissible).

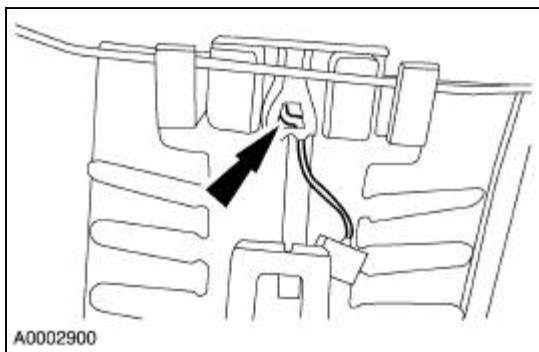
 **CAUTION:** When removing the seat backrest trim panel, be careful not to damage the J-hooks. If the seat backrest trim panel J-hooks are damaged, install a new seat backrest trim panel.

 **CAUTION:** When removing the seat backrest trim panel, be careful not to damage the pin-type retainers. Pulling towards you, use a smooth, controlled force to release the pin-type retainers.

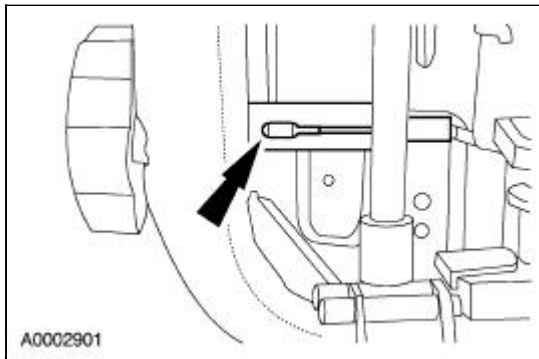
Remove the seat backrest trim panel.

Seats with manual lumbar

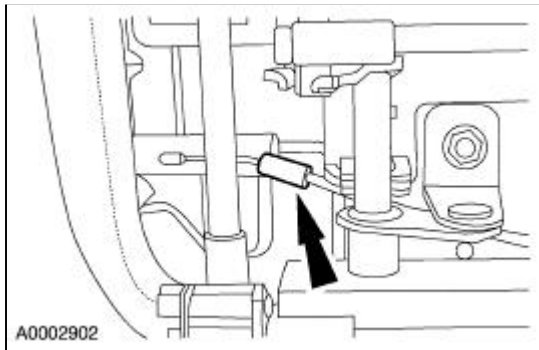
3. Remove the retaining hook.



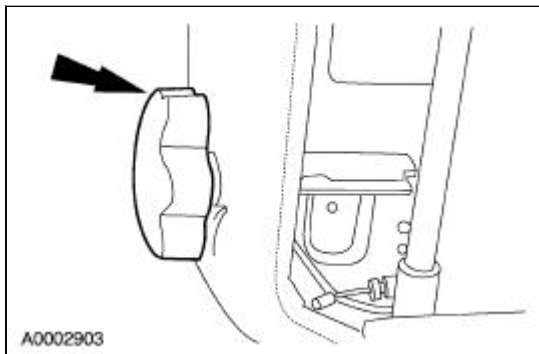
4. Align the end of the adjusting cable in the slot.



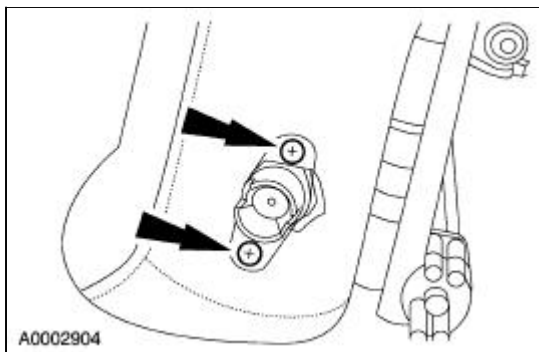
5. Release the adjusting cable.



6. Remove the manual lumbar knob.



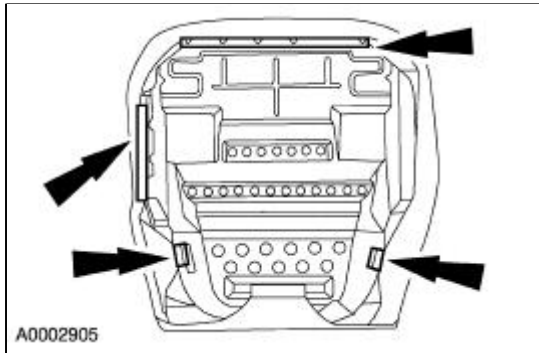
7. Remove the manual lumbar screws.




All seats

8. Remove the front cushion side shield. For additional information, refer to [Seat—Front Cushion Side Shield](#) in this section.

9. Remove the seat track. For additional information, refer to [Seat Track](#) in this section.
10. Remove the seat regulator control switch. For additional information, refer to [Seat Control Switch](#) in this section.
11. Release the J-hooks and seat cushion trim cover.

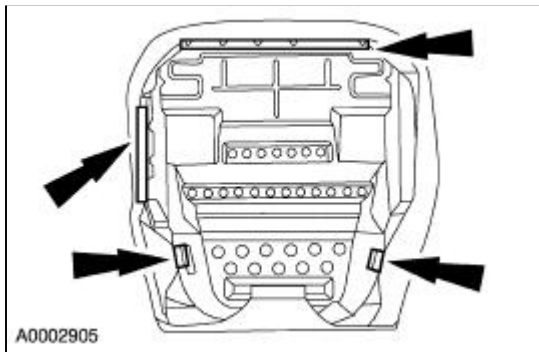


Assembly

 **WARNING:** To reduce the risk of serious personal injury, read and follow all warnings, cautions, and notes at the beginning of the removal procedure.

All seats

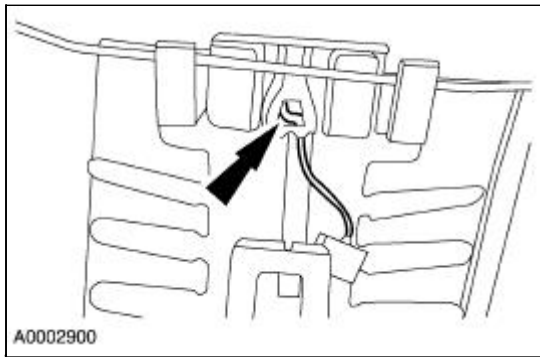
1. Install the J-hooks and the seat trim cover.



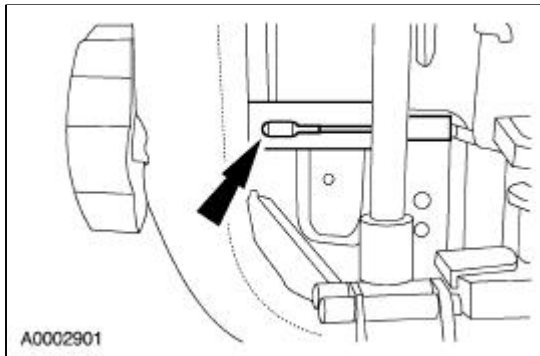
2. Install the front cushion side shield. For additional information, refer to [Seat—Front Cushion Side Shield](#) in this section.
3. Install the seat track. For additional information, refer to [Seat Track](#) in this section.
4. Install the seat regulator control switch. For additional information, refer to [Seat Control Switch](#) in this section.

Seats with manual lumbar

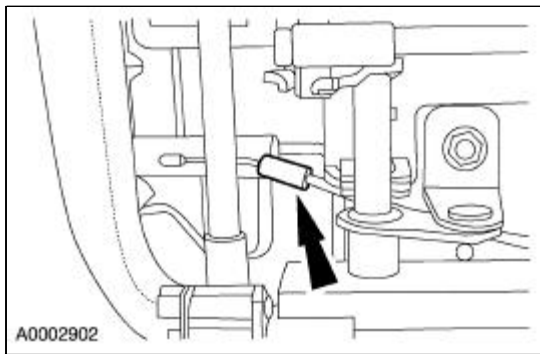
5. Install the retaining hook.



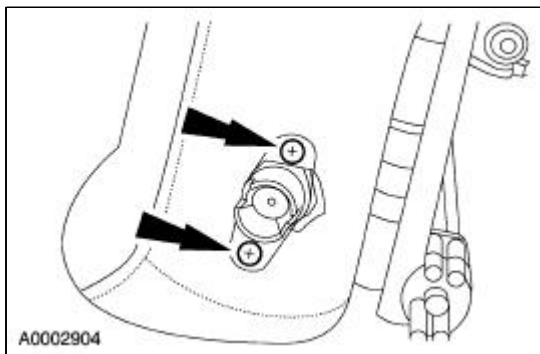
6. Align the end of the adjusting cable in the slot.



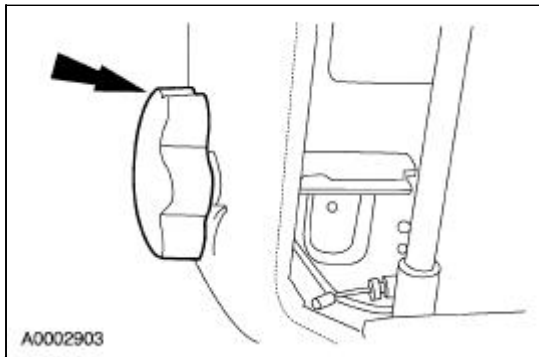
7. Install the adjusting cable.



8. Install the manual lumbar screws.



9. Install the manual lumbar knob.



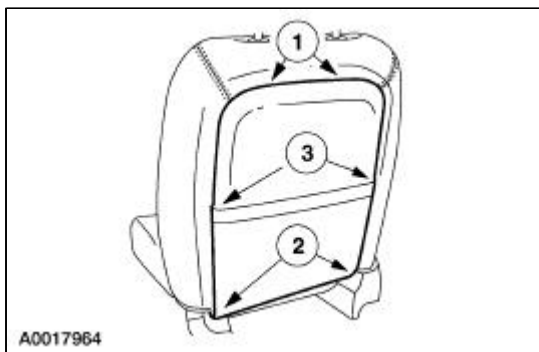
All seats

10.  **CAUTION: Inspect the seat back trim panel J-hooks for damage. If damaged, install a new seat back trim panel.**


NOTE: If re-installing the original seat backrest trim panel, install new pin-type retainers.

Install the seat backrest trim panel.


1. Angle the top of the seat backrest trim panel inward and up to engage the upper J-hooks to the seat backrest frame.
2. While holding the seat backrest trim panel up, align the pin-type retainers at the bottom of the seat backrest trim panel and install them into the seat backrest frame.
3. With the palm of your hand, install the J-clips by pushing down on the seat backrest trim panel and towards the center of the seat.
 - Check the retention of the seat backrest trim panel by lightly pulling on the bottom, sides, and top where the retainers are located.




11. Restore the vehicle to operating condition.

1.  **WARNING: To reduce the risk of serious personal injury, read and follow all warnings, notes, and instructions in the seat removal and installation procedure.**

Install the affected seat. For additional information, refer to [Front Seat](#) in this section.

2.  **WARNING: To reduce the risk of serious personal injury, read and follow all warnings, cautions, notes, and instructions in the supplemental restraint system (SRS) deactivation and reactivation procedure.**

Reactivate the supplemental restraint system (SRS). For additional information, refer to [Supplemental Restraint System \(SRS\) Deactivation and Reactivation](#) in this section.


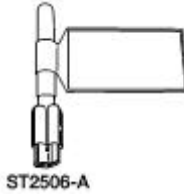
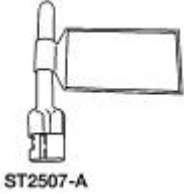
3.  **WARNING: The restraint system diagnostic tool is for restraint system service only. Remove from the vehicle prior to road use. Failure to remove could result in injury and possible violation of vehicle safety standards.**

With all the restraint system diagnostic tools removed, prove out the supplemental restraint system (SRS). For additional information, refer to [Section 501-20B](#).


4. Check the active restraint system for correct operation. For additional information, refer to [Section 501-20A](#).
-


Front Seat Backrest

Special Tool(s)

 ST2502-A	Diagnostic Tool, Restraint System (2 Req'd) 418-F395
 ST2506-A	Diagnostic Tool, Restraint System (3 Req'd) 418-F088 (105-R0012)
 ST2507-A	Diagnostic Tool, Restraint System (2 Req'd) 418-133 (40-009)

Disassembly

 **WARNING:** Always wear safety glasses when repairing a air bag supplemental restraint system (SRS) vehicle and when handling an airbag module. This will reduce the risk of injury in the event of an accidental deployment.


 **WARNING:** After deployment, the air bag surface can contain deposits of sodium hydroxide, a product of the gas generant combustion that is irritating to the skin. Wash your hands with soap and water afterwards.

 **WARNING:** Never probe the connectors on the air bag module. Doing so can result in air bag deployment, which can result in personal injury.

NOTE: If a side air bag deployment took place the seatback pad, trim cover, and side air bag module must be replaced. The seatback frame should be replaced if necessary.

NOTE: The left side is shown, the right side is similar.

1. Prepare the vehicle for front seat backrest removal.


1.  **WARNING:** To avoid accidental deployment and possible personal injury, the backup power supply must be depleted before repairing or replacing any front or side air bag supplemental restraint system (SRS) components and before servicing, replacing, adjusting or striking components near the front or side air bag sensors, such as doors, instrument panel, console, door latches, strikers, seats and hood latches.

Please refer to the appropriate vehicle shop manual to determine location of the front air bag sensors.


The side air bag sensors are located at or near the base of the B-pillar.

To deplete the backup power supply energy, disconnect the battery ground cable and wait at least one minute. Be sure to disconnect auxiliary batteries and power supplies (if equipped).

Disconnect the battery ground cable (14301) and wait at least one minute. For additional information, refer to [Section 414-01](#).

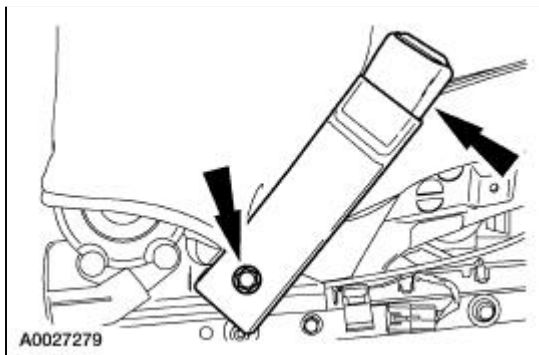
2.  **WARNING:** To reduce the risk of serious personal injury, read and follow all warnings, cautions, notes, and instructions in the supplemental restraint system (SRS) deactivation and reactivation procedure.

Deactivate the supplemental restraint system (SRS). For additional information, refer to [Supplemental Restraint System \(SRS\) Deactivation and Reactivation](#) in this section.

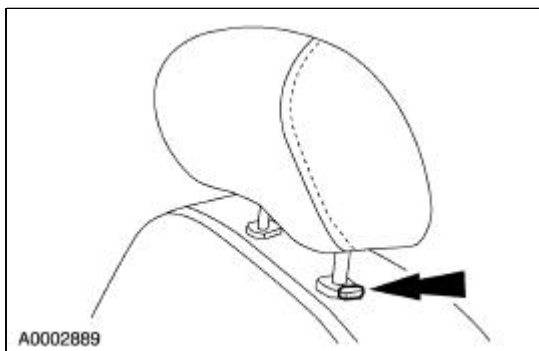
3.  **WARNING:** To reduce the risk of serious personal injury, read and follow all warnings, cautions, notes, and instructions in the seat removal and installation procedure.

Remove the affected seat. For additional information, refer to [Front Seat](#) in this section.

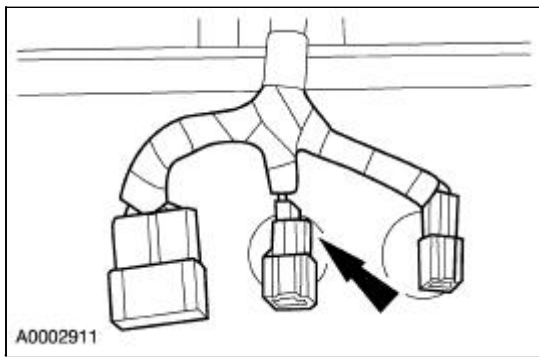
4. Remove the seat backrest. For more information, refer to [Front Seat Backrest](#) in this section.
2. Remove the front cushion side shield trim panel. For additional information, refer to [Seat—Front Cushion Side Shield](#) in this section.
3. Remove the bolt and the safety belt buckle.



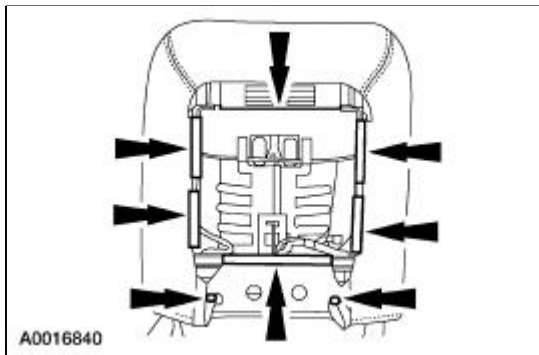
4. Remove the headrest.



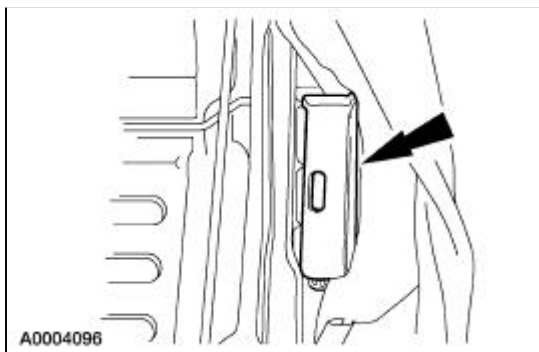
5. Release the electrical connector locators.



6. Release the J-retainers and pin-type retainers.



7. Reposition the seat backrest trim cover and pad and remove the side air bag module retaining nut cover.

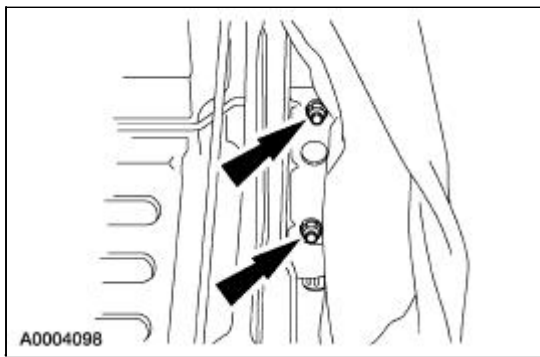


8. Push the wire harness and grommet through the seat backrest frame.

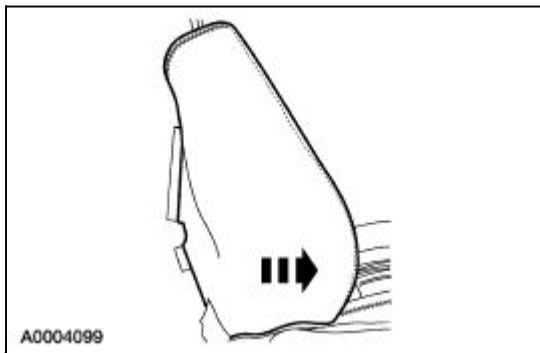


9. **NOTE:** If installing a new side air bag module, use new retaining nuts. If the same side air bag module is to be reused then reuse the side air bag module nuts.

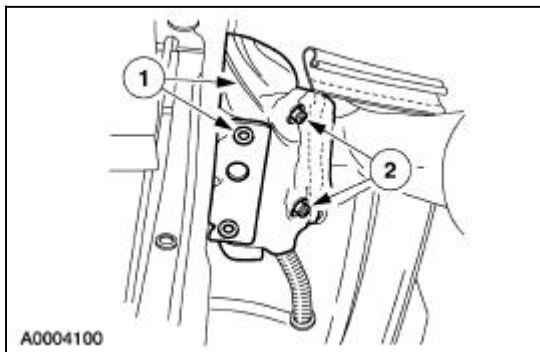
Remove the side air bag nuts. For additional information, refer to [Section 501-20B](#).



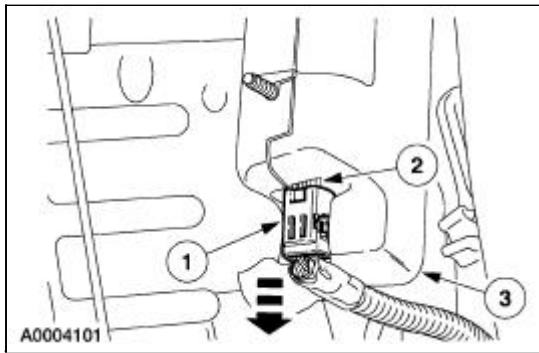
10. With one hand on the side air bag module, position the seat backrest trim cover and pad forward enough to access the side air bag module.



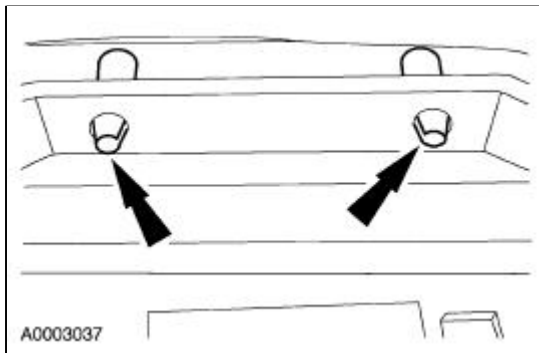
11. Remove the side air bag module from the deployment chute.
 1. Separate the side air bag module and deployment chute from the seat backrest mounting bracket.
 2. Pull the side air bag module mounting studs back through the deployment chute openings and remove the side air bag module from the deployment chute.



12. Disconnect and remove the side air bag module.
 1. Slide the side air bag electrical connector locking clip to disengage it.
 2. Release the two connector tabs (one shown) by pushing in on them and disconnect the side air bag module.
 3. Remove the side air bag module.



13. Pull back the cover to remove the headrest retaining clip.



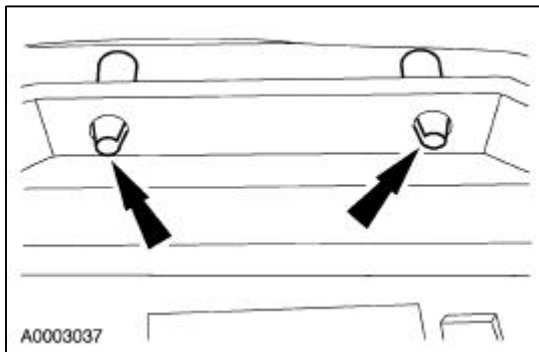
14. Remove the seat backrest cover from the frame.

Assembly

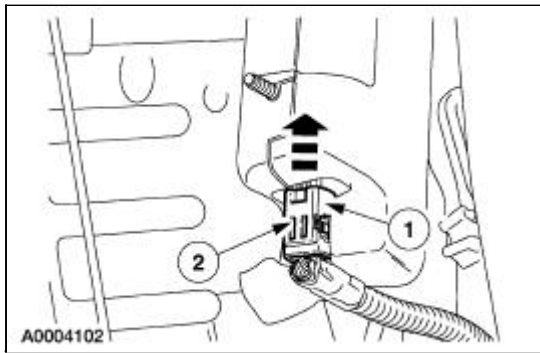


WARNING: To reduce the risk of serious personal injury, read and follow all warnings, cautions, and notes at the beginning of the removal procedure.

1. Position the seat backrest cover and install the headrest guides.



2. Install the seat backrest cover onto the frame.
3. Connect the side air bag module electrical connector.
 1. Install the connector to the side air bag module.
 2. Slide the side air bag module electrical connector locking clip to secure the connector to the side air bag module.



4. Make sure the electrical connector is securely fastened to the side air bag module.

⚠ WARNING: Inspect the mounting surfaces of the side air bag module for any foreign objects before installing the side air bag module. If any foreign objects are found, remove them. Failure to do so may result in personal injury in the event of an air bag deployment.

⚠ WARNING: Inspect the side air bag deployment chute and the side air bag cavity in the seat back pad for any foreign objects. If any foreign objects are found, remove them. Failure to do so may result in personal injury in the event of an air bag deployment.

⚠ WARNING: Before installing the side air bag module into the deployment chute, check it for damage and foreign objects. If the air bag module is damaged, replace it. If any foreign objects are found, remove them. Failure to do so may result in personal injury in the event of an air bag deployment.

⚠ WARNING: If the air bag cover has separated or the air bag material has been exposed, install a new side air bag module. Do not attempt to repair the air bag module. Failure to do so may result in personal injury in the event of an air bag deployment.

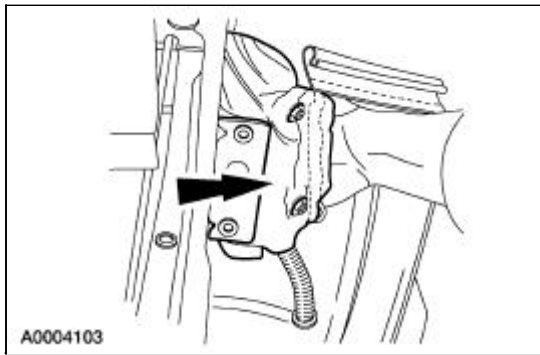
⚠ WARNING: Check the side air bag deployment chute for damage. The deployment chute must not be repaired. If there is any damage to the deployment chute, the seat back trim cover and deployment chute must be installed new as a unit.


⚠ WARNING: If the air bag deployment chute is not properly positioned, the side air bag may not deploy properly.

5. **NOTE:** The alignment pin will only allow the side air bag module to be installed to the seat backrest mounting bracket one way.

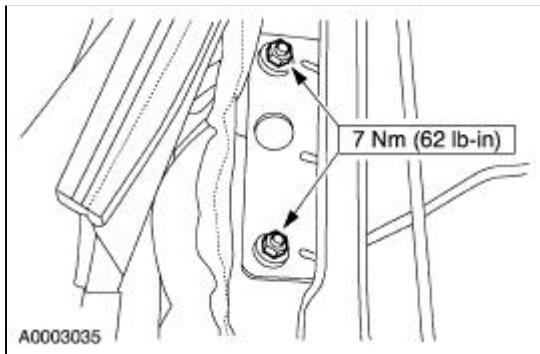
Position the side air bag module into the deployment chute.

- Position the side air bag module into the deployment chute with the alignment pin offset to the top and the electrical connector to the bottom of the seat backrest. This will position the alignment pin correctly when the side air bag module and deployment chute are mounted to the seat backrest frame mounting bracket.
- The side air bag module mounting studs must come through the deployment chute stud openings.

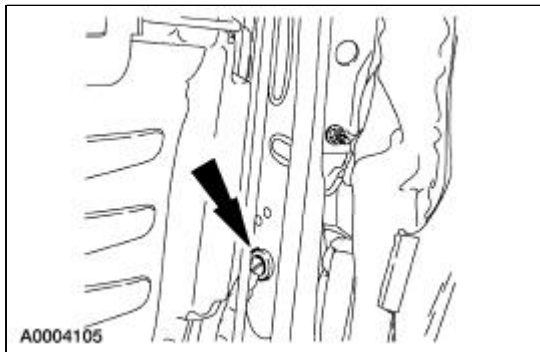


6.  **WARNING:** Inspect the mounting surfaces of the deployment chute and the seat back frame mounting bracket for any foreign objects before installing the side air bag module/deployment chute assembly. If any foreign objects are found, remove them. Failure to do so may result in personal injury in the event of an air bag deployment.

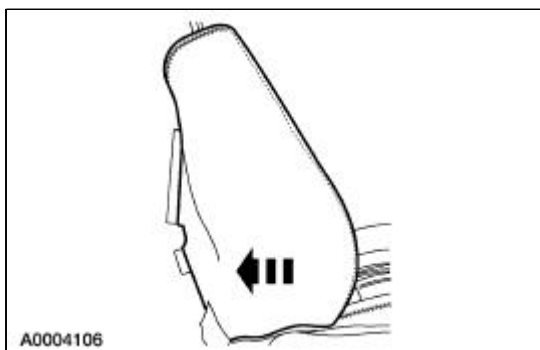
Install the new side air bag module retaining nuts and tighten to specification.



7. Pull the wire harness back through the hole in the seat backrest frame and seat the grommet.

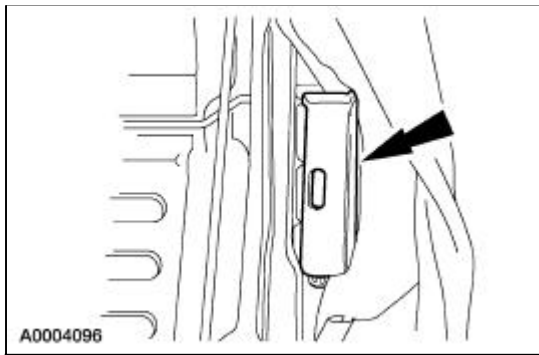


8. Reposition the seat backrest pad and trim cover to the seat backrest frame.

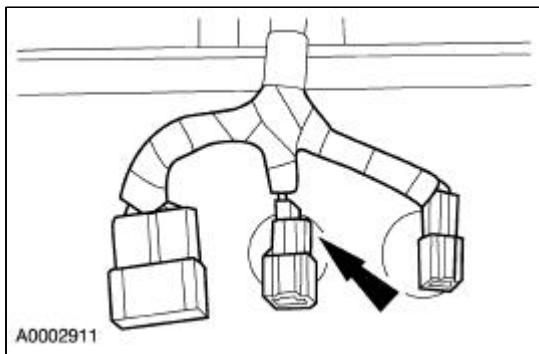


9. Attach the side air bag retaining nut cover.

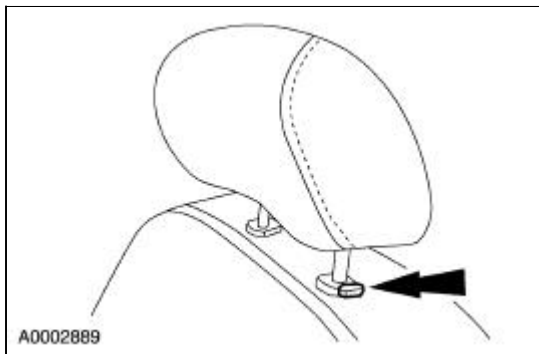
- Check that all three attaching clips on the side air bag nuts cover are correctly installed around the side air bag mounting bracket.



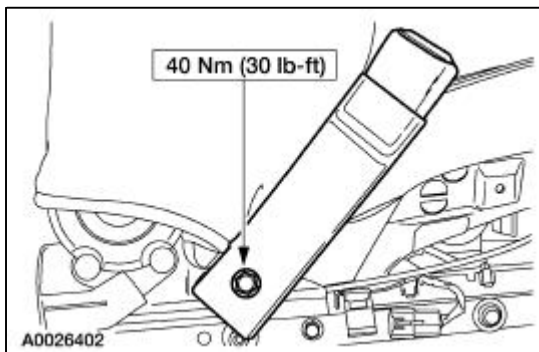
10. Install the electrical connector locators.



11. Install the headrest.




12. Position the front seat safety belt buckle. Install the bolt.




13. Install the front cushion side shield trim panel. For additional information, refer to [Seat—Front Cushion Side Shield](#) in this section.

14. Restore the vehicle to operating condition.


1. Install the seat backrest. For additional information, refer to [Front Seat Backrest](#) in this section.

2.  **WARNING: To reduce the risk of serious personal injury, read and follow all warnings, notes, and instructions in the seat removal and installation procedure.**

Install the affected seat. For additional information, refer to [Front Seat](#) in this section.

3.  **WARNING: To reduce the risk of serious personal injury, read and follow all warnings, cautions, notes, and instructions in the supplemental restraint system (SRS) deactivation and reactivation procedure.**

Reactivate the supplemental restraint system (SRS). For additional information, refer to [Supplemental Restraint System \(SRS\) Deactivation and Reactivation](#) in this section.

4.  **WARNING: The restraint system diagnostic tool is for restraint system service only. Remove from the vehicle prior to road use. Failure to remove could result in injury and possible violation of vehicle safety standards.**

With all the restraint system diagnostic tools removed, prove out the supplemental restraint system (SRS). For additional information, refer to [Section 501-20B](#).

5. Check the active restraint system for correct operation. For additional information, refer to [Section 501-20A](#).

**WINDOW REGULATOR ELECTRIC DRIVE
CURRENT DRAW**

Description	Specification
No load	5 amperes or less at 12.8 volts

Lubricants

Item	Specification
Urethane Glass Prep Essex U-401	WSB-M2G314-B
Urethane Glass Primer Essex U-402	WSB-M5B280-C
Urethane Metal Primer Essex U-413	WSB-M2G234-C
Urethane Adhesive 400-HV	WSB-M2G316-B
Urethane Adhesive Essex U-216	WSB-M2G316-B
Rear Window Defroster Repair D8AZ-19562-AA or equivalent	WSB-M4J58-B
Dark Walnut Metallic Acrylic Lacquer Touch Up Paint ALBZ-19500-5858A or equivalent	ESR-M2-P100-C

Torque Specifications

Description	Nm	lb-ft	lb-in
Anti-theft shield screw	10	—	89
Door lock cylinder nut	10	—	89
Front door window regulator assembly bolts	5	—	44
Front door inner support bolts	12	9	—
Front window regulator to glass bolts	12	9	—
Inner front door support bracket nuts	12	9	—
Latch screws	13	10	—
Window motor screws	3	—	27
Rear door inner support bolts	12	9	—
Rear door window regulator bolts and nuts	5	—	44

Glass, Frames and Mechanisms

The glass, frames and mechanisms include:

- front door window motor
- rear door window motor
- master window regulator control switch
- back window glass
- front door window glass
- rear door window glass
- rear quarter window glass
- front door window regulator
- rear door window regulator
- windshield glass

Window, One-Touch Down

The driver window one-touch down feature is activated by pressing the master window regulator control switch to the second down position. This allows the front door window glass to move downward until it is fully lowered. Momentarily pressing the window regulator control switch while the window is moving downward will stop the front door window glass.

Window Glass, Door

The bottom of the door window glass is mounted on a slider bracket which is part of the door window regulator. Door window glass bracket spacers provide attachment points for the door window glass and prevent direct contact between the slider bracket and the door window glass.

Switch, Window Regulator Control

Power windows are standard in the LS series. The master window regulator control switch can be used to power any or all of the power windows. A single window regulator control is located on all passenger door armrests to activate the individual power window only.



Motor, Window Regulator

The front and rear window regulator motors are replaced separately.

Glass, Frames and Mechanisms

Refer to Wiring Diagrams Section [501-11](#) for schematic and connector information.

Special Tool(s)

 ST2332-A	Worldwide Diagnostic System (WDS) 418-F224, New Generation STAR (NGS) Tester 418-F052, or equivalent diagnostic tool
 ST1137-A	73III Automotive Meter 105-R0057 or equivalent

Principles of Operation

Front Electronics Module (FEM) and Rear Electronics Module (REM)

The front electronics module (FEM) receives inputs and delivers outputs to a majority of the electronically controlled features which reside primarily in the front section of the vehicle. The rear electronics module (REM) receives inputs and delivers outputs to a majority of the electronically controlled features which reside primarily in the rear section of the vehicle. The FEM and REM are configurable modules and must be correctly configured to the vehicle. The modules may also be configured to allow additional features or functions to be added to the vehicle. The FEM and REM do not have any optional window control configurations.

Driver Door Module (DDM)

The DDM receives inputs from the remote keyless entry transmitter and hardwired components such as the master window regulator control switch and delivers outputs in the form of SCP network messages and hardwired component control. The DDM is a configurable module and must be correctly configured to the vehicle. The DDM may also be configured to allow additional features or functions to be added to the vehicle. The only DDM window feature that can be optionally configured is the window global open and close feature.

Module Inputs and Outputs

This system is unique in that many of the inputs that the FEM, REM and DDM receive are over the SCP communication network. These input messages come from other modules connected to the

network. The FEM, REM and DDM will interpret the inputs, and in turn command the correct output that was requested. The modules also receive inputs which come directly from components which are hardwired to the modules such as the window regulator control switches.

One type of output the modules provide is over the SCP communication network in the form of messages. These types of outputs are usually generated from a module monitoring a hardwired input and sending a status message to another module. These outputs are commonly required by other modules to carry out their functions. The second type of output is the control of a component directly hardwired to the module.

Master Window Regulator Control Switch

The master window regulator control switch is hardwired to the DDM. Activating the master window regulator control switch sends a voltage signal to the DDM. The DDM will interpret the signal and control the power and ground to the driver front window regulator electric drive.

Activation of any of the passenger window switches on the master window regulator control switch sends a voltage signal to the DDM. The DDM interprets the signal and sends out the appropriate message over the SCP communication network. For the passenger front window, the FEM will interpret the DDM message and control the passenger front window regulator electric drive. For the rear passenger windows, the REM will interpret the DDM message and control the appropriate rear window regulator electric drive.

The driver one-touch down feature allows the driver front window to be lowered without holding the master window regulator control switch. Activation of the master window regulator control switch to the second down position sends a separate voltage signal to the DDM. The DDM will then control the power and ground to the driver front window regulator electric drive until a switch input is received or the motor reaches a stalled condition.

Passenger Window Power Supply

The REM controls the power supply to all three remote window regulator control switches. To protect the REM from a potential failure, the REM will remove power from the common passenger window power supply when a short to ground is sensed in any remote window regulator control switch, associated circuitry or the power output circuit of the REM. Power will be restored to the power output circuit upon a cycling of the ignition switch. If the REM output circuit is shorted to ground, the REM will immediately remove power from the common power supply circuit. If any remote window regulator control switch or its associated circuits are shorted to ground, the power will remain on the REM output circuit until the switch or circuit containing the short to ground is activated.

Passenger Window Lock-Out

The master window regulator control switch incorporates a passenger window lock-out switch. Activating the passenger window lock-out switch sends a separate voltage signal to the DDM. The DDM will then output a message to the REM. The REM will in turn remove power from the common passenger window power supply circuit. The rear window operation will be allowed from the master window regulator control switch only.

Passenger Front Power Window

The passenger front power window is controlled by the FEM. The passenger front window regulator control switch is hardwired directly to the FEM. Activating the passenger front window regulator control

switch sends a voltage input to the FEM. The FEM then controls power and ground to the passenger front power window regulator electric drive, which is directly hardwired to the FEM. The voltage signal will only be received if the REM is supplying voltage to the remote window regulator control switch circuit.

The passenger front window can also be controlled by the master window regulator control switch. Activating the passenger front switch on the master window regulator control switch sends a voltage input to the DDM. The DDM will then send a message to the FEM over the network. The FEM then controls power and ground to the passenger front window regulator electric drive.

Left Rear (LR) and Right Rear (RR) Power Windows

The LR and RR power windows are controlled by the REM. Operating commands for the rear power windows are received in two forms, from the master window regulator control switch over the SCP communication network from the DDM, or directly from the LR or RR window regulator control switches, which are hardwired to the REM.

Activating the LR or RR switch on the master window regulator control switch causes the DDM to send a message to the REM over the SCP communication network. The REM will then control power and ground to the appropriate window regulator electric drive to raise or lower the window.

Activating either the LR or RR window regulator control switch sends a voltage signal to the REM. The REM will then control power and ground to the appropriate window regulator electric drive to raise or lower the window. A voltage signal will only be received if the window lock-out is OFF and the REM is supplying voltage to the remote window regulator control switch power circuit.

Rear Window Defrost

The rear window defrost feature is controlled by the REM, powertrain control module (PCM), and the dual automatic temperature control (DATC) module. The rear window defrost switch is incorporated in the climate control head. When the switch is selected ON, the DATC module will send a message over the SCP communication network to the REM. The REM will then check its other messages for vehicle rpm from the PCM. If the rpm message is received, the REM will then ground the rear window defrost relay coil control circuit which is hardwired to the REM. The ground signal closes the rear window defrost relay which applies power to the rear window grid through the antenna isolator module. Fault management of the rear window defrost feature will prevent the rear window defrost from operating when a rpm or ignition switch invalid/missing data message is received.

Diagnosis

The FEM, REM and DDM constantly monitor systems under their control and report a concern in the form of a diagnostic trouble code (DTC). DTCs can be retrieved with the diagnostic tool or an equivalent tester through the SCP communication network.

This vehicle's design makes it unique in that electronic functions are divided into zones. The DDM controls features near the driver front door. The FEM controls features in the front portion of the vehicle and the REM controls the features in the rear portion. These systems rely heavily on the SCP communication network in order to transmit and receive messages. It is vital when diagnosing this vehicle's electronic systems, to understand:

- where the input (command) originates.
- all input information messages necessary in order for a feature to operate correctly.

- which module(s) receive(s) the input (or command message).
- if the module which received the input (message) controls the output of the feature, or does it output a message over the communication network to another module.
- which module controls the output of the feature.

Delayed Accessory

Delayed accessory operation allows the power windows, radio and moon roof (if equipped) to operate for up to ten minutes after the ignition is turned to OFF. The delayed accessory function is controlled by the DDM. When the ignition switch is turned from RUN to OFF, the DDM will begin the timing sequence. If a door is opened or the ignition switch is activated to another position, the DDM will cancel the delayed accessory operation.

Heated Wiper Park

The heated wiper park grid (located within the lower painted area of the windshield) receives power from the heated wiper park relay located in the underhood auxiliary junction box (AJB). The heated wiper park relay coil is connected to a fused circuit from the underhood AJB. The heated wiper park relay is controlled by a switched ground from the DATC module controlled heated wiper park ON/OFF switch. The heated wiper park grid is automatically activated by the DATC module when ambient air temperature drops below 38° F (3° C), and can be manually activated by pushing the heated wiper park ON/OFF switch. The system can be manually switched OFF, and will shut off automatically when ambient air temperature rises above 38° F (3° C) or if the vehicle voltage is low.

Inspection and Verification

NOTE: The DATC module, DDM, FEM, and REM must be reconfigured upon replacement. For more information refer to [Section 418-01](#).

1. Verify the customer concern by operating the system.
2. Visually inspect for obvious signs of mechanical or electrical damage.

Visual Inspection Chart

Mechanical	Electrical
<ul style="list-style-type: none"> ● Window regulator ● Window run weatherstrip ● Door window glass 	<ul style="list-style-type: none"> ● Battery junction box (BJB) fuse(s): 409 (5A), 419 (30A), 420 (20A), 422 (30A), 425 (40A), 426 (30A), 427 (30A), 429 (30A), and 430 (20A) ● Central junction box (CJB) fuse 207 (5A) ● Underhood auxiliary junction box (AJB) fuse 113 (30A) ● Master window regulator control switch ● Remote window regulator control switch ● Window regulator electric drive ● DATC module ● DDM ● FEM ● REM ● Rear window defrost grid ● Heated wiper park grid ● Circuitry

3. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.

4. If the diagnostic tool does not power up, refer to the diagnostic tool manual.
5. Carry out the DATA LINK DIAGNOSTICS test. If the diagnostic tool responds with:
 - CKT 914, CKT 915 or CKT70 = ALL ECUS NO RESP/NOT EQUIP, refer to [Section 418-00](#).
 - NO RESP/NOT EQUIP for FEM, go to Pinpoint Test A.
 - NO RESP/NOT EQUIP for REM, go to Pinpoint Test B.
 - NO RESP/NOT EQUIP for DDM, go to Pinpoint Test C.
 - NO RESP/NOT EQUIP for DATC module, refer to [Section 412-00](#).
 - SYSTEM PASSED, retrieve and record the continuous diagnostic trouble codes (DTCs), clear the continuous DTCs and carry out self-test diagnostics for the FEM, REM, DDM, and DATC module.
6. If DTCs related to the DATC module are retrieved, refer to [Section 412-00](#).
7. If the DTCs retrieved are related to the concern, go to the FEM Diagnostic Trouble Code (DTC) Index, REM Diagnostic Trouble Code (DTC) Index, or DDM Diagnostic Trouble Code (DTC) Index.
8. If no DTCs related to the concern are retrieved, proceed to the Symptom Chart to continue the diagnostics.

FEM Diagnostic Trouble Code (DTC) Index

DTC	Description	Source	Action
B1319	Driver Door Ajar Circuit Failure	FEM	REFER to Section 417-02 .
B1327	Passenger Door Ajar Circuit Failure	FEM	REFER to Section 417-02 .
B1342	ECU Is Defective	FEM	CLEAR the DTC. REPEAT the FEM self-test. If DTC B1342 is retrieved, INSTALL a new FEM. REFER to Section 419-10 . CLEAR the DTCs. REPEAT the self-test.
B1438	Wiper Mode Select Switch Circuit Failure	FEM	REFER to Section 501-16 .
B1446	Wiper Park Sense Circuit Failure	FEM	REFER to Section 501-16 .
B1479	Wiper Washer Fluid Level Sensor Circuit Failure	FEM	REFER to Section 413-01 .
B1499	Lamp Turn Signal Left Circuit Failure	FEM	REFER to Section 417-01 .
B1501	Lamp Turn Signal Left Circuit Short to Battery	FEM	REFER to Section 417-01 .
B1503	Lamp Turn Signal Right Circuit Failure	FEM	REFER to Section 417-01 .
B1505	Lamp Turn Signal Right Circuit Short to Battery	FEM	REFER to Section 417-01 .
B1519	Hood Switch Circuit Failure	FEM	REFER to Section 419-01A .
B1567	Lamp Headlamp High-Beam	FEM	REFER to Section 417-01 .

	Circuit Failure		
B1676	Battery Pack Voltage Out of Range	FEM	REFER to Section 414-00 .
B1794	Lamp Headlamp Low-Beam Circuit Failure	FEM	REFER to Section 417-01 .
B2214	Window Passenger Front Up Switch Short to Battery	FEM	GO to Pinpoint Test G .
B2215	Window Passenger Front Down Switch Short to Battery	FEM	GO to Pinpoint Test G .
B2312	Mirror Passenger Horizontal Feedback Potentiometer Circuit Failure	FEM	REFER to Section 501-09 .
B2316	Mirror Passenger Vertical Feedback Potentiometer Circuit Failure	FEM	REFER to Section 501-09 .
B2477	Module Configuration Failure	FEM	REFER to Section 418-01 .
C1284	Oil Pressure Switch Failure	FEM	REFER to Section 413-01 .
C1446	Brake Switch Circuit Failure	FEM	REFER to Section 413-01 .
C1924	VAPS Solenoid Actuator Output Circuit Short to Ground	FEM	REFER to Section 211-00 .
C1925	VAPS Solenoid Actuator Return Circuit Failure	FEM	REFER to Section 211-00 .
U1027	SCP (J1850) Invalid or Missing Data for Engine RPM	PCM	CARRY OUT the PCM self-test. REFER to the Powertrain Control/Emissions Diagnosis (PC/ED) manual.
U1041	SCP (J1850) Invalid or Missing Data for Vehicle Speed	ABS	CARRY OUT the ABS self-test. REFER to Section 206-09A .
U1059	SCP (J1850) Invalid or Missing Data for Transmission / Transaxle / PRNDL	PCM	CARRY OUT the PCM self-test. REFER to the Powertrain Control/Emissions Diagnosis (PC/ED) manual.
U1218	SCP (J1850) Invalid or Missing Data for External Lamps	ICM	CARRY OUT the ICM self-test. REFER to Section 413-01 .
U1222	SCP (J1850) Invalid or Missing Data for Interior Lamps	ICM	CARRY OUT the ICM self-test. REFER to Section 413-01 .
U1227	SCP (J1850) Invalid or Missing Data for Body Status Request	ICM	CARRY OUT the ICM self-test. REFER to Section 413-01 .

FEM Parameter Identification (PID) Index

PID	Description	Expected Value
AL_EVT1	Last 8 Alarm Events	DROPEN, HOODTR, IGNTAM, PANIC, T_AJAR, RR_SD, LR_SD, P_DOOR, D_DOOR, RADIO, WINDO, ULTRS, NOEVNT, BB_SND

AL_EVT2	Last 8 Alarm Events	DROPEN, HOODTR, IGNTAM, PANIC, T_AJAR, RR_SD, LR_SD, P_DOOR, D_DOOR, RADIO, WINDO, ULTRS, NOEVNT, BB_SND
AL_EVT3	Last 8 Alarm Events	DROPEN, HOODTR, IGNTAM, PANIC, T_AJAR, RR_SD, LR_SD, P_DOOR, D_DOOR, RADIO, WINDO, ULTRS, NOEVNT, BB_SND
AL_EVT4	Last 8 Alarm Events	DROPEN, HOODTR, IGNTAM, PANIC, T_AJAR, RR_SD, LR_SD, P_DOOR, D_DOOR, RADIO, WINDO, ULTRS, NOEVNT, BB_SND
AL_EVT5	Last 8 Alarm Events	DROPEN, HOODTR, IGNTAM, PANIC, T_AJAR, RR_SD, LR_SD, P_DOOR, D_DOOR, RADIO, WINDO, ULTRS, NOEVNT, BB_SND
AL_EVT6	Last 8 Alarm Events	DROPEN, HOODTR, IGNTAM, PANIC, T_AJAR, RR_SD, LR_SD, P_DOOR, D_DOOR, RADIO, WINDO, ULTRS, NOEVNT, BB_SND
AL_EVT7	Last 8 Alarm Events	DROPEN, HOODTR, IGNTAM, PANIC, T_AJAR, RR_SD, LR_SD, P_DOOR, D_DOOR, RADIO, WINDO, ULTRS, NOEVNT, BB_SND
AL_EVT8	Last 8 Alarm Events	DROPEN, HOODTR, IGNTAM, PANIC, T_AJAR, RR_SD, LR_SD, P_DOOR, D_DOOR, RADIO, WINDO, ULTRS, NOEVNT, BB_SND
CCNT	Number Of Continuous DTCs In Module	one count per bit
D_DOOR	Left Front Door Ajar Switch	CLOSED, AJAR
FLUID_1	Brake Fluid Level Switch #1	OFF, ON
HOOD_SW	Hood Ajar Switch	CLOSED, AJAR
IGN_R	Ignition Switch -RUN Position	NO, YES
L_HIGH	Left High Beam Lamp Driver	Off---, Off-B-, On---, On-B-
L_LOW	Left Low Beam Lamp	Off---, Off-B-, On---, On-B-
LF_TURN	Left Front Turn Lamp	Off---, Off-B-, On---, On-B-
LMRKOUT	Left Front Marker Lamp	Off---, Off-B-, On---, On-B-
OILWRN	Oil Level Warning Lamp	Off---, On---
P_DN_SW	Passenger Down Activated	OFF, DOWN
P_DOOR	Passenger Door Ajar Switch	CLOSED, AJAR
P_UP_SW	Passenger Up Activated	OFF, UP
PRK_BRK	Parking Brake Switch Input	OFF, ON
PSMRPSH	Passenger Mirror Position Sensor (Left/Right)	#####
PSMRPSV	Passenger Mirror Position	#####
PSPWAMP	Power Window Passenger's Peak Motor Current	#####
PWM_DC1	PWM Duty Cycle #1	%

R_HIGH	Right High Beam Lamp Driver	Off---, Off-B-, On---, On-B-
R_LOW	Right Low Beam Lamp	Off---, Off-B-, On---, On-B-
RADIOSW	Security Input Switch Status	OFF, ON
RF_TURN	Right Front Turn Lamp	Off---, Off-B-, On---, On-B-
RMRKSTB	Right Front Marker Lamp	Off---, Off-B-, On---, On-B-
STLKOUT	Steering Column Lock Ground Output	OFF, ON
VBAT	Battery Voltage	Volts
WFLUID	Washer Fluid Level	LOW, OK
WPMODE	Wiper Control Mode Select	WASH, OPEN, INVLD, OFF, INTVL1, INTVL2, INTVL3, INTVL4, INTVL5, INTVL6, INTVL7, LOW, HIGH
WPPRKS	Windshield Wiper Park Sense	notPRK, PARKED

FEM Active Command Index

Active Command	Display	Action
BACKLIGHTING INTENSITY CONTROL COMMAND	ILLUM	%
BRAKE SYSTEM CONTROL COMMAND	SHFT LOCK	OFF, ON
EXTERIOR LAMP CONTROL	PARKLAMPS	OFF, ON
FRONT WINDOW CONTROL	RR UP	OFF, ON
FRONT WINDOW CONTROL	PR DOWN	OFF, ON
FRONT WINDSHIELD WIPER/WASHER	SPEED RLY	OFF, ON
FRONT WINDSHIELD WIPER/WASHER	WASH RLY	OFF, ON
FRONT WINDSHIELD WIPER/WASHER	WIPER RLY	OFF, ON
HEAD/CORNERING LAMP CONTROL	HIGH BEAM	OFF, ON
HEAD/CORNERING LAMP CONTROL	LOW BEAM	OFF, ON
INDICATOR LAMP CONTROL	NON MIL	OFF, ON
LAMP CONTROL COMMAND	HDLMPWSH	OFF, ON
POWER MIRROR CONTROL	PR DOWN	OFF, ON
POWER MIRROR CONTROL	PR LEFT	OFF, ON
POWER MIRROR CONTROL	PR RIGHT	OFF, ON
POWER MIRROR CONTROL	PR UP	OFF, ON
STEERING COLUMN CONTROL COMMAND	LOCK_GND	OFF, ON
TURN SIGNAL AND MARKER LAMPS	HAZARD	OFF, ON
VAPS II OUTPUT PULSE CONTROL	VAPSIIOU	%

REM Diagnostic Trouble Code (DTC) Index

DTC	Description	Source	Action
B1201	Fuel Sender Circuit Failure	REM	REFER to Section 413-01 .
B1300	Power Door Lock Circuit Failure	REM	REFER to Section 501-14B .
B1310	Power Door Unlock Circuit Failure	REM	REFER to Section 501-14B .
B1331	Decklid Ajar Rear Door Circuit Failure	REM	REFER to Section 417-02 .
B1335	Door Ajar RR Circuit Failure	REM	REFER to Section 417-02 .
B1342	ECU Is Defective	REM	CLEAR the DTC. REPEAT the REM self-test. If DTC B1342 is retrieved, INSTALL a new REM. REFER to Section 419-10 . CLEAR the DTCs. REPEAT the self-test.
B1483	Brake Pedal Input Circuit Failure	REM	REFER to Section 417-01 .
B1499	Lamp Turn Signal Left Circuit Failure	REM	REFER to Section 417-01 .
B1501	Lamp Turn Signal Left Circuit Short to Battery	REM	REFER to Section 417-01 .
B1503	Lamp Turn Signal Right Circuit Failure	REM	REFER to Section 417-01 .
B1505	Lamp Turn Signal Right Circuit Short to Battery	REM	REFER to Section 417-01 .
B1551	Decklid Release Circuit Failure	REM	REFER to Section 501-14B .
B1571	Door Ajar LR Circuit Failure	REM	REFER to Section 417-02 .
B1676	Battery Pack Voltage Out of Range	REM	REFER to Section 414-00 .
B2172	Inertia Switch Input Circuit Open	REM	REFER to Powertrain Control/Emissions Diagnosis (PC/ED) manual.
B2174	Window Driver Rear Remote Up Switch Short to Battery	REM	GO to Pinpoint Test M .
B2178	Window Driver Rear Remote Down Switch Short to Battery	REM	GO to Pinpoint Test M .
B2190	Window Passenger Rear Remote Up Switch Short to Battery	REM	GO to Pinpoint Test J .
B2194	Window Passenger Rear Remote Down Switch Short to Battery	REM	GO to Pinpoint Test J .
B2477	Module Configuration Failure	REM	REFER to Section 418-01 .
U1041	SCP (J1850) Invalid or Missing Data for Vehicle Speed	ABS	CARRY OUT the ABS self-test. REFER to Section 206-09A .
U1059	SCP (J1850) Invalid or Missing Data for Transmission/Transaxle/PRNDL	PCM	CARRY OUT the PCM self-test. REFER to the Powertrain Control/Emissions Diagnosis (PC/ED) manual.
U1218	SCP (J1850) Invalid or Missing Data for External Lamps	ICM	CARRY OUT the ICM self-test. REFER to Section 413-01 .

REM Parameter Identification (PID) Index

PID	Description	Expected Value

BOO	Brake Switch Input	OFF, ON
DECKLID	Decklid Ajar Switch	CLOSED, AJAR
DL_DSRM	Decklid Disarm	NO, YES
DLIDOUT	Decklid Driver	Off---, Off--G, Off-B-, Off-BG, OffO--, OffO-G, OffOB-, OffOBG, On---, On--G, On-B-, On-BG, OnO--, OnO-G, OnOB-, OnOBG
DLIDRLS	Deck Lid Release	OFF, ON
L_TAIL	Left & Right Tail Lamp	Off---, Off--G, Off-B-, Off-BG, OffO--, OffO-G, OffOB-, OffOBG, On---, On--G, On-B-, On-BG, OnO--, OnO-G, OnOB-, OnOBG
LMRKOUT	Left Marker Lamp Driver Output State	OFF, ON
LMRKSTB	Left Marker Lamp Driver Short To Battery	NO, YES
LR_TURN	Left & Right Rear Turn Lamp	Off---, Off--G, Off-B-, Off-BG, OffO--, OffO-G, OffOB-, OffOBG, On---, On--G, On-B-, On-BG, OnO--, OnO-G, OnOB-, OnOBG
LRDN_SW	Left Rear Down Activated	OFF, DOWN
LRDR_SW	Left Rear Door Ajar Switch	CLOSED, AJAR
LRUP_SW	Left Rear Up Activated	OFF, UP
PD_LOCK	Passenger Door Lock	NO, YES
PD_UNLK	Passenger Door Unlock	NOTLOC, LOCK
R_TAIL	Left & Right Tail Lamp	Off---, Off--G, Off-B-, Off-BG, OffO--, OffO-G, OffOB-, OffOBG, On---, On--G, On-B-, On-BG, OnO--, OnO-G, OnOB-, OnOBG
RR_TURN	Left & Right Rear Turn Lamp	Off---, Off--G, Off-B-, Off-BG, OffO--, OffO-G, OffOB-, OffOBG, On---, On--G, On-B-, On-BG, OnO--, OnO-G, OnOB-, OnOBG
RRDN_SW	Right Rear Window Down Switch	OFF, UP
RRDR_SW	Right Rear Door Ajar Switch	CLOSED, AJAR
RRUP_SW	Right Rear Window Up Switch	OFF, DOWN

REM Active Command Index

Active Command	Display	Action
EXTERIOR LAMP CONTROL	BACKUPLMP	OFF, ON
EXTERIOR LAMP CONTROL	H MNT STP	OFF, ON
EXTERIOR LAMP CONTROL	L STOP	OFF, ON
EXTERIOR LAMP CONTROL	PARKLAMPS	OFF, ON
EXTERIOR LAMP CONTROL	R DEF RLY	OFF, ON
EXTERIOR LAMP CONTROL	R FOG LMP	OFF, ON

EXTERIOR LAMP CONTROL	R STOP	OFF, ON
POWER WINDOW ENABLE COMMAND	PSGR RLY	OFF, ON
REAR DOOR LOCK CONTROL	LR LOCK	OFF, ON
REAR DOOR LOCK CONTROL	LR UNLOCK	OFF, ON
REAR DOOR LOCK CONTROL	RELEASE	OFF, ON
REAR WINDOW CONTROL	LR DOWN	OFF, ON
REAR WINDOW CONTROL	LR UP	OFF, ON
REAR WINDOW CONTROL	RR DOWN	OFF, ON
REAR WINDOW CONTROL	RR UP	OFF, ON
TURN SIGNAL AND MARKER LAMPS	HAZARD	OFF, ON

DDM Diagnostic Trouble Code (DTC) Index

DTC	Description	Source	Action
B1309	Power Door Lock Circuit Short to Ground	DDM	REFER to Section 501-14B .
B1341	Power Door Unlock Circuit Short to Ground	DDM	REFER to Section 501-14B .
B1342	ECU Is Defective	DDM	CLEAR the DTC. REPEAT the DDM self-test. If DTC B1342 is retrieved, INSTALL a new DDM. REFER to Section 419-10 . CLEAR the DTCs. REPEAT the self-test.
B1400	Driver Power Window One Touch Window Relay Circuit Short to Battery	DDM	GO to Pinpoint Test Q .
B1405	Driver Power Window Down Circuit Short to Battery	DDM	GO to Pinpoint Test F .
B1408	Driver Power Window Up Circuit Short to Battery	DDM	GO to Pinpoint Test F .
B1416	Power Window LR Motor Circuit Short to Battery	DDM	GO to Pinpoint Test N .
B1420	Passenger Power Window Motor Circuit Short to Battery	DDM	GO to Pinpoint Test H .
B1424	Power Window RR Motor Circuit Short to Battery	DDM	GO to Pinpoint Test K .
B1530	Memory Set Switch Circuit Short to Ground	DDM	REFER to Section 501-09 .
B1534	Memory 1 Switch Circuit Short to Ground	DDM	REFER to Section 501-09 .
B1538	Memory 2 Switch Circuit Short to Ground	DDM	REFER to Section 501-09 .
B1676	Battery Pack Voltage Out of Range	DDM	REFER to Section 419-10 .
B2112	Door Driver Set Switch Stuck Failure	DDM	REFER to Section 501-14B .
B2116	Door Driver Reset Switch	DDM	REFER to Section 501-14B .

	Stuck Failure		
B2320	Mirror Driver Horizontal Feedback Potentiometer Circuit Failure	DDM	REFER to Section 501-09 .
B2324	Mirror Driver Vertical Feedback Potentiometer Circuit Failure	DDM	REFER to Section 501-09 .
B2336	Mirror Switch Assembly Circuit Failure	DDM	REFER to Section 501-09 .
B2425	Remote Keyless Entry Out of Synchronization	DDM	REFER to Section 501-14B .
B2477	Module Configuration Failure	DDM	REFER to Section 418-01 .
U1041	SCP (J1850) Invalid or Missing Data for Vehicle Speed	ABS	CARRY OUT the ABS self-test. REFER to Section 206-09A .
U1059	SCP (J1850) Invalid or Missing Data for Transmission / Transaxle / PRNDL	PCM	CARRY OUT the PCM self-test. REFER to the Powertrain Control/Emissions Diagnosis (PC/ED) manual.

DDM Parameter Identification (PID) Index

PID	Description	Expected Value
ALLOCK	All Doors Lock Sense	notACT, ACTIVE
CCNT	Number Of Continuous DTCs In Module	one count per bit
CNTUNLK	Central Door Unlock Switch Status	notACT, ACTIVE
D_DN_SW	Drivers Window Down Switch	OFF, DOWN
D_DSRLM	Driver Door Unlock Disarm Switch	NO, YES
D_PWPK	Drivers Power Window Peak Current	AMP
D_UP_SW	Drivers Window Up Switch	OFF, UP
DMIR_H	Drivers Side Mirror Horizontal Motor	notSEN, SENSED
DMIR_V	Drivers Mirror Vertical	notSEN, SENSED
DR_LOCK	Drivers Door Lock Output State	NO, YES
DR_UNLK	All Doors Unlock Output State	NO, YES
DRLKCYL	Door Lock Cylinder	notACT, ACTIVE
DVMRPSH	Driver Mirror Horizontal Position	one count per bit
DVMRPSV	Driver Mirror Position	one count per bit
LRDN_SW	Left Rear Down Activated	OFF, DOWN
LRUP_SW	Left Rear Up Activated	OFF, UP
MEM1_SW	Memory Recall Switch #1	notACT, ACTIVE
MEM2_SW	Memory Recall Switch #2	notACT, ACTIVE
MEMS_SW	Memory Set Switch	notACT, ACTIVE
MIR_SEL	Power Mirror Select Switch	DRVMIR, PSGMIR, OFF
MIRH_SW	Pow Mir Position Switch - Horizontal	SHORT, RIGHT, LEFT, OFF

MIRV_SW	Power Mir Position Switch - Vertical	SHORT, UP, DOWN, OFF
OTD_SW	One Touch Down Switch	OFF, DOWN
P_DN_SW	Passenger Down Activated	OFF, DOWN
P_UP_SW	Passenger Up Activated	OFF, UP
RRDN_SW	Right Rear Down Activated	OFF, DOWN
RRUP_SW	Right Rear Up Activated	OFF, UP
VBAT	Battery Voltage	Volts

DDM Active Command Index

Active Command	Display	Action
DOOR LOCK CONTROL	DD LOCK	OFF, ON
DOOR LOCK CONTROL	DD UNLOCK	OFF, ON
DOUBLE LOCK COMMAND	DOUBLE LK	UNLOCK, LOCK
FRONT WINDOW CONTROL	DR DOWN	OFF, ON
FRONT WINDOW CONTROL	DR UP	OFF, ON
ONE TOUCH WINDOW DOWN & ACCY DELAY	ONE TOUCH	OFF, ON
POWER MIRROR CONTROL	DR DOWN	OFF, ON
POWER MIRROR CONTROL	DR LEFT	OFF, ON
POWER MIRROR CONTROL	DR RIGHT	OFF, ON
POWER MIRROR CONTROL	DR UP	OFF, ON

Symptom Chart

Symptom Chart

Condition	Possible Sources	Action
<ul style="list-style-type: none"> No communication with the front electronic module (FEM) 	<ul style="list-style-type: none"> BJB fuses: 425 (40A) and 422 (20A). CJB fuse 207 (5A). FEM. Circuitry. 	<ul style="list-style-type: none"> GO to Pinpoint Test A.
<ul style="list-style-type: none"> No communication with the rear electronic module (REM) 	<ul style="list-style-type: none"> BJB fuse 425 (40A). CJB fuses: 207 (5A) and 235 (5A). REM. Circuitry. 	<ul style="list-style-type: none"> GO to Pinpoint Test B.
<ul style="list-style-type: none"> No communication with the driver door module (DDM) 	<ul style="list-style-type: none"> BJB fuse 425 (40A). CJB fuse 207 (5A). DDM. 	<ul style="list-style-type: none"> GO to Pinpoint Test C.





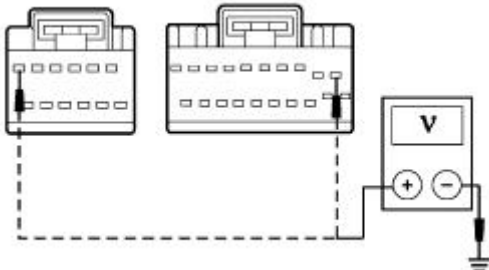
	<ul style="list-style-type: none"> ● Circuitry. 	
<ul style="list-style-type: none"> ● All power windows are inoperative — from the master window regulator control switch only 	<ul style="list-style-type: none"> ● Circuitry. ● Master window regulator control switch. ● DDM. 	<ul style="list-style-type: none"> ● GO to Pinpoint Test D.
<ul style="list-style-type: none"> ● All passenger power windows are inoperative — from the remote window regulator control switches 	<ul style="list-style-type: none"> ● Circuitry. ● Remote window regulator control switches. ● REM. ● FEM. 	<ul style="list-style-type: none"> ● GO to Pinpoint Test E.
<ul style="list-style-type: none"> ● A single power window is inoperative — driver window from the master window regulator control switch 	<ul style="list-style-type: none"> ● BJB fuse 420 (20A). ● Circuitry. ● Master window regulator control switch. ● DDM. 	<ul style="list-style-type: none"> ● GO to Pinpoint Test F.
<ul style="list-style-type: none"> ● A single power window is inoperative — passenger front from master and passenger front window regulator control switches 	<ul style="list-style-type: none"> ● BJB fuse 426 (30A). ● Passenger front window regulator electric drive. ● Passenger front window regulator control switch. ● FEM. ● Circuitry. 	<ul style="list-style-type: none"> ● GO to Pinpoint Test G.
<ul style="list-style-type: none"> ● A single power window is inoperative — passenger front from the master window regulator control switch only 	<ul style="list-style-type: none"> ● Master window regulator control switch. ● DDM. ● Circuitry. 	<ul style="list-style-type: none"> ● GO to Pinpoint Test H.
<ul style="list-style-type: none"> ● A single power window is inoperative — passenger front from the passenger front window regulator control switch only 	<ul style="list-style-type: none"> ● Passenger front window regulator control switch. ● FEM. ● Circuitry. 	<ul style="list-style-type: none"> ● GO to Pinpoint Test I.
<ul style="list-style-type: none"> ● A single power window is inoperative — right rear from master and remote window regulator control switches 	<ul style="list-style-type: none"> ● BJB fuse 430 (20A). ● RR window regulator electric drive. ● RR window regulator control switch. ● REM. ● Circuitry. 	<ul style="list-style-type: none"> ● GO to Pinpoint Test J.
<ul style="list-style-type: none"> ● A single power window is inoperative — right rear from the master window regulator control switch only 	<ul style="list-style-type: none"> ● Master window regulator control switch. ● DDM. ● Circuitry. 	<ul style="list-style-type: none"> ● GO to Pinpoint Test K.

<ul style="list-style-type: none"> ● A single power window is inoperative — right rear from RR window regulator control switch only 	<ul style="list-style-type: none"> ● RR window regulator control switch. ● REM. ● Circuitry. 	<ul style="list-style-type: none"> ● GO to Pinpoint Test L.
<ul style="list-style-type: none"> ● A single power window is inoperative — left rear from all window regulator control switches 	<ul style="list-style-type: none"> ● BJB fuse 419 (30A). ● LR window regulator electric drive. ● LR window regulator control switch. ● REM. ● Circuitry. 	<ul style="list-style-type: none"> ● GO to Pinpoint Test M.
<ul style="list-style-type: none"> ● A single power window is inoperative — left rear from the master window regulator control switch only 	<ul style="list-style-type: none"> ● Master window regulator control switch. ● DDM. ● Circuitry. 	<ul style="list-style-type: none"> ● GO to Pinpoint Test N.
<ul style="list-style-type: none"> ● A single power window is inoperative — left rear from the LR window regulator control switch only 	<ul style="list-style-type: none"> ● LR window regulator control switch. ● REM. ● Circuitry. 	<ul style="list-style-type: none"> ● GO to Pinpoint Test O.
<ul style="list-style-type: none"> ● All/single passenger power windows are inoperative — passenger window lock-out not operating correctly 	<ul style="list-style-type: none"> ● Master window regulator control switch. ● DDM. ● Circuitry. 	<ul style="list-style-type: none"> ● GO to Pinpoint Test P.
<ul style="list-style-type: none"> ● The one touch down feature is inoperative 	<ul style="list-style-type: none"> ● DDM. ● Master window regulator control switch. ● Circuitry. 	<ul style="list-style-type: none"> ● GO to Pinpoint Test Q.
<ul style="list-style-type: none"> ● The defrost system is inoperative — rear window defrost 	<ul style="list-style-type: none"> ● BJB fuse 429 (30A). ● Rear window defrost relay. ● Rear window defrost switch. ● REM. ● DATC module. ● Circuitry. 	<ul style="list-style-type: none"> ● GO to Pinpoint Test R.
<ul style="list-style-type: none"> ● The defrost system is inoperative — heated wiper park 	<ul style="list-style-type: none"> ● Underhood AJB Fuse 113 (30A). ● Heated wiper park relay. ● REM. ● DATC module. ● Circuitry. 	<ul style="list-style-type: none"> ● GO to Pinpoint Test S.
<ul style="list-style-type: none"> ● The defrost system will not shut off automatically — rear window defrost 	<ul style="list-style-type: none"> ● Rear window defrost relay. ● Rear window defrost switch. ● REM. ● DATC module. ● Circuitry. 	<ul style="list-style-type: none"> ● GO to Pinpoint Test T.

<ul style="list-style-type: none"> The defrost system will not shut off automatically — heated wiper park 	<ul style="list-style-type: none"> Heated wiper park relay. DATC module. Circuitry. 	<ul style="list-style-type: none"> GO to Pinpoint Test U.
<ul style="list-style-type: none"> The delayed accessory is inoperative/does not operate correctly 	<ul style="list-style-type: none"> DDM. 	<ul style="list-style-type: none"> INSTALL a new DDM. REFER to Section 419-10. TEST the system for normal operation.

Pinpoint Tests

PINPOINT TEST A: NO COMMUNICATION WITH THE FRONT ELECTRONIC MODULE (FEM)

CONDITIONS	DETAILS/RESULTS/ACTIONS
A1 CHECK CIRCUITS 29-DK20 (OG/GN) AND 29S-DK22 (OG/YE) FOR VOLTAGE	
NOTE: Cycle ignition switch from OFF to RUN to enable the switched system power feature.	
<p>1</p>  <p>2</p>  <p>FEM C201c</p> <p>3</p>  <p>FEM C201f</p> <p>4</p>  <p>5</p>  <p>A0006297</p>	<p>5</p> <p>Measure the voltage between FEM C201c pin 6, circuit 29-DK20 (OG/GN), harness side and ground; and between FEM C201f pin 1, circuit 29S-DK22 (OG/YE) harness side and ground.</p>

- Are the voltages greater than 10 volts?

→ **Yes**
GO to [A2](#).

→ **No**
REPAIR the circuit(s) in question. TEST the system for normal operation.

A2 CHECK CIRCUITS 31-DK20 (BK/RD), 31-DK20A (BK/RD), 31-DK20B (BK/RD), 31-DK20C (BK/RD) AND 31-DK20D (BK/RD) FOR OPENS

1

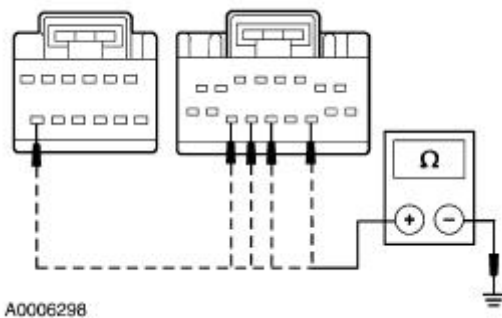


2



FEM C201a

3



3 Using the following table, measure the resistance between FEM connectors, harness side and ground:

FEM	Pin	Circuit
C201c	12	31-DK20 (BK/RD)
C201a	11	31-DK20A (BK/RD)
C201a	13	31-DK20B (BK/RD)
C201a	14	31-DK20C (BK/RD)
C201a	15	31-DK20D (BK/RD)

- Is the resistance less than 5 ohms?

→ **Yes**
REFER to [Section 418-00](#).

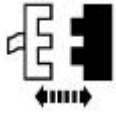
→ **No**
REPAIR the circuit(s) in question. TEST the system for normal operation.

PINPOINT TEST B: NO COMMUNICATION WITH THE REAR ELECTRONIC MODULE (REM)

CONDITIONS	DETAILS/RESULTS/ACTIONS
B1 CHECK CIRCUIT 29-DK31 (OG/BK) FOR VOLTAGE	
NOTE: Cycle ignition switch from OFF to RUN to enable the switched system power feature.	
1	

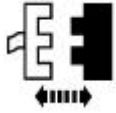


2



REM C420d

3

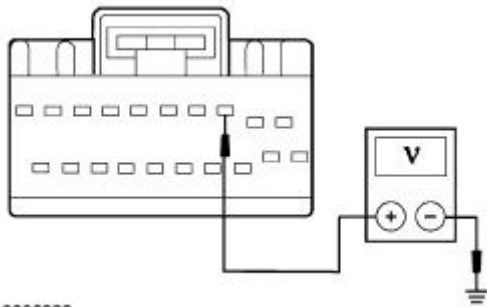


REM C420c

4



5



A0006299

5 Measure the voltage between REM C420d pin 3, circuit 29-DK31 (OG/BK), harness side and ground.

• Is the voltage greater than 10 volts?

→ Yes
GO to [B2](#).

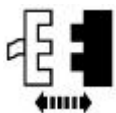
→ No
REPAIR the circuit. TEST the system for normal operation.

B2 CHECK CIRCUITS 29S-DK31 (OG/BK), 31-DK30D (BK), 31-DK30E (BK), 31-DK30F (BK), 31-DK30G (BK) AND 31-DK30H (BK/OG), FOR OPENS

1



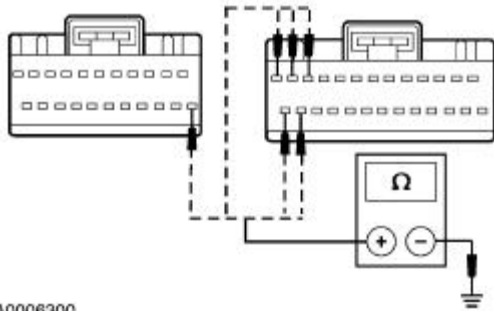
2



REM C420b

3

3 Using the following table, measure the resistance between REM connectors,



A0006300

harness side and ground:

REM	Pin	Circuit
C420c	13	29S-DK31 (OG/BK)
C420c	12	31-DK30E (BK)
C420c	11	31-DK30D (BK)
C420c	26	31-DK30G (BK)
C420c	25	31-DK30F (BK)
C420b	12	31-DK30H (BK)

- Is the resistance less than 5 ohms?


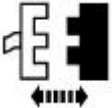

→ **Yes**

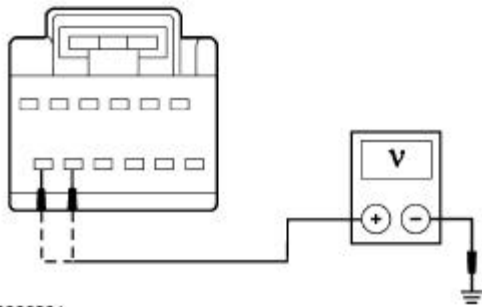
REFER to [Section 418-00](#).

→ **No**

REPAIR the circuit(s) in question. TEST the system for normal operation.

PINPOINT TEST C: NO COMMUNICATION WITH THE DRIVER DOOR MODULE (DDM)

CONDITIONS	DETAILS/RESULTS/ACTIONS
C1 CHECK CIRCUITS 29-AJ80 (OG/BU) AND 29S-AJ86 (OG/BU) FOR VOLTAGE	
NOTE: Cycle ignition switch from OFF to RUN to enable the switched system power feature.	
<p>1</p>  <p>2</p>  <p>DDM C501a</p> <p>3</p>  <p>4</p>	<p>4</p> <p>Measure the voltage between DDM C501a pin 11, circuit 29-AJ80 (OG/BU), harness side and ground; and between DDM C501a pin 12, circuit 29S-AJ86 (OG/BU), harness side and ground.</p>



A0006301

- Is the voltage greater than 10 volts?

→ **Yes**
GO to [C2](#).

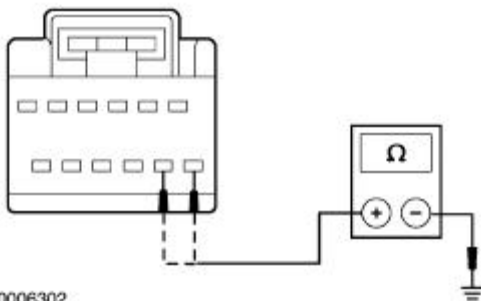
→ **No**
REPAIR the circuit(s) in question. TEST the system for normal operation.

C2 CHECK CIRCUITS 31-AJ80B (BK/OG) AND 91-AJ80 (BN/BU) FOR OPENS

1



2



A0006302

- 2 Measure the resistance between DDM C501a pin 7, circuit 91-AJ80 (BN/BU), harness side and ground; and between DDM C501a pin 8, circuit 31-AJ80B (BK/OG), harness side and ground.

- Is the resistance less than 5 ohms?

→ **Yes**
REFER to [Section 418-00](#).

→ **No**
REPAIR the circuit(s) in question. TEST the system for normal operation.

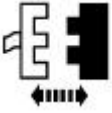
PINPOINT TEST D: ALL POWER WINDOWS ARE INOPERATIVE — FROM THE MASTER WINDOW REGULATOR CONTROL SWITCH ONLY

CONDITIONS	DETAILS/RESULTS/ACTIONS
D1 CHECK VOLTAGE TO THE MASTER WINDOW REGULATOR CONTROL SWITCH	

1



2

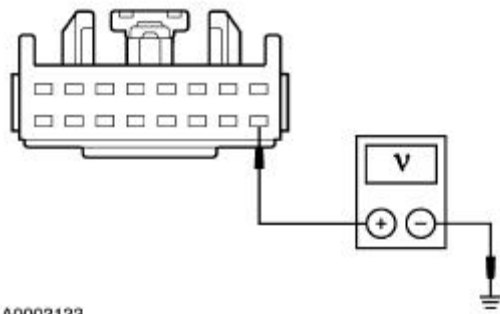


Master Window Regulator Control Switch C504

3



4



A0003133

4

Measure the voltage between master window regulator control switch C504 pin 9, circuit 7-AJ7 (YE/RD), harness side and ground.

● Is the voltage greater than 6 volts?

→ **Yes**
GO to [D2](#).

→ **No**
GO to [D3](#).

D2 CHECK THE MASTER WINDOW REGULATOR CONTROL SWITCH

1


Check the master window regulator control switch; Refer to Wiring Diagrams Section 700-09, Component Testing.


● Did the master window regulator control switch pass the component test?

→ **Yes**
INSTALL a new DDM. REFER to [Section 419-10](#). CLEAR the DTCs. REPEAT the self-test.

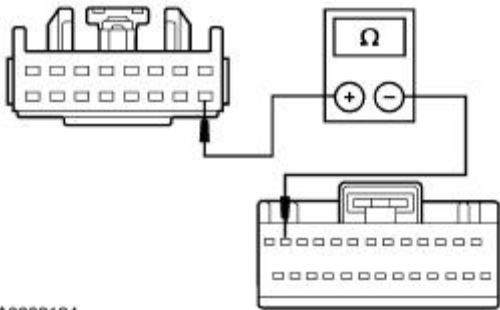
→ **No**
INSTALL a new master window regulator control switch. REFER to [Switch—Master Window Regulator Control](#) in this section. CLEAR the DTCs. REPEAT the self-test.

D3 CHECK CIRCUIT 7-AJ7 (YE/RD) FOR AN OPEN

1 

2 

DDM C501d

3 

A0003134

3 Measure the resistance between the master window regulator control switch C504 pin 9, circuit 7-AJ7 (YE/RD), harness side and DDM C501d pin 12, circuit 7-AD1 (YE), harness side.

- Is the resistance less than 5 ohms?

→ **Yes**
INSTALL a new DDM. REFER to [Section 419-10](#) . CLEAR the DTCs. REPEAT the self-test.

→ **No**
REPAIR the circuit. CLEAR the DTCs. REPEAT the self-test.

PINPOINT TEST E: ALL PASSENGER POWER WINDOWS ARE INOPERATIVE — FROM THE REMOTE WINDOW REGULATOR CONTROL SWITCHES

CONDITIONS	DETAILS/RESULTS/ACTIONS
<p>NOTE: The REM supplies power to the three remote window regulator control switches through a single output circuit and splice. To protect the REM from potential failure, the REM will remove power when a short to ground is sensed in any remote window regulator control switch, associated circuitry or the power output circuit of the REM. Power will be restored to the power output circuit upon a cycling of the ignition switch. If the REM output circuit is shorted to ground, the REM will immediately remove power from the circuit. If any remote window regulator control switch or its associated circuits are shorted to ground, the REM will continue to supply power to the output circuit until the switch or circuit containing the failure is activated.</p>	
<p>E1 CHECK FOR FEM DTCS</p>	
	<p>1 Retrieve the recorded results from the FEM self-test.</p> <ul style="list-style-type: none"> • Were any FEM DTCs retrieved that are related to the concern?

- **Yes**
REFER to the FEM Diagnostic Trouble Code (DTC) Index.
- **No**
GO to [E2](#).

E2 CHECK FOR REM DTCS

- 1 Retrieve the recorded results from the REM self-test.
 - **Were any REM DTCS retrieved that are related to the concern?**
- **Yes**
REFER to the REM Diagnostic Trouble Code (DTC) Index.
 - **No**
GO to [E3](#).

E3 CHECK CIRCUIT 7-AJ14A (YE/BU) FOR POWER

NOTE: Cycle the ignition switch from OFF to RUN to enable the switched system power feature.

1



2

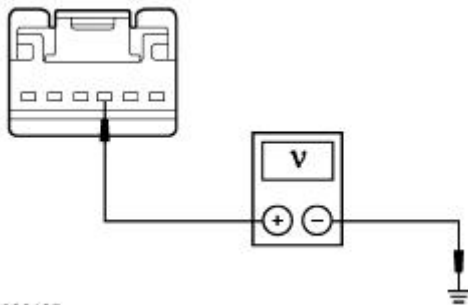


LR Window Regulator Control Switch C701

3



4



A0003135

- 4 Measure the voltage between LR window regulator control switch C701 pin 3, circuit 7-AJ14A (YE/BU), harness side and ground.

- **Is the voltage reading greater than 10 volts?**

- **Yes**
GO to [E7](#).

→ **No**
GO to [E4](#).

E4 CHECK CIRCUIT 7-AJ1 (YE) FOR AN OPEN

1

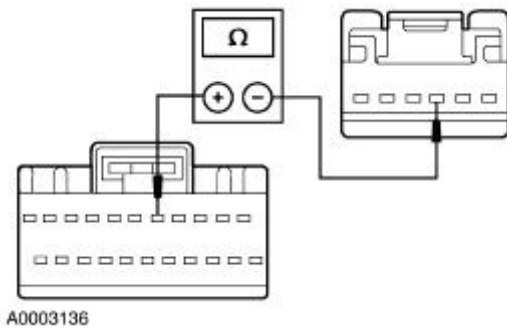


2



REM C420b

3



3 Measure the resistance between LR window regulator control switch C701 pin 3, circuit 7-AJ14A (YE/BU), harness side and REM C420b pin 5, circuit 7-AJ1 (YE), harness side.

- Is the resistance less than 5 ohms?

→ **Yes**
GO to [E5](#).

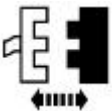
→ **No**
REPAIR the circuit. CLEAR the DTCs.
REPEAT the self-test.

E5 CHECK CIRCUIT 7-AJ1 (YE) FOR A SHORT TO GROUND

1



2

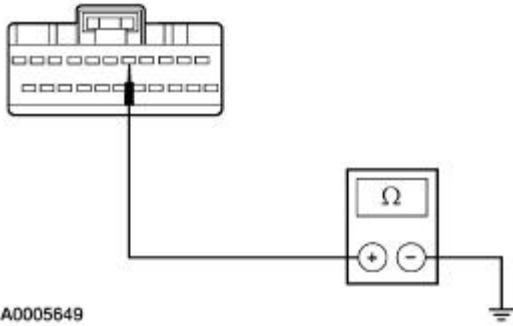


3

2 Disconnect the remote passenger window regulator control switches:

- passenger front C604
- RR passenger C801
- LR passenger C701

3 Measure the resistance between REM C420b pin 5, circuit 7-AJ1 (YE), harness side and ground.



- Is the resistance greater than 10,000 ohms?

→ **Yes**
GO to [E6](#).

→ **No**
REPAIR the circuit. CLEAR the DTCs. REPEAT the self-test.

E6 CHECK FOR A SHORTED REMOTE WINDOW REGULATOR CONTROL SWITCH

1



2 Check the RR, LR and passenger front window regulator control switches; Refer to Wiring Diagrams Section 700-09, Component Testing.

- Did the remote window regulator control switches pass the component test?

→ **Yes**
INSTALL a new REM. REFER to [Section 419-10](#). CLEAR the DTCs. REPEAT the self-test.

→ **No**
INSTALL a new passenger window regulator control switch. CLEAR the DTCs. REPEAT the self-test.

E7 CHECK THE PASSENGER FRONT WINDOW OPERATION

1 Operate the passenger front window UP and DOWN using the passenger front window regulator control switch.

- Does the passenger front window operate correctly?

→ **Yes**
GO to [E10](#).

→ **No**
GO to [E8](#).

E8 CHECK THE PASSENGER FRONT WINDOW REGULATOR CONTROL SWITCH

1



2



Passenger Front Window Regulator Control Switch C604

3 Check the passenger front window regulator control switch; Refer to Wiring Diagrams Section 700-09, Component Testing.

- **Did the passenger front window regulator control switch pass the component test?**

→ **Yes**
GO to [E9](#).

→ **No**
INSTALL a new passenger window regulator control switch. CLEAR the DTCs. REPEAT the self-test.

E9 CHECK CIRCUITS 8-AJ18 (WH/VT) AND 10-AJ18 (GY/WH) FOR A SHORT TO GROUND

1

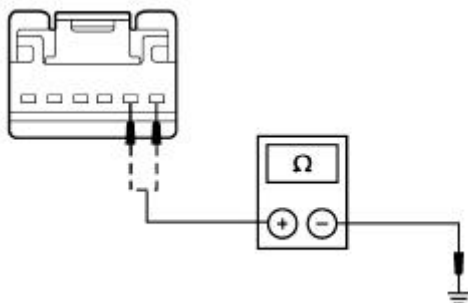


2



FEM C201e

3



A0003137

3 Measure the resistance between passenger front window regulator control switch C604 pin 1, circuit 8-AJ18 (WH/VT), harness side and ground; and between passenger front window regulator control switch C604 pin 2, circuit 10-AJ18 (GY/WH), harness side and ground

- **Are the resistances greater than**

10,000 ohms?

- **Yes**
INSTALL a new FEM. REFER to [Section 419-10](#). CLEAR the DTCs. REPEAT the self-test.
- **No**
REPAIR the circuit. CLEAR the DTCs. REPEAT the self-test.

E10 CHECK THE LEFT REAR AND RIGHT REAR WINDOW OPERATION

1



2



LR Window Regulator Control Switch C701

3



- 4 Operate the rear windows UP and DOWN using the LR and RR window regulator control switches.

- Do the rear windows operate correctly?

- **Yes**
The system is operating correctly. VERIFY the concern and REFER to the Symptom Chart.

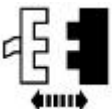
- **No**
GO to [E11](#).

E11 CHECK THE LR AND RR WINDOW REGULATOR CONTROL SWITCH

1



2



LR C701 and RR C801 Window Regulator Control Switches

- 3 Check the LR and RR window regulator control switches; Refer to Wiring Diagrams Section 700-09, Component

Testing.

- **Did the window regulator control switches pass the component test?**

→ **Yes**
GO to [E12](#).

→ **No**
INSTALL a new rear window regulator control switch. CLEAR the DTCs.
REPEAT the self-test.

E12 CHECK CIRCUIT 8-AJ24 (WH), 10-AJ24 (GY), 8-AJ14A (WH/BU) and 10-AJ14A (GY/VT) FOR A SHORT TO GROUND

1

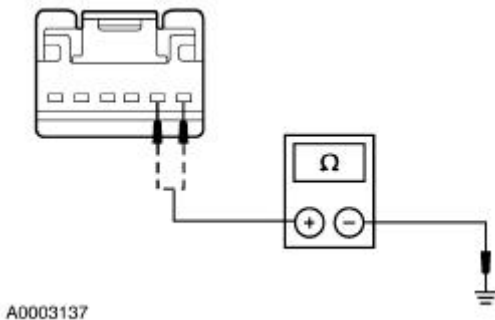


2



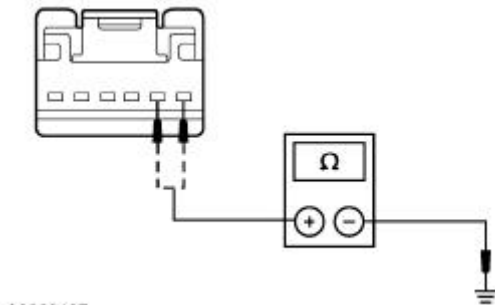
REM C420c and C420d

3



A0003137

4



A0003137

3 Measure the resistance between RR window regulator control switch C801 pin 1, circuit 8-AJ24 (WH), harness side and ground; and between RR window regulator control switch C801 pin 2, circuit 10-AJ24A (GY), harness side and ground.

4 Measure the resistance between LR window regulator control switch C701 pin 1, circuit 8-AJ14A (WH/BU), harness side and ground; and between LR window regulator control switch C701 pin 2, circuit 10-AJ14A (GY/VT), harness side and ground.


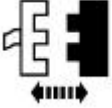
- **Are the resistances greater than 10,000 ohms?**

→ **Yes**
INSTALL a new REM. REFER to [Section 419-10](#). CLEAR the DTCs.

REPEAT the self-test.

→ **No**
REPAIR the circuit in question. CLEAR the DTCs. REPEAT the self-test.

PINPOINT TEST F: A SINGLE POWER WINDOW IS INOPERATIVE — DRIVER WINDOW FROM THE MASTER WINDOW REGULATOR CONTROL SWITCH

CONDITIONS	DETAILS/RESULTS/ACTIONS
F1 CHECK THE DDM DTCS	
NOTE: Cycle the ignition switch from OFF to RUN to enable the switched system power feature.	
	<p>1 Retrieve the recorded results from the DDM self-test.</p> <p>● Were any DDM DTCs retrieved that are related to the concern?</p> <p>→ Yes IF DTC B1405 or B1408 was retrieved, GO to F2.</p> <p>Any other DDM DTCs, REFER to the DDM Diagnostic Trouble Code (DTC) Index.</p> <p>→ No GO to F4.</p>
F2 CHECK THE MASTER WINDOW REGULATOR CONTROL SWITCH	
<p>1</p>  <p>2</p>  <p>Master Window Regulator Control Switch C504</p>	<p>3 Check the master window regulator control switch; Refer to Wiring Diagrams Section 700-09, Component Testing.</p> <p>● Did the master window regulator control switch pass the component test?</p> <p>→ Yes GO to F3.</p>

→ **No**
INSTALL a new master window regulator control switch. REFER to [Switch—Master Window Regulator Control](#) in this section. CLEAR the DTCs. REPEAT the self-test.

F3 CHECK CIRCUIT 7S-AJ40 (YE/RD) AND CIRCUIT 7S-AJ41 (YE/BU) FOR A SHORT TO BATTERY

1



2

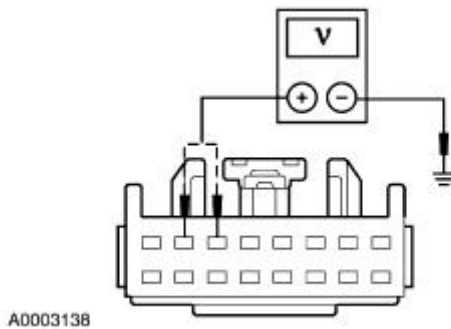


DDM C501d

3



4



4 Measure the voltage between master window regulator control switch C504 pin 6, circuit 7S-AJ40 (YE/RD), harness side and ground; and between master window regulator control switch C504 pin 7, circuit 7S-AJ41 (YE/BU), harness side and ground.

● Is the voltage greater than 10 volts?

→ **Yes**
REPAIR the circuit. CLEAR the DTCs. REPEAT the self-test. GO to [E6](#).

→ **No**
INSTALL a new DDM. REFER to [Section 419-10](#). CLEAR the DTCs. REPEAT the self-test.

F4 CHECK THE DDM OUTPUT

1



2



3



4



4 Select DDM active command FRONT WINDOW CONTROL.

5 Trigger DR UP to ON then OFF. Then trigger DR DOWN to ON then OFF.

• **Did the driver front window raise and lower?**

→ **Yes**
GO to [F5](#).

→ **No**
GO to [F9](#).

F5 CHECK THE DDM PIDS D_UP_SW AND D_DN_SW

1



1 Monitor the DDM PIDs D_UP_SW and D_DN_SW while operating the master window regulator control switch to the UP and DOWN positions.

• **Do the DDM PIDs agree with the master window regulator control switch positions?**

→ **Yes**
INSTALL a new DDM. REFER to [Section 419-10](#). CLEAR the DTCs. REPEAT the self-test.

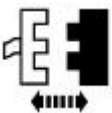
→ **No**
GO to [F6](#).

F6 CHECK THE WINDOW REGULATOR CONTROL SWITCH

1



2



Master Window Regulator Control Switch C504

3 Check the master window regulator control switch; Refer to Wiring Diagrams Section 700-09, Component Testing.

• **Did the master window regulator**

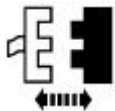
control switch pass the component test?

→ **Yes**
GO to [F7](#).

→ **No**
INSTALL a new master window regulator control switch. REFER to [Switch—Master Window Regulator Control](#) in this section. CLEAR the DTCs. REPEAT the self-test.

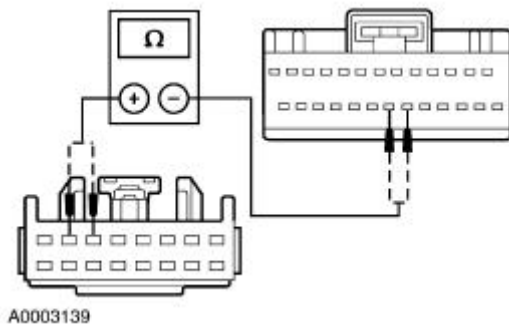
F7 CHECK CIRCUITS 7S-AJ40 (YE/RD) AND 7S-AJ41 (YE/BU) FOR AN OPEN

1



DDM C501d

2



2

Measure the resistance between master window regulator control switch C504 pin 6, circuit 7S-AJ40 (YE/RD), harness side and DDM C501d pin 20 circuit 7S-AJ40 (YE/RD), harness side; and between master window regulator control switch C504 pin 7, circuit 7S-AJ41 (YE/BU), harness side and DDM C501d pin 19 circuit 7S-AJ41 (YE/BU), harness side.

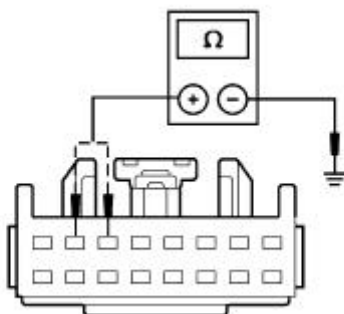
● **Are the resistances less than 5 ohms?**

→ **Yes**
GO to [F8](#).

→ **No**
REPAIR the circuit. CLEAR the DTCs. REPEAT the self-test.

F8 CHECK CIRCUITS 7S-AJ40 (YE/RD) AND 7S-AJ41 (YE/BU) FOR A SHORT TO GROUND

1



1

Measure the resistance between master window regulator control switch C504 pin 6, circuit 7S-AJ40 (YE/RD), harness side and ground; and between master window regulator control switch C504 pin 7, circuit 7S-AJ41 (YE/BU), harness side and ground.

● **Are the resistances greater than 10,000 ohms?**

→ **Yes**
INSTALL a new DDM. REFER to [Section 419-10](#). CLEAR the DTCs. REPEAT the self-test.

→ **No**
REPAIR the circuit. CLEAR the DTCs. REPEAT the self-test.

F9 CHECK POWER TO BJB FUSE 420 (20A)

1



2



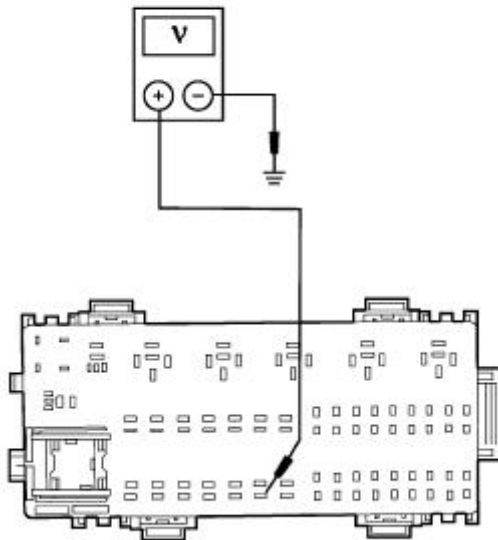
BJB Fuse 420 (20A)

3



4

4 Measure the voltage between BJB fuse 420 (20A), input terminal and ground.



A0003141

● Is the voltage greater than 10 volts?

→ **Yes**
GO to [F10](#).

→ **No**
REPAIR the circuit. CLEAR the DTCs.

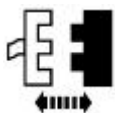
REPEAT the self-test.

F10 CHECK FOR VOLTAGE FROM THE DDM

1



2



Driver Front Window Regulator Electric Drive C524

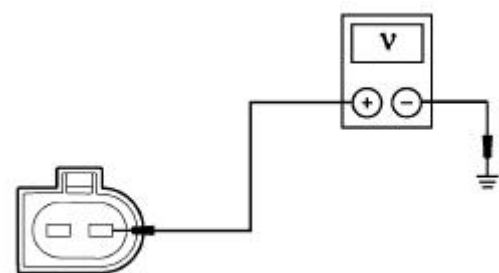
3



4

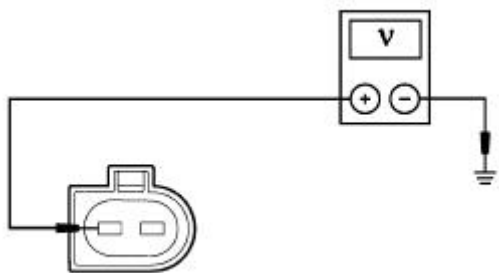


5



A0003143

6



A0003144

4 Select DDM active command FRONT WINDOW CONTROL.

5 Measure the voltage between driver front window regulator electric drive C524, circuit 32-AJ26 (WH), harness side and ground while triggering DR DOWN to ON. Note reading.

6 Measure the voltage between driver front window regulator electric drive C524, circuit 33-AJ26 (YE), harness side and ground while triggering DR UP to ON.

• Are the voltages greater than 10 volts when commanded ON?

→ Yes
GO to [F11](#).

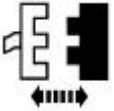
→ No
GO to [F12](#).

F11 CHECK CIRCUIT 31-AJ80 (BK) FOR AN OPEN

1

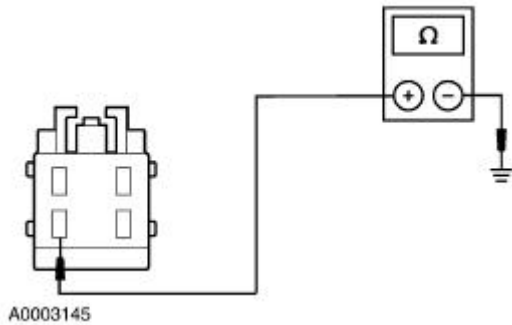


2



DDM C501b

3



3

Measure the resistance between DDM C501b pin 3, circuit 31-AJ80 (BK), harness side and ground.

● **Is the resistance less than 5 ohms?**

→ **Yes**

INSTALL a new driver front window regulator electric drive. REFER to [Motor and Window Regulator—Front Door](#) in this section. CLEAR the DTCs. REPEAT the self-test.

→ **No**

REPAIR the circuit. CLEAR the DTCs. REPEAT the self-test.

F12 CHECK WINDOW POWER TO THE DDM

1



2



DDM C501b

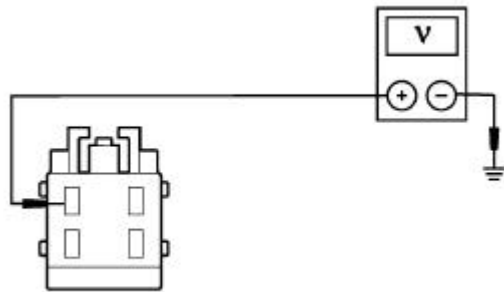
3



4

4

Measure the voltage between DDM C501b pin 4, circuit 30-AJ80 (RD), harness side and ground.



A0003146

- Is the voltage greater than 10 volts?

→ **Yes**
GO to [F13](#).

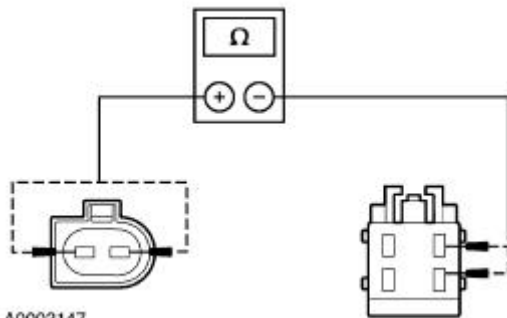
→ **No**
REPAIR the circuit. CLEAR the DTCs.
REPEAT the self-test.

F13 CHECK CIRCUIT 32-AJ26 (WH) AND CIRCUIT 33-AJ26 (YE) FOR AN OPEN

1



2



A0003147


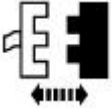
- 2 Measure the resistance between driver front window regulator electric drive C524, circuit 32-AJ26 (WH), harness side and DDM C501b pin 1, circuit 32-AJ26 (WH), harness side; and between driver front window regulator electric drive C524, circuit 33-AJ26 (YE), harness side and DDM C501b pin 2, circuit 33-AJ26 (YE), harness side.

- Are the resistances less than 5 ohms?

→ **Yes**
INSTALL a new DDM. REFER to [Section 419-10](#). CLEAR the DTCs. REPEAT the self-test.

→ **No**
REPAIR the circuit. CLEAR the DTCs.
REPEAT the self-test.

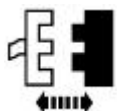
PINPOINT TEST G: A SINGLE POWER WINDOW IS INOPERATIVE — PASSENGER FRONT FROM MASTER AND PASSENGER FRONT WINDOW REGULATOR CONTROL SWITCHES

CONDITIONS	DETAILS/RESULTS/ACTIONS
G1 CHECK THE DDM DTCS	
	<p>1 Retrieve the recorded results from the DDM self-test.</p> <ul style="list-style-type: none"> • Were any DDM DTCs retrieved? <p>→ Yes REFER to the DDM Diagnostic Trouble Code (DTC) Index.</p> <p>→ No GO to G2.</p>
G2 CHECK THE FEM DTCS	
	<p>1 Retrieve the recorded results from the FEM self-test.</p> <ul style="list-style-type: none"> • Were any FEM DTCs retrieved that are related to the concern? <p>→ Yes If DTC B2214 or B2215 were retrieved, GO to G3. All others, REFER to the FEM Diagnostic Trouble Code (DTC) Index.</p> <p>→ No GO to G5.</p>
G3 CHECK THE PASSENGER FRONT WINDOW REGULATOR CONTROL SWITCH	
<p>1</p>  <p>2</p>  <p>Passenger Front Window Regulator Control Switch C604</p>	<p>3 Check the passenger front window regulator control switch; Refer to Wiring Diagrams Section 700-09, Component Testing.</p> <ul style="list-style-type: none"> • Did the passenger front window regulator control switch pass the component test? <p>→ Yes GO to G4.</p> <p>→ No INSTALL a new passenger front window regulator control switch. CLEAR the</p>

DTCs. REPEAT the self-test.

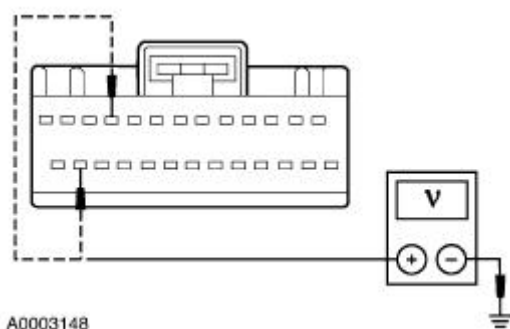
G4 CHECK CIRCUIT 8-AJ18 (WH/VT) AND CIRCUIT 10-AJ18 (GY/WH) FOR A SHORT TO BATTERY

1



FEM C201e

2



2

Measure the voltage between FEM C201e pin 25, circuit 8-AJ18 (WH/VT), harness side and ground; and between FEM C201e pin 10, circuit 10-AJ18 (GY/WH), harness side and ground.

● Is the voltage greater than 10 volts?

→ **Yes**

REPAIR the circuit in question. CLEAR the DTCs. REPEAT the self-test. GO to [G6](#).

→ **No**

INSTALL a new FEM. REFER to [Section 419-10](#). CLEAR the DTCs. REPEAT the self-test.

G5 CHECK THE FEM OUTPUT

NOTE: Cycle the ignition switch from OFF to RUN to enable the switched system power feature.

1



2



3



4



4

Select FEM active command FRONT WINDOW CONTROL.

5

Trigger PR UP to ON then OFF. Then

trigger PR DOWN to ON then OFF.

- Did the passenger front window raise and lower?

→ **Yes**

INSTALL a new FEM. REFER to [Section 419-10](#). CLEAR the DTCs. REPEAT the self-test.

→ **No**

GO to [G6](#).

G6 CHECK POWER TO BJB FUSE 426 (20A)

1



2

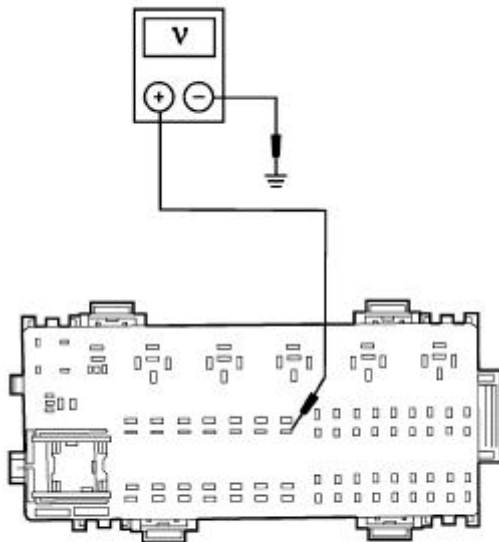


BJB Fuse 426 (30A)

3



4



4

Measure the voltage between BJB fuse 426 (30A), input terminal and ground.

A0003149

- Is the voltage greater than 10 volts?

→ **Yes**
GO to [G7](#).

→ **No**
REPAIR the BJB input circuit. CLEAR the DTCs. REPEAT the self-test.

G7 CHECK THE FEM OUTPUTS

1



2



Passenger Front Window Regulator Electric Drive C608

3



BJB Fuse 426 (30A)

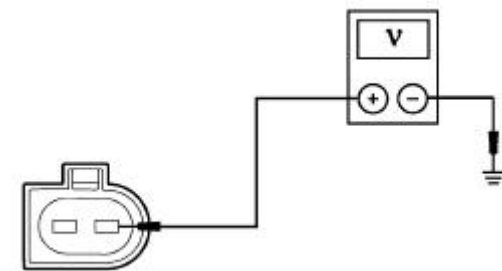
4



5



6



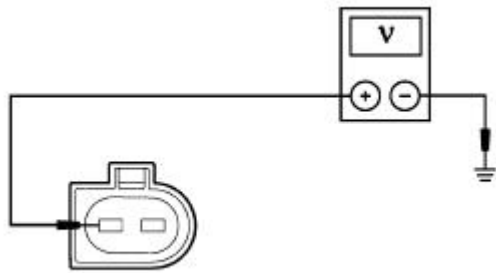
A0003143

7

5 Select FEM active command FRONT WINDOW CONTROL.

6 Measure the voltage between passenger front window regulator electric drive C608, circuit 32-AJ27 (WH/VT), harness side and ground while triggering PR DOWN to ON. Note reading.

7 Measure the voltage between passenger front window regulator electric drive C608, circuit 33-AJ27 (YE/VT), harness side and ground while triggering PR UP to ON.



A0003144

- Are the voltages greater than 10 volts when commanded ON?

→ **Yes**
GO to [G8](#).

→ **No**
GO to [G9](#).

G8 CHECK CIRCUIT 31-AJ71 (BK/YE) FOR AN OPEN

1

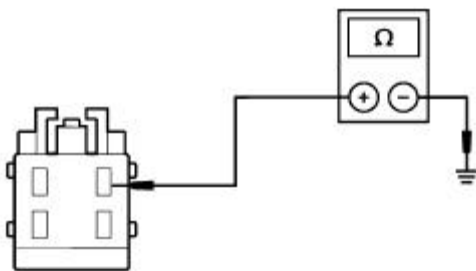


2



FEM C201d

3



A0003157

- 3 Measure the resistance between FEM C201d pin 4, circuit 31-AJ71 (BK/YE), harness side and ground.

- Is the resistance less than 5 ohms?

→ **Yes**
INSTALL a new passenger front window regulator electric drive. REFER to [Motor and Window Regulator—Front Door](#).
CLEAR the DTCs. REPEAT the self-test.

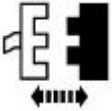
→ **No**
REPAIR the circuit. CLEAR the DTCs.
REPEAT the self-test.

G9 CHECK POWER TO THE FEM

1



2

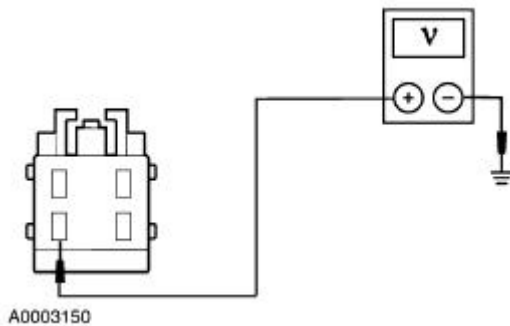


FEM C201d

3



4



4 Measure the voltage between FEM C201d pin 3, circuit 30-AJ71 (RD/YE), harness side and ground.

• Is the voltage greater than 10 volts?

→ **Yes**
GO to [G10](#).

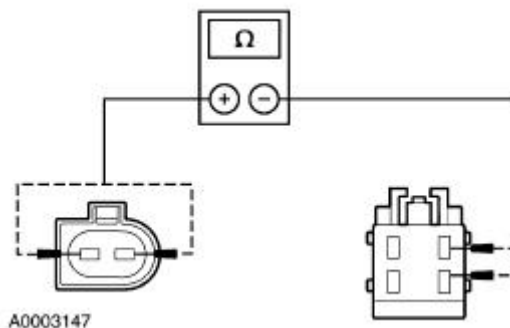
→ **No**
REPAIR the circuit. CLEAR the DTCs.
REPEAT the self-test.

G10 CHECK CIRCUIT 32-AJ27 (WH/VT) AND CIRCUIT 33-AJ27 (YE/VT) FOR AN OPEN

1




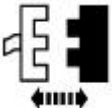
2



2 Measure the resistance between passenger front window electric drive C608, circuit 32-AJ27 (WH/VT), harness side and FEM C201d pin 2, circuit 32-AJ27 (WH/VT), harness side; and between passenger front window electric drive C608, circuit 33-AJ27 (YE/VT), harness side and FEM C201d pin 1, circuit 33-AJ27 (YE/VT), harness side.

	<ul style="list-style-type: none"> ● Are the resistances less than 5 ohms? <p>→ Yes INSTALL a new FEM. REFER to Section 419-10. CLEAR the DTCs. REPEAT the self-test.</p> <p>→ No REPAIR the circuit in question. CLEAR the DTCs. REPEAT the self-test.</p>
--	--

PINPOINT TEST H: A SINGLE POWER WINDOW IS INOPERATIVE — PASSENGER FRONT FROM THE MASTER WINDOW REGULATOR CONTROL SWITCH ONLY

CONDITIONS	DETAILS/RESULTS/ACTIONS
H1 CHECK THE DDM DTCS	
	<p>1 Retrieve the recorded results from the DDM self-test.</p> <ul style="list-style-type: none"> ● Were any DDM DTCs retrieved? <p>→ Yes If DTC B1420 was retrieved, GO to H2. For all other DDM DTCs, REFER to the FEM Diagnostic Trouble Code (DTC) Index.</p> <p>→ No GO to H4.</p>
H2 CHECK THE MASTER WINDOW REGULATOR CONTROL SWITCH	
<p>1</p>  <p>2</p>  <p>Master Window Regulator Control Switch C504</p>	<p>3 Check the master window regulator control switch; Refer to Wiring Diagrams Section 700-09, Component Testing.</p> <ul style="list-style-type: none"> ● Did the master window regulator control switch pass the component test?

→ **Yes**
GO to [H3](#).

→ **No**
INSTALL a new master window regulator control switch; REFER to [Switch—Master Window Regulator Control](#) . CLEAR the DTCs. REPEAT the self-test.

H3 CHECK CIRCUIT 7S-AJ48 (YE/VT) AND CIRCUIT 7S-AJ47 (YE/BK) FOR A SHORT TO BATTERY

1

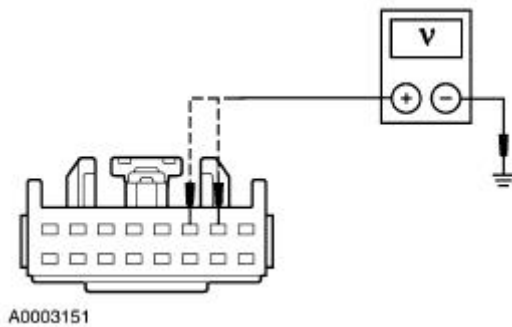


DDM C501d

2



3



3 Measure the voltage between master window regulator control switch C504 pin 3, circuit 7S-AJ48 (YE/VT), harness side and ground; and between master window regulator control switch C504 pin 2, circuit 7S-AJ47 (YE/BK), harness side and ground.

● **Is the voltage greater than 10 volts?**

→ **Yes**
REPAIR the circuit in question. CLEAR the DTCs. REPEAT the self-test.

→ **No**
INSTALL a new DDM. REFER to [Section 419-10](#) . CLEAR the DTCs. REPEAT the self-test.

H4 CHECK THE DDM PIDS P_UP_SW AND P_DN_SW

1



2



3



4



4

Monitor the DDM PIDS P_UP_SW and P_DN_SW while operating the passenger front window from the master window regulator control switch in the UP and DOWN positions.

- **Did the DDM PIDS P_UP_SW and P_DN_SW agree with the master window regulator control switch positions?**

→ **Yes**

INSTALL a new DDM. REFER to [Section 419-10](#). CLEAR the DTCs. REPEAT the self-test.

→ **No**

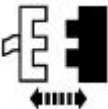
GO to [H5](#).

H5 CHECK THE WINDOW REGULATOR CONTROL SWITCH

1



2



Master Window Regulator Control Switch C504

3

Check the master window regulator control switch; Refer to Wiring Diagrams Section 700-09, Component Testing.

- **Did the master window regulator control switch pass the component test?**

→ **Yes**

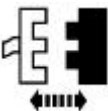
GO to [H6](#).

→ **No**

INSTALL a new master window regulator control switch. REFER to [Switch—Master Window Regulator Control](#) in this section. CLEAR the DTCs. REPEAT the self-test.

H6 CHECK CIRCUITS 7S-AJ48 (YE/VT) AND 7S-AJ41 (YE/BK) FOR AN OPEN

1



DDM C501d

2

A0003152

2

Measure the resistance between master window regulator control switch C504 pin 3, circuit 7S-AJ48 (YE/VT), harness side and DDM C501d pin 3 circuit 7S-AJ48 (YE/VT), harness side; and between master window regulator control switch C504 pin 2, circuit 7S-AJ47 (YE/BK), harness side and DDM C501d pin 2 circuit 7S-AJ41 (YE/BK), harness side.

- Are the resistances less than 5 ohms?

→ Yes
GO to [H7](#).

→ No
REPAIR the circuit in question. CLEAR the DTCs. REPEAT the self-test.

H7 CHECK CIRCUITS 7S-AJ48 (YE/VT) AND 7S-AJ47 (YE/BK) FOR A SHORT TO GROUND

1

A0003153

1

Measure the resistance between master window regulator control switch C504 pin 3, circuit 7S-AJ48 (YE/VT), harness side and ground; and between master window regulator control switch C504 pin 2, circuit 7S-AJ47 (YE/BK), harness side and ground.

- Are the resistances greater than 10,000 ohms?

→ Yes
INSTALL a new DDM. REFER to [Section 419-10](#). CLEAR the DTCs. REPEAT the self-test.

→ No
REPAIR the circuit. CLEAR the DTCs. REPEAT the self-test.

PINPOINT TEST I: A SINGLE POWER WINDOW IS INOPERATIVE — PASSENGER FRONT FROM THE PASSENGER FRONT WINDOW REGULATOR CONTROL SWITCH ONLY

CONDITIONS	DETAILS/RESULTS/ACTIONS
------------	-------------------------

I1 CHECK THE FEM DTCS

1 Retrieve the recorded results from the FEM self-test.

- **Were any FEM DTCS retrieved that are related to the concern?**

→ **Yes**
REFER to the FEM Diagnostic Trouble Code (DTC) Index.

→ **No**
GO to [I2](#).

I2 CHECK THE FEM PIDS P_UP_SW AND P_DN_SW

NOTE: Cycle the ignition switch to enable the switched system power feature.

1



2



3



4



4 Monitor the FEM PIDS P_UP_SW and P_DN_SW while operating the passenger front window regulator control switch in the UP and DOWN positions.

- **Did the FEM PIDS P_UP_SW and P_DN_SW PIDs agree with the passenger front window regulator control switch positions?**

→ **Yes**
INSTALL a new FEM. REFER to [Section 419-10](#). CLEAR the DTCs. REPEAT the self-test.

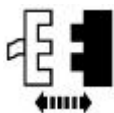
→ **No**
GO to [I3](#).

I3 CHECK THE PASSENGER FRONT WINDOW REGULATOR CONTROL SWITCH

1



2



Passenger Front Window Regulator Control Switch C604

3 Check the passenger front window regulator control switch; Refer to Wiring Diagrams Section 700-09, Component Testing.

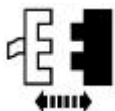
- **Did the passenger front window regulator control switch pass the component test?**

→ **Yes**
GO to [14](#).

→ **No**
INSTALL a new passenger front window regulator control switch. CLEAR the DTCs. REPEAT the self-test.

14 CHECK THE POWER TO THE PASSENGER FRONT WINDOW REGULATOR CONTROL SWITCH

1

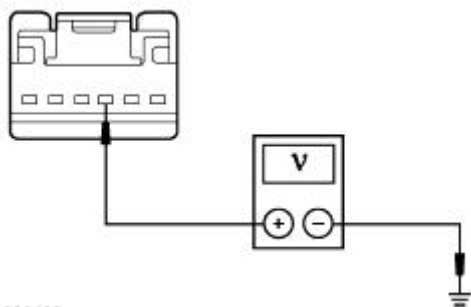


Passenger Front Window Switch C604

2



3




3 Measure the voltage between passenger front window regulator control switch C604 pin 3, circuit 7-AJ18 (YE/VT), harness side and ground.


- **Is the voltage greater than 10 volts?**

→ **Yes**
GO to [15](#).

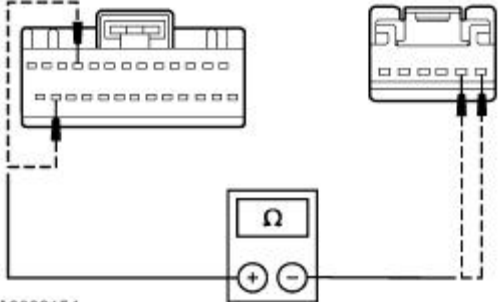
→ **No**
REPAIR the circuit. CLEAR the DTCs. REPEAT the self-test.

15 CHECK CIRCUITS 8-AJ18 (WH/VT) AND 8-AJ18 (GY/WH) FOR AN OPEN

1 

2 

FEM C201e

3 

3 Measure the resistance between passenger front window regulator control switch C604 pin 1, circuit 8-AJ18 (WH/VT), harness side and FEM C201e pin 25 circuit 8-AJ18 (WH/VT), harness side; and between passenger front window regulator control switch C604 pin 2, circuit 8-AJ18 (GY/WH), harness side and FEM C201e pin 10 circuit 10-AJ18 (GY/WH), harness side.

- **Are the resistances less than 5 ohms?**

→ **Yes**
INSTALL a new FEM. REFER to [Section 419-10](#). CLEAR the DTCs. REPEAT the self-test.

→ **No**
REPAIR the circuit. CLEAR the DTCs. REPEAT the self-test.

PINPOINT TEST J: A SINGLE POWER WINDOW IS INOPERATIVE — RIGHT REAR FROM MASTER AND REMOTE WINDOW REGULATOR CONTROL SWITCHES

CONDITIONS	DETAILS/RESULTS/ACTIONS
J1 CHECK THE DDM DTCS	<p>1 Retrieve the recorded results from the DDM self-test.</p> <ul style="list-style-type: none"> ● Were any DDM DTCs retrieved? <p>→ Yes REFER to the DDM Diagnostic Trouble Code (DTC) Index.</p> <p>→ No GO to J2.</p>

J2 CHECK THE REM DTCS

1 Retrieve the recorded results from the REM self-test.

- **Were any REM DTCS retrieved that are related to the concern?**

→ **Yes**

If DTC B2190 or B2194 were retrieved, GO to [J3](#).

For all other REM DTCS; REFER to the REM Diagnostic Trouble Code (DTC) Index.

→ **No**

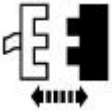
GO to [J5](#).

J3 CHECK THE RR WINDOW REGULATOR CONTROL SWITCH

1



2



RR Window Regulator Control Switch C801

3 Check the RR window regulator control switch; Refer to Wiring Diagrams Section 700-09, Component Testing.

- **Did the RR window regulator control switch pass the component test?**

→ **Yes**

GO to [J4](#).

→ **No**

INSTALL a new RR window regulator control switch. CLEAR the DTCS. REPEAT the self-test.

J4 CHECK CIRCUIT 10-AJ24 (GY/WH) AND CIRCUIT 8-AJ24 (WH) FOR A SHORT TO BATTERY

1



2

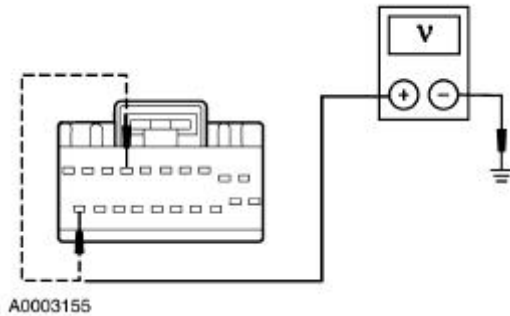


REM C420d

3



4



4

Measure the voltage between REM C420d pin 7, circuit 8-AJ24 (WH), harness side and ground; and between REM C420d pin 20, circuit 10-AJ24 (GY/WH), harness side and ground.

● Is the voltage greater than 10 volts?

→ Yes

REPAIR the circuit. CLEAR the DTCs. REPEAT the self-test.

→ No

INSTALL a new REM. REFER to [Section 419-10](#). CLEAR the DTCs. REPEAT the self-test.

J5 CHECK THE REM OUTPUT

NOTE: Cycle the ignition switch from OFF to RUN to enable the switched system power feature.

1



2



3



4



4

Select REM active command REAR WINDOW CONTROL.

5

Trigger RR UP to ON then OFF. Then trigger RR DOWN to ON then OFF.

● Did the right rear window raise and lower?

→ **Yes**
INSTALL a new REM. REFER to [Section 419-10](#). CLEAR the DTCs. REPEAT the self-test.

→ **No**
GO to [J6](#).

J6 CHECK POWER TO BJB FUSE 430 (20A)

1



2

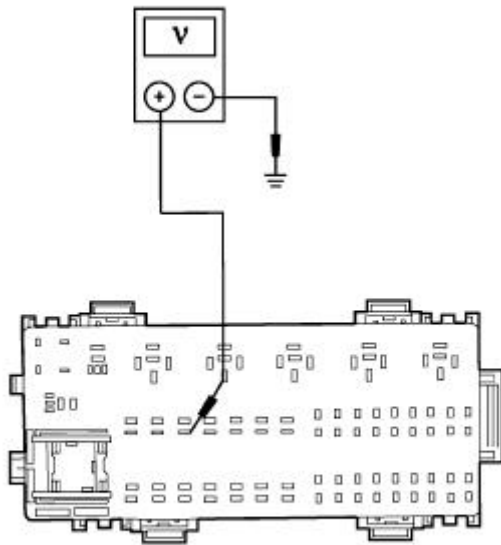


BJB Fuse 430 (20A)

3



4



A0008637

4 Measure the voltage between BJB fuse 430 (20A), input terminal and ground.

● Is the voltage greater than 10 volts?

→ **Yes**
GO to [J7](#).

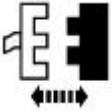
→ **No**
REPAIR the BJB input circuit. CLEAR the DTCs. REPEAT the self-test.

J7 CHECK THE REM OUTPUTS

1



2



RR Window Regulator Electric Drive C803

3



BJB Fuse 430 (20A)

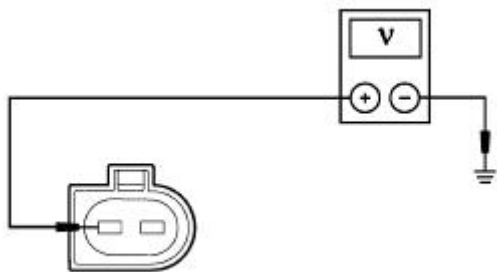
4



5

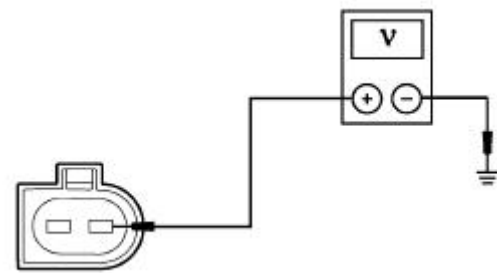


6



A0003144

7



A0003143

5 Select REM active command REAR WINDOW CONTROL.

6 Measure the voltage between RR window regulator electric drive C803, circuit 35-AJ23 (VT/WH), harness side and ground while triggering the REM active command RR DOWN to ON.

7 Measure the voltage between RR window regulator electric drive C803, circuit 34-AJ23 (BU/OG), harness side and ground while triggering the REM active command RR UP to ON.

- Are the voltages greater than 10 volts when the REM active commands are triggered to ON?

→ **Yes**
GO to [J8](#).

→ **No**
GO to [J9](#).

J8 CHECK CIRCUIT 31-DK30B (RD) FOR AN OPEN

1

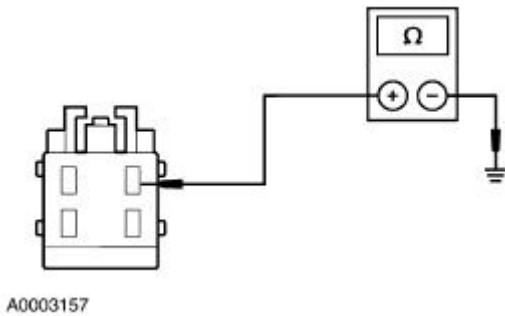


2



REM C420g

3



3 Measure the resistance between REM C420g pin 1, circuit 31-DK30B (RD), harness side and ground.

● **Is the resistance less than 5 ohms?**

→ **Yes**
INSTALL a new RR window regulator electric drive. REFER to [Motor and Window Regulator—Rear Door](#). CLEAR the DTCs. REPEAT the self-test.

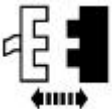
→ **No**
REPAIR the circuit. CLEAR the DTCs. REPEAT the self-test.

J9 CHECK WINDOW POWER TO THE REM

1



2

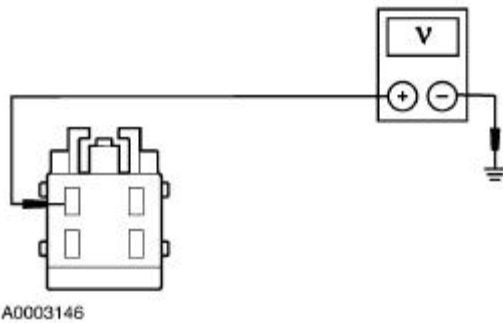


REM C420g

3



4



4

Measure the voltage between REM C420g pin 2, circuit 30-DK30 (RD), harness side and ground.

● Is the voltage greater than 10 volts?

→ **Yes**
GO to [J10](#).

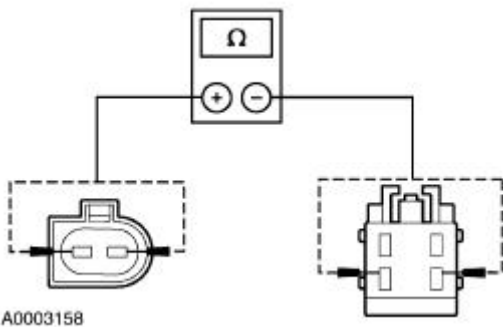
→ **No**
REPAIR the circuit. CLEAR the DTCs.
REPEAT the self-test.

J10 CHECK CIRCUIT 35-AJ23 (VT/WH) AND CIRCUIT 34-AJ23 (BU/OG) FOR AN OPEN

1



2



2


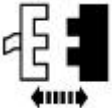

Measure the resistance between RR window regulator electric drive C803, circuit 34-AJ23 (BU/OG), harness side and REM C420g pin 3, circuit 34-AJ23 (BU/OG), harness side; and between RR window regulator electric drive C803, circuit 35-AJ23 (VT/WH), harness side and REM C420g pin 4, circuit 35-AJ23 (VT/WH), harness side.

● Are the resistances less than 5 ohms?

→ **Yes**
INSTALL a new REM. REFER to [Section 419-10](#). CLEAR the DTCs. REPEAT the self-test.

→ **No**
REPAIR the circuit. CLEAR the DTCs.
REPEAT the self-test.

PINPOINT TEST K: A SINGLE POWER WINDOW IS INOPERATIVE — RIGHT REAR FROM THE MASTER WINDOW REGULATOR CONTROL SWITCH ONLY

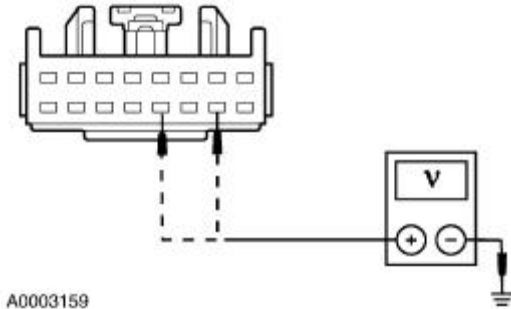
CONDITIONS	DETAILS/RESULTS/ACTIONS
K1 CHECK THE DDM DTCS	
	<p>1 Retrieve the recorded results from the DDM self-test.</p> <ul style="list-style-type: none"> • Were any DDM DTCs retrieved? <p>→ Yes If DTC B1424 was retrieved, GO to K2. For all other DDM DTCs; REFER to the DDM Diagnostic Trouble Code (DTC) Index.</p> <p>→ No GO to K4.</p>
K2 CHECK THE MASTER WINDOW REGULATOR CONTROL SWITCH	
<p>1</p>  <p>2</p>  <p>Master Window Regulator Control Switch C504</p>	<p>3 Check the master window regulator control switch. Refer to Wiring Diagrams Section 700-09, Component Testing.</p> <ul style="list-style-type: none"> • Did the master window regulator control switch pass the component test? <p>→ Yes GO to K3.</p> <p>→ No INSTALL a new master window regulator control switch. REFER to Switch—Master Window Regulator Control in this section. CLEAR the DTCs. REPEAT the self-test.</p>
K3 CHECK CIRCUIT 7S-AJ52 (YE) AND CIRCUIT 7S-AJ51 (YE/RD) FOR A SHORT TO BATTERY	
<p>1</p> 	

DDM C501d

2



3



A0003159

3

Measure the voltage between master window regulator control switch C504 pin 10, circuit 7S-AJ52 (YE), harness side and ground; and between master window regulator control switch C504 pin 12, circuit 7S-AJ51 (YE/RD), harness side and ground.

● Is the voltage greater than 10 volts?

→ Yes

REPAIR the circuit in question. CLEAR the DTCs. REPEAT the self-test.

→ No

INSTALL a new DDM. REFER to [Section 419-10](#). CLEAR the DTCs. REPEAT the self-test.

K4 CHECK THE DDM PIDS RRUP_SW AND RRDN_SW

1



2



3



3

Monitor the DDM PIDs RRUP_SW and RRDN_SW while operating the right rear window from the master window regulator control switch to the UP and DOWN positions.

● Did the DDM PIDs RRUP_SW and RRDN_SW agree with the master window regulator control switch positions?

→ Yes

INSTALL a new DDM. REFER to [Section 419-10](#). CLEAR the DTCs. REPEAT the self-test.

→ No

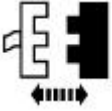
GO to [K5](#).

K5 CHECK THE WINDOW REGULATOR CONTROL SWITCH

1



2



Master Window Regulator Control Switch C504

3 Check the master window regulator control switch; Refer to Wiring Diagrams Section 700-09, Component Testing.

- **Did the master window regulator control switch pass the component test?**

→ **Yes**
GO to [K6](#).

→ **No**
INSTALL a new master window regulator control switch. REFER to [Switch—Master Window Regulator Control](#) in this section. CLEAR the DTCs. REPEAT the self-test.

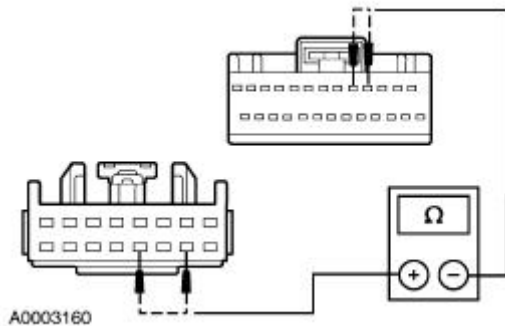
K6 CHECK CIRCUITS 7S-AJ52 (YE) AND 7S-AJ51 (YE/RD) FOR AN OPEN

1



DDM C501c

2



2 Measure the resistance between master window regulator control switch C504 pin 10, circuit 7S-AJ52 (YE), harness side and DDM C501c pin 5 circuit 7S-AJ52 (YE), harness side; and between master window regulator control switch C504 pin 12, circuit 7S-AJ51 (YE/RD), harness side and DDM C501d pin 4 circuit 7S-AJ51 (YE/RD), harness side.

- **Are the resistances less than 5 ohms?**

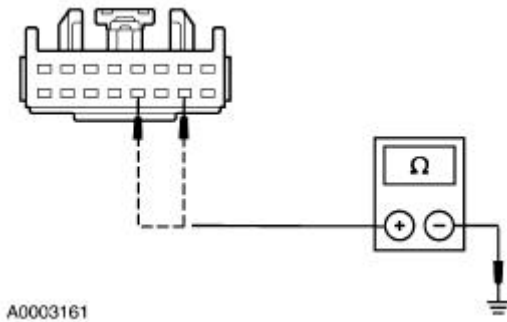
→ **Yes**
GO to [K7](#).

→ **No**

REPAIR the circuit in question. CLEAR the DTCs. REPEAT the self-test.

K7 CHECK CIRCUITS 7S-AJ52 (YE) AND 7S-AJ51 (YE/RD) FOR A SHORT TO GROUND

1



1

Measure the resistance between master window regulator control switch C504 pin 10, circuit 7S-AJ52 (YE), harness side and ground; and between master window regulator control switch C504 pin 12, circuit 7S-AJ51 (YE/RD), harness side and ground.

- Are the resistances greater than 10,000 ohms?

→ **Yes**

INSTALL a new DDM. REFER to [Section 419-10](#). CLEAR the DTCs. REPEAT the self-test.

→ **No**

REPAIR the circuit in question. CLEAR the DTCs. REPEAT the self-test.

PINPOINT TEST L: A SINGLE POWER WINDOW IS INOPERATIVE — RIGHT REAR FROM RR WINDOW REGULATOR CONTROL SWITCH ONLY

CONDITIONS	DETAILS/RESULTS/ACTIONS
L1 CHECK THE FEM DTCS	
	<p>1 Retrieve the recorded results from the REM self-test.</p> <ul style="list-style-type: none"> • Were any REM DTCs retrieved that are related to the concern? <p>→ Yes REFER to the REM Diagnostic Trouble Code (DTC) Index.</p> <p>→ No GO to L2.</p>
L2 CHECK THE REM PIDS RRUP_SW AND RRDN_SW	
NOTE: Cycle the ignition switch to enable the switched system power feature.	
1	



2



3



4



4 Monitor the REM PIDS RRUP_SW and RRDN_SW while operating the RR window regulator control switch to the UP and DOWN positions.

- Did the REM PIDS RRUP_SW and RRDN_SW agree with the RR window regulator control switch positions?

→ Yes
INSTALL a new REM. REFER to [Section 419-10](#). CLEAR the DTCs. REPEAT the self-test.

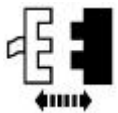
→ No
GO to [L3](#).

L3 CHECK THE RR WINDOW REGULATOR CONTROL SWITCH

1



2



RR Window Regulator Control Switch C801

3 Check the RR window regulator control switch; Refer to Wiring Diagrams Section 700-09, Component Testing.

- Did the RR window regulator control switch pass the component test?

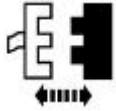
→ Yes
GO to [L4](#).

→ No
INSTALL a new RR window regulator

control switch. CLEAR the DTCs.
REPEAT the self-test.

L4 CHECK THE POWER TO THE RR WINDOW REGULATOR CONTROL SWITCH

1

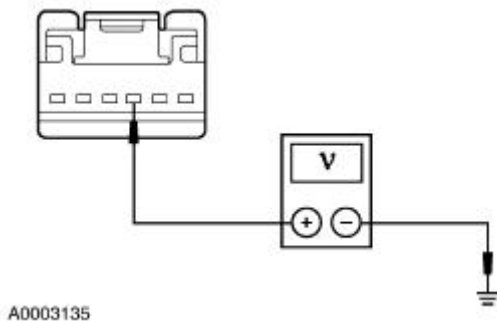


RR Window Regulator Control Switch C801

2



3



3 Measure the voltage between RR window regulator control switch C801 pin 3, circuit 7-AJ24 (YE), harness side and ground.

● Is the voltage greater than 10 volts?

→ Yes
GO to [L5](#).

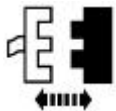
→ No
REPAIR the circuit. CLEAR the DTCs.
REPEAT the self-test.

L5 CHECK CIRCUITS 8-AJ24 (GYWH) AND 10-AJ24 (GY) FOR AN OPEN

1



2



REM C420d

3

3 Measure the resistance between RR window regulator control switch C801 pin 7, circuit 8-AJ24 (WH), harness side and REM C420d pin 7 circuit 8-AJ24 (WH), harness side; and between RR window regulator control switch C801 pin 2, circuit 10-AJ24 (GY/WH), harness side and REM C420d pin 20 circuit 10-AJ24 (GY/WH), harness side.

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- **Are the resistances less than 5 ohms?**

→ **Yes**
 INSTALL a new REM. REFER to [Section 419-10](#). CLEAR the DTCs. REPEAT the self-test.

→ **No**
 REPAIR the circuit in question. CLEAR the DTCs. REPEAT the self-test.

PINPOINT TEST M: A SINGLE POWER WINDOW IS INOPERATIVE — LEFT REAR FROM ALL WINDOW REGULATOR CONTROL SWITCHES

CONDITIONS	DETAILS/RESULTS/ACTIONS
M1 CHECK THE DDM DTCS	<p>1 Retrieve the recorded results from the DDM self-test.</p> <ul style="list-style-type: none"> ● Were any DDM DTCs retrieved? <p>→ Yes REFER to the DDM Diagnostic Trouble Code (DTC) Index.</p> <p>→ No GO to M2.</p>
M2 CHECK THE REM DTCS	<p>1 Retrieve the recorded results from the REM self-test.</p> <ul style="list-style-type: none"> ● Were any REM DTCs retrieved that are related to the concern? <p>→ Yes If DTC B2174 or B2178 were retrieved, GO to M3.</p>

For all other REM DTCs, REFER to the REM Diagnostic Trouble Code (DTC) Index.

→ **No**
GO to [M5](#).

M3 CHECK THE LR WINDOW REGULATOR CONTROL SWITCH

1



2



LR Window Regulator Control Switch C701

3 Check the LR window regulator control switch; Refer to Wiring Diagrams Section 700-09, Component Testing.

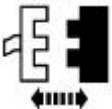
- **Did the LR window regulator control switch pass the component test?**

→ **Yes**
GO to [M4](#).

→ **No**
INSTALL a new LR window regulator control switch. CLEAR the DTCs. REPEAT the self-test.

M4 CHECK CIRCUIT 10-AJ14 (GY/VT) AND CIRCUIT 8-AJ14 (WH/BU) FOR A SHORT TO BATTERY

1



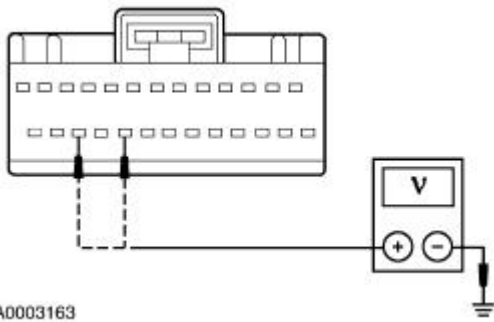
REM C420c

2



3

3 Measure the voltage between REM C420c pin 24, circuit 8-AJ14 (WH/BU), harness side and ground; and between REM C420c pin 22, circuit 10-AJ14 (GY/VT), harness side and ground.



● Is the voltage greater than 10 volts?

→ **Yes**

REPAIR the circuit in question. CLEAR the DTCs. REPEAT the self-test.

→ **No**

INSTALL a new REM. REFER to [Section 419-10](#). CLEAR the DTCs. REPEAT the self-test.

M5 CHECK THE REM OUTPUT

NOTE: Cycle the ignition switch from OFF to RUN to enable the switched system power feature.

1



2



3



4



4

Trigger the REM active commands LR UP and LR DOWN to ON then OFF.

● Did the left rear window raise and lower?

→ **Yes**

INSTALL a new REM. REFER to [Section 419-10](#). CLEAR the DTCs. REPEAT the self-test.

→ **No**

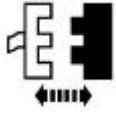
GO to [M6](#).

M6 CHECK POWER TO BJB FUSE 419 (20A)

1



2

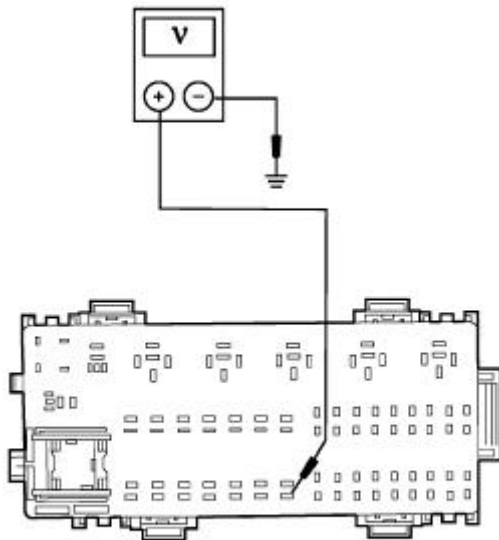


BJB Fuse 419 (20A)

3



4



A0003164

4 Measure the voltage between BJB fuse 419 (20A), input terminal and ground.

● Is the voltage greater than 10 volts?

→ Yes
GO to [M7](#).

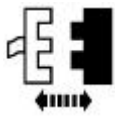
→ No
REPAIR the BJB input circuit. CLEAR the DTCs. REPEAT the self-test.

M7 CHECK THE REM OUTPUTS

1



2



LR Window Regulator Electric Drive C703

3



BJB Fuse 419 (20A)

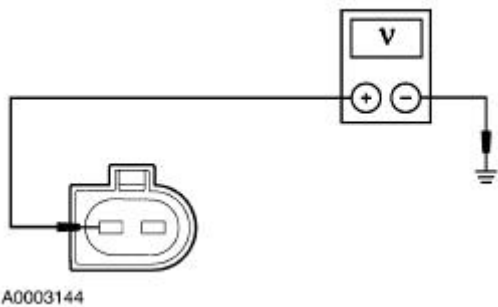
4



5



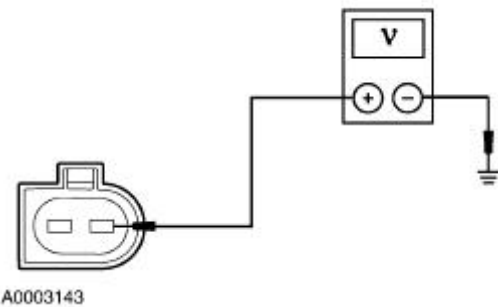
6



6

Measure the voltage between LR window regulator electric drive C703, circuit 35-AJ13 (VT/BU), harness side and ground while triggering the REM active command LR DOWN to ON.

7



7

Measure the voltage between LR window regulator electric drive C703, circuit 34-AJ13 (BU/RD), harness side and ground while triggering the REM active command LR UP to ON.

- Are the voltages greater than 10 volts when the REM active commands LR DOWN and LR UP are triggered to ON?

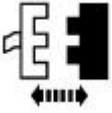
→ Yes
GO to [M8](#).

→ No
GO to [M9](#).

1

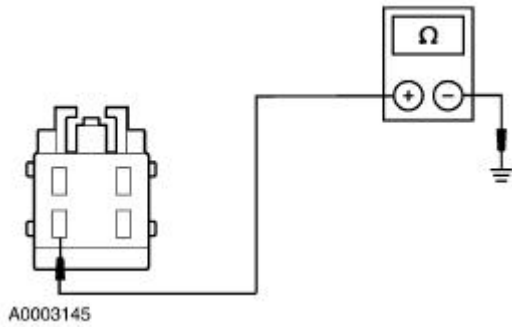


2



REM C420f

3



3 Measure the resistance between REM C420f pin 3, circuit 31-DK30A (BK/OG), harness side and ground.

● Is the resistance less than 5 ohms?

→ **Yes**
INSTALL a new LR window regulator electric drive. REFER to [Motor and Window Regulator—Rear Door](#) in this section. CLEAR the DTCs. REPEAT the self-test.

→ **No**
REPAIR the circuit. CLEAR the DTCs. REPEAT the self-test.

M9 CHECK WINDOW POWER TO THE REM

1



2



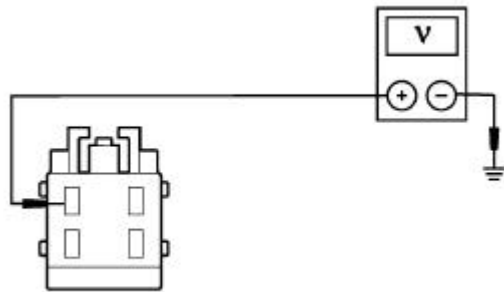
REM C420f

3



4

4 Measure the voltage between REM C420f pin 2, circuit 30-DK30A (RD), harness side and ground.



A0003146

- Is the voltage greater than 10 volts?

→ **Yes**
GO to [M10](#).

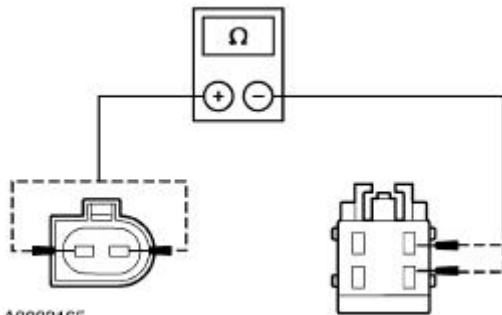
→ **No**
REPAIR the circuit. CLEAR the DTCs.
REPEAT the self-test.

M10 CHECK CIRCUIT 35-AJ13 (VT/BU) AND CIRCUIT 34-AJ13 (BU/RD) FOR AN OPEN

1



2



A0003165


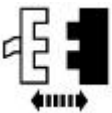
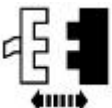
2 Measure the resistance between LR window regulator electric drive C703, circuit 34-AJ13 (BU/RD), harness side and REM C420f pin 1, circuit 34-AJ13 (BU/RD), harness side; and between LR window regulator electric drive C703, circuit 35-AJ13 (VT/BU), harness side and REM C420f pin 3, circuit 35-AJ13 (VT/BU), harness side.

- Are the resistances less than 5 ohms?

→ **Yes**
INSTALL a new REM. REFER to [Section 419-10](#). CLEAR the DTCs. REPEAT the self-test.

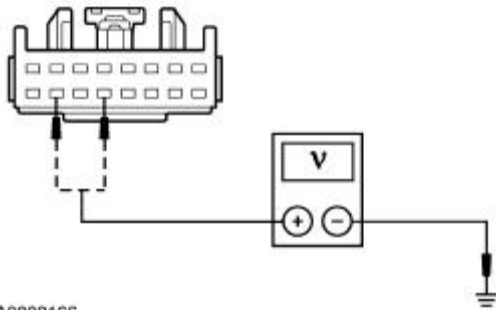
→ **No**
REPAIR the circuit in question. CLEAR the DTCs. REPEAT the self-test.

PINPOINT TEST N: A SINGLE POWER WINDOW IS INOPERATIVE — LEFT REAR FROM THE MASTER WINDOW REGULATOR CONTROL SWITCH ONLY

CONDITIONS	DETAILS/RESULTS/ACTIONS
N1 CHECK THE DDM DTCS	
	<p>1 Retrieve the recorded results from the DDM self-test.</p> <ul style="list-style-type: none"> • Were any DDM DTCs retrieved? <p>→ Yes If DTC B1416 was retrieved, GO to N2.</p> <p>For all other DDM DTCs, REFER to the DDM Diagnostic Trouble Code (DTC) Index.</p> <p>→ No GO to N4.</p>
N2 CHECK THE MASTER WINDOW REGULATOR CONTROL SWITCH	
<p>1 </p> <p>2  Master Window Regulator Control Switch C504</p>	<p>3 Check the master window regulator control switch; Refer to Wiring Diagrams Section 700-09, Component Testing.</p> <ul style="list-style-type: none"> • Did the master window regulator control switch pass the component test? <p>→ Yes GO to N3.</p> <p>→ No INSTALL a new master window regulator control switch. REFER to Switch—Master Window Regulator Control in this section. CLEAR the DTCs. REPEAT the self-test.</p>
N3 CHECK CIRCUIT 7S-AJ50 (YE/BU) AND CIRCUIT 7S-AJ49 (YE/GN) FOR A SHORT TO BATTERY	
<p>1  DDM C501d</p> <p>2</p>	



3



A0003166

3

Measure the voltage between master window regulator control switch C504 pin 15, circuit 7S-AJ50 (YE/BU), harness side and ground; and between master window regulator control switch C504 pin 13, circuit 7S-AJ49 (YE/GN), harness side and ground.

● **Is the voltage greater than 10 volts?**

→ **Yes**

REPAIR the circuit in question. CLEAR the DTCs. REPEAT the self-test.

→ **No**

INSTALL a new DDM. REFER to [Section 419-10](#). CLEAR the DTCs. REPEAT the self-test.

N4 CHECK THE DDM PIDS LRUP_SW AND LRDN_SW

1



2



3



4



4

Monitor the DDM PIDS LRUP_SW and LRDN_SW while operating the left rear window to the UP and DOWN positions from the master window regulator control switch.

● **Did the DDM PIDS LRUP_SW and LRDN_SW agree with the master window regulator control switch positions?**

→ **Yes**

INSTALL a new DDM. REFER to [Section 419-10](#). CLEAR the DTCs. REPEAT the

self-test.

→ **No**
GO to [N5](#).

N5 CHECK THE WINDOW REGULATOR CONTROL SWITCH

1



2



Master Window Regulator Control Switch C504

3 Check the master window regulator control switch; Refer to Wiring Diagrams Section 700-09, Component Testing.

- **Did the master window regulator control switch pass the component test?**

→ **Yes**
GO to [N6](#).

→ **No**
INSTALL a new master window regulator control switch. REFER to [Switch—Master Window Regulator Control](#) in this section. CLEAR the DTCs. REPEAT the self-test.

N6 CHECK CIRCUITS 7S-AJ50 (YE/BU) AND 7S-AJ49 (YE/GN) FOR AN OPEN

1



DDM C501c

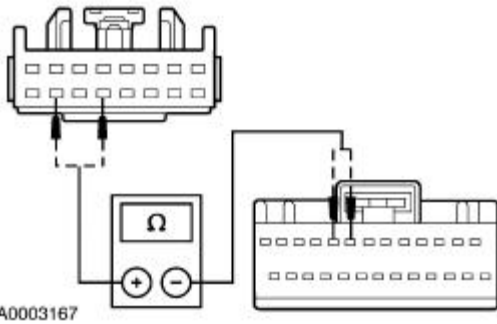
2



Master Window Regulator Control Switch C504

3

3 Measure the resistance between master window regulator control switch C504 pin 15, circuit 7S-AJ50 (YE/BU), harness side and DDM C501c pin 9 circuit 7S-AJ50 (YE/BU), harness side; and between master window regulator control switch C504 pin 13, circuit 7S-AJ49 (YE/GN), harness side and DDM C501c pin 8 circuit 7S-AJ49 (YE/GN), harness side.



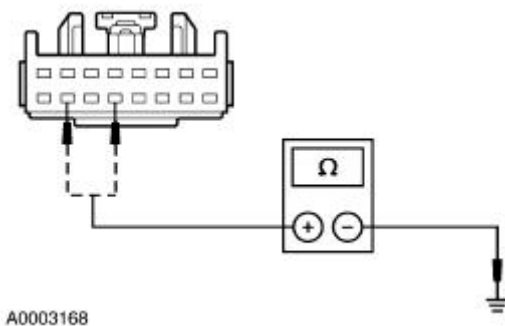
- Are the resistances less than 5 ohms?

→ **Yes**
GO to [N7](#).

→ **No**
REPAIR the circuit in question. CLEAR the DTCs. REPEAT the self-test.

N7 CHECK CIRCUITS 7S-AJ50 (YE/BU) AND 7S-AJ49 (YE/GN) FOR A SHORT TO GROUND

1



1

Measure the resistance between master window regulator control switch C504 pin 15, circuit 7S-AJ50 (YE/BU), harness side and ground; and between master window regulator control switch C504 pin 13, circuit 7S-AJ49 (YE/GN), harness side and ground.

- Are the resistances greater than 10,000 ohms?

→ **Yes**
INSTALL a new DDM. REFER to [Section 419-10](#). CLEAR the DTCs. REPEAT the self-test.

→ **No**
REPAIR the circuit in question. CLEAR the DTCs. REPEAT the self-test.

PINPOINT TEST O: A SINGLE POWER WINDOW IS INOPERATIVE — LEFT REAR FROM THE LR WINDOW REGULATOR CONTROL SWITCH ONLY

CONDITIONS	DETAILS/RESULTS/ACTIONS
O1 CHECK THE REM DTCS	

1 Retrieve the recorded results from the REM self-test.

- Were any REM DTCs retrieved that are related to the concern?

→ **Yes**
REFER to the REM Diagnostic Trouble Code (DTC) Index.

→ **No**
GO to [O2](#).

O2 CHECK THE REM PIDS LRUP_SW AND LRDN_SW

NOTE: Cycle the ignition switch to enable the switched system power feature.

1



2



3



4



4 Monitor the REM PIDS LRUP_SW and LRDN_SW while operating the LR window regulator control switch to the UP and DOWN positions.

- Did the REM PIDS LRUP_SW and LRDN_SW agree with the LR window regulator control switch positions?

→ **Yes**
INSTALL a new REM. REFER to [Section 419-10](#). CLEAR the DTCs. REPEAT the self-test.

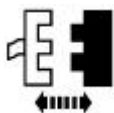
→ **No**
GO to [O3](#).

O3 CHECK THE LR WINDOW REGULATOR CONTROL SWITCH

1



2



LR Window Regulator Control Switch C701

3 Check the LR window regulator control switch; Refer to Wiring Diagrams Section 700-09, Component Testing.

- Did the LR window regulator control switch pass the component test?

→ Yes
GO to O4.

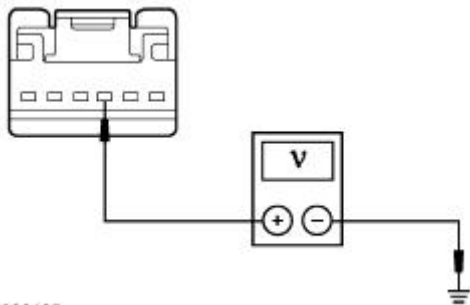
→ No
INSTALL a new LR window regulator control switch. CLEAR the DTCs. REPEAT the self-test.

O4 CHECK THE POWER TO THE LR WINDOW REGULATOR CONTROL SWITCH

1



2



2 Measure the voltage between LR window regulator control switch C701 pin 3, circuit 7-AJ14A (YE/BU), harness side and ground.

- Is the voltage greater than 10 volts?

→ Yes
GO to O5.

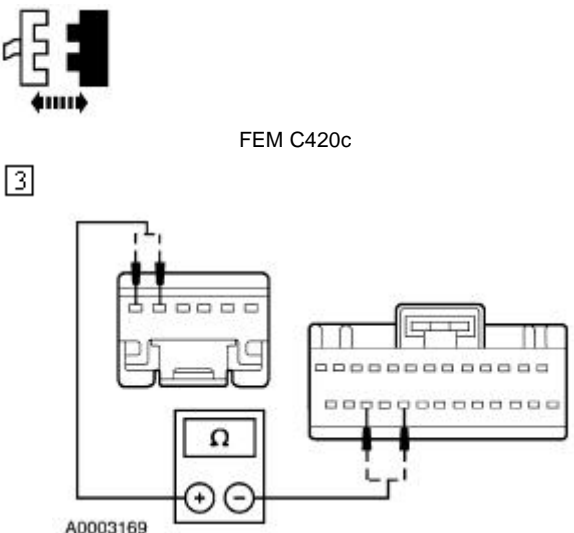
→ No
REPAIR the circuit. CLEAR the DTCs. REPEAT the self-test.

O5 CHECK CIRCUITS 8-AJ14A (WH/BU) AND 10-AJ14 (GY/VT) FOR AN OPEN

1



2



FEM C420c

3

3



Measure the resistance between LR window regulator control switch C701 pin 1, circuit 8-AJ14A (WH/BU), harness side and REM C420c pin 24 circuit 8-AJ14A (WH/BU), harness side; and between LR window regulator control switch C701 pin 2, circuit 10-AJ14 (GY/VT), harness side and REM C420c pin 22 circuit 10-AJ14 (GY/VT), harness side.

- Are the resistances less than 5 ohms?

→ Yes
INSTALL a new REM. REFER to [Section 419-10](#). CLEAR the DTCs. REPEAT the self-test.

→ No
REPAIR the circuit in question. CLEAR the DTCs. REPEAT the self-test.

PINPOINT TEST P: ALL/SINGLE PASSENGER POWER WINDOWS ARE INOPERATIVE — PASSENGER WINDOW LOCK-OUT NOT OPERATING CORRECTLY

CONDITIONS	DETAILS/RESULTS/ACTIONS
P1 CHECK THE MASTER WINDOW REGULATOR CONTROL SWITCH	
<p>1</p>  <p>2</p>  <p>Master Window Regulator Control Switch C504</p>	<p>3</p> <p>Check the master window regulator control switch; Refer to Wiring Diagrams Section 700-09, Component Testing.</p> <ul style="list-style-type: none"> • Did the master window regulator control switch pass the component test?

→ **Yes**
GO to [P2](#).

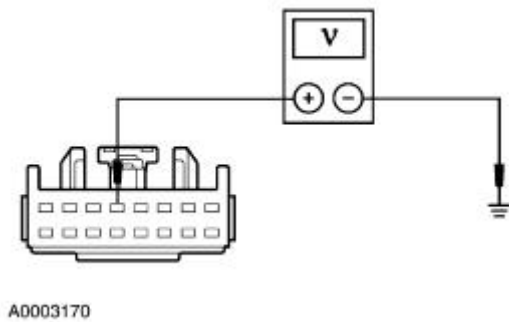
→ **No**
INSTALL a new master window regulator control switch. REFER to [Switch—Master Window Regulator Control](#) in this section. CLEAR the DTCs. REPEAT the self-test.

P2 CHECK CIRCUIT 7S-AJ20 (YE/BU) FOR A SHORT TO BATTERY

1



2



2 Measure the voltage between master window regulator control switch C504 pin 5, circuit 7S-AJ20 (YE/BU), harness side and ground.

● Is the voltage greater than 10 volts?

→ **Yes**
GO to [P3](#).

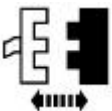
→ **No**
GO to [P4](#).

P3 CHECK THE DDM FOR AN INTERNAL SHORT TO BATTERY

1



2



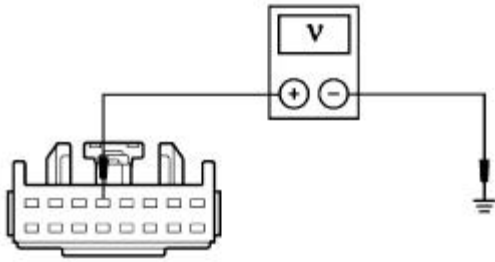
DDM C501d

3



4

4 Measure the voltage between master window regulator control switch C504 pin 5, circuit 7S-AJ20 (YE/BU), harness side and ground.



A0003170

- Is the voltage greater than 10 volts?

→ **Yes**

REPAIR the circuit. CLEAR the DTCs.
REPEAT the self-test.

→ **No**

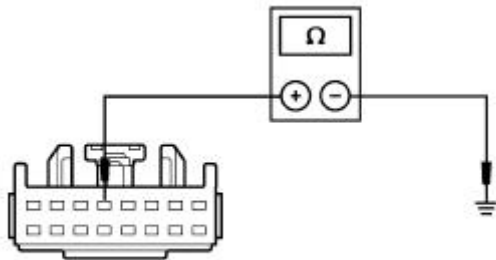
INSTALL a new DDM. REFER to [Section 419-10](#). CLEAR the DTCs. REPEAT the self-test.

P4 CHECK CIRCUIT 7S-AJ20 (YE/BU) FOR A SHORT TO GROUND

1



2



A0003171

2

Measure the resistance between master window regulator control switch C504 pin 5, circuit 7S-AJ20 (YE/BU), harness side and ground.

- Is the resistance greater than 10,000 ohms?

→ **Yes**

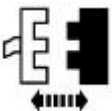
GO to [P6](#).

→ **No**

GO to [P5](#).

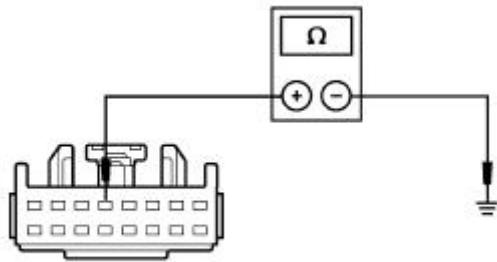
P5 CHECK THE DDM FOR AN INTERNAL SHORT TO GROUND

1



DDM C501d

2



A0003171

2

Measure the resistance between master window regulator control switch C504 pin 5, circuit 7S-AJ20 (YE/BU), harness side and ground.

● Is the resistance greater than 10,000 ohms?

→ **Yes**
INSTALL a new DDM. REFER to [Section 419-10](#). CLEAR the DTCs. REPEAT the self-test.

→ **No**
REPAIR the circuit. CLEAR the DTCs. REPEAT the self-test.

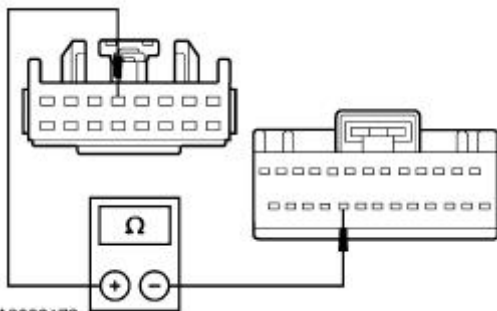
P6 CHECK CIRCUIT 7S-AJ20 (YE/BU) FOR AN OPEN

1



DDM C501c

2



A0003172

2

Measure the resistance between master window regulator control switch C504 pin 5, circuit 7S-AJ20 (YE/BU), harness side and DDM C501c pin 22, circuit 7S-AJ20 (YE/BU), harness side.



● Is the resistance less than 5 ohms?

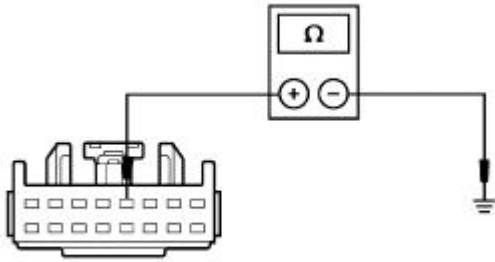
→ **Yes**
INSTALL a new DDM. REFER to [Section 419-10](#). CLEAR the DTCs. REPEAT the self-test.

→ **No**
REPAIR the circuit. CLEAR the DTCs. REPEAT the self-test.

PINPOINT TEST Q: THE ONE TOUCH DOWN FEATURE IS

INOPERATIVE

CONDITIONS	DETAILS/RESULTS/ACTIONS
Q1 CHECK THE DDM DTCS	
	<p>1 Retrieve the recorded results from the DDM self-test.</p> <ul style="list-style-type: none"> ● Were any DDM DTCs retrieved? <p>→ Yes If DTC B1400 was retrieved, GO to Q6.</p> <p>For all other DTCs, REFER to the DDM Diagnostic Trouble Code (DTC) Index.</p> <p>→ No GO to Q2.</p>
Q2 CHECK THE MASTER WINDOW REGULATOR CONTROL SWITCH	
<p>1</p>  <p>2</p>  <p>Master Window Regulator Control Switch C504</p>	<p>3 Check the master window regulator control switch; Refer to Wiring Diagrams Section 700-09, Component Testing.</p> <ul style="list-style-type: none"> ● Did the master window regulator control switch pass the component test? <p>→ Yes GO to Q3.</p> <p>→ No INSTALL a new master window regulator control switch. REFER to Switch—Master Window Regulator Control in this section. CLEAR the DTCs. REPEAT the self-test.</p>
Q3 CHECK CIRCUIT 7S-AJ16 (YE/BK) FOR A SHORT TO GROUND	
<p>1</p>	<p>1 Measure the resistance between master window regulator control switch C504 pin 4, circuit 7S-AJ16 (YE/BK), harness side and ground.</p>



A0003173

- Is the resistance greater than 10,000 ohms?

→ **Yes**
GO to [Q5](#).

→ **No**
GO to [Q4](#).

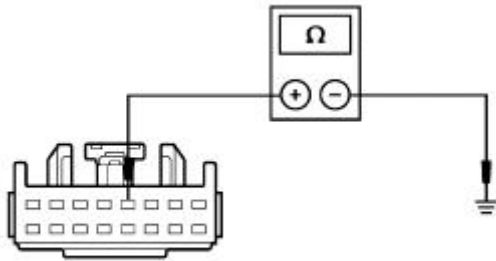
Q4 CHECK THE DDM FOR AN INTERNAL SHORT TO GROUND

1



DDM C501d

2



A0003173

- 2 Measure the resistance between master window regulator control switch C504 pin 4, circuit 7S-AJ16 (YE/BK), harness side and ground.

- Is the resistance greater than 10,000 ohms?

→ **Yes**
INSTALL a new DDM. REFER to [Section 419-10](#). CLEAR the DTCs. REPEAT the self-test.

→ **No**
REPAIR the circuit. CLEAR the DTCs. REPEAT the self-test.

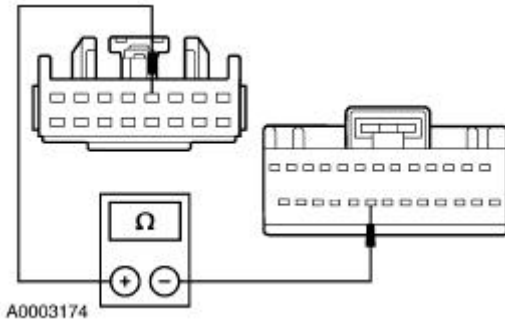
Q5 CHECK CIRCUIT 7S-AJ16 (YE/BK) FOR AN OPEN

1



DDM C501c

2



2

Measure the resistance between master window regulator control switch C504 pin 4, circuit 7S-AJ16 (YE/BK), harness side and DDM C501c pin 21, circuit 7S-AJ16 (YE/BK), harness side.

● Is the resistance less than 5 ohms?

→ Yes

INSTALL a new DDM. REFER to [Section 419-10](#). CLEAR the DTCs. REPEAT the self-test.

→ No

REPAIR the circuit in question. CLEAR the DTCs. REPEAT the self-test.

Q6 CHECK THE MASTER WINDOW REGULATOR CONTROL SWITCH FOR AN INTERNAL SHORT

1



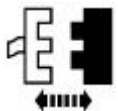
2



3



4



Master Window Regulator Control Switch C504

3

Monitor the DDM PID OTD_SW.

● Did the DDM PID OTD_SW change when the master window regulator control switch C504 was disconnected?

→ **Yes**
 INSTALL a new master window regulator control switch. REFER to [Switch—Master Window Regulator Control](#) in this section. CLEAR the DTCs. REPEAT the self-test.

→ **No**
 GO to [Q7](#).

Q7 CHECK CIRCUIT 7S-AJ16 (YE/BK) FOR A SHORT TO BATTERY

1



2

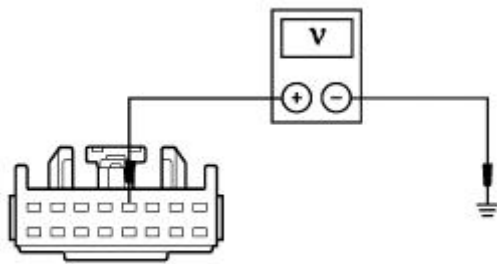


DDM C501d

3



4



A0003175

4 Measure the voltage between master window regulator control switch C504 pin 4, circuit 7S-AJ16 (YE/BK), harness side and ground.

● **Is the voltage greater than 10 volts?**

→ **Yes**
 REPAIR the circuit. CLEAR the DTCs. REPEAT the self-test.

→ **No**
 INSTALL a new DDM. REFER to [Section 419-10](#). CLEAR the DTCs. REPEAT the self-test.

PINPOINT TEST R: THE DEFROST SYSTEM IS INOPERATIVE — REAR WINDOW DEFROST

CONDITIONS	DETAILS/RESULTS/ACTIONS
R1 CHECK THE REM DTCS	

1 Retrieve the recorded results from the REM self-test.

● Are any REM DTCs retrieved?

→ **Yes**
REFER to the REM Diagnostic Trouble Code (DTC) Index.

→ **No**
GO to [R2](#).

R2 CHECK THE REM OUTPUT

1



2



3



3 Trigger the REM active command R DEF RLY to ON then OFF while listening for the rear window defrost relay to click.

● Did the rear window defrost relay click when activated ON and OFF?

→ **Yes**
GO to [R3](#).

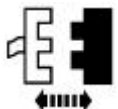
→ **No**
GO to [R6](#).

R3 CHECK THE REAR WINDOW DEFROST POWER

1



2



Rear Window Defrost Power Connector

3

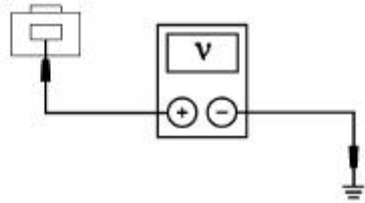


4

4 Trigger the REM active command R DEF RLY to ON.



5



A0003178

5 Measure the voltage between rear window defrost power connector, circuit (BK), harness side and ground.

• Is the voltage greater than 10 volts?

→ **Yes**
GO to [R4](#).

→ **No**
GO to [R10](#).

R4 CHECK THE REAR WINDOW DEFROST GROUND CIRCUIT

1

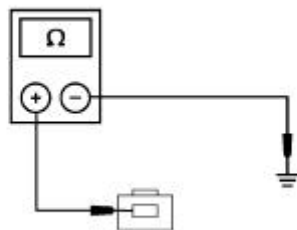


2



Rear Window Defrost Ground Connector

3



A0003179

3 Measure the resistance between rear window defrost ground connector, circuit (BK), harness side and ground.

• Is the resistance less than 5 ohms?

→ **Yes**
GO to [R5](#).

→ **No**
REPAIR the circuit. TEST the system for normal operation.

R5 CHECK THE REAR WINDOW DEFROST GRID

1 Carry out the grid wire component test. Refer to Component Tests.

- **Did the rear window defrost grid pass the component test?**

→ **Yes**

INSTALL a new DATC module; REFER to [Section 412-04](#). CLEAR the DTCs.

REPEAT the self-test. If the rear window defrost is still inoperative, INSTALL a new REM, REFER to [Section 419-10](#). CLEAR the DTCs. REPEAT the self-test.

→ **No**

REPAIR the rear window defrost grid. For additional information, REFER to [Lead Terminal Repair](#) in this section. TEST the system for normal operation.

R6 CHECK THE POWER SUPPLY TO THE REAR WINDOW DEFROST RELAY

1



2



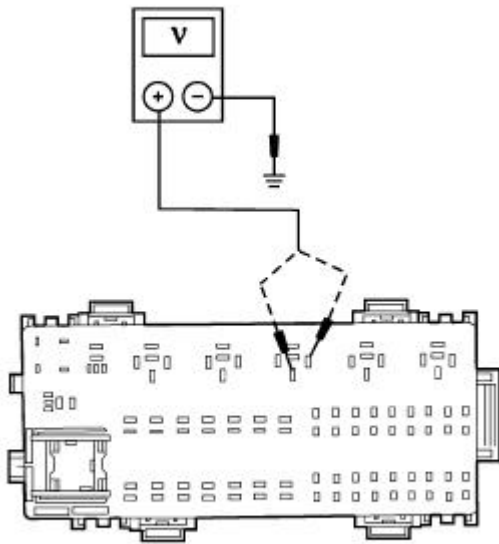
Rear Window Defrost Relay C443

3



4

4 Measure the voltage between the rear window defrost relay C443 pin 86, circuit 30-HB23A (RD/WH), harness side and ground; and between rear window defrost relay C443 pin 30, circuit 30-HB23A (RD/WH), harness side and ground.



A0003176

- Are the voltages greater than 10 volts?

→ **Yes**
GO to [R7](#).

→ **No**
GO to [R9](#).

R7 CHECK THE REAR WINDOW DEFROST RELAY

- 1 Check the rear window defrost relay. Refer to Wiring Diagrams Section 700-09, Component Testing.

- Did the rear window defrost relay pass the component test?

→ **Yes**
GO to [R8](#).

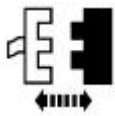
→ **No**
INSTALL a new rear window defrost relay. TEST the system for normal operation.

R8 CHECK CIRCUIT 91S-HB23 (BN/WH) FOR AN OPEN

1

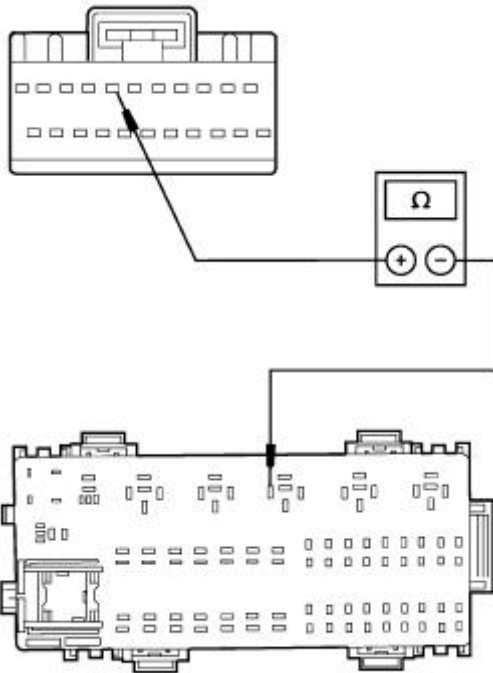


2



REM C420b

3



A0003177

3

Measure the resistance between REM C420b pin 7, circuit 91S-HB23 (BN/WH), harness side and rear window defrost relay C443 pin 85, circuit 91S-HB23 (BN/WH), harness side.

● Is the resistance less than 5 ohms?

→ Yes

INSTALL a new DATC module; REFER to [Section 412-04](#). CLEAR the DTCs. REPEAT the self-test.

If rear window defrost is still inoperative, INSTALL a new REM, REFER to [Section 419-10](#). CLEAR the DTCs. REPEAT the self-test.

→ No

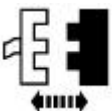
REPAIR the circuit. TEST the system for normal operation.

R9 CHECK CIRCUIT 30-HB23 (RD/WH) FOR OPEN

1

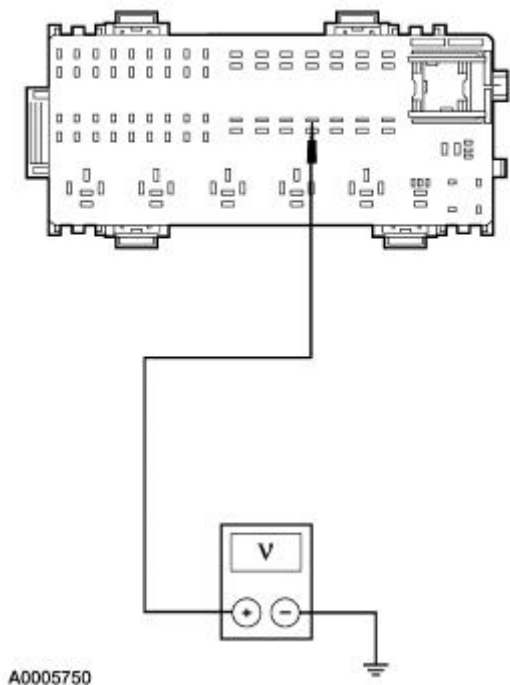


2



BJB Fuse 429 (30A)

3



3

Measure the voltage between BJB fuse 429 (30A) pin 1, circuit 30-HB23 (RD/WH), harness side and ground.

● Is the voltage greater than 10 volts?

→ **Yes**
REPAIR circuit 30-HB23 (RD/WH). TEST the system for normal operation.

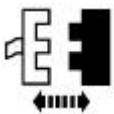
→ **No**
REPAIR the BJB input circuit. TEST the system for normal operation.

R10 CHECK THE OUTPUT TO THE ANTENNA ISOLATOR MODULE

1



2



Antenna Isolator Module C301

3



4



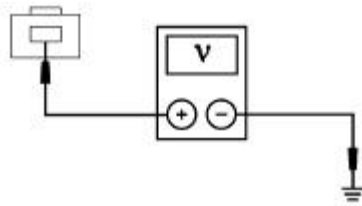
5

4

Trigger the REM active command R DEF RLY to ON.

5

Measure the voltage between antenna



A0003178

isolator module C301, circuit 15S-HB19 (GN/BU), harness side and ground.

- Is the voltage greater than 10 volts?

→ **Yes**
 INSTALL a new antenna isolator module. REFER to [Section 415-02](#). TEST the system for normal operation.

→ **No**
 GO to [R11](#).

R11 CHECK CIRCUIT 15S-HB19 (GN/BU) FOR AN OPEN

1

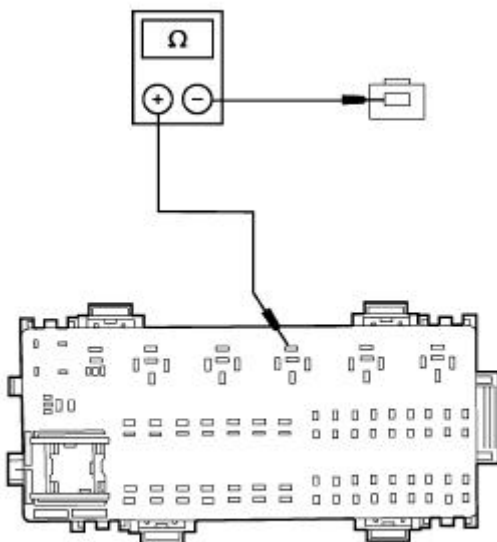


2



Rear Window Defrost Relay C443

3


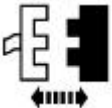


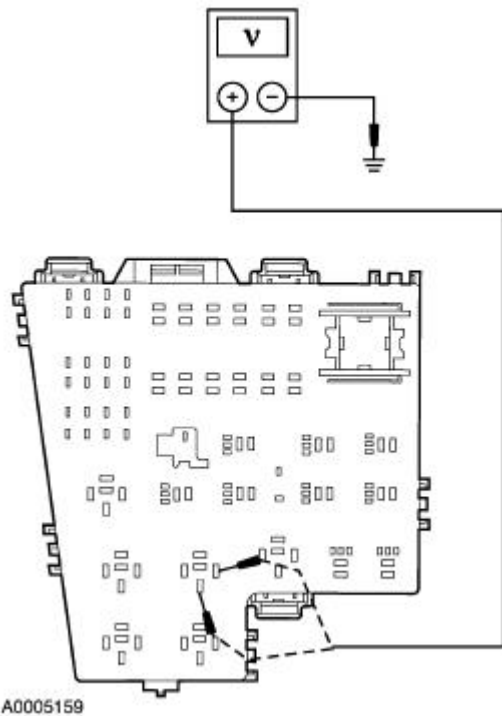
A0003180

3 Measure the resistance between antenna isolator module C301, circuit 15S-HB19 (GN/BU), harness side and rear window defrost relay C443 pin 87, circuit 15S-DA13 (GN/YE), harness side.

	<ul style="list-style-type: none"> ● Is the resistance less than 5 ohms? <p>→ Yes GO to R12.</p> <p>→ No REPAIR the circuit. TEST the system for normal operation.</p>
R12 CHECK THE REAR WINDOW DEFROST RELAY	
	<p>1 Check the rear window defrost relay. Refer to Wiring Diagrams Section 700-09, Component Testing.</p> <ul style="list-style-type: none"> ● Did the rear window defrost relay pass the component test? <p>→ Yes REPAIR circuit 30-HB23 (RD/WH). TEST the system for normal operation.</p> <p>→ No INSTALL a new rear window defrost relay. TEST the system for normal operation.</p>

PINPOINT TEST S: THE DEFROST SYSTEM IS INOPERATIVE — HEATED WIPER PARK

CONDITIONS	DETAILS/RESULTS/ACTIONS
S1 CHECK THE POWER TO THE HEATED WIPER PARK RELAY	
<p>1</p>  <p>2</p>  <p>Heated Wiper Park Relay C1014</p> <p>3</p>	<p>3 Measure the voltage between heated wiper park relay C1014 pin 86, circuit 30-HB8A (RD/OG), harness side and ground; and between heated wiper park relay C1014 pin 30, circuit 30-HB8 (RD/OG), harness side and ground.</p>



- Are both voltages greater than 10 volts?

→ **Yes**
GO to [S2](#).

→ **No**
GO to [S6](#).

S2 CHECK THE SWITCHED GROUND FROM THE DATC MODULE

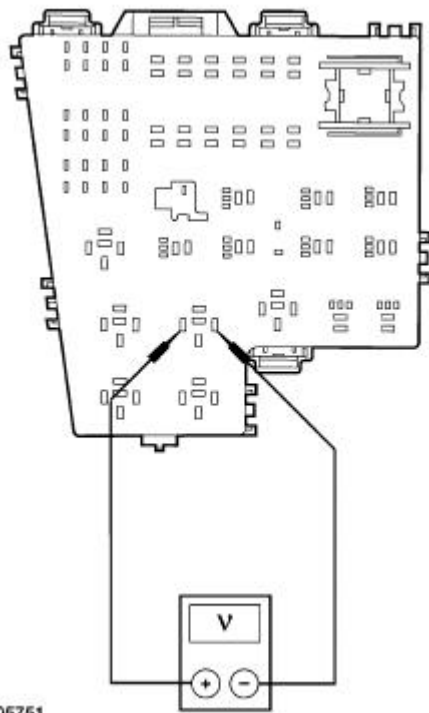
1



3

2 Depress the heated wiper park switch to the ON position.

3 Measure the voltage between heated wiper park relay C1014 pin 85, circuit 91S-HB7 (BN/RD), harness side and heated wiper park relay C1014 pin 86, circuit 30-HB8A (RD/OG), harness side.



A0005751

● Is the voltage greater than 10 volts?

→ Yes
GO to [S3](#).

→ No
GO to [S7](#).

S3 CHECK THE HEATED WIPER PARK RELAY OUTPUT

1

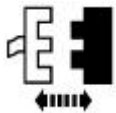


2



Heated Wiper Park Relay C1014

3



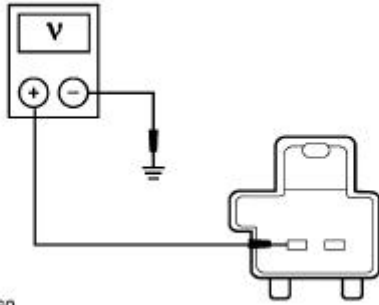
Heated Wiper Park C247

4



5 Operate the heated wiper park switch to the ON position.

6



A0005160

6

Measure the voltage between heated wiper park C247 pin 1, circuit 30S-HB42 (BK), harness side and ground.

● Is the voltage greater than 10 volts?

→ **Yes**
GO to [S5](#).

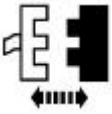
→ **No**
GO to [S4](#).

S4 CHECK CIRCUIT 30S-HB42 (BK) FOR AN OPEN

1

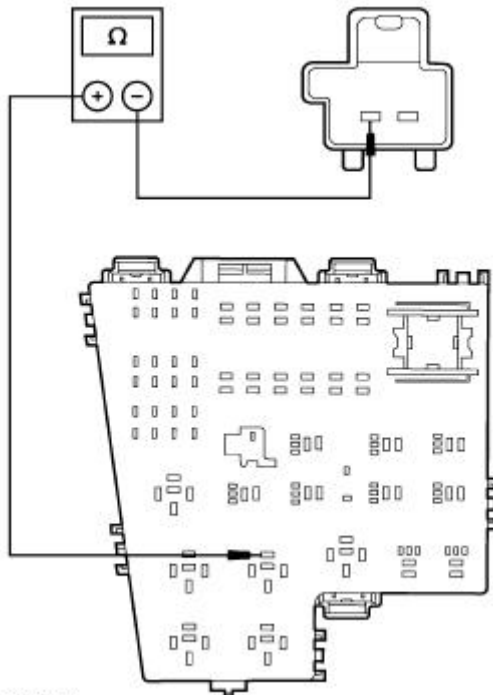


2



Heated Wiper Park Relay C1014

3



A0005162

3

Measure the resistance between heated wiper park relay C1014 pin 87, circuit 30S-HB42 (RD/YE), harness side and heated wiper park C247 pin 1, circuit 30S-HB42 (BK), harness side.

● Is the resistance less than 5 ohms?

→ **Yes**
INSTALL a new heated wiper park relay.
TEST the system for normal operation.

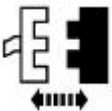
→ **No**
REPAIR the circuit. TEST the system for normal operation.

S5 CHECK THE HEATED WIPER PARK GROUND

1



2

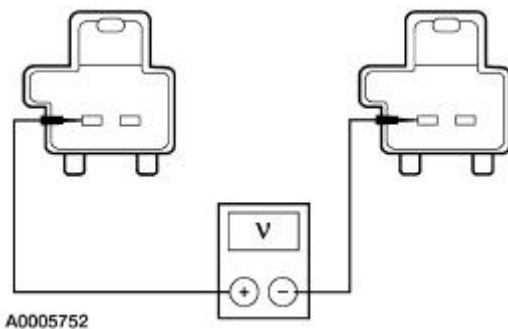


Heated Wiper Park C246

3



5



4 Operate the heated wiper park switch to the ON position.

5 Measure the voltage between heated wiper park C247 pin 1, circuit 30S-HB42 (BK), harness side and heated wiper park C246 pin 1, circuit 31-HB42 (BK), harness side.

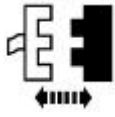
● Is the voltage greater than 10 volts?

→ **Yes**
INSTALL a new windshield. REFER to [Windshield Glass](#) in this section. TEST the system for normal operation.

→ **No**
REPAIR circuit 31-HB42 (BK). TEST the system for normal operation.

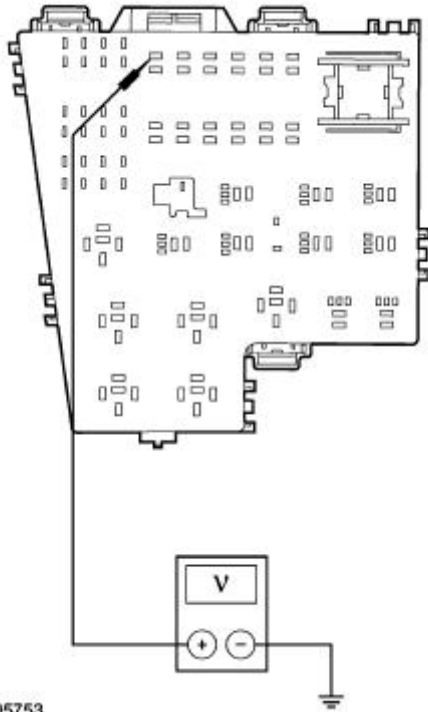
S6 CHECK THE UNDERHOOD AJB FOR POWER

1



Underhood AJB Fuse 113 (30A)

2



2

Measure the voltage between underhood AJB fuse 113 (30A) pin 1 (input circuit), harness side and ground.

● Is the voltage greater than 10 volts?

→ Yes

REPAIR circuit 30-HB8. TEST the system for normal operation.

→ No

REPAIR the underhood AJB input circuit. TEST the system for normal operation.

S7 CHECK CIRCUIT 91S-HB7 (BN/RD) FOR AN OPEN

1



2

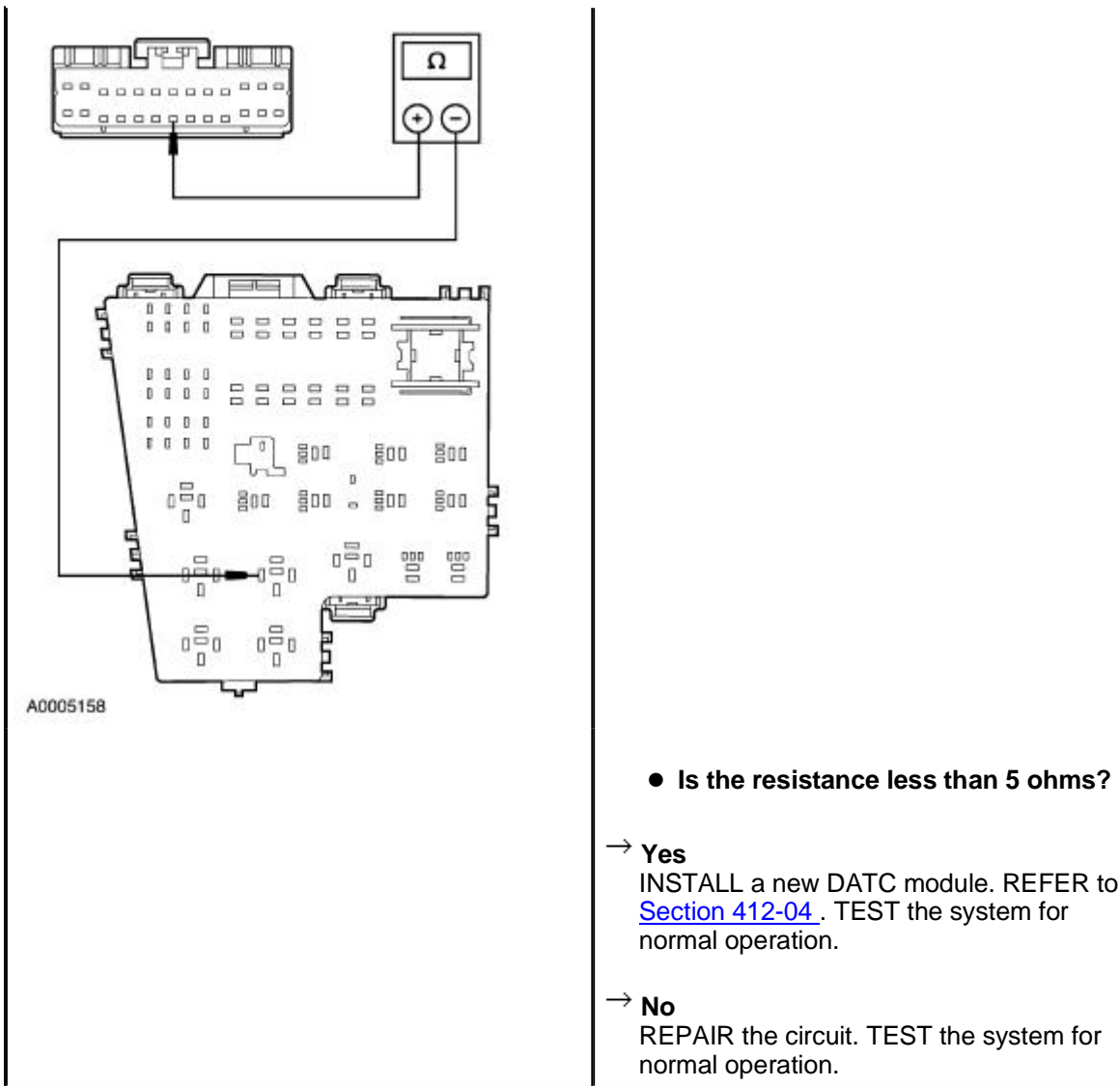


DATC Module C228b

3

3

Measure the resistance between heated wiper park relay C1014 pin 85, circuit 91S-HB7 (BN/RD), harness side and DATC module C228b pin 20, circuit 91S-HB7 (BN/RD), harness side.

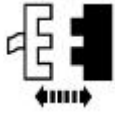


PINPOINT TEST T: THE DEFROST SYSTEM WILL NOT SHUT OFF AUTOMATICALLY — REAR WINDOW DEFROST

CONDITIONS	DETAILS/RESULTS/ACTIONS
T1 CHECK THE REM DTCS	<p>1 Retrieve the recorded results from the REM self-test.</p> <ul style="list-style-type: none"> ● Are any REM DTCS retrieved? <p>→ Yes REFER to the REM Diagnostic Trouble Code (DTC) Index.</p> <p>→ No GO to T2.</p>
T2 CHECK FOR A STUCK OR STICKING REAR WINDOW DEFROST RELAY	
1	



2



Rear Window Defrost Relay C443

3



● Is the rear window defrost defroster off?

→ Yes
GO to [T3](#).

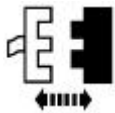
→ No
GO to [T5](#).

T3 CHECK THE REAR WINDOW DEFROST RELAY

1



2



Rear Window Defrost Relay C443

3 Check the rear window defrost relay; refer to Wiring Diagrams Section 700-09, Component Testing.

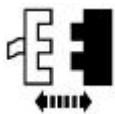
● Did the rear window defrost relay pass the component test?

→ Yes
GO to [T4](#).

→ No
INSTALL a new rear window defrost relay. TEST the system for normal operation.

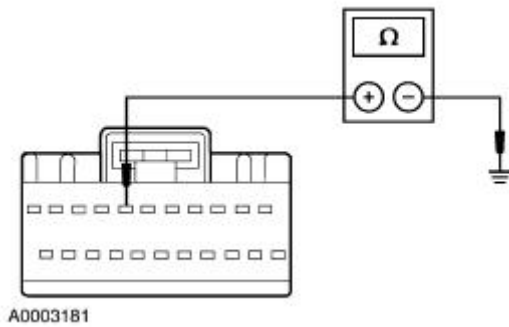
T4 CHECK CIRCUIT 91S-HB23 (BN/WH) FOR A SHORT TO GROUND

1



REM C420b

2



2

Measure the resistance between REM C420b pin 7, circuit 91S-HB23 (BN/WH), harness side and ground.

- Is the resistance greater than 10,000 ohms?

→ Yes

INSTALL a new REM. REFER to [Section 419-10](#). CLEAR the DTCs. REPEAT the self-test.

→ No

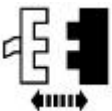
REPAIR the circuit. TEST the system for normal operation.

T5 CHECK CIRCUITS 15S-DC1 (GN/YE) AND 29S-HB1 (OG/YE) FOR SHORT TO POWER

1



2



BJB Fuse 409 (5A)

3



4

4

Measure voltage between BJB fuse 409 (5A) pin 1, circuit 15S-DC1 (GN/YE), harness side and ground and between BJB fuse 409 (5A) pin 2, circuit 29S-HB1 (OG/YE), harness side and ground.


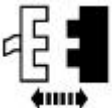
A0008334

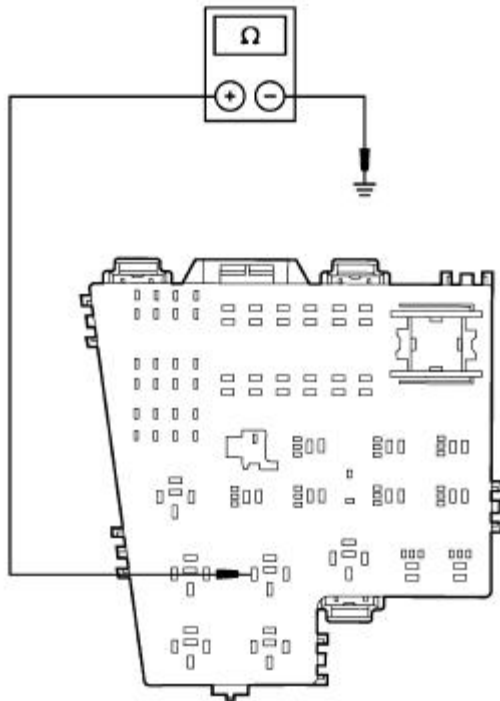
- Are the voltages greater than 10 volts?

→ **Yes**
REPAIR the circuit in question. TEST the system for normal operation.

→ **No**
VERIFY the symptom; REFER to the Symptom Chart.

PINPOINT TEST U: THE DEFROST SYSTEM WILL NOT SHUT OFF AUTOMATICALLY — HEATED WIPER PARK

CONDITIONS	DETAILS/RESULTS/ACTIONS
U1 CHECK FOR A SHORTED CONTROL CIRCUIT	
<p>1 </p> <p>2 </p> <p>Heated Wiper Park Relay C1014</p> <p>3</p>	<p>3 Measure the resistance between heated wiper park relay C1014 pin 85, circuit 91S-HB7 (BN/RD), harness side and ground.</p>



A0005157

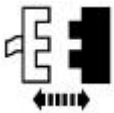
- Is the resistance greater than 10,000 ohms?

→ **Yes**
GO to [U3](#).

→ **No**
GO to [U2](#).

U2 CHECK CIRCUIT 91S-HB7 (BN/RD) FOR A SHORT TO GROUND

1

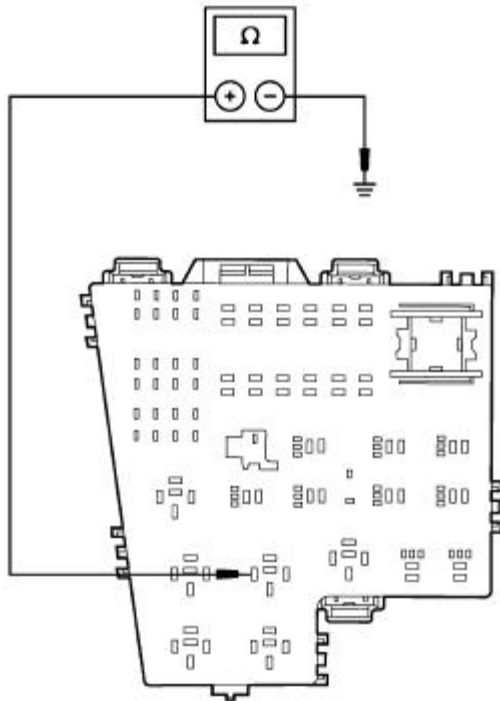


DATC Module C228b

2

2

Measure the resistance between heated wiper park relay C1014 pin 85, circuit 91S-HB7 (BN/RD), harness side and ground.



A0005157

- Is the resistance greater than 10,000 ohms?

- **Yes**
INSTALL a new DATC module. REFER to [Section 412-04](#). TEST the system for normal operation.
- **No**
REPAIR the circuit. TEST the system for normal operation.

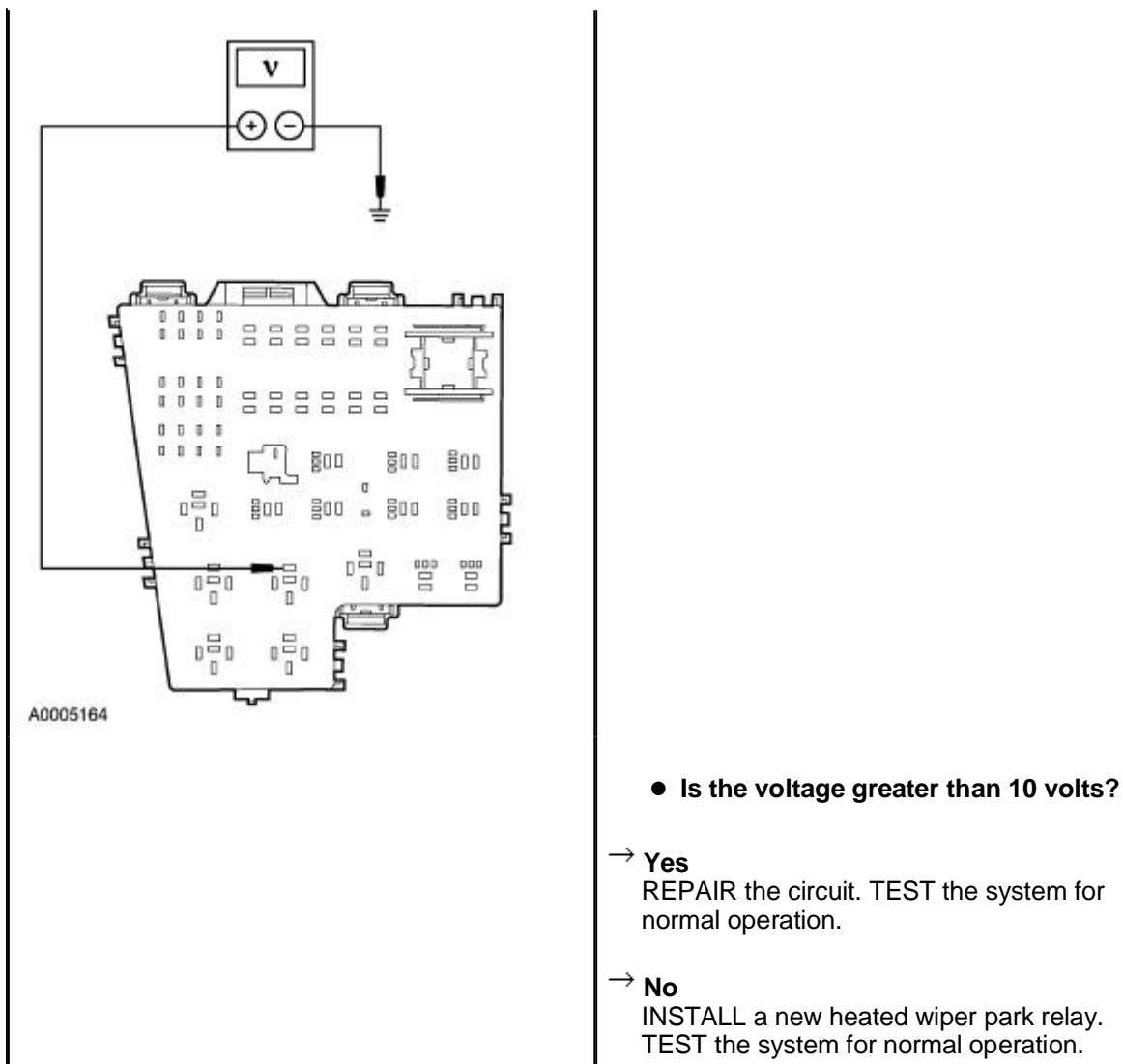
U3 CHECK CIRCUIT 30S-HB42 (RD/YE) FOR A SHORT TO BATTERY

1



2

- 2 Measure the voltage between heated wiper park relay C1014 pin 87, circuit 30S-HB42 (RD/YE), harness side and ground.




Component Test

Grid Wire Test

1. Using a bright lamp in the vehicle, inspect the wire grid from the exterior. A broken grid wire will appear as a brown spot.
2. Run the engine at idle. Set the rear window defrost switch to ON. The indicator light should come on.
3. Working in the vehicle with a voltmeter, contact the broad red-brown stripes of the rear glass window positive lead to battery side and the negative lead to ground side. The meter should read 10-13 volts. A lower voltage reading indicates a loose ground connection.
4. Contact a good ground point with the negative lead of the meter. The voltage reading should remain the same.
5. With the negative lead of the meter grounded, touch each grid line of the rear window defrost glass (42006) at its midpoint with the positive lead. A reading of approximately six volts indicates that the line is good. A reading of zero volts indicates that the line is broken between the midpoint and the B+ side of the grid line. A reading of 12 volts indicates that the circuit is broken between the midpoint of the grid line and ground.

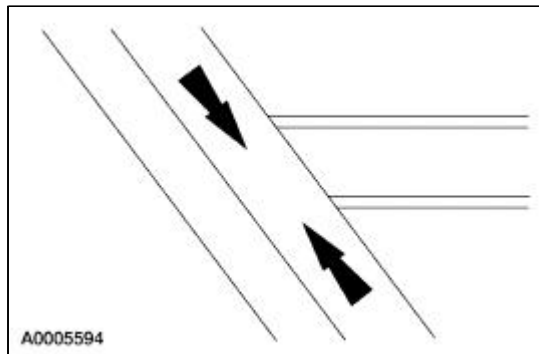
Lead Terminal Repair

Special Tool(s)

 ST1110-A	Heat Gun 107-R0300 or equivalent
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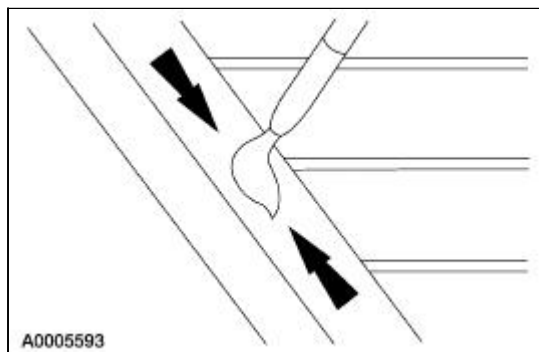
1. **NOTE:** The rear window glass (42006) must be at room temperature at the time of the repair.


Clean the bus bar in the area to be repaired with steel wool (3/0 to 4/0 grade).



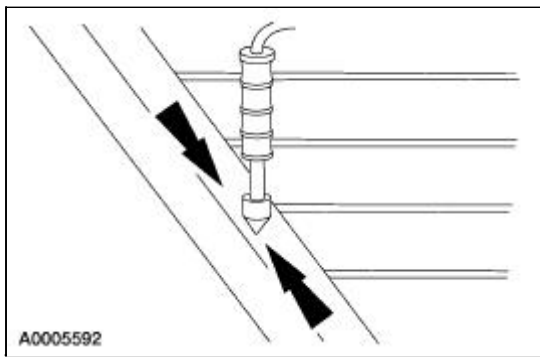
2. **NOTE:** Allow 10 minutes of drying time between the coats.

Apply three coats of Rear Window Defroster Repair D8AZ-19562-AA or equivalent meeting Ford specification ESB-M4J58-A to the surface.



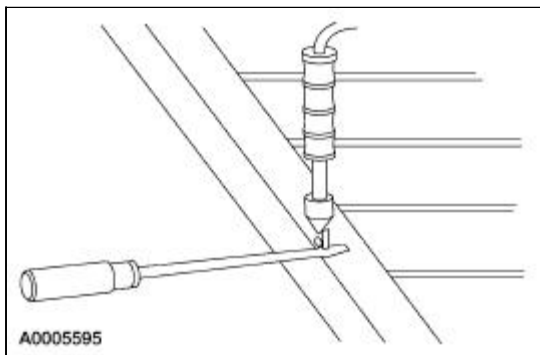
3.  **CAUTION:** Do not overheat the rear window glass or damage to the rear window glass may occur.

Tin the bus bar repair area with solder.



4.  **CAUTION:** To prevent overheating the rear window glass, remove the soldering gun as soon as the solder flows.

Preheat the rear window glass in the area to be repaired using the special tool and solder the terminal to the bus bar.



5. **NOTE:** Turn the heated back window switch ON for five minutes prior to the final inspection of the repair.

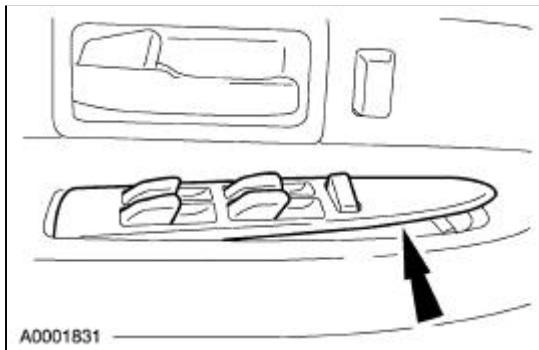
Apply Rear Window Defroster Repair D8AZ-19562-AA or equivalent meeting Ford specification ESB-M4J58-A to the repair area as needed.

Switch —Master Window Regulator Control

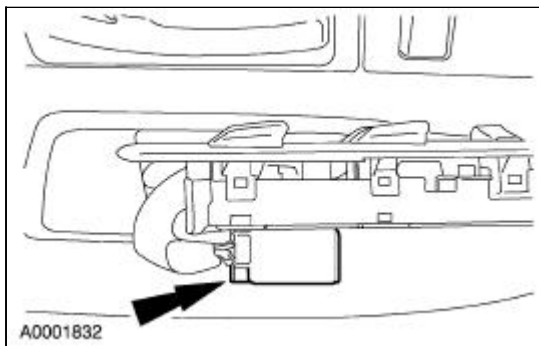
Removal and Installation

1.  **CAUTION:** Carefully lift out the master control regulator switch from the front of the door panel to avoid breaking the tab.

Remove the master window control regulator switch.






2. Disconnect the electrical connector.




3. To install, reverse the removal procedure.

Window Glass —Back


Special Tool(s)

 ST1320-A	Rotunda Interior Auto Glass Cut-Out Knife Kit 164-R2450 or equivalent
 ST1109-A	Rotunda Pneumatic Knife with Offset Blade 107-R1511 or equivalent
 ST2085-A	The Pumper 164-R2459 or equivalent

Removal

 **WARNING:** To prevent glass splinters from entering the eyes or cutting the hands, wear safety glasses and heavy gloves when cutting the glass from the vehicle.

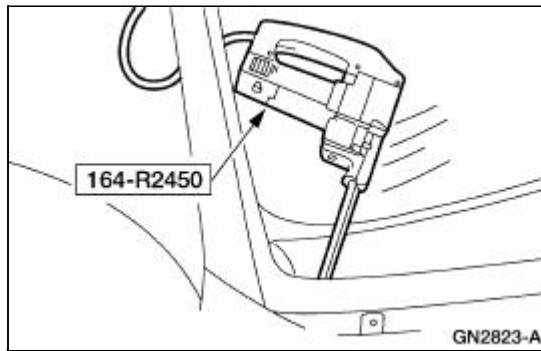
 **CAUTION:** Do not scratch the pinch weld.

1. Remove the package tray trim panel. For additional information, refer to [Section 501-05](#).
2. Disconnect the three back window glass electrical connectors:
 - two rear defrost electrical connectors.
 - FM antenna electrical connector.
3. If equipped, disconnect the cellular phone antenna connector.
4. Lower the rear portion of the headliner.
5. Using a soft brush or vacuum, remove the dirt and foreign material from the pinch weld.
6.  **CAUTION:** Care must be taken to avoid scratching the pinch weld.

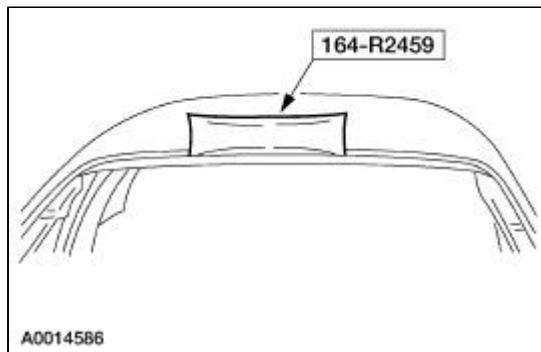
NOTE: Lubricate the existing urethane adhesive with water to aid the special tool while cutting.

Using the special tool, starting at the top center of the back window glass, cut the adhesive

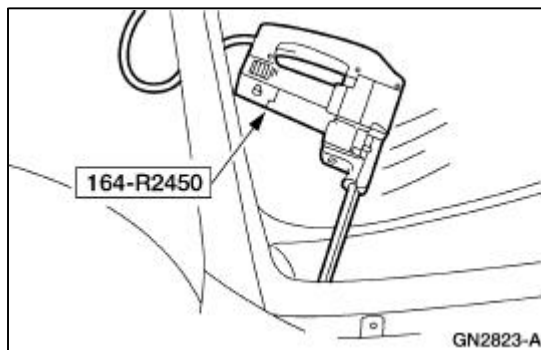
away from the glass and work down the sides.



7. Using the special tool, distance the back window glass from the body.



8. Using the special tool, cut the remaining urethane adhesive and remove the back window glass.



9. Using a soft brush or vacuum, remove the dirt and foreign material from the pinch weld.

Installation

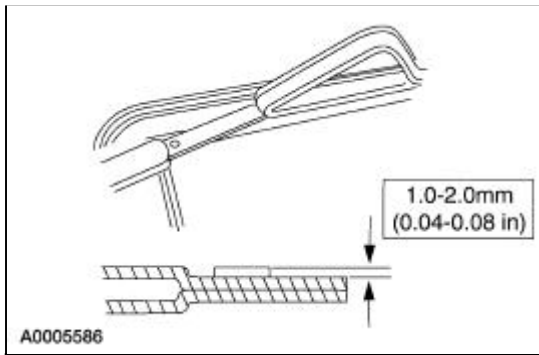
⚠ CAUTION: After installing the new urethane-installed glass, the vehicle should not be driven until the urethane adhesive has cured. The curing time at temperatures above 13° C (55° F) and relative humidity above 50% is 12-24 hours. (Refer to the Essex drive away chart for the cure times as the temperatures and humidity vary). Inadequate curing of the urethane adhesive may adversely affect the strength of the urethane adhesive bond.


1. Dry fit the replacement back window glass to the existing urethane bed on the body pinch weld. Align the back window glass in the opening for uniform fit.
2. Use tape or non-permanent marking pencil to make alignment marks on the back window glass (preferably at the setting blocks), and the body to aid in the installation alignment of the replacement back window glass.

3. After alignment, remove the back window glass and molding assemblies from the vehicle and place on a stable work surface.


4.  **CAUTION: Care must be taken to avoid scratching the pinch weld.**

Trim the remaining urethane adhesive on the pinch weld using only the full-cut method. In this method, most of the existing urethane adhesive is removed leaving a level bead around the entire pinch weld.

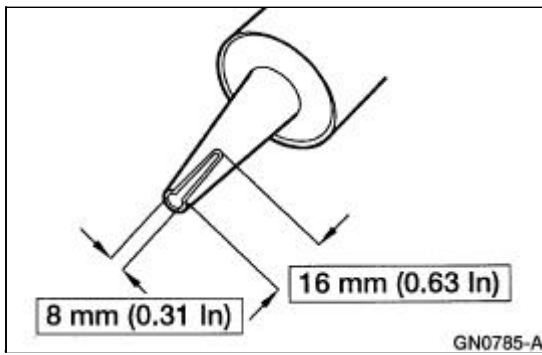


5.  **WARNING: All rust found on the pinch weld must be removed and the pinch weld restored to OEM specifications. If surface rust is found, remove completely down to clean, bare metal. Prime pinch weld metal with an OEM recommended curing automotive paint primer and allow to cure properly. If rust has penetrated through the pinch weld metal, repair the pinch weld sheet metal at a body shop before proceeding.**

Check the pinch weld for damaged sheet metal, raised sheet metal at the spot welds, rust or foreign material that may cause glass breakage. Clean or repair surface as necessary.

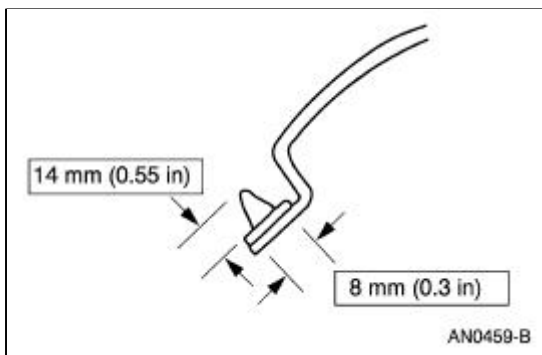
6. Use the wool applicator to apply Urethane Metal Primer Essex U-413 meeting Ford specification WSB-M2G234-C to any exposed metal on the pinch weld. Allow six to ten minutes to dry.
7. If reinstalling the original back window glass, remove any excess urethane adhesive.
8. Clean the inside of the glass surface with an alcohol-free cleaner to make sure the ceramic-coated area is clean.
9.  **CAUTION: Wipe off the urethane glass prep immediately after each application because it flash dries. Apply deliberate strokes, making sure not to overlap the applied area.**

If installing a new back window glass, apply Urethane Glass Prep Essex U-401 meeting Ford specification WSB-M2G314-B twice around the glass surface to be prepped.
10. If installing a new back window glass, apply Urethane Glass Primer Essex U-402 meeting Ford specification WSB-M5B280-C to the same area that was prepped in the previous step. Allow five minutes to dry.
11. Cut the urethane adhesive applicator tip to specification.



12. **⚠ CAUTION:** If the vehicle is to be driven within 24 hours of urethane adhesive application, Urethane Adhesive Essex U-216 meeting Ford specification WSB-M2G316-B must be used due to its one-hour cure time.

Apply a bead of Urethane Adhesive Essex 400-HV or Essex U-216, meeting Ford specification WSB-M2G316-B to the pinch weld.



13. **⚠ CAUTION:** Open the windows to prevent the back window glass from being pushed out by air pressure if a door is closed.

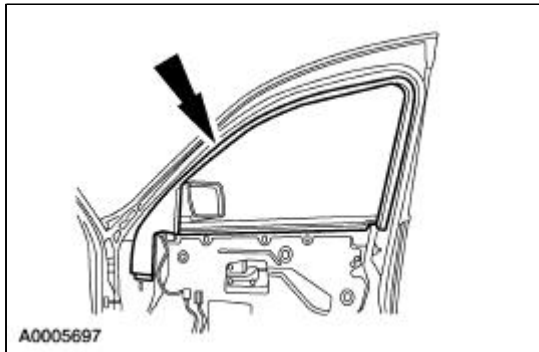
Install the back window glass on the pinch weld. Align the back window glass to the body using the alignment marks while pushing downward to set the stops.

14. Inspect the back window glass for air or water leaks and add urethane adhesive where needed.
15. If equipped, install the cellular phone antenna. For additional information, refer to [Section 419-05](#).
16. Connect the three back window electrical connectors:
- two rear defroster connectors.
 - FM antenna electrical connector.
17. Install the package tray trim panel. For additional information, refer to [Section 501-05](#).
-

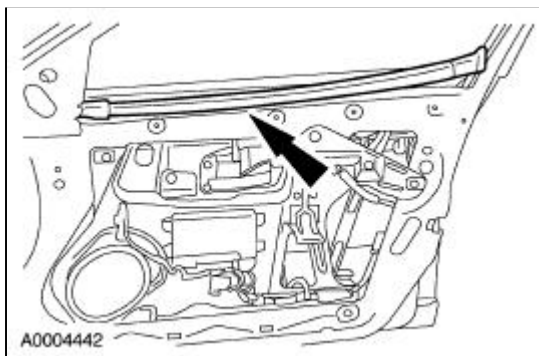
Window Glass —Front Door

Removal and Installation

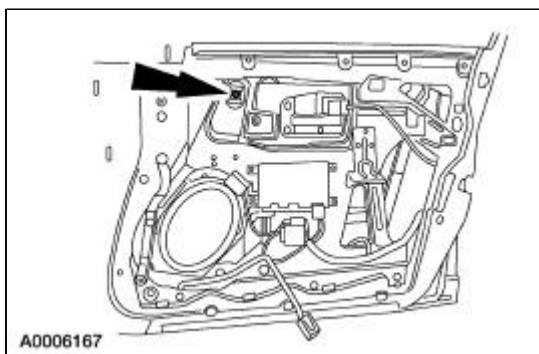
1. Remove the door trim panel. For additional information; refer to [Section 501-05](#).
2. Remove the interior garnish moulding.



3. Remove the watershield.
4. Remove the interior weatherstrip.

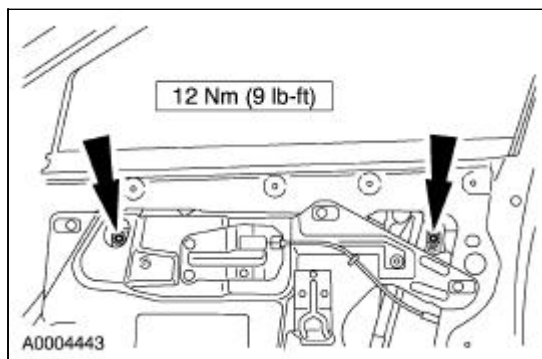


5. Position the forward front window regulator to glass bolt to the bottom of the access hole.



6. **NOTE:** Do not remove the bolts.

Loosen the front window regulator to glass bolts.



7. Hold the glass in place and lower the window regulator to the bottom of the door panel.

8. Remove the front door window glass.

9.  **CAUTION: Make sure the front door window glass correctly seats in the glass mounting brackets as the front door window glass is raised.**

NOTE: Position the front door window glass against the B-pillar.

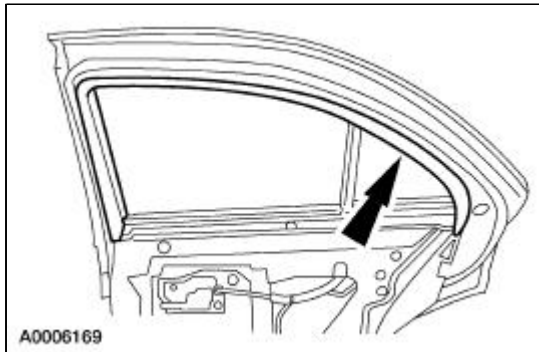
NOTE: Support the front door window glass and raise the window regulator to the full upright position.

To install, reverse the removal procedure.

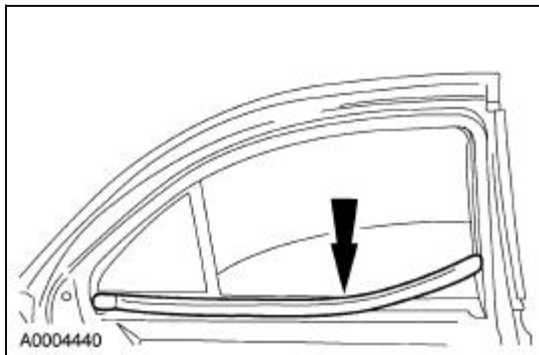
Window Glass —Rear Door

Removal and Installation

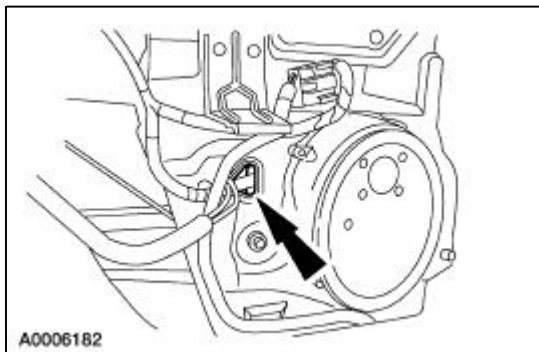
1. Remove the rear door trim panel. For additional information, refer to [Section 501-05](#).
2. Remove the interior garnish molding.



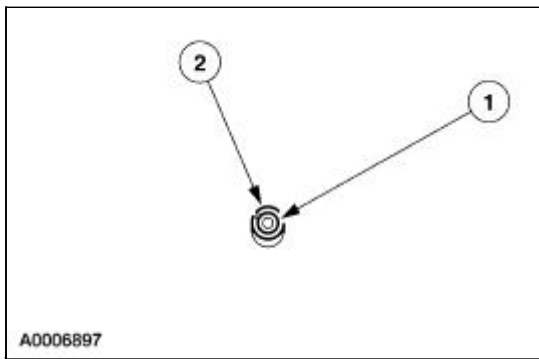
3. Remove the interior weather strip.



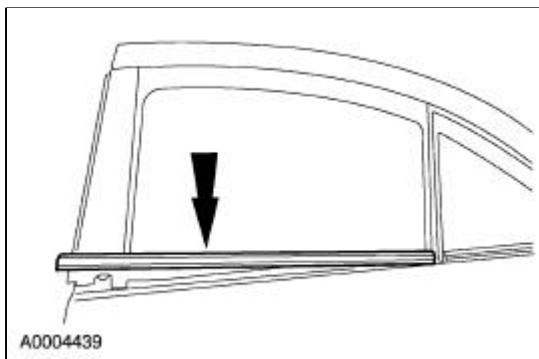
4. Lower the rear door window glass until the glass spacer bracket is visible in the access hole.



5. Remove the rear door window glass spacer bracket.
 1. Using a punch, remove the center portion of the spacer bracket.
 2. Remove the outer portion of the spacer bracket.

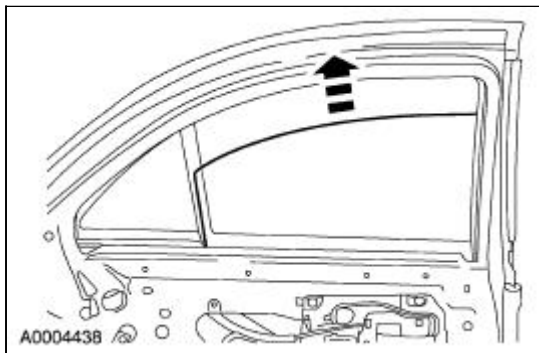


6. Remove the exterior weatherstrip.



7. Remove the rear door window glass.

- Lift the rear door window glass out of the window regulator.
- Lower the rear door window glass out of the channel.
- Lift the rear door window glass through the belt opening to the outside of the channel.



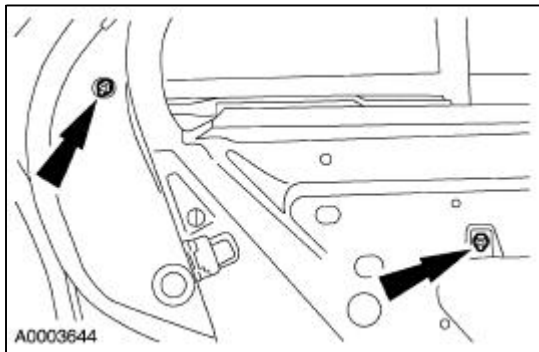
8. **NOTE:** Prior to the installation of the window, reinstall the outer and center portion of the spacer bracket into the rear door window glass. The spacer bracket should protrude equal distances on both sides of the window glass.

To install, reverse the removal procedure.

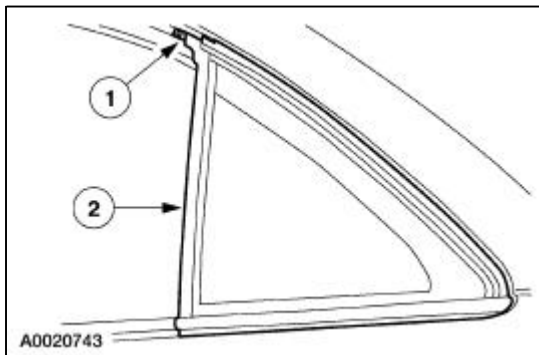
Window Glass —Rear Quarter

Removal and Installation

1. Remove the rear door window glass. For additional information, refer to [Window Glass—Rear Door](#).
2. Remove the rear door glass run and the exterior moulding at the top of the glass.
3. Remove the quarter window glass nuts.



4. Remove the quarter window glass.
 1. Remove the screw.
 2. Remove the quarter window glass.



5. **NOTE:** If reinstalling the original quarter glass, clean off any remaining butyl prior to installation.

NOTE: Clean the area of any remaining foam or residue prior to installation of the quarter window glass.

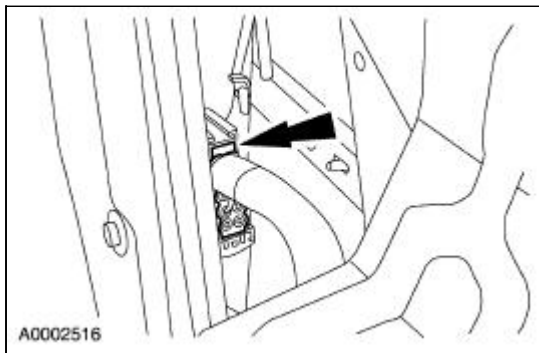
NOTE: Apply the new butyl to the installation area.

To install, reverse the removal procedure.

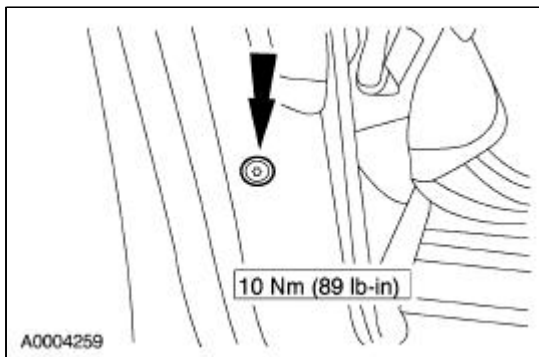
Window Regulator —Front Door

Removal and Installation

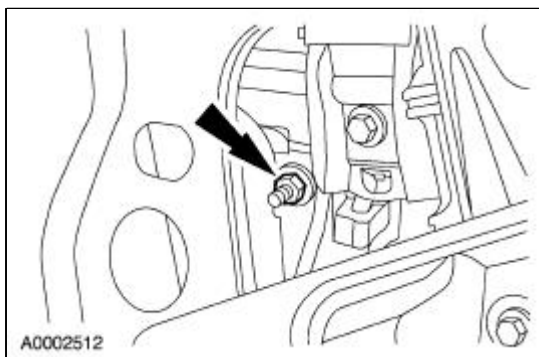
1. Remove the front door window glass. For additional information, refer to [Window Glass—Front Door](#).
2. Disconnect the door latch electrical connector.



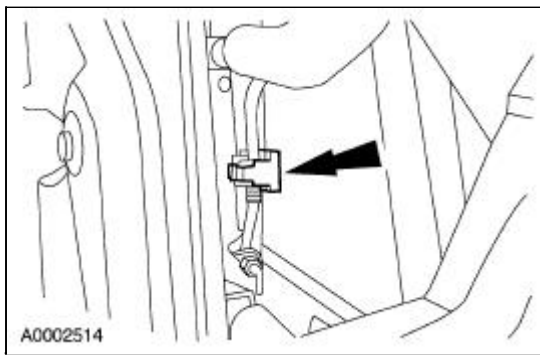
3. Remove the anti-theft shield screw.



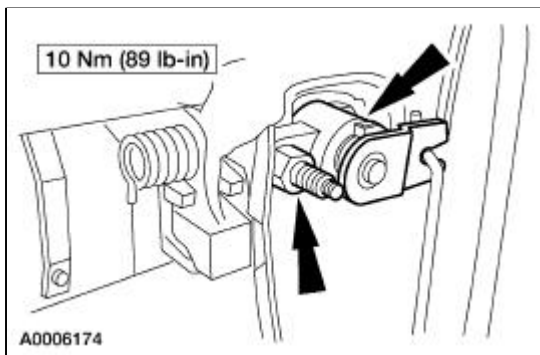
4. Remove the nut and position the anti-theft shield aside.



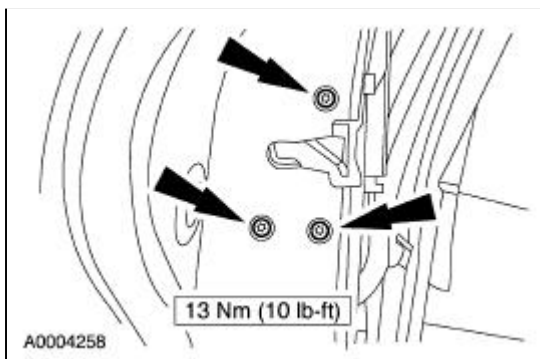
5. Release the clip and disconnect the exterior door handle actuating rod.



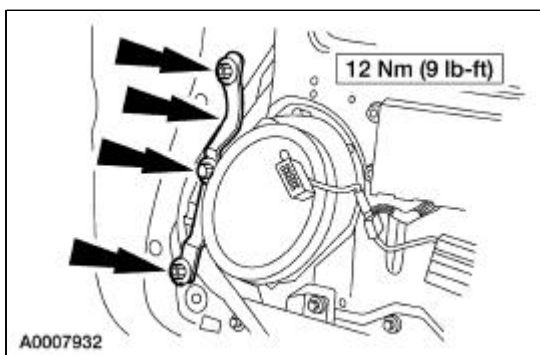
6. Remove the nut and the door lock cylinder (driver door only).



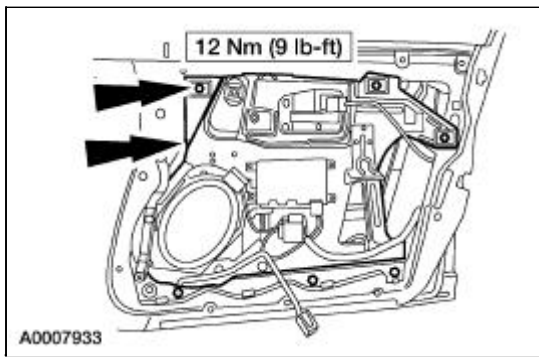
7. Remove the latch screws.



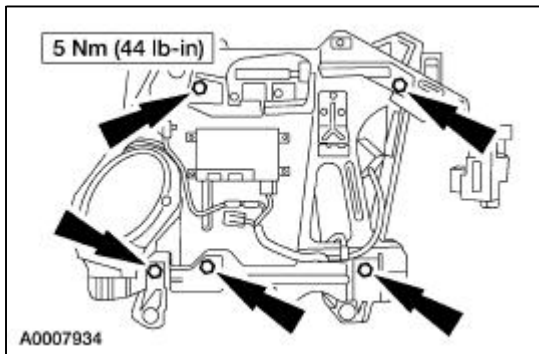
8. Remove the two nuts, the bolt and the inner front door support bracket.



9. Remove the bolts and the front door inner support.



10. Remove the bolts and the window regulator assembly.
 - Disconnect the harness locators and reposition the harness.

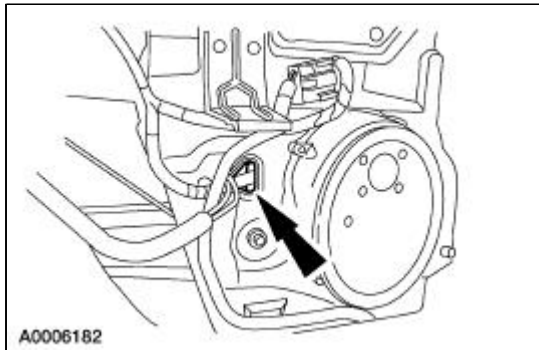


11. To install, reverse the removal procedure.
-

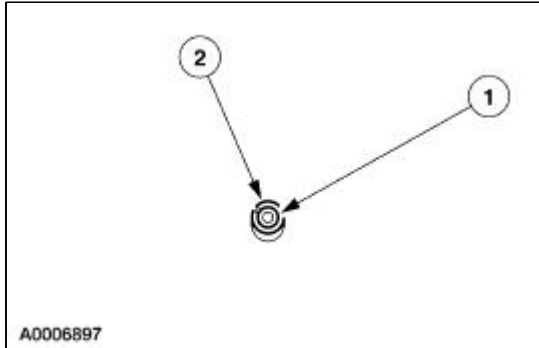
Window Regulator —Rear Door

Removal

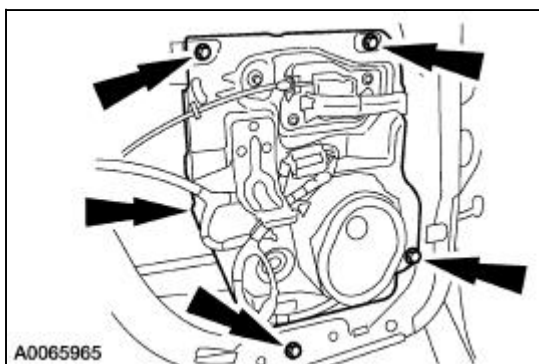
1. Remove the rear door trim panel. For additional information, refer to [Section 501-05](#).
2. Lower the rear door window glass until the glass spacer bracket is visible in the access hole.



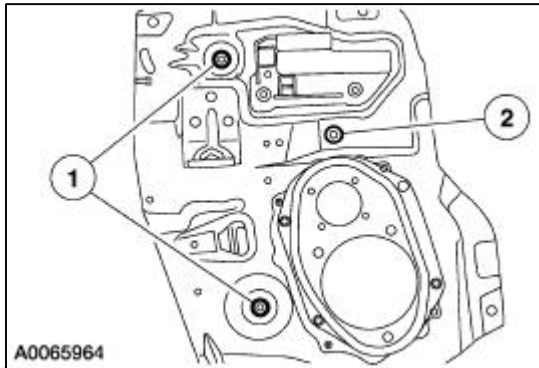
3. Remove the rear door window glass spacer bracket.
 1. Using a punch, remove the center portion of the spacer bracket.
 2. Remove the outer portion of the spacer bracket.



4. Position the rear window glass to the top of the window opening and tape around the door frame to hold in place.
5. Position the inner door module assembly aside.
 1. Remove the bolts.
 2. Position the support aside.



6. Remove the rear door window regulator.
 1. Remove the two nuts.
 2. Remove the bolt.
 3. Remove the rear door window regulator.
 - Disconnect the electrical connector.

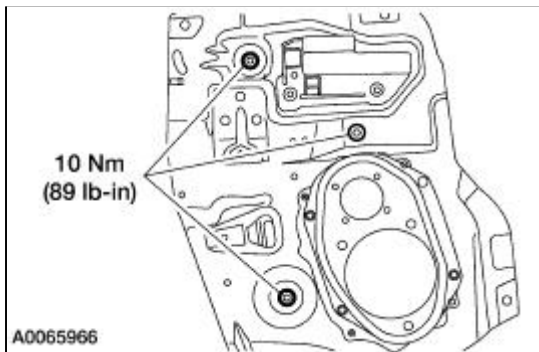


Installation

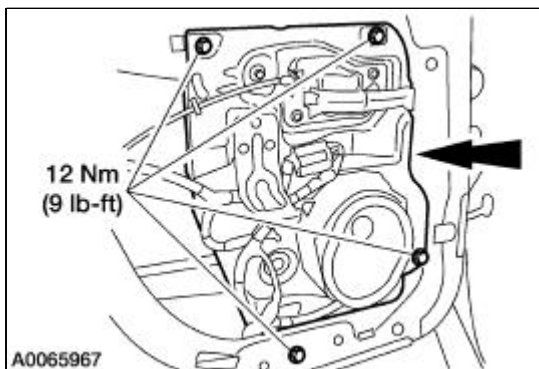
1. **NOTE:** Prior to the attaching the window to the regulator, reinstall the outer and center portions of the spacer bracket into the rear door window glass. The spacer bracket should protrude equal distances on both sides of the window glass.

Install the spacer bracket into the rear door window glass.

2. Install the rear door window regulator.
 1. Position the window regulator.
 2. Install the two nuts and one bolt.
 - Connect the electrical connector.



3. Position the inner door module assembly to the door and install the bolts.

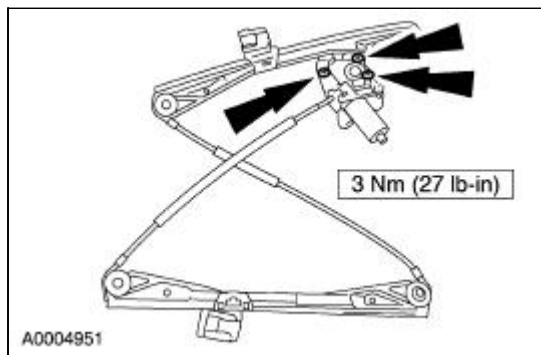


4. Operate the rear door window regulator to the full up position until the rear window glass spacer bracket is engaged with the regulator.
 - An audible click should be heard when the spacer bracket is engaged.
 5. Install the rear door trim panel. For additional information, refer to Section 501-05.
 6. Check the rear door window glass for proper operation.
-

Motor and Window Regulator —Front Door

Removal and Installation

1. Remove the front door window regulator. For additional information, refer to [Window Regulator—Front Door](#).
2. Remove the screws and the motor from the front door window regulator.

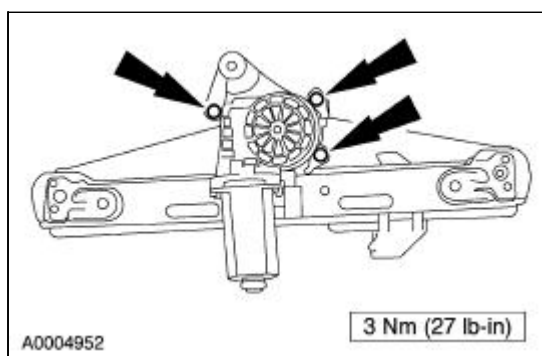


3. To install, reverse the removal procedure.

Motor and Window Regulator —Rear Door

Removal and Installation




1. Remove the rear door window regulator. For additional information, refer to [Window Regulator—Rear Door](#).
2. Remove the screws and the motor from the rear door window regulator.




3. To install, reverse the removal procedure.
-

Windshield Glass

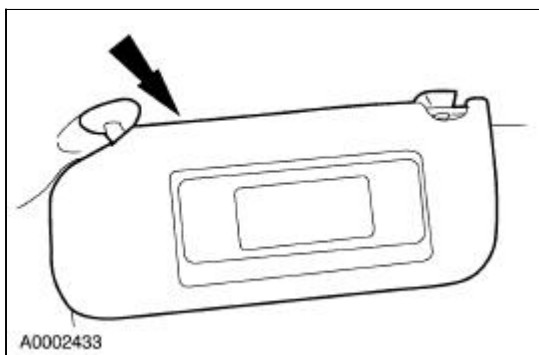
Special Tool(s)

 ST1109-A	Pneumatic Knife with Offset Blade 107-R1511 or equivalent
 ST1320-A	Interior Auto Glass Cut-Out Knife Kit 164-R2450 or equivalent
 ST2085-A	The Pumper 164-R2459 or equivalent

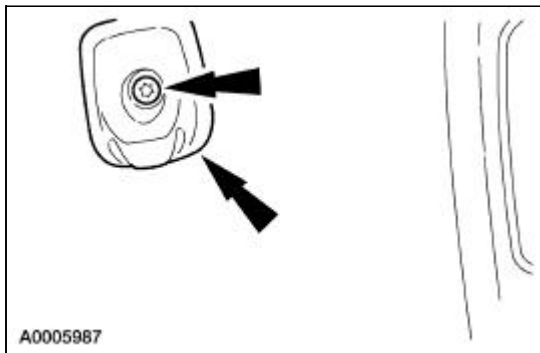
Removal

 **WARNING:** To prevent glass splinters from entering the eyes or cutting the hands, wear safety glasses and heavy gloves when cutting the glass from the vehicle.

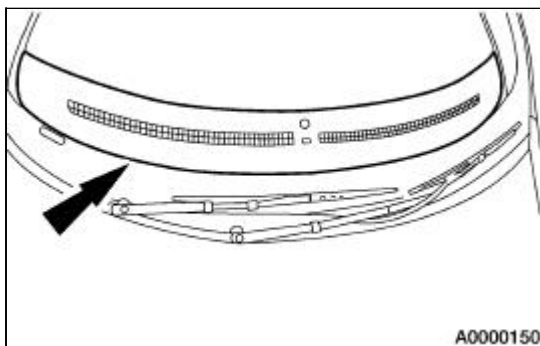
1. Remove the cowl vent screen. For additional information, refer to [Section 501-02](#).
2. Remove the interior rear view mirror. For additional information, refer to [Section 501-09](#).
3. Remove the rain sensor module (if equipped). For additional information, refer to [Section 501-16](#).
4. Remove the screws and the sun visors.
 - Disconnect the electrical connectors.




5. Remove the screws and the sun visor clips.



6. Remove the LH and RH windshield side garnish mouldings. For additional information, refer to [Section 501-05](#).
7. Partially remove the front door weatherstrip.
8. Partially drop the headliner near the windshield glass opening and block with suitable material.
9. Disconnect the two heated wiper park grid electrical connectors.
10. Remove the instrument panel defroster opening grille assembly.
 - Disconnect the electrical connectors.



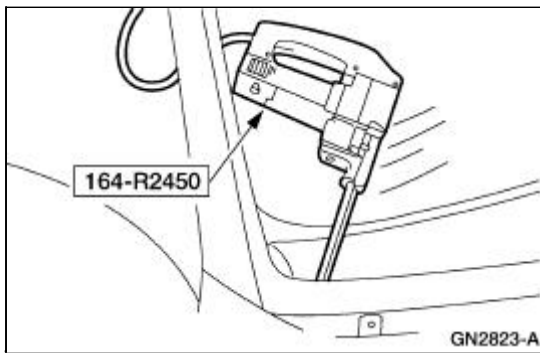
11. Remove the eight screws and the windshield drip mouldings.
12. Using a soft brush or vacuum, remove dirt and foreign material from the pinch weld.
13.  **CAUTION: Cover the instrument panel in order to prevent possible damage.**

 **CAUTION: Care must be used to avoid scratching the pinch weld.**

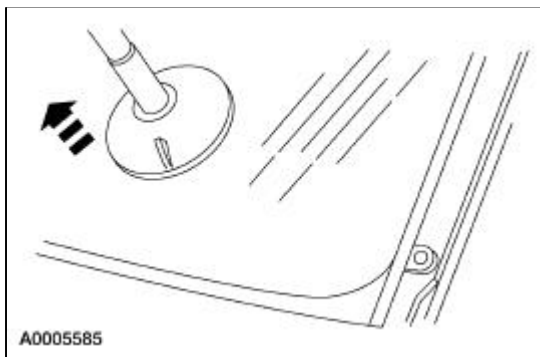
NOTE: Lubricate the existing urethane adhesive with water to aid the special tool while cutting.

NOTE: When cutting foam inside, first cut foam dam to access urethane adhesive.

Using the special tool, starting at the top center of the windshield glass, cut the urethane adhesive away from the glass and work down the sides.



14. Remove the windshield glass and mouldings assembly using a suitable suction tool.



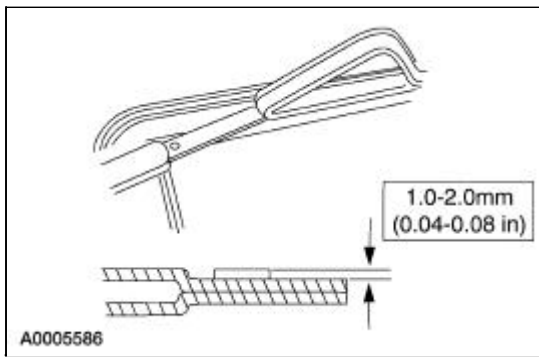
15. Remove the dual lock windshield glass stops from the sheet metal frame.
16. Using a soft brush or vacuum, remove dirt and foreign material from the pinch weld.

Installation

⚠ CAUTION: After installing the new urethane-installed glass, the vehicle should not be driven until the urethane adhesive has cured. The curing time at temperatures above 13° C (55° F) and relative humidity above 50% is 12-24 hours. (Refer to the Essex drive away chart for the cure times as the temperatures and humidity vary). Inadequate curing of the urethane adhesive may adversely affect the strength of the urethane adhesive bond.

1. Dry fit the replacement windshield glass to the existing urethane bed on the body pinch weld. Align the windshield in the opening for uniform fit and adjust setting blocks as needed for best fit.
2. Use tape or non-permanent marking pencil to make alignment marks on the windshield (preferably at the setting blocks), and the body to aid in the installation alignment of the replacement windshield.
3. After alignment, remove the windshield glass and moulding assemblies from the vehicle and place on a stable work surface.
4. **⚠ CAUTION:** Care must be taken to avoid scratching the pinch weld.

Trim the remaining urethane adhesive on the pinch weld. The urethane must be smooth and free of cuts and contamination after trimming. Avoid touching the urethane surface after preparation.



5. **⚠ CAUTION: All rust found on the pinch weld must be removed and the pinch weld restored to OEM specifications. If surface rust is found, remove completely down to clean, bare metal. Prime pinch weld metal with an OEM recommended curing automotive paint primer and allow to cure properly. If rust has penetrated through the pinch weld metal, repair the pinch weld sheet metal at a body shop before proceeding.**

Check the pinch weld for damaged sheet metal, raised sheet metal at the spot welds, rust or foreign material that may cause glass breakage. Clean or repair surface as necessary.

6. Use the wool applicator to apply Urethane Metal Primer Essex U-413 meeting Ford specification WSB-M2G234-C to any exposed metal on the pinch weld. Allow six to ten minutes to dry.
7. If re-installing the same windshield glass that was removed, trim the remaining urethane adhesive from the windshield surface, leaving a thin layer for adhering to the new urethane bead.
8. Clean the inside of the glass surface with an alcohol-free cleaner to make sure the ceramic-coated area is clean.
9. **NOTE:** If the moulding is already on the windshield glass, proceed to the next step.

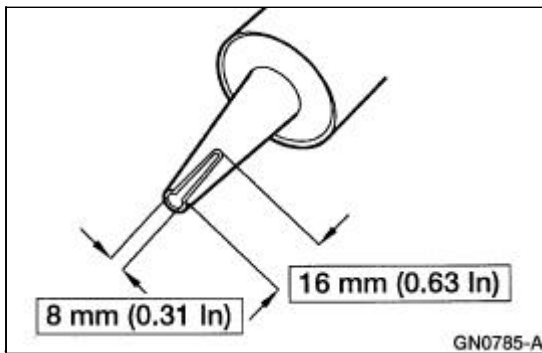
Align the "V" notch in the ceramic paint and windshield outside molding at top center. Fully seat the windshield outside molding along the top edge of the windshield glass and along the sides and bottom edges of the windshield glass.

10. Remove the dual lock windshield glass stop adhesive backing.

11. **⚠ CAUTION: Wipe off the urethane glass prep immediately after each application because it flash dries. Apply deliberate strokes, making sure not to overlap the applied area.**

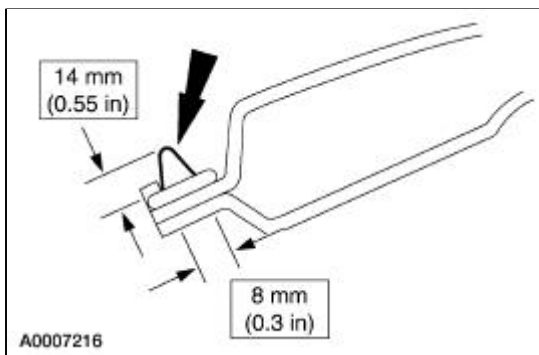
If installing a new windshield glass, apply Urethane Glass Prep Essex U-401 meeting Ford specification WSB-M2G314-B twice around the glass surface to be prepped.

12. If installing a new windshield glass, apply Urethane Glass Primer Essex U-402 meeting Ford specification WSB-M5B280-C to the same area that was prepped in the previous step. Allow five minutes to dry.
13. Cut the urethane adhesive applicator tip to specification.



14. **⚠ CAUTION:** If the vehicle is to be driven within 24 hours of urethane adhesive application, Urethane Adhesive Essex U-216 meeting Ford specification WSB-M2G316-B must be used due to its one-hour cure time.

Apply a bead of Urethane Adhesive Essex 400-HV or Essex U-216 meeting Ford specification WSB-M2G316-B to the pinch weld just outside the foam dam.

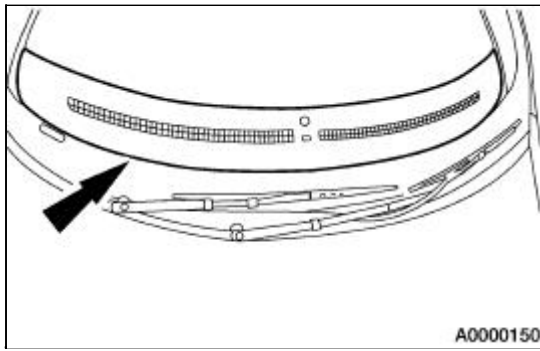


15. **⚠ CAUTION:** Before installing the windshield glass, open the windows slightly to prevent the windshield from being pushed out by air pressure as the door is closed.

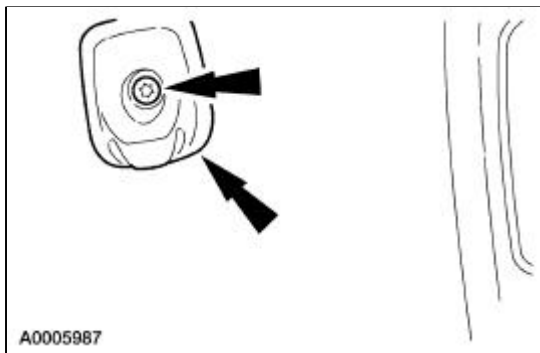
NOTE: The windshield glass must be positioned within 10 minutes of applying the urethane adhesive.

Install the windshield glass on the vehicle, aligning it with marks made previously.

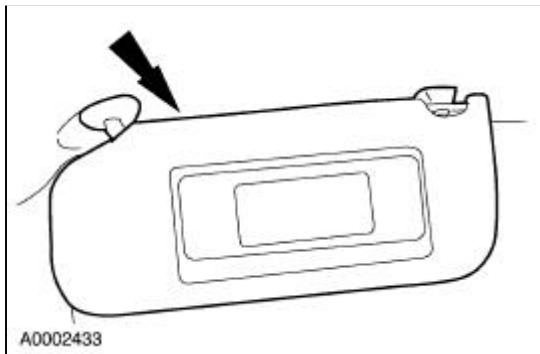
16. Check the windshield installation for air or water leaks through the urethane bead and add urethane adhesive where needed.
17. Place two strips of duct tape onto the windshield glass and secure it to the roof panel. This will help avoid misalignment while the urethane cures.
18. Install the windshield drip mouldings.
- Install the eight screws.
19. Install the instrument panel defrost opening grille assembly.
- Connect the electrical connector.



20. Connect the two heated wiper park grid electrical connectors.
21. Position the headliner.
22. Install the weatherstrips.
23. Install the LH and RH windshield side garnish mouldings. For additional information, refer to [Section 501-05](#).
24. Install the sun visor clips and screws.



25. Install the sun visors and screws.
 - Connect the electrical connectors.



26. Install the rain sensor module. For additional information, refer to [Section 501-16](#).
27. Install the rear view mirror. For additional information, refer to [Section 501-09](#).
28. Install the cowl vent screen. For additional information, refer to [Section 501-02](#).

Torque Specifications

Description	Nm	lb-ft	lb-in
Bulkhead electrical connector bolt	3	—	27
Floor console assembly rear screws	8	—	71
Glove compartment bolts	6	—	53
Instrument panel cowl side bolts	20	15	—
Instrument panel cowl side nuts	20	15	—
Instrument panel cowl top screws	3	—	27
Instrument panel reinforcement bolts	20	15	—
Instrument panel tunnel brace bolts	20	15	—
Intermediate shaft to steering column pinch bolt	35	26	—

Instrument Panel

The instrument panel consists of the following components:

- passenger air bag module
 - instrument panel cluster finish panel
 - glove compartment
 - instrument cluster
 - audio unit
 - climate control head
 - instrument panel finish panels
 - instrument panel defroster opening grille
 - instrument panel steering column opening cover reinforcement
 - instrument panel steering column cover
-

Console —Floor

The floor console consists of the following components:

- console air condition duct
- console base assembly (automatic transmission)
- console base assembly (manual transmission)
- console rear finish panel assembly
- console finish panel assembly

The console finish panel assembly consists of the following components:

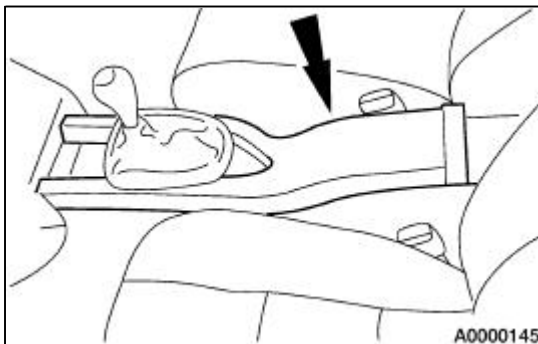
- armrest assembly
 - single cupholder assembly (manual transmission)
 - dual cupholder assembly (automatic transmission)
 - phone presenter assembly
-

Instrument Panel

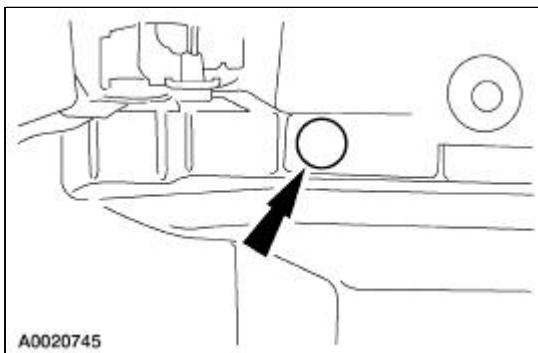
Removal

 **CAUTION:** Electronic modules are sensitive to static electrical charges. If exposed to these charges, damage may result.

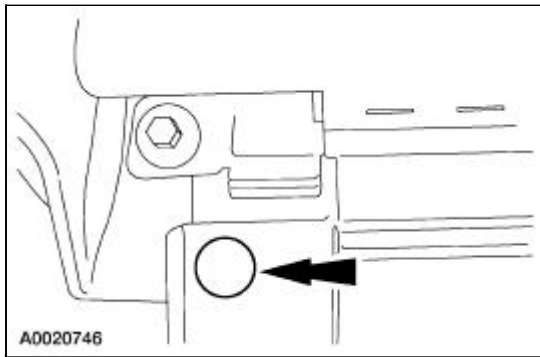
1. Position the steering wheel in the straight ahead position.
2. Remove the driver air bag module. For additional information, refer to [Section 501-20B](#).
3. Remove the floor console. For additional information, refer to [Console—Floor](#) in this section.
4. Remove the console A/C duct.



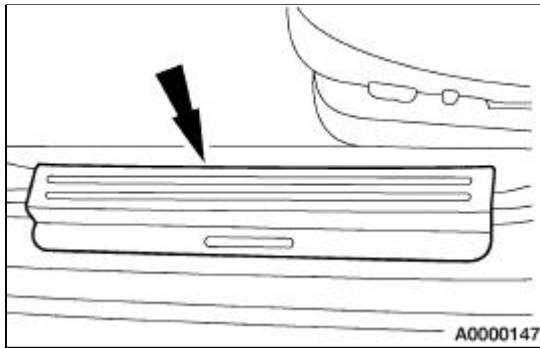
5. If equipped, remove the automatic transmission selector lever assembly. For additional information, refer to [Section 307-05](#).
6. Remove the three pin-type retainers and the LH instrument panel insulator.
 - Disconnect the courtesy lamp.



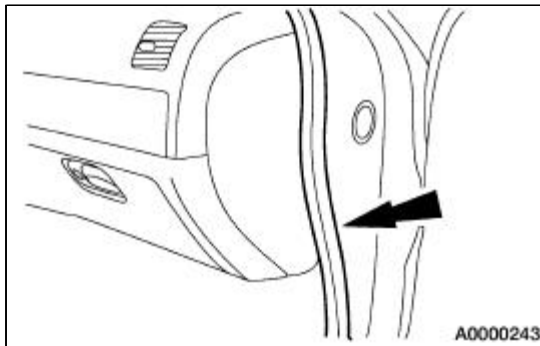
7. Remove the two pin-type retainers and the RH instrument panel insulator.
 - Disconnect the courtesy lamp.



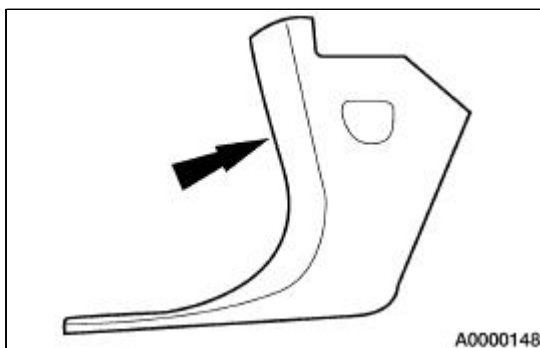
8. Remove the LH and RH scuff plates.



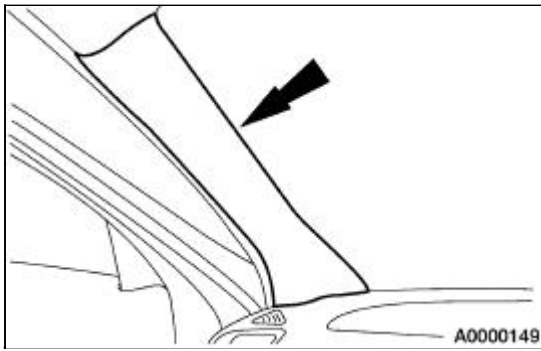
9. Position the LH and RH door weatherstrips aside.



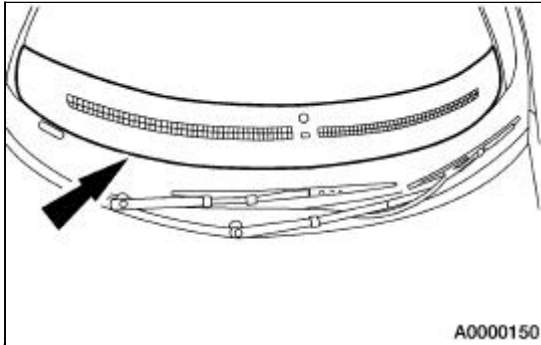
10. Remove the LH and RH A-pillar lower trim panels.



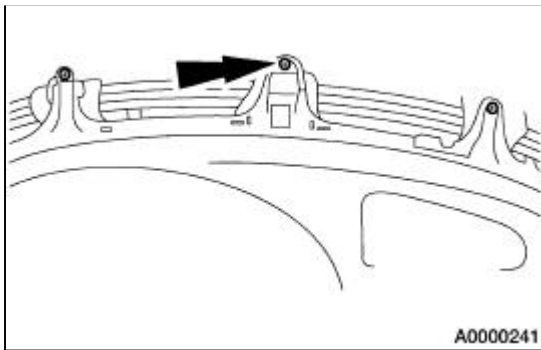
11. Remove the LH and RH windshield side garnish mouldings.



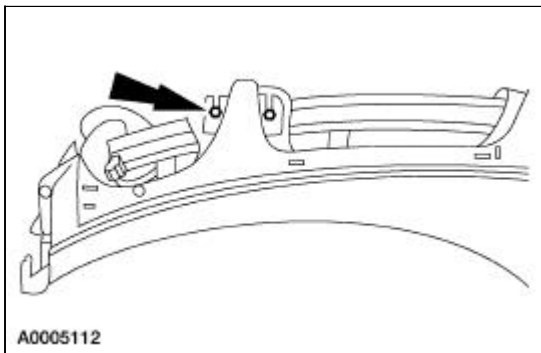
12. Remove the instrument panel defroster opening grille assembly.
 - Disconnect the electrical connector.



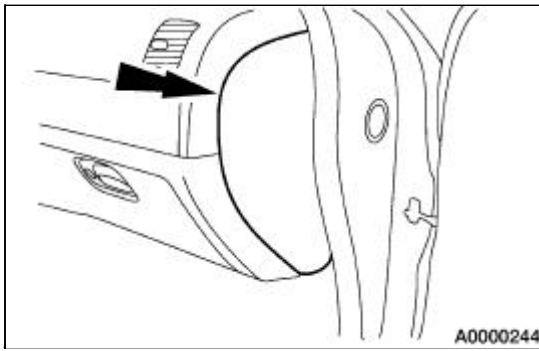
13. Remove the instrument panel cowl top screws.



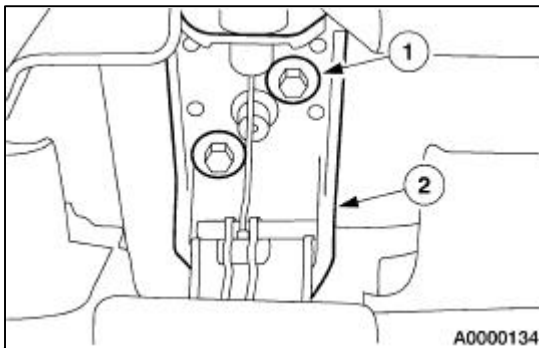
14. Loosen the instrument panel upper reinforcement bolts.



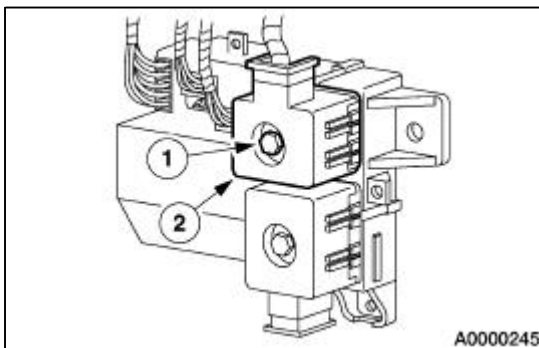
15. Remove the LH and RH instrument panel side finish panels.



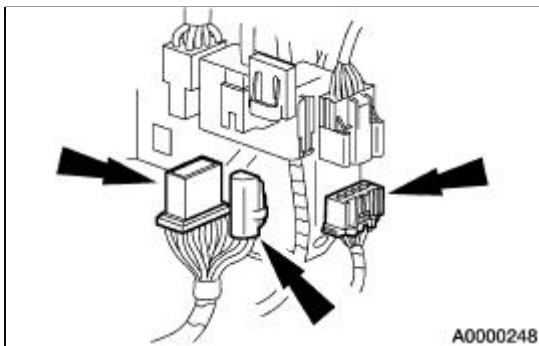
16. Position the hood release handle and cable aside.
 1. Remove the screws.
 2. Position the hood release handle and cable aside.



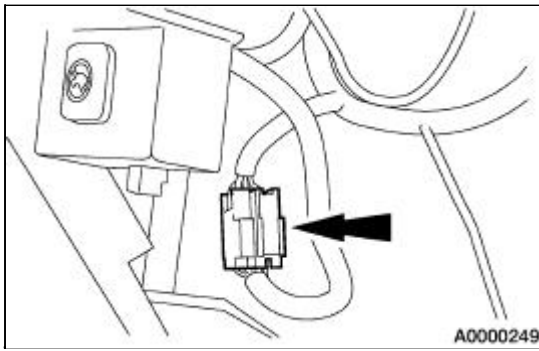
17. Disconnect the upper RH bulkhead electrical connector.
 1. Loosen the bolt.
 2. Disconnect the upper RH bulkhead electrical connector.



18. Disconnect the RH electrical connectors through the instrument panel side opening.



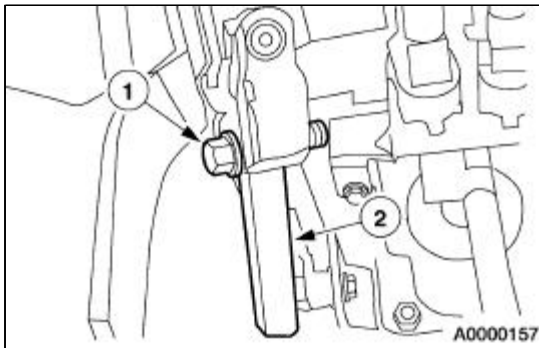
19. Disconnect the passenger side tunnel electrical connector.



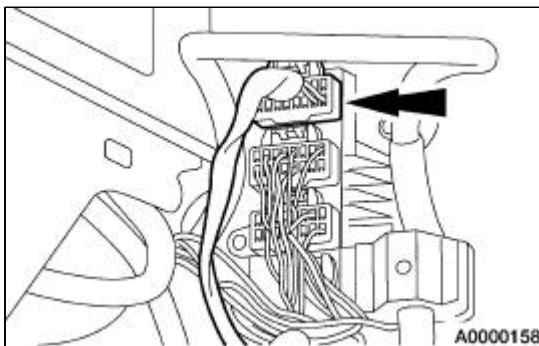
20.  **CAUTION: Secure the steering wheel to prevent any rotation or damage to the air bag sliding contact.**

Separate the intermediate shaft from the steering column.

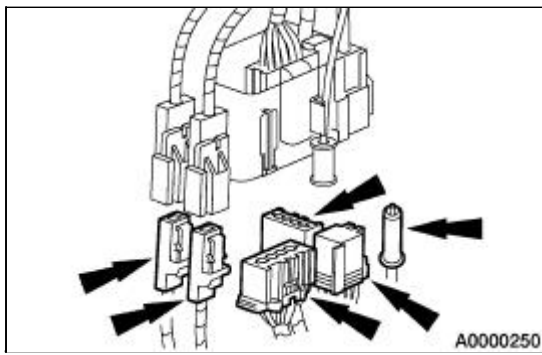
1. Remove the pinch bolt.
2. Separate the intermediate shaft from the steering column.



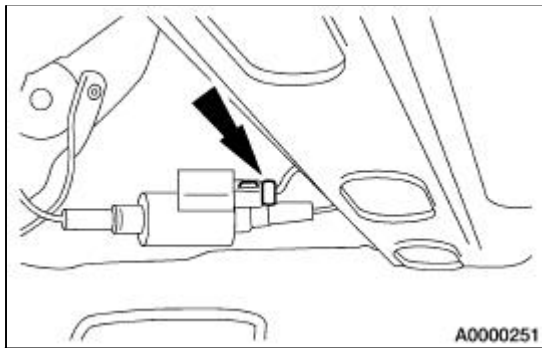
21. Disconnect the LH junction box electrical connector.
- Position the carpet aside to gain access to the connector.



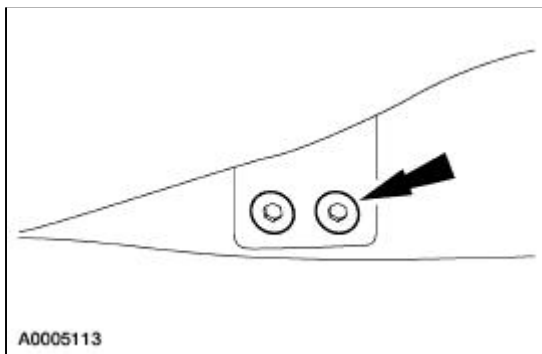
22. Disconnect the LH electrical connectors through the instrument panel side opening.



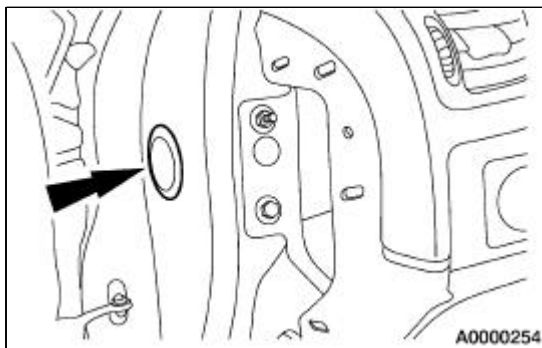
23. If equipped, disconnect the ignition shift interlock electrical connector.



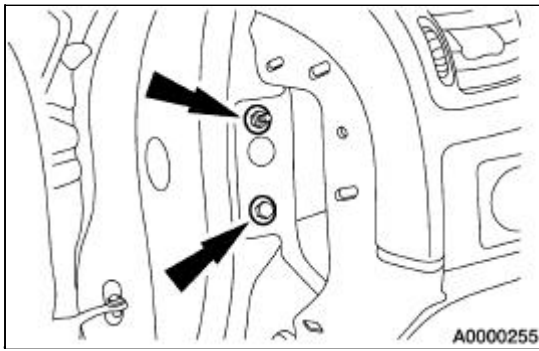
24. Remove the four instrument panel tunnel brace bolts.
● Position the carpet aside to gain access to the bolts.



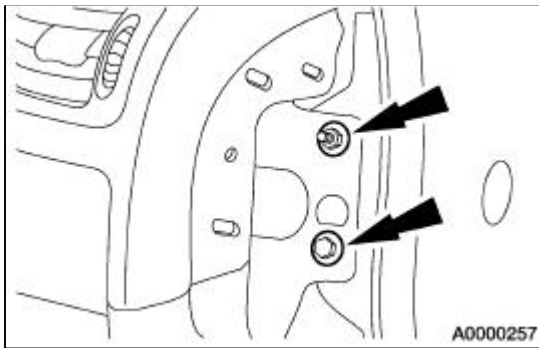
25. Remove the driver side outer instrument panel cowl side cover and reinforcement bolt.



26. Remove the LH instrument panel cowl side bolt and nut.



27. Remove the RH instrument panel cowl side bolt and nut.



28. **NOTE:** Two technicians are required to carry out this step.

Remove the instrument panel.

Installation

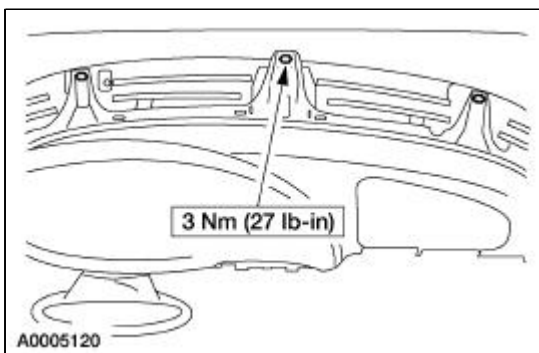


CAUTION: Electronic modules are sensitive to static electrical charges. If exposed to these charges, damage may result.

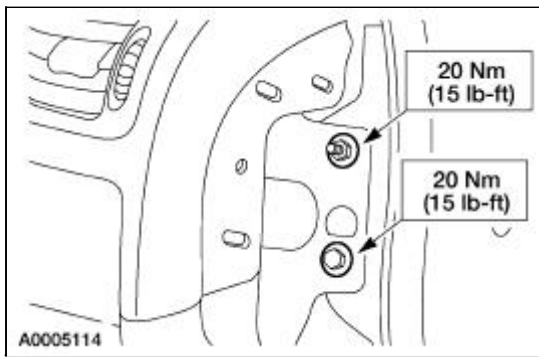
1. **NOTE:** Two technicians are required to carry out this step.

Install the instrument panel.

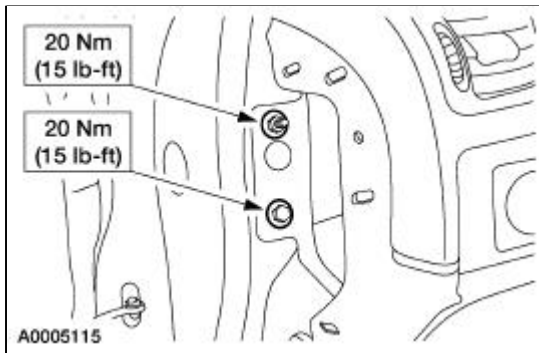
2. Install the instrument panel cowl top screws.



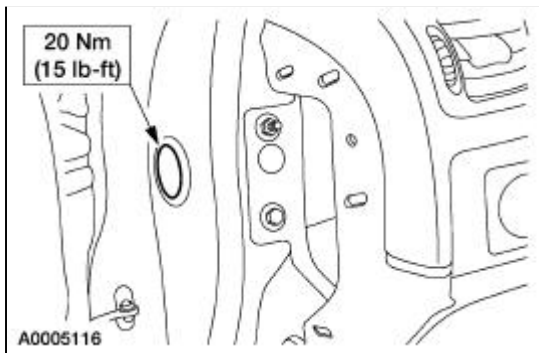
3. Install the RH instrument panel cowl side bolt and nut.



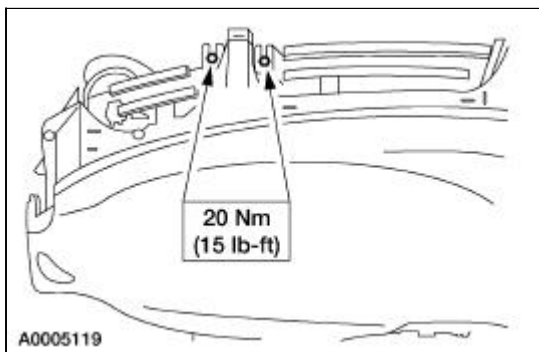
4. Install the LH instrument panel cowl side bolt and nut.



5. Install the driver side outer instrument panel cowl side reinforcement bolt and cover.



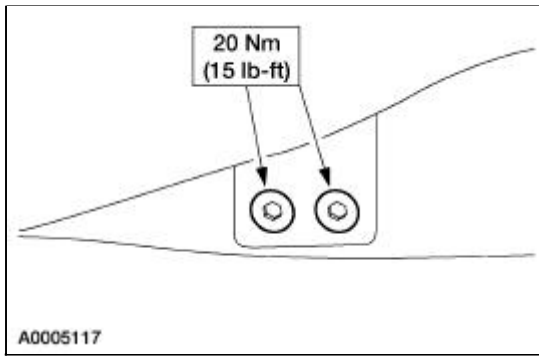
6. Tighten the instrument panel upper reinforcement bolts.



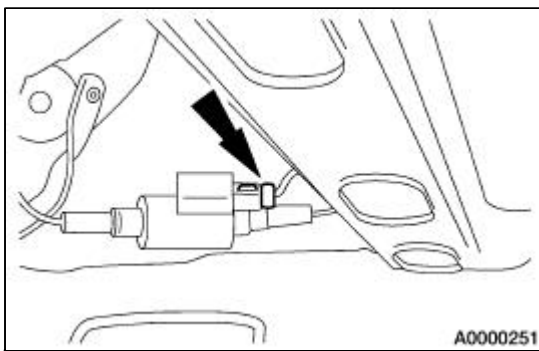
7.  **CAUTION:** Be sure the steering column cover reinforcement is in place before completing this step.

Install the four instrument panel tunnel brace bolts.

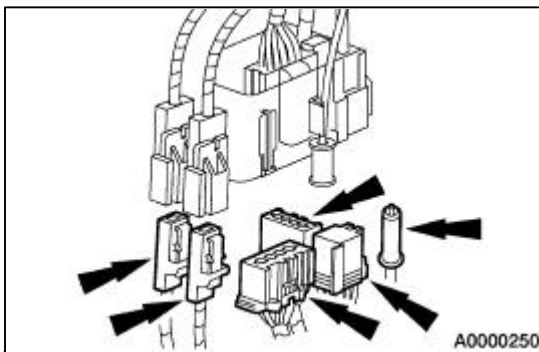
- Reposition the carpet.



8. If equipped, connect the ignition shift interlock electrical connector.

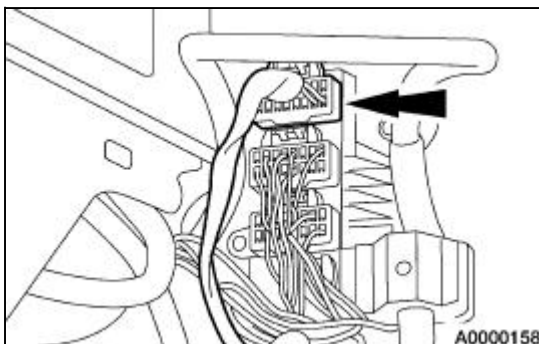


9. Connect the LH electrical connectors through the instrument panel side opening.



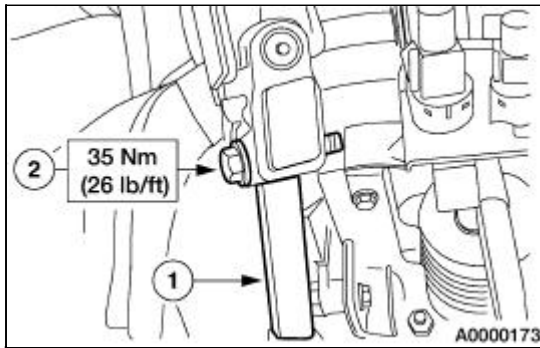
10. Connect the LH junction box electrical connector.

- Reposition the carpet.

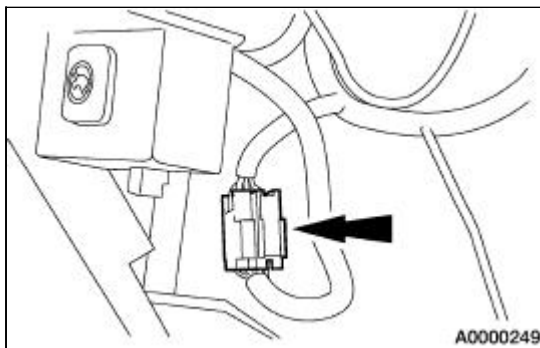


11. Connect the intermediate shaft to the steering column.

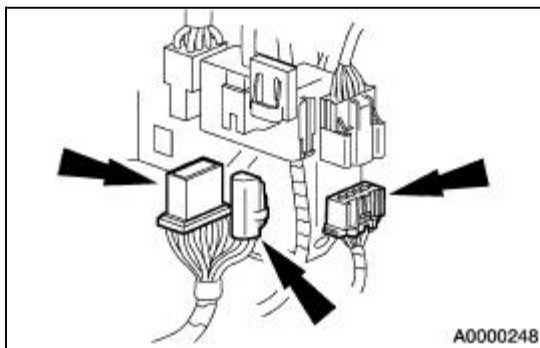
1. Connect the intermediate shaft to the steering column.
2. Install the pinch bolt.



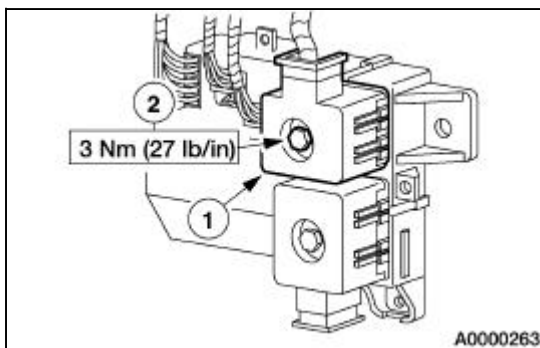
12. Connect the passenger side tunnel electrical connector.



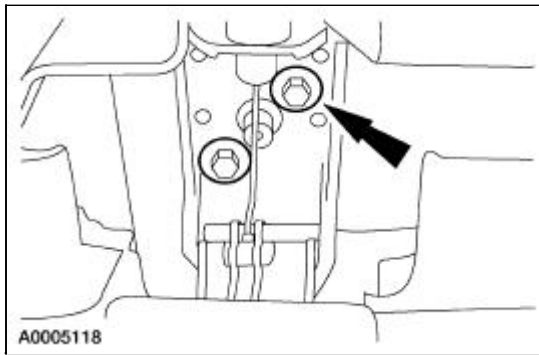
13. Connect the RH electrical connectors through the instrument panel side opening.



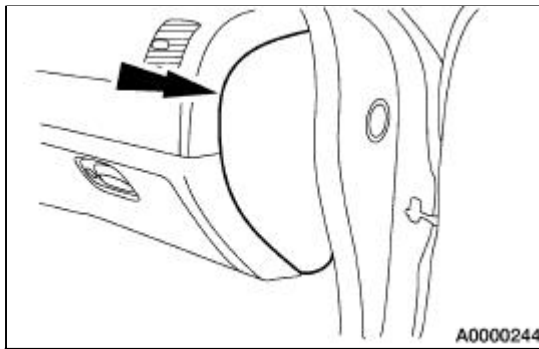
14. Connect the RH bulkhead electrical connector.
 1. Connect the RH bulkhead electrical connector.
 2. Tighten the bolt.



15. Position the hood release handle and cable and install the screws.

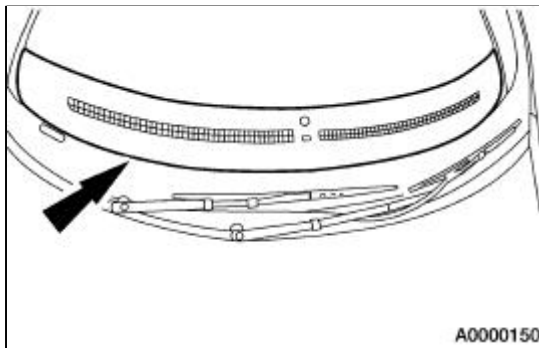


16. Install the LH and RH instrument panel side finish panels.

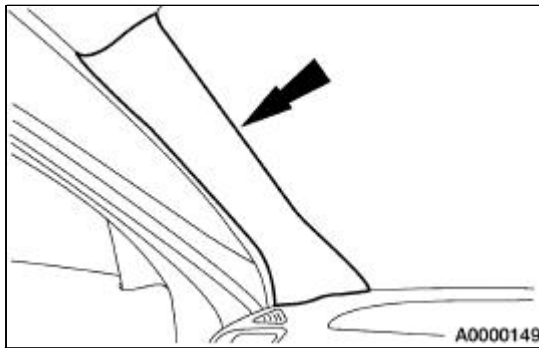


17. Install the instrument panel defroster opening grille assembly.

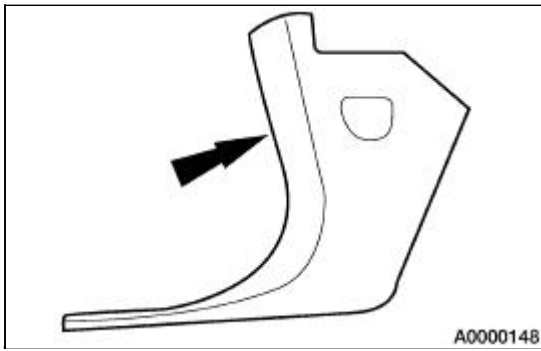
- Connect the electrical connector.



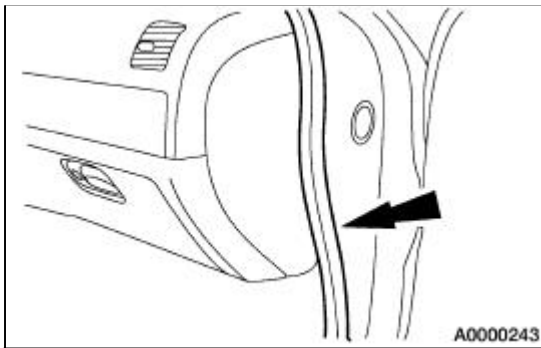
18. Install the LH and RH windshield side garnish mouldings.



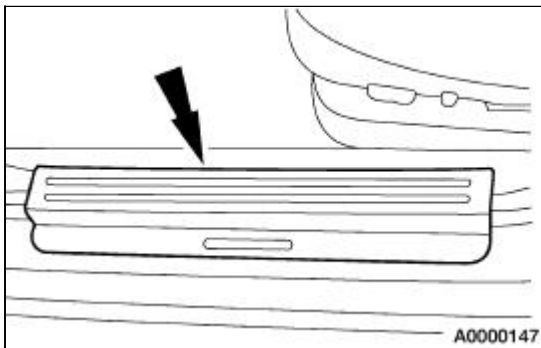
19. Install the LH and RH A-pillar lower trim panels.



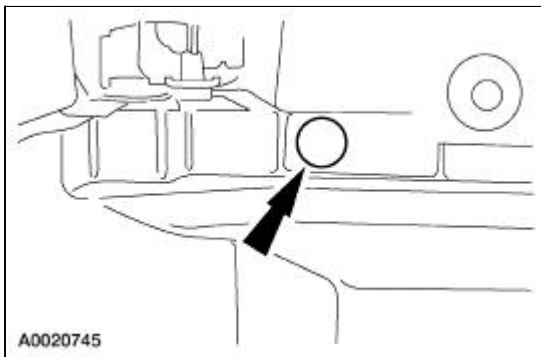
20. Install the LH and RH door weatherstrips.



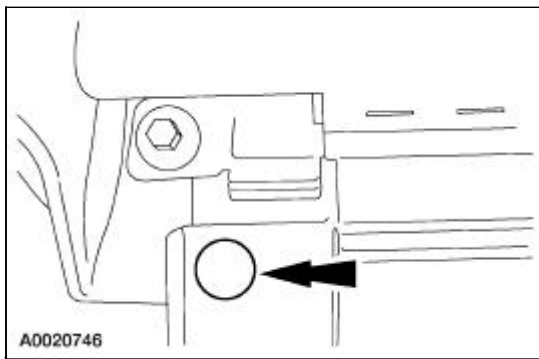
21. Install the LH and RH scuff plates.



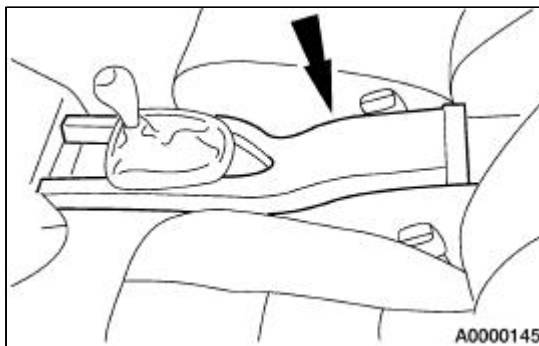
22. Position the LH instrument panel insulator and install the three pin-type retainers.
- Connect the courtesy lamp.



23. Position the RH instrument panel insulator and install the two pin-type retainers.
- Connect the courtesy lamp.



24. If equipped, install the automatic transmission selector lever assembly. For additional information, refer to [Section 307-05](#).
25. Install the console A/C duct.

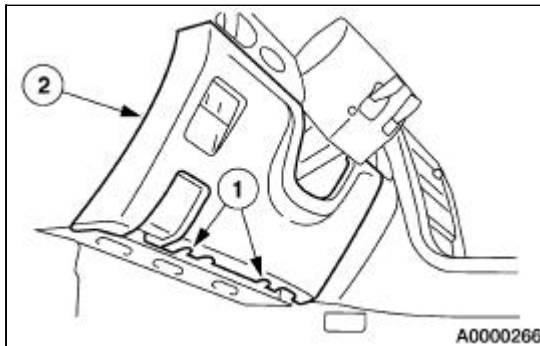


26. Install the floor console. For additional information, refer to [Console—Floor](#) in this section.
 27. Install the driver air bag module. For additional information, refer to [Section 501-20B](#).
-

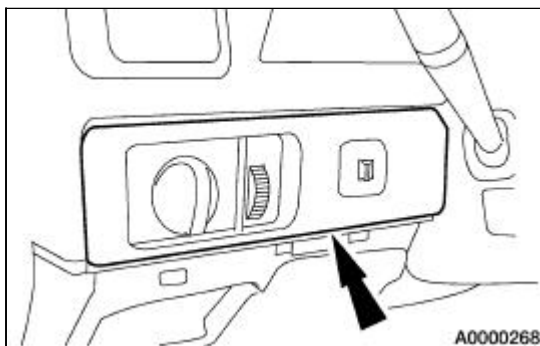
Instrument Panel —Cluster Finish Panel

Removal and Installation

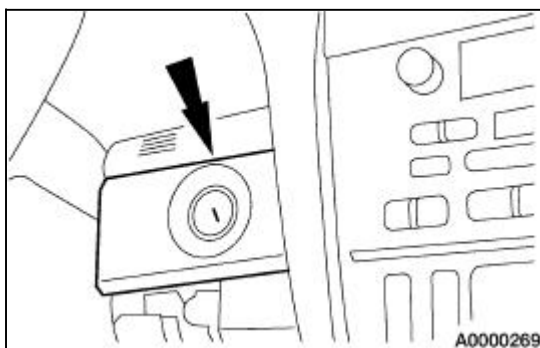
1. Adjust the steering column to the full tilt down and full extended position.
2. Disconnect the battery ground cable. For additional information, refer to [Section 414-01](#).
3. Remove the instrument panel steering column cover.
 1. Remove the pin-type retainers.
 2. Remove the instrument panel steering column cover.
 - Disconnect the electrical connectors.



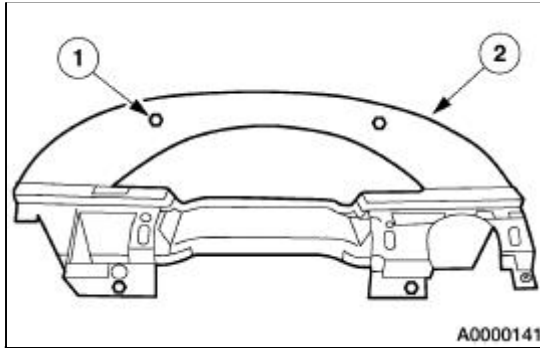
4. Remove the outer instrument panel finish panel.
 - Disconnect the electrical connectors.



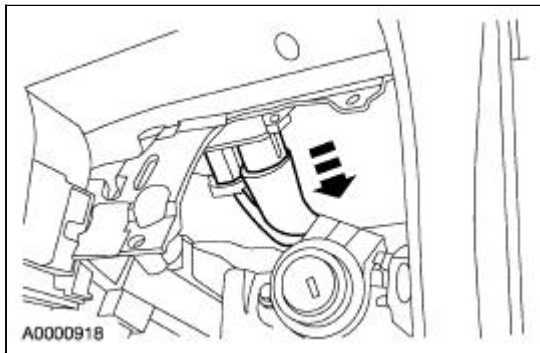
5. Remove the inner instrument panel finish panel.



6. Position the instrument panel cluster finish panel aside.
 1. Remove the screws.
 2. Position the instrument panel cluster finish panel aside.



7. Disconnect the in-car air temperature sensor and remove the instrument panel cluster finish panel.

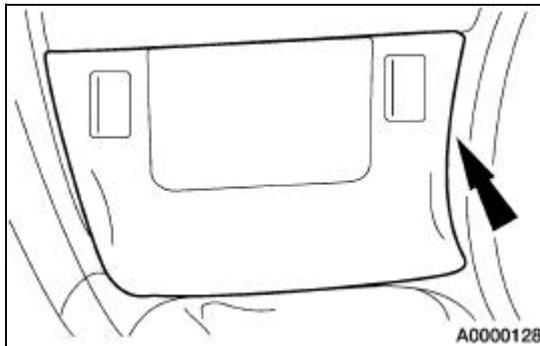


8. To install, reverse the removal procedure.
-

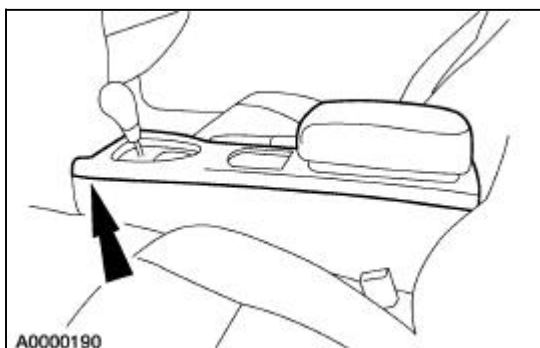
Console —Floor

Removal and Installation

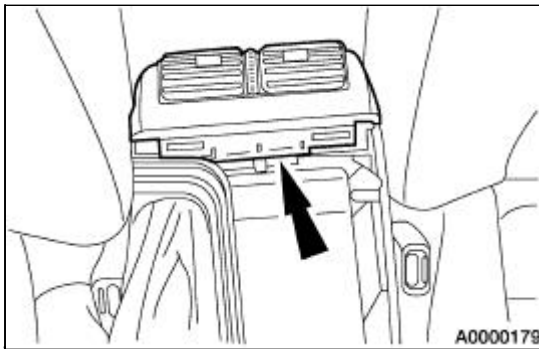
1. Apply the parking brake.
2. If equipped with a manual transmission, place the selector lever in fourth gear.
3. If equipped with an automatic transmission, place the selector lever in neutral.
4. Disconnect the battery ground cable. For additional information, refer to [Section 414-01](#).
5. Remove the ashtray finish panel.
 - Disconnect the electrical connectors.



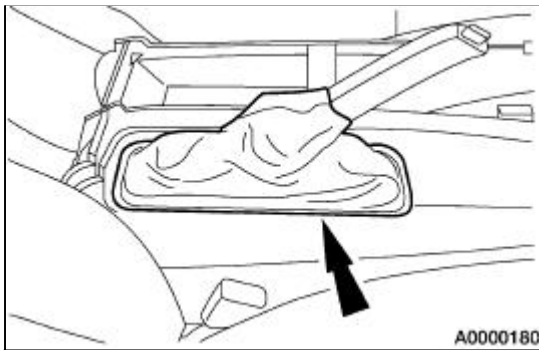
6. If equipped with a manual transmission, remove the gearshift lever knob.
7. If equipped, disconnect the cellular phone electrical connectors.
8. Remove the console finish panel assembly by pulling upward from the front first.
 - If equipped, disconnect the traction control switch electrical connector.
 - If equipped, release the cellular phone wiring harness from the console finish panel assembly.



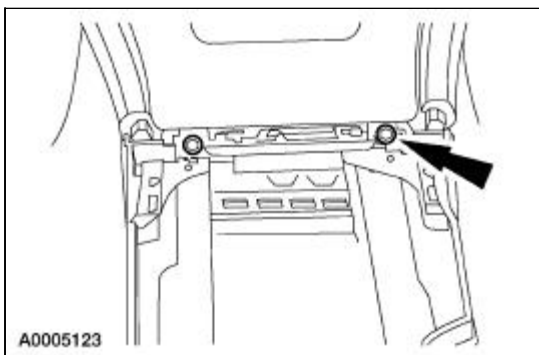
9. Remove the console rear finish panel assembly.
 - Unclip by pulling rearward.



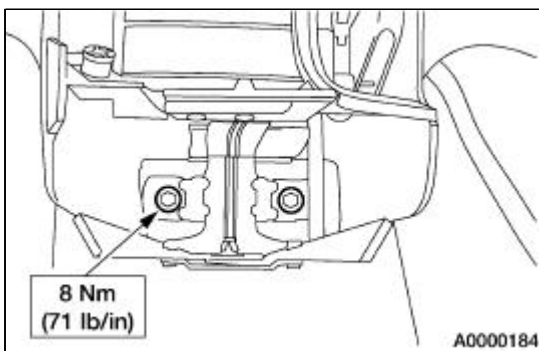
10. Unclip the parking brake boot from the console base.



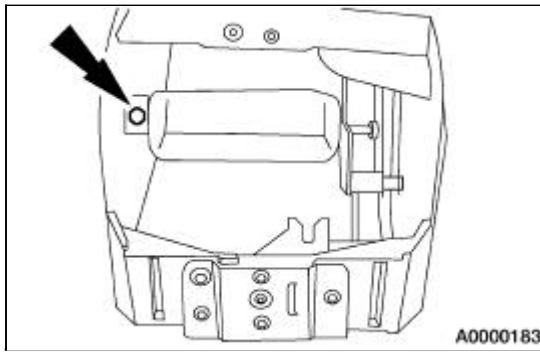
11. Remove the console assembly front screws.



12. Remove the console assembly rear screws.



13. Remove the console air condition duct mounting screw.

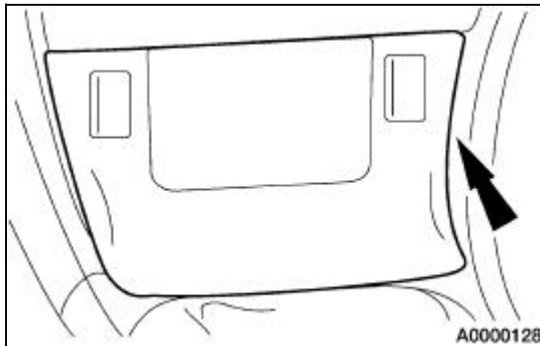


14. Remove the console assembly by sliding rearward.
 15. To install, reverse the removal procedure.
-

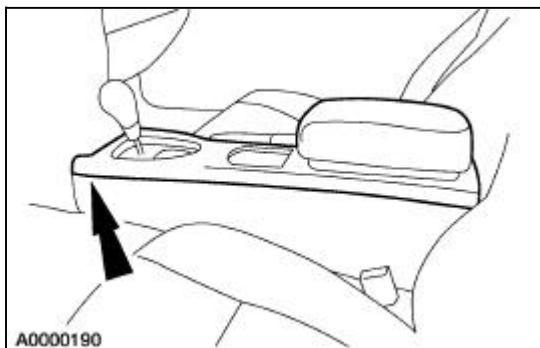
Console —Floor, Finish Panel Assembly

Removal and Installation

1. Apply the parking brake.
2. If equipped with a manual transmission, place the selector lever in fourth gear.
3. If equipped with an automatic transmission, place the selector lever in neutral.
4. Disconnect the battery ground cable. For additional information, refer to [Section 414-01](#).
5. Remove the ashtray finish panel.
 - Disconnect the electrical connectors.



6. If equipped with a manual transmission, remove the gearshift lever knob.
7. If equipped, disconnect the cellular phone electrical connectors.
8. Remove the console finish panel assembly by pulling upward from the front first.
 - If equipped, disconnect the traction control switch electrical connector.
 - If equipped, release the cellular phone wiring harness from the console finish panel assembly.



9. To install, reverse the removal procedure.

Glove Compartment

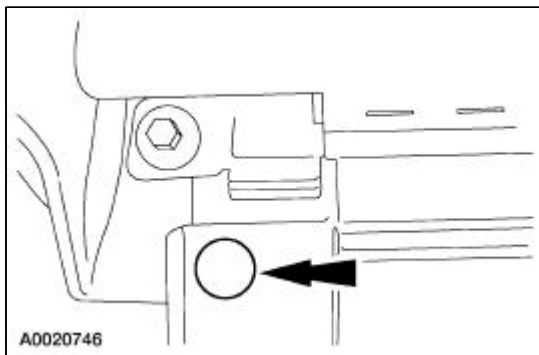
Removal

All Vehicles

1. Disconnect the battery ground cable. For additional information, refer to [Section 414-01](#).

Late Build Vehicles

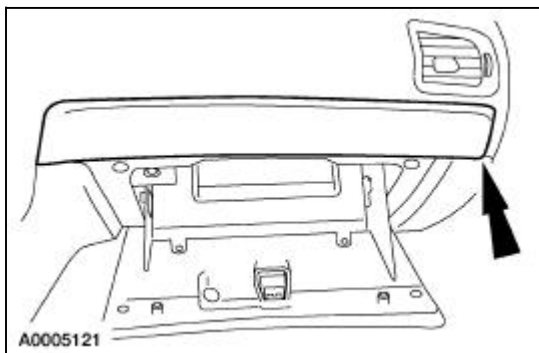
2. Remove the two pin-type retainers and the RH instrument panel insulator.
 - Disconnect the courtesy lamp.



3. Remove the RH floor heat duct.
4. From under the instrument panel, release the assist cable from the glove compartment arm.

All Vehicles

5. Open the glove compartment.
6. Remove the instrument panel finish panel.

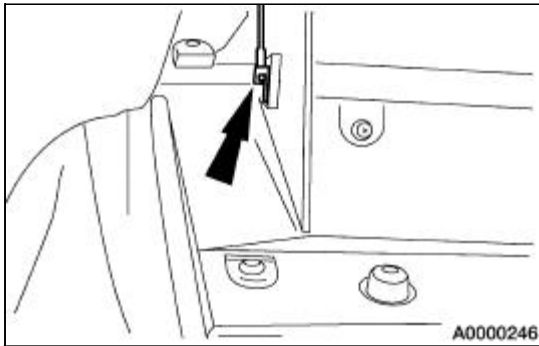


Late Build Vehicles

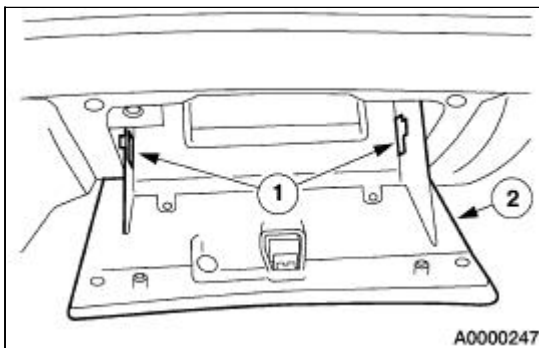
7. Push down on the glove compartment arms and lower the glove compartment door.

Early Build Vehicles

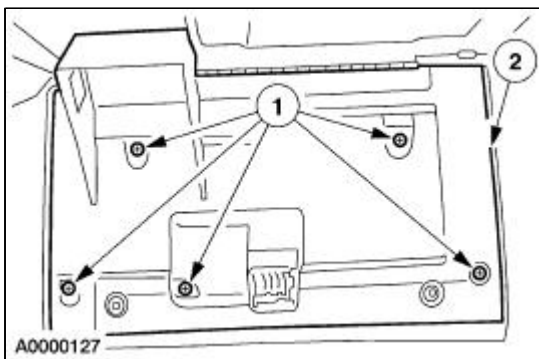
8. Release the assist cable from the glove compartment.



9. Lower the glove compartment.
 1. Release the glove compartment stops.
 2. Lower the glove compartment.

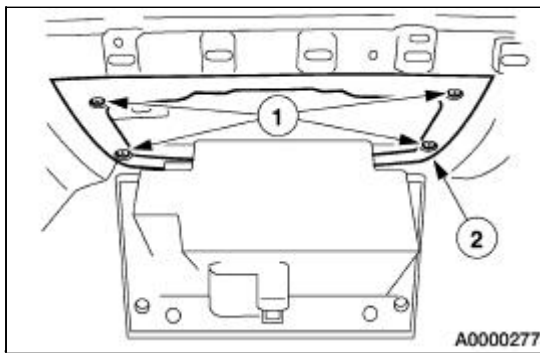


10. If equipped with a compact disc changer, remove the glove compartment door inner panel.
 1. Remove the screws.
 2. Remove the glove compartment door inner panel.

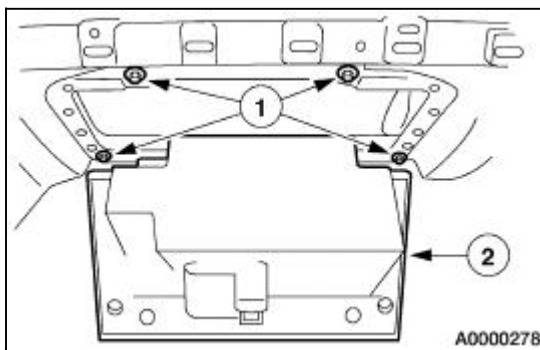


All Vehicles

11. Remove the glove compartment instrument panel finish panel.
 1. Remove the screws.
 2. Remove the finish panel.
 - Disconnect the electrical connectors.

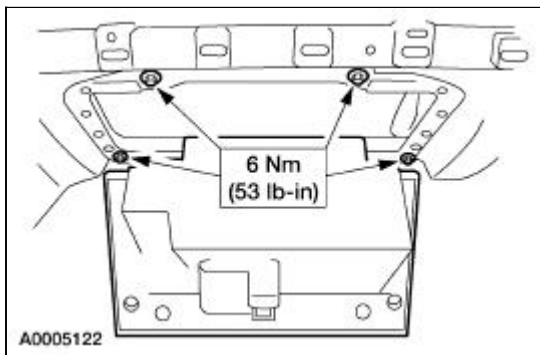


12. Remove the glove compartment.
 1. Remove the bolts.
 2. Remove the glove compartment.
 - Disconnect the electrical connector.



Installation

1. To install, reverse the removal procedure.



General Specifications

Item	Specification
Lubricants	
Multi-Purpose Grease Spray F5AZ-19G209-AA	ESR-M1C159-A
Penetrating and Lock Lubricant E8AZ-19A501-B	—

Torque Specifications

Description	Nm	lb-ft	lb-in
Theft shield screw	10	—	89
Door latch screw	13	10	—
Exterior door handle nuts, rear door	11	8	—
Exterior door handle nut, front door	10	—	89
Lock cylinder nut	10	—	89

**LOCK REPAIR/REPLACEMENT
SPECIFICATIONS**

Part Number	Lock Repair Package Name
11582	Ignition Cylinder
5421990	Door Lock
5443262	Luggage Compartment Lid
5406082	Glove Box
5421970	Lock Lever Kit

Handles, Locks, Latches and Mechanisms

Actuator

The actuator is not repairable and is a part of the latch assembly.

Fuel Filler Door Lock Switch

The fuel filler door lock switch actuates a solenoid integral to the fuel filler door latch to release the fuel tank filler door.

Global Window Open/Close



WARNING: Disconnect the battery ground cable when working on or near the driver side door cylinder lock rod or door latch. Failure to follow these instructions may result in personal injury.

This vehicle is equipped with a global window open/close feature activated by turning the key to either the lock or unlock position and holding it there for at least three seconds. Turning the key to the lock position will close all of the windows. Turning the key to the unlock position will open all of the windows. This function can accidentally be activated when working around or with the driver side door cylinder lock rod or door latch causing the windows to abruptly open or close. To avoid personal injury, always disconnect the battery ground cable when working on or near the driver side door cylinder lock rod or door latch.

Lock Cylinder Repair

Individual lock cylinders are repaired by discarding the inoperative cylinder and building a new lock cylinder using the appropriate lock repair package. The lock repair package includes a detailed instruction sheet to build the new lock cylinder to the current key code of the vehicle.

Luggage Compartment Remote Control Lock Switch

Refer to [Section 501-14B](#) for diagnostics.

Power Locks

The door lock system consists of:

- interior front door latch remote control assembly
- front door latch and cable assembly
- exterior door handle and front door latch actuating rod
- lock cylinder rod
- door latch striker plate

- door lock cylinder
- adjunct actuator
- circuit wiring and circuit protection
- front door lock switch

Refer to [Section 501-14B](#) for diagnostics.

Theft Shield

The theft shield is:

- located inside the driver door panel.
- fastened near the bottom of the door and the door handle.

Trunk Release Lockout Switch

The trunk release lockout switch is:

- located within the glove compartment.
 - disables the trunk release switch.
-

Locks, Latches and Mechanisms

Refer to [Section 501-14B](#) for power door lock diagnostics.

Refer to [Section 501-14B](#) for luggage compartment lid remote control lock switch diagnostics.

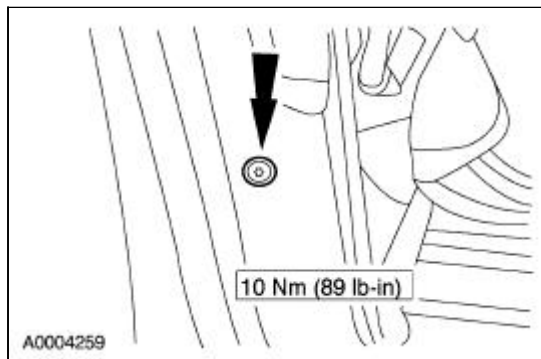
Latch —Front Door

Removal and Installation

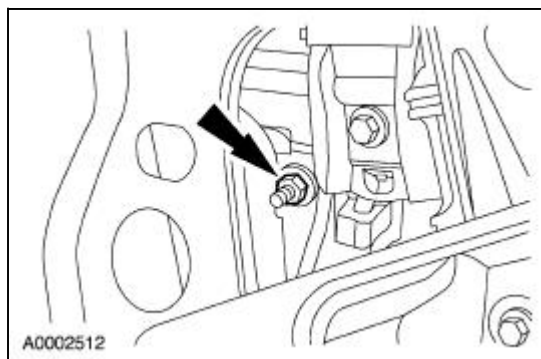
 **WARNING:** Disconnect the battery ground cable when working on or near the driver side door cylinder lock rod or door latch. Failure to follow these instructions may result in personal injury.

Driver and Passenger Front Door

1. Disconnect the battery ground cable (14301). For additional information, refer to [Section 414-01](#).
2. Remove the front door trim panel. For additional information, refer to [Section 501-05](#).
3. Remove the lower theft shield screw.

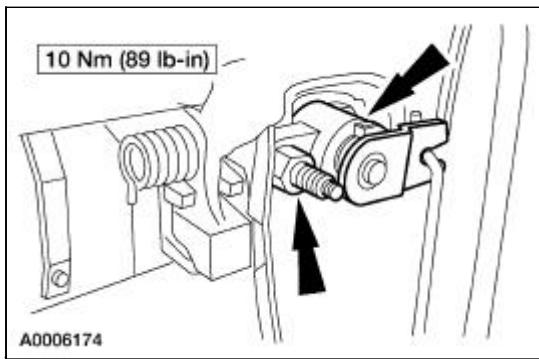


4. Remove the nut and position the theft shield aside .



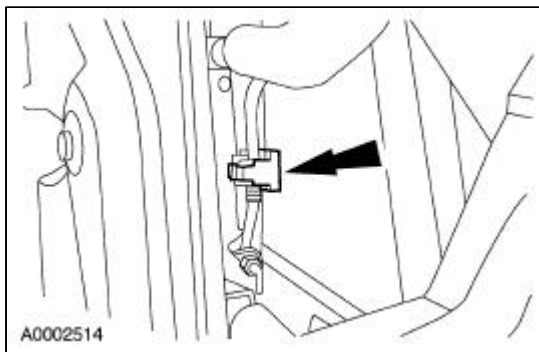
Driver Door Only

5. Remove the nut and the lock cylinder.

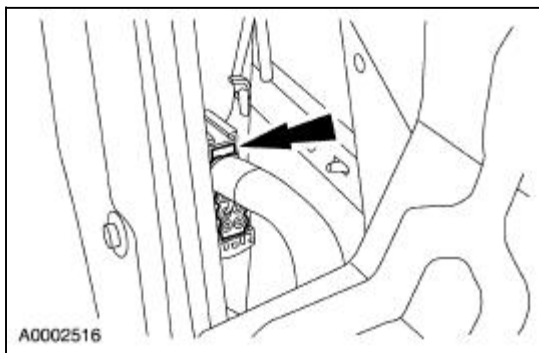


Driver and Passenger Front Door

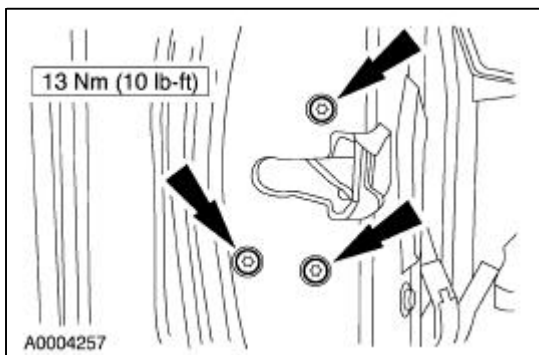
6. Release the clip and disconnect the exterior door handle actuator rod.
 - If equipped, disconnect the door lock cylinder switch electrical connector.



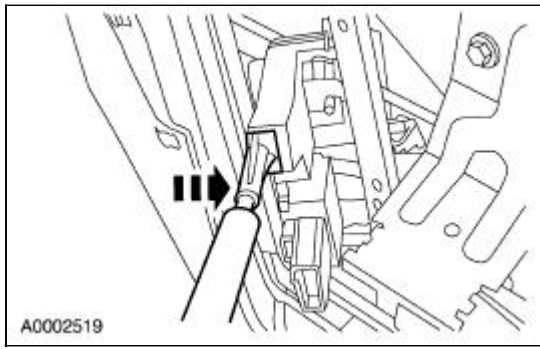
7. Disconnect the electrical connector.



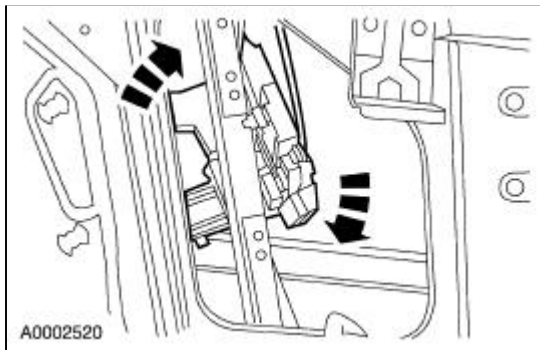
8. Remove the door latch screws.



9. Remove the interior handle actuating cable.



10. Remove the door latch.

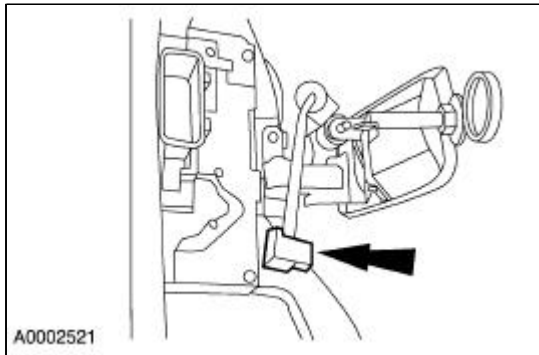


11. To install, reverse the removal procedure.

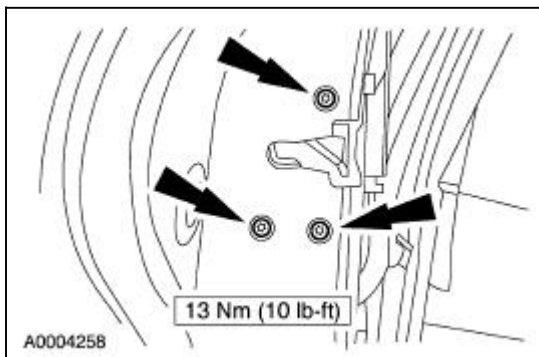
Latch —Rear Door

Removal and Installation

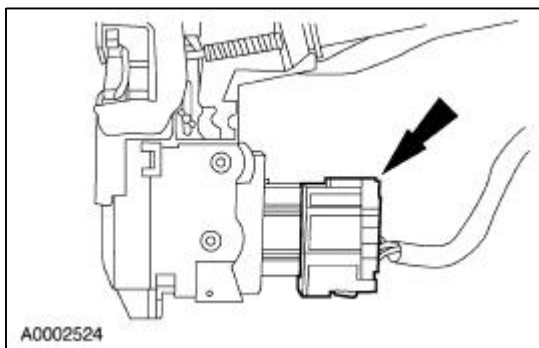
1. Remove the rear door trim panel. For additional information, refer to [Section 501-05](#).
2. Release the clip and disconnect the exterior door handle actuating rod.



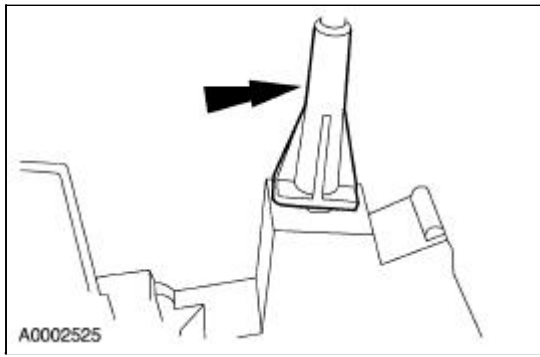
3. Remove the door latch screws.



4. Disconnect the electrical connector.



5. Remove the interior door handle release cable and remove the rear door latch.



6. To install, reverse the removal procedure.

Handle —Exterior Front Door

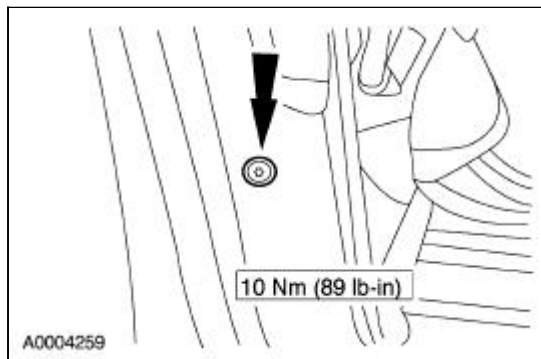
Removal and Installation

Driver and Passenger Front Door

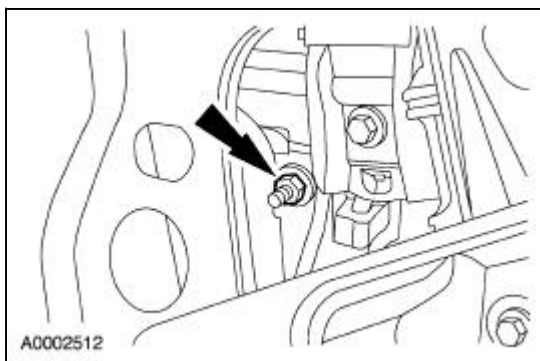


WARNING: Disconnect the battery ground cable when working on or near the driver side door cylinder lock rod or door latch. Failure to follow these instructions may result in personal injury.

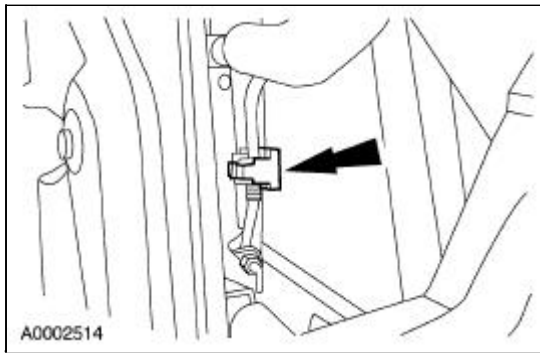
1. Disconnect the battery ground cable (14301). For additional information, refer to [Section 414-01](#).
2. Remove the front door trim panel. For additional information, refer to [Section 501-05](#).
3. Remove the lower theft shield screw.



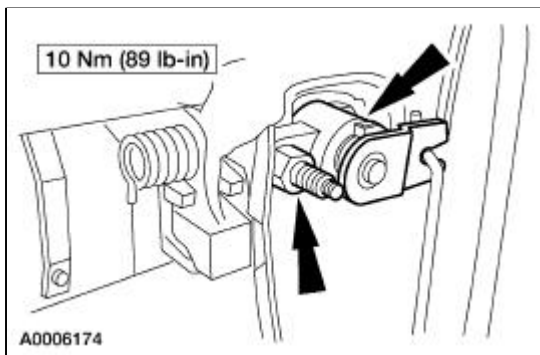
4. Remove the nut and position the theft shield aside.



5. Release the clip and disconnect the exterior door handle actuating rod.
 - If equipped, disconnect the door lock cylinder switch electrical connector.

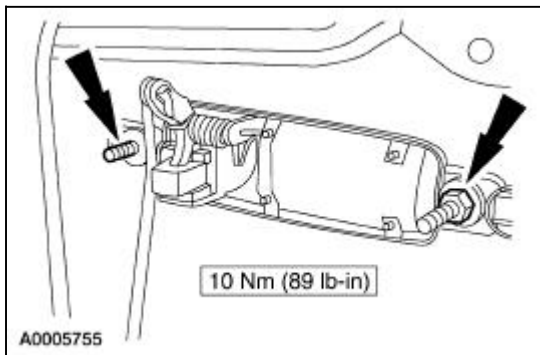


6. Remove the nut and position the door lock cylinder aside.



Driver and Passenger Front Door

7. Remove the nut and the exterior door handle.

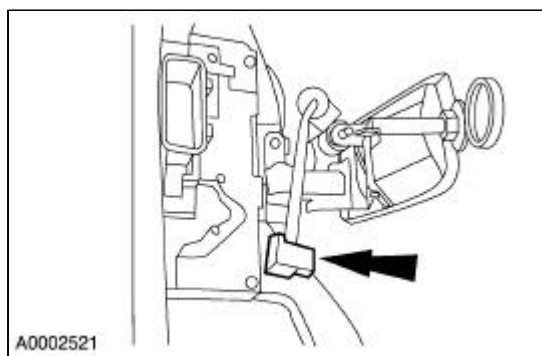


8. To install, reverse the removal procedure.
-

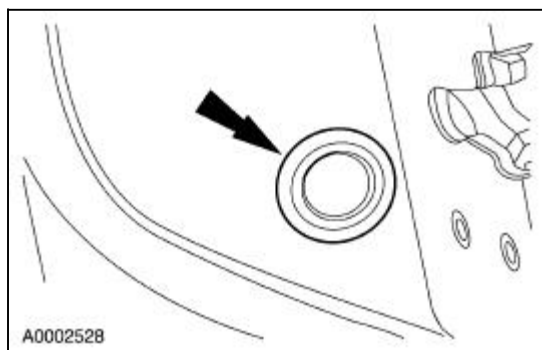
Handle —Exterior Rear Door

Removal and Installation

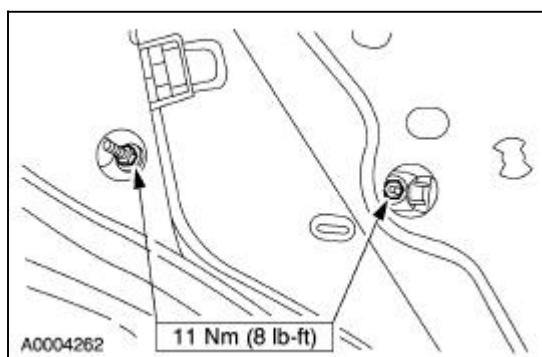
1. Remove the rear door trim panel. For additional information, refer to [Section 501-05](#).
2. Release the clip and disconnect the exterior door handle actuator rod.



3. Remove the grommet.



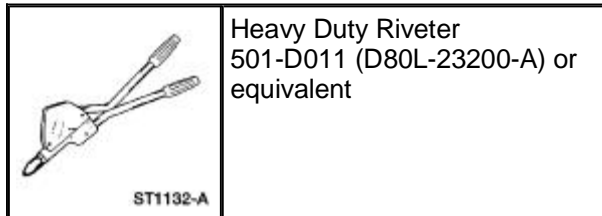
4. Remove the nuts and exterior door handle.



5. To install, reverse the removal procedure.

Handle —Interior Door

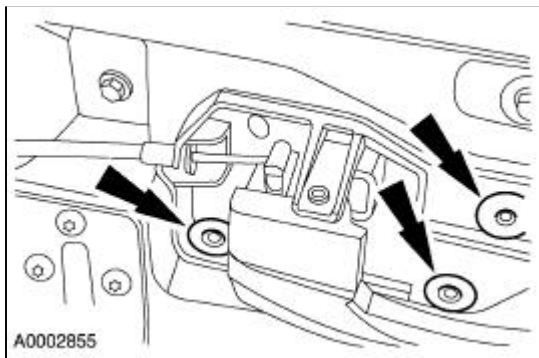
Special Tool(s)



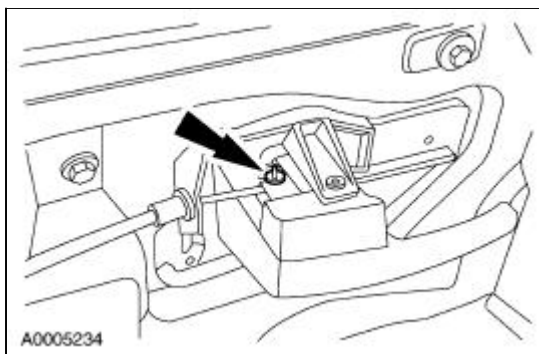
Removal and Installation

1. Disconnect the battery ground cable (14301). For additional information, refer to [Section 414-01](#).
2. Remove the door trim panel. For additional information, refer to [Section 501-05](#).
3. **NOTE:** Using the special tool is required to install the rivets.

Remove the rivets.



4. Release the cable and remove the interior door handle.



5. To install, reverse the removal procedure.

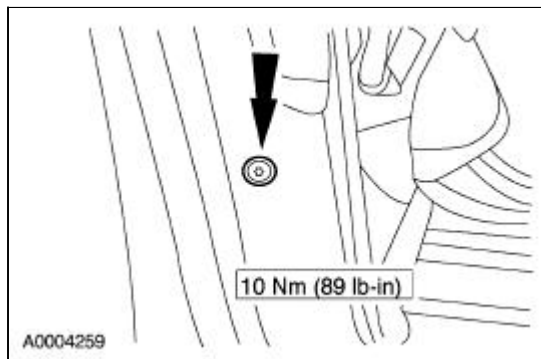
Lock Cylinder —Door

Removal and Installation

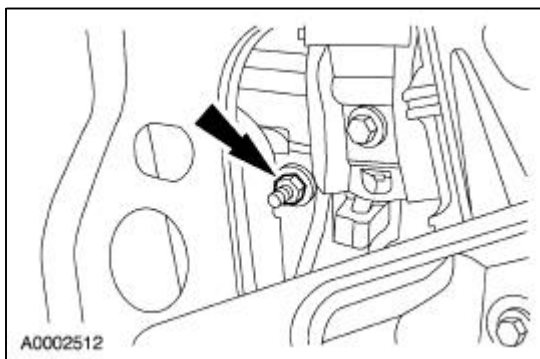
⚠ WARNING: Disconnect the battery ground cable when working on or near the driver side door cylinder lock rod or door latch. Failure to follow these instructions may result in personal injury.

NOTE: Individual lock cylinders are repaired by discarding the inoperative cylinder and building a new lock cylinder using the appropriate lock repair package. The lock repair package includes a detailed instruction sheet to build the new lock cylinder to the current key code of the vehicle.

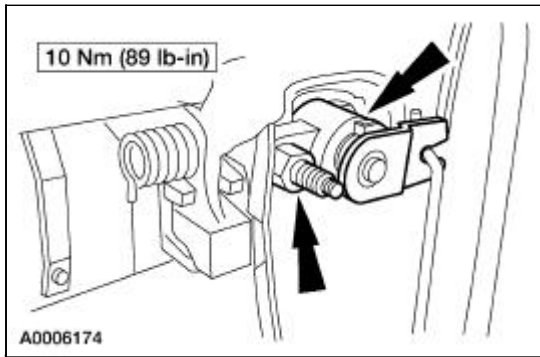
1. Disconnect the battery ground cable (14301). For additional information, refer to [Section 414-01](#).
2. Remove the front door trim panel. For additional information, refer to [Section 501-05](#).
3. Remove the lower theft shield screw.



4. Remove the nut and the theft shield.



5. Remove the lock cylinder nut and remove the lock cylinder.
 - If equipped, disconnect the door lock cylinder switch electrical connector.

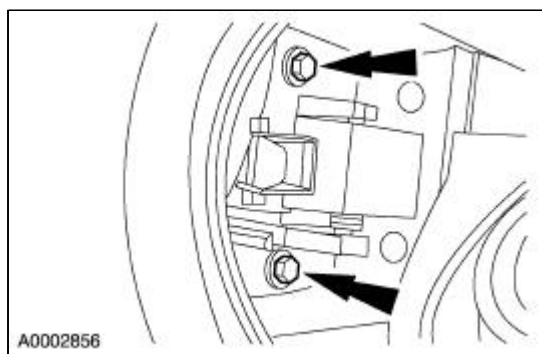


6. To install, reverse the removal procedure.

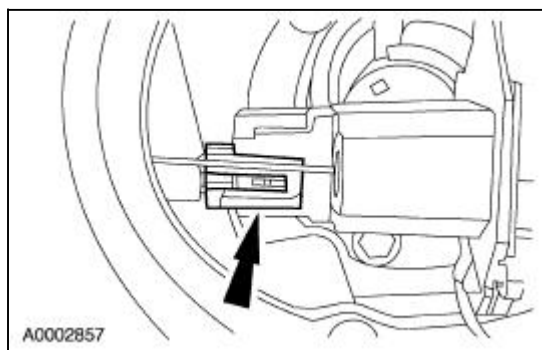
Latch Remote Control —Fuel Door Release

Removal and Installation

1. Remove the fuel filler cap.
2. Remove the bolts and position the fuel door release latch remote control aside.



3. Disconnect the electrical connector and remove the latch remote control.

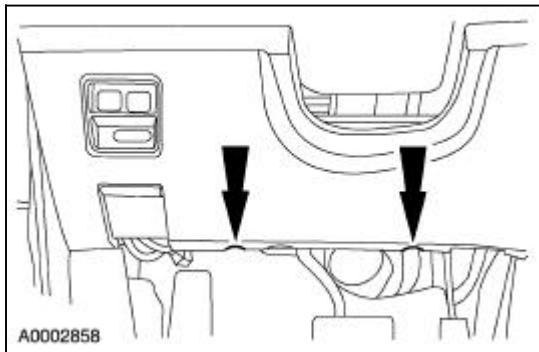


4. To install, reverse the removal procedure.
-

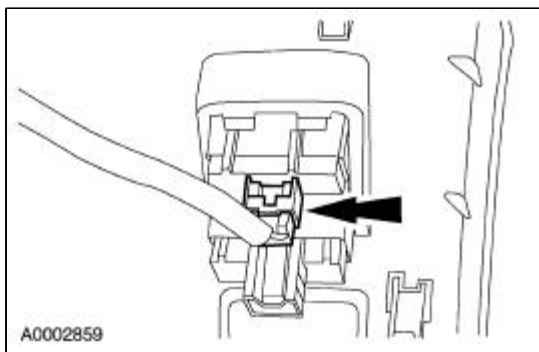
Switch —Fuel and Luggage Compartment Lid Release

Removal and Installation

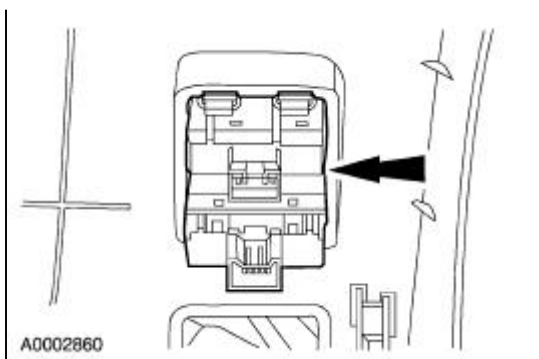
1. Remove the instrument panel steering column cover.



2. Disconnect the electrical connector.



3. Remove the fuel luggage compartment lid release switch.

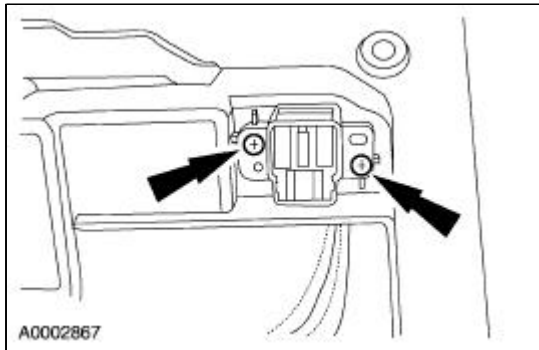


4. To install, reverse the removal procedure.

Switch —Luggage Compartment Lid Lockout

Removal and Installation

1. Remove the glove compartment. For additional information, refer to [Section 501-12](#).
2. Remove the screws and the luggage compartment lid lockout switch.



3. To install, reverse the removal procedure.
-

Keyless Entry

The keyless entry system consists of the following:

- driver door module (DDM)
- four button remote transmitter
- front electronic module (FEM)
- rear electronic module (REM)

For removal and installation of the actuator, refer to [Section 501-14A](#).

For removal and installation of the driver door module (DDM), refer to [Section 419-10](#).



For removal and installation of the rear electronic module (REM), refer to [Section 419-10](#).

For removal and installation of the front electronic module (FEM), refer to [Section 419-10](#).

Keyless Entry

Refer to Wiring Diagrams Section [501-14B](#) for schematic and connector information.

Special Tool(s)

 ST1217-A	New Generation STAR (NGS) Tester 418-F048 (007-00500) or equivalent
 ST1137-A	73III Automotive Meter 105-R0057 or equivalent

Principles of Operation

The rear electronics module (REM) controls the output functions of the door locks for the following:

- Passenger front door lock actuator
- Passenger rear door lock actuator
- Driver rear door lock actuator

The REM controls the input functions of the door locks for the following:

- Passenger door lock and unlock switch

The driver door module (DDM) controls the output functions of the door locks for the following:

- Driver door lock actuator

The DDM controls the input functions of the door locks for the following:

- Driver door lock and unlock switch

Operating commands for the passenger front, passenger rear and driver rear lock actuators are received in two forms: the standard corporate protocol (SCP) communication network from the DDM or directly from the passenger door lock and unlock switch, which is hardwired to the REM. The driver door lock and unlock switch is hardwired to the DDM. When the driver switch is activated, the DDM will activate the driver door lock actuator and also sends a message through the SCP network. In turn, the REM will output the desired command to the appropriate lock actuators. When the passenger door lock and unlock switch is activated, the REM will activate the lock actuators, which it controls, and it will also send a message through the SCP network to the DDM to activate the driver door lock actuator.

Operating commands for the driver actuator are received in two forms: through the SCP communication network from the REM or directly from the driver door lock and unlock switch, which is hardwired to the DDM. The passenger door lock and unlock switch is hardwired to the REM. When the passenger switch is activated, the REM will activate the passenger front, passenger rear, and driver rear door lock actuators and also send a message through the SCP network. In turn, the DDM will output the desired command to the driver front door lock actuator. When the driver door lock and unlock switch is activated, the DDM will activate the driver lock actuator, which it controls, and it will also send a message through the SCP network to the REM to activate the appropriate door lock actuators.

Operating commands for the luggage compartment release lock motor are received in two forms: directly from the luggage compartment release switch which is hardwired to the REM, or through the SCP network from the DDM. When the luggage compartment release switch is activated, the REM will activate the luggage compartment lock actuator, which is hardwired to the REM. The luggage compartment unlock operation is also possible when activated from the remote transmitter through the DDM, with the DDM sending a message over the SCP network. The REM will then activate the luggage compartment release motor.

The DDM receives inputs from the remote transmitter(s) and delivers outputs enabling the driver to lock and unlock the vehicle's power lock system, or to arm and disarm the perimeter alarm. The DDM can be programmed to accept up to four transmitter ID codes from four remote transmitters.

Remote locking and unlocking of the doors is accomplished by the DDM receiving a command message from the remote transmitter. The DDM then processes the command and sends a signal directly to the driver door lock actuator, and sends a message through the SCP network, to the REM which will drive the appropriate passenger door lock actuators. Fault management will disable the remote locking and unlocking feature in the event of an ignition switch or PRNDL invalid or missing message to the front electronic module (FEM).

All power door locks and the luggage compartment release motor are powered by the switched system power (SSP) feature. A failure of any or all of the SSP features could cause inoperative power door locks. When diagnosing power door locks, it is essential to determine if all the related symptoms and DTCs are controlled by the SSP feature.

Inspection and Verification

1. Verify the customer concern by operating the system.
2. Visually inspect for obvious signs of mechanical and electrical damage.

Visual Inspection Chart

Mechanical	Electrical
<ul style="list-style-type: none"> ● Door lock mechanisms 	<ul style="list-style-type: none"> ● Central junction box (CJB) Fuses: <ul style="list-style-type: none"> ■ 222 (10A) ■ 207 (5A) ● Battery junction box (BJB) Fuses: <ul style="list-style-type: none"> ■ 401 (15A) ■ 422 (20A) ■ 425 (40A) ● DDM ● REM ● FEM ● Circuitry ● Remote transmitter

3. If the concern remains after the inspection, connect the New Generation STAR (NGS) Tester to the data link connector (DLC) located beneath the instrument panel and select the vehicle to be tested from the NGS menu. If the NGS does not communicate with the vehicle:
 - check that the program card is correctly installed.
 - check the connections to the vehicle.
 - check the ignition switch position.
4. If the NGS still does not communicate with the vehicle, refer to the New Generation STAR (NGS) Tester manual.
5. Carry out the DATA LINK DIAGNOSTICS. If the NGS responds with:
 - CKT914, CKT915 or CKT70 = ALL ECUS NO RESP/NOT EQUIP, refer to [Section 418-00](#).
 - NO RESP/NOT EQUIP for DDM, go to Pinpoint Test A.
 - NO RESP/NOT EQUIP for REM, go to Pinpoint Test B.
 - NO RESP/NOT EQUIP for FEM, go to Pinpoint Test R.
 - SYSTEM PASSED, retrieve and record the continuous diagnostic trouble codes (DTCs), erase the continuous DTCs, and carry out self-test diagnostics for the DDM, FEM or REM.
6. If the DTCs retrieved are related to the concern, go to DDM Diagnostic Trouble Code (DTC) Index, REM Diagnostic Trouble Code (DTC) Index, FEM Diagnostic Trouble Code (DTC) Index, or SSP Relay Index to continue diagnostics.
7. If no DTCs related to the concern are retrieved, proceed to Symptom Chart to continue diagnostics.

Diagnostic Trouble Code (DTC) Index

DTC	Description	Source	Action
B1309	Power Door Lock Circuit Short to Ground	DDM	GO to Pinpoint Test C .
B1341	Power Door Unlock Circuit Short to Ground	DDM	GO to Pinpoint Test C .
B1342	ECU Is Defective	DDM	INSTALL a new DDM. REFER to Section 419-10 . REPEAT the self-test. CLEAR the DTCs.
B1400	Driver Power Window One Touch Window Relay Circuit Short to Battery	DDM	REFER to Section 501-11 .
B1405	Driver Power Window Down Circuit Short to Battery	DDM	REFER to Section 501-11 .
B1408	Driver Power Window Up Circuit Short to Battery	DDM	REFER to Section 501-11 .
B1416	Power Window LR Motor Circuit Short to Battery	DDM	REFER to Section 501-11 .
B1420	Passenger Power Window Motor Circuit Short to Battery	DDM	REFER to Section 501-11 .
B1424	Power Window RR Motor Circuit Short	DDM	REFER to Section 501-11 .

	to Battery		
B1530	Memory Set Switch Circuit Short to Ground	DDM	REFER to Section 501-09 .
B1534	Memory 1 Switch Circuit Short to Ground	DDM	REFER to Section 501-09 .
B1538	Memory 2 Switch Circuit Short to Ground	DDM	REFER to Section 501-09 .
B1676	Battery Pack Voltage Out of Range	DDM	REFER to Section 414-00 .
B2112	Door Driver Set Switch Stuck Failure	DDM	GO to Pinpoint Test E .
B2116	Door Driver Reset Switch Stuck Failure	DDM	GO to Pinpoint Test E .
B2320	Mirror Driver Horizontal Feedback Potentiometer Circuit Failure	DDM	REFER to Section 501-09 .
B2324	Mirror Driver Vertical Feedback Potentiometer Circuit Failure	DDM	REFER to Section 501-09 .
B2336	Mirror Switch Assembly Circuit Failure	DDM	REFER to Section 501-09 .
B2425	Remote Keyless Entry Out of Synchronization	DDM	GO to Pinpoint Test L .
B2477	Module Configuration Failure	DDM	REFER to Section 418-01 .

Parameter Identification (PID) Index

PID	Description	Expected Value
D_DN_SW	Driver Window Down Switch	OFF, DOWN
D_PWPK	Driver Power Window Peak Current	AMP
D_UP_SW	Driver Window Up Switch	OFF, UP
DMIR_H	Driver Side Mirror Horizontal Motor	notSEN, SENSED
DMIR_V	Driver Mirror Vertical	notSEN, SENSED
DR_LOCK	Driver Door Lock Output State	NO, YES
DR_UNLK	All Doors Unlock Output State	NO, YES
DRLKCYL	Door Lock Cylinder	notACT, ACTIVE
MEM1_SW	Memory Recall Switch #1	notACT, ACTIVE
MEM2_SW	Memory Recall Switch #2	notACT, ACTIVE
MEMS_SW	Memory Set Switch	notACT, ACTIVE
MIR_SEL	Power Mirror Select Switch	DRVMIR, PSGMIR, OFF
MIRH_SW	Pow Mir Position Switch - Horizontal	SHORT, RIGHT, LEFT, OFF
OTD_SW	One Touch Down Switch	OFF, DOWN
VBAT	Battery Voltage	Volts

Active Command Index

Active Command	Display	Action

DOOR LOCK CONTROL	DD LOCK	OFF, ON
DOOR LOCK CONTROL	DD UNLOCK	OFF, ON
FRONT WINDOW CONTROL	DR DOWN	OFF, ON
FRONT WINDOW CONTROL	DR UP	OFF, ON
ONE TOUCH WINDOW DOWN & ACCY DELAY	ONE TOUCH	OFF, ON
DRIVER POWER MIRROR CONTROL	DR DOWN	OFF, ON
DRIVER POWER MIRROR CONTROL	DR LEFT	OFF, ON
DRIVER POWER MIRROR CONTROL	DR RIGHT	OFF, ON
DRIVER POWER MIRROR CONTROL	DR UP	OFF, ON

FEM Diagnostic Trouble Code (DTC) Index

DTC	Description	Source	Action
B1319	Driver Door Ajar Circuit Failure	FEM	REFER to Section 417-02 .
B1327	Passenger Door Ajar Circuit Failure	FEM	REFER to Section 417-02 .
B1342	ECU Is Defective	FEM	INSTALL a new FEM. REFER to Section 419-10 . REPEAT the self-test. CLEAR the DTCs.
B1438	Wiper Mode Select Switch Circuit Failure	FEM	REFER to Section 501-16 .
B1446	Wiper Park Sense Circuit Failure	FEM	REFER to Section 501-16 .
B1479	Wiper Washer Fluid Level Sensor Circuit Failure	FEM	REFER to Section 413-01 .
B1499	Lamp Turn Signal Left Circuit Failure	FEM	REFER to Section 417-01 .
B1501	Lamp Turn Signal Left Circuit Short to Battery	FEM	REFER to Section 417-01 .
B1503	Lamp Turn Signal Right Circuit Failure	FEM	REFER to Section 417-01 .
B1505	Lamp Turn Signal Right Circuit Short to Battery	FEM	REFER to Section 417-01 .
B1519	Hood Switch Circuit Failure	FEM	REFER to Section 419-01A .
B1567	Lamp Headlamp High Beam Circuit Failure	FEM	REFER to Section 417-01 .
B1676	Battery Pack Voltage Out of Range	FEM	REFER to Section 414-00 .
B1794	Lamp Headlamp Low Beam Circuit Failure	FEM	REFER to Section 417-01 .
B2214	Window Passenger Front Up Switch Short to Battery	FEM	REFER to Section 501-11 .
B2215	Window Passenger Front Down Switch Short to Battery	FEM	REFER to Section 501-11 .
B2312	Mirror Passenger Horizontal Feedback Potentiometer Circuit Failure	FEM	REFER to Section 501-09 .

B2316	Mirror Passenger Vertical Feedback Potentiometer Circuit Failure	FEM	REFER to Section 501-09 .
B2477	Module Configuration Failure	FEM	REFER to Section 418-01 .
C1284	Oil Pressure Switch Failure	FEM	REFER to Section 413-01 .
C1446	Brake Switch Circuit Failure	FEM	REFER to Section 413-01 .
C1924	VAPS Solenoid Actuator Output Circuit Short to Ground	FEM	REFER to Section 211-00 .
C1925	VAPS Solenoid Actuator Return Circuit Failure	FEM	REFER to Section 211-00 .
U1027	SCP (J1850) Invalid or Missing Data for Engine RPM	PCM	CARRY OUT the PCM self-test. REFER to the Powertrain Control/Emissions Diagnosis (PC/ED) manual.
U1041	SCP (J1850) Invalid or Missing Data for Vehicle Speed	ABS	CARRY OUT the ABS self-test. REFER to Section 206-09A .
U1059	SCP (J1850) Invalid or Missing Data for Transmission / Transaxle / PRNDL	PCM	CARRY OUT the PCM self-test. REFER to the Powertrain Control/Emissions Diagnosis (PC/ED) manual.
U1218	SCP (J1850) Invalid or Missing Data for External Lamps	ICM	CARRY OUT the ICM self-test. REFER to Section 413-01 .
U1222	SCP (J1850) Invalid or Missing Data for Interior Lamps	ICM	CARRY OUT the ICM self-test. REFER to Section 413-01 .
U1227	SCP (J1850) Invalid or Missing Data for Body Status Request	ICM	CARRY OUT the ICM self-test. REFER to Section 413-01 .

FEM Parameter Identification (PID) Index

PID	Description	Expected Value
CCNT	Number Of Continuous DTCs In Module	one count per bit
D_DOOR	Left Front Door Ajar Switch	CLOSED, AJAR
FLUID_1	Brake Fluid Level Switch #1	OFF, ON
IGN_R	Ignition Switch -RUN Position	NO, YES
L_HIGH	Left High Beam Lamp Driver	Off---, Off-B-, On---, On-B-
L_LOW	Left Low Beam Lamp	Off---, Off-B-, On---, On-B-
LF_TURN	Left Front Turn Lamp	Off---, Off-B-, On---, On-B-
LMRKOUT	Left Front Marker Lamp	Off---, Off-B-, On---, On-B-
OILWRN	Oil Level Warning Lamp	Off---, On---
P_DN_SW	Passenger Down Activated	OFF, DOWN
P_DOOR	Passenger Door Ajar Switch	CLOSED, AJAR
P_UP_SW	Passenger Up Activated	OFF, UP
PRK_BRK	Parking Brake Switch Input	OFF, ON
PSMRPSH	Passenger Mirror Position Sensor (Left/Right)	#####
PSMRPSV	Passenger Mirror Position	#####

PSPWAMP	Power Window Passenger's Peak Motor Current	#####
PWM_DC1	PWM Duty Cycle #1	%
R_HIGH	Right High Beam Lamp Driver	Off---, Off-B-, On---, On-B-
R_LOW	Right Low Beam Lamp	Off---, Off-B-, On---, On-B-
RADIOSW	Security Input Switch Status	OFF, ON
RF_TURN	Right Front Turn Lamp	Off---, Off-B-, On---, On-B-
RMRKSTB	Right Front Marker Lamp	Off---, Off-B-, On---, On-B-
STLKOUT	Steering Column Lock Ground Output	OFF, ON
VBAT	Battery Voltage	Volts
WFLUID	Washer Fluid Level	LOW, OK
WPMODE	Wiper Control Mode Select	WASH, OPEN, INVLD, OFF, INTVL1, INTVL2, INTVL3, INTVL4, INTVL5, INTVL6, INTVL7, LOW, HIGH
WPPRSW	Windshield Wiper Park Sense	notPRK, PARKED

FEM Active Command Index

Active Command	Display	Action
BACKLIGHTING INTENSITY CONTROL COMMAND	ILLUM	%
BRAKE SYSTEM CONTROL COMMAND	SHFT LOCK	OFF, ON
EXTERIOR LAMP CONTROL	PARKLAMPS	OFF, ON
FRONT WINDOW CONTROL	RR UP	OFF, ON
FRONT WINDOW CONTROL	PR DOWN	OFF, ON
FRONT WINDSHIELD WIPER/WASHER	SPEED RLY	OFF, ON
FRONT WINDSHIELD WIPER/WASHER	WASH RLY	OFF, ON
FRONT WINDSHIELD WIPER/WASHER	WIPER RLY	OFF, ON
HEAD/CORNERING LAMP CONTROL	HIGH BEAM	OFF, ON
HEAD/CORNERING LAMP CONTROL	LOW BEAM	OFF, ON
INDICATOR LAMP CONTROL	NON MIL	OFF, ON
LAMP CONTROL COMMAND	HDLMPWSH	OFF, ON
PASSENGER POWER MIRROR CONTROL	PR DOWN	OFF, ON
PASSENGER POWER MIRROR CONTROL	PR LEFT	OFF, ON
PASSENGER POWER MIRROR CONTROL	PR RIGHT	OFF, ON
PASSENGER POWER MIRROR CONTROL	PR UP	OFF, ON
TURN SIGNAL AND MARKER LAMPS	HAZARD	OFF, ON
VAPS II OUTPUT PULSE CONTROL	VAPSIIOUT	%

REM Diagnostic Trouble Code (DTC) Index

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DTC	Description	Source	Action
B1201	Fuel Sender Circuit Failure	REM	REFER to Section 413-01 .
B1300	Power Door Lock Circuit Failure	REM	GO to Pinpoint Test D .
B1310	Power Door Unlock Circuit Failure	REM	GO to Pinpoint Test D .
B1331	Decklid Ajar Rear Door Circuit Failure	REM	REFER to Section 417-02 .
B1335	Door Ajar RR Circuit Failure	REM	REFER to Section 417-02 .
B1342	ECU Is Defective	REM	INSTALL a new REM. REFER to Section 419-10 . REPEAT the self-test. CLEAR the DTCs.
B1483	Brake Pedal Input Circuit Failure	REM	REFER to Section 417-01 .
B1499	Lamp Turn Signal Left Circuit Failure	REM	REFER to Section 417-01 .
B1501	Lamp Turn Signal Left Circuit Short to Battery	REM	REFER to Section 417-01 .
B1503	Lamp Turn Signal Right Circuit Failure	REM	REFER to Section 417-01 .
B1505	Lamp Turn Signal Right Circuit Short to Battery	REM	REFER to Section 417-01 .
B1551	Decklid Release Circuit Failure	REM	GO To Pinpoint Test J .
B1571	Door Ajar LR Circuit Failure	REM	REFER to Section 417-02 .
B1676	Battery Pack Voltage Out of Range	REM	REFER to Section 414-00 .
B2172	Inertia Switch input Circuit Open	REM	REFER to the Powertrain Control/Emissions Diagnosis (PC/ED) manual.
B2174	Window Driver Rear Remote Up Switch Short to Battery	REM	REFER to Section 501-11 .
B2178	Window Driver Rear Remote Down Switch Short to Battery	REM	REFER to Section 501-11 .
B2190	Window Passenger Rear Remote Up Switch Short to Battery	REM	REFER to Section 501-11 .
B2194	Window Passenger Rear Remote Down Switch Short to Battery	REM	REFER to Section 501-11 .
B2477	Module Configuration Failure	REM	REFER to Section 418-01 .
U1059	SCP (J1850) Invalid or missing Data for Transmission/Transaxle/ PRNDL	PCM	CARRY OUT the PCM self-test. REFER to the Powertrain Control/Emissions Diagnosis (PC/ED) manual.
U1041	SCP (J1850) Invalid or Missing Data for Vehicle Speed	ABS	CARRY OUT the ABS self-test. REFER to Section 206-09A .
U1218	SCP (J1850) Invalid or Missing Data for External Lamps	ICM	CARRY OUT the Instrument Cluster self-test. REFER to Section 413-01 .

REM Parameter Identification (PID) Index

PID	Description	Expected Value
BOO	Brake Switch Input	OFF, ON
DECKLID	Decklid Ajar Switch	CLOSED, AJAR
DL_DSARM	Decklid Disarm	NO, YES

DLIDOUT	Decklid Driver	Off---, Off--G, Off-B-, Off-BG, OffO--, OffO-G, OffOB-, OffOBG, On---, On--G, On-B-, On-BG, OnO--, OnO-G, OnOB-, OnOBG
DLIDRLS	Decklid Release	OFF, ON
L_TAIL	Left and Right Tail Lamp	Off---, Off--G, Off-B-, Off-BG, OffO--, OffO-G, OffOB-, OffOBG, On---, On--G, On-B-, On-BG, OnO--, OnO-G, OnOB-, OnOBG
LMRKOUT	Left Marker Lamp Driver Output State	OFF, ON
LMRKSTB	Left Marker Lamp Driver Short To Battery	NO, YES
LR_TURN	Left and Right Rear Turn Lamp	Off---, Off--G, Off-B-, Off-BG, OffO--, OffO-G, OffOB-, OffOBG, On---, On--G, On-B-, On-BG, OnO--, OnO-G, OnOB-, OnOBG
LRDN_SW	Left Rear Window Down Switch	OFF, UP
LRDR_SW	Left Rear Door Ajar Switch	CLOSED, AJAR
LRUP_SW	Left Rear Window Up Switch	OFF, DOWN
PD_LOCK	Passenger Door Lock	NO, YES
PD_UNLK	Passenger Door Unlock	NOTLOC, LOCK
R_TAIL	Left and Right Tail Lamp	Off---, Off--G, Off-B-, Off-BG, OffO--, OffO-G, OffOB-, OffOBG, On---, On--G, On-B-, On-BG, OnO--, OnO-G, OnOB-, OnOBG
RR_TURN	Left and Right Rear Turn Lamp	Off---, Off--G, Off-B-, Off-BG, OffO--, OffO-G, OffOB-, OffOBG, On---, On--G, On-B-, On-BG, OnO--, OnO-G, OnOB-, OnOBG
RRDN_SW	Right Rear Window Down Switch	OFF, UP
RRDR_SW	Right Rear Door Ajar Switch	CLOSED, AJAR
RRUP_SW	Right Rear Window Up Switch	OFF, DOWN

REM Active Command Index

Active Command	Display	Action
EXTERIOR LAMP CONTROL	BACKUPLMP	OFF, ON
EXTERIOR LAMP CONTROL	H MNT STP	OFF, ON
EXTERIOR LAMP CONTROL	L STOP	OFF, ON
EXTERIOR LAMP CONTROL	PARKLAMPS	OFF, ON
EXTERIOR LAMP CONTROL	R DEF RLY	OFF, ON
EXTERIOR LAMP CONTROL	R FOG LMP	OFF, ON
EXTERIOR LAMP CONTROL	R STOP	OFF, ON
POWER WINDOW ENABLE COMMAND	PSGR RLY	OFF, ON

REAR DOOR LOCK CONTROL	LR LOCK	OFF, ON
REAR DOOR LOCK CONTROL	LR UNLOCK	OFF, ON
REAR DOOR LOCK CONTROL	RELEASE	OFF, ON
REAR WINDOW CONTROL	LR DOWN	OFF, ON
REAR WINDOW CONTROL	RR DOWN	OFF, ON
TURN SIGNAL AND MARKER LAMPS	HAZARD	OFF, ON

SSP Relay Index

Relay	Fuse	Controlled System(s)
SSP1	BJB Fuse 430 (30A)	<ul style="list-style-type: none"> • Driver power door lock (FEM) • LH and RH high beam headlamps (FEM) • RF park, turn, and side marker lamps (FEM) <ul style="list-style-type: none"> • RH low beam headlamp • Driver power mirror
SSP2	BJB Fuse 431 (30A)	<ul style="list-style-type: none"> • LH low beam headlamp (FEM) • LF park, turn, and sidemarker lamps (FEM) <ul style="list-style-type: none"> • Interior courtesy and demand lighting • Windshield wiper washer pump • Switch illumination backlighting
SSP3	BJB Fuse 424 (30A)	<ul style="list-style-type: none"> • High mounted stoplamp (REM) • RR park and stoplamps (REM) <ul style="list-style-type: none"> • Reversing lamps (REM) • LR turn signals (REM) • Passenger power mirror • Trailer stoplamps and turn signals (if equipped with trailer tow)
SSP4	BJB Fuse 423 (30A)	<ul style="list-style-type: none"> • LR park and stoplamps (REM) <ul style="list-style-type: none"> • RR turn signals (REM) • Passenger door and side locks (REM) <ul style="list-style-type: none"> • License lamps • Trunk release solenoid and switch • Fuel door release solenoid and switch <ul style="list-style-type: none"> • Trunk lamp • Trailer park lamps (if equipped with trailer tow)

When diagnosing an SSP relay, check that all systems for that relay are inoperative. Refer to [Section 417-01](#) if:

- all systems for one SSP relay are inoperative
- all systems for all SSP relays are inoperative

Symptom Chart


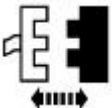

Symptom Chart

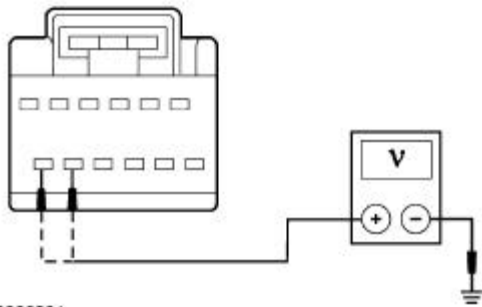
Condition	Possible Sources	Action
<ul style="list-style-type: none"> No communication with the driver door module (DDM) 	<ul style="list-style-type: none"> BJB Fuse 425 (40A). Circuitry. DDM. 	<ul style="list-style-type: none"> GO to Pinpoint Test A.
<ul style="list-style-type: none"> No communication with the rear electronic module (REM) 	<ul style="list-style-type: none"> BJB Fuse 425 (40A). CJB Fuse 207 (5A). Circuitry. REM. 	<ul style="list-style-type: none"> GO to Pinpoint Test B.
<ul style="list-style-type: none"> All door locks are inoperative — from driver door switch 	<ul style="list-style-type: none"> Switch. Circuitry. DDM. 	<ul style="list-style-type: none"> GO to Pinpoint Test C.
<ul style="list-style-type: none"> All door locks are inoperative — from passenger door switch 	<ul style="list-style-type: none"> Switch. Circuitry. REM. 	<ul style="list-style-type: none"> GO to Pinpoint Test D.
<ul style="list-style-type: none"> All door locks are inoperative — from driver door lock cylinder 	<ul style="list-style-type: none"> Door lock cylinder. Circuitry. DDM. 	<ul style="list-style-type: none"> GO to Pinpoint Test E.
<ul style="list-style-type: none"> A single door lock is inoperative — driver door 	<ul style="list-style-type: none"> CJB Fuse 222 (10A). Actuator. Circuitry. DDM. 	<ul style="list-style-type: none"> GO to Pinpoint Test F.
<ul style="list-style-type: none"> More than one door lock is inoperative — passenger door, right rear door, and left rear door 	<ul style="list-style-type: none"> BJB Fuse 401 (15A). Circuitry. REM. 	<ul style="list-style-type: none"> GO to Pinpoint Test G.
<ul style="list-style-type: none"> More than one door lock is inoperative — passenger door and rear door 	<ul style="list-style-type: none"> Actuators. Circuitry. REM. 	<ul style="list-style-type: none"> GO to Pinpoint Test H.
<ul style="list-style-type: none"> A single door lock is inoperative — left rear door 	<ul style="list-style-type: none"> Actuator. Circuitry. REM. 	<ul style="list-style-type: none"> GO to Pinpoint Test I.
<ul style="list-style-type: none"> The luggage compartment door is inoperative — from release switch 	<ul style="list-style-type: none"> Release switch. Circuitry. REM. 	<ul style="list-style-type: none"> GO to Pinpoint Test J.
<ul style="list-style-type: none"> The luggage compartment door is inoperative — from release switch and remote transmitter 	<ul style="list-style-type: none"> Solenoid. Circuitry. REM. DDM. 	<ul style="list-style-type: none"> GO to Pinpoint Test K.
<ul style="list-style-type: none"> The doors do not lock or unlock using the remote transmitter 	<ul style="list-style-type: none"> Battery. Remote transmitter. DDM. 	<ul style="list-style-type: none"> GO to Pinpoint Test L.
<ul style="list-style-type: none"> The memory seat does not operate correctly using the remote transmitter 	<ul style="list-style-type: none"> Battery. Remote transmitter. DDM. 	<ul style="list-style-type: none"> GO to Pinpoint Test M.

<ul style="list-style-type: none"> ● The auto-lock does not operate correctly 	<ul style="list-style-type: none"> ● Door ajar switch. ● DDM. ● Shifter. 	<ul style="list-style-type: none"> ● GO to Pinpoint Test N.
<ul style="list-style-type: none"> ● The smart lock does not operate correctly 	<ul style="list-style-type: none"> ● DDM. 	<ul style="list-style-type: none"> ● GO to Pinpoint Test O.
<ul style="list-style-type: none"> ● Panic feature is inoperative 	<ul style="list-style-type: none"> ● Battery. ● Remote transmitter. ● FEM. ● DDM. 	<ul style="list-style-type: none"> ● GO to Pinpoint Test P.
<ul style="list-style-type: none"> ● The luggage compartment door is inoperative using the remote transmitter 	<ul style="list-style-type: none"> ● Battery. ● Remote transmitter. ● DDM. 	<ul style="list-style-type: none"> ● GO to Pinpoint Test Q.
<ul style="list-style-type: none"> ● No communication with the front electronic module (FEM) 	<ul style="list-style-type: none"> ● BJB Fuses: <ul style="list-style-type: none"> ■ 425 (40A). ■ 422 (20A). ● CJB Fuse 207 (5A). ● Circuitry. ● FEM. 	<ul style="list-style-type: none"> ● GO to Pinpoint Test R.

Pinpoint Tests

PINPOINT TEST A: NO COMMUNICATION WITH THE DRIVER DOOR MODULE (DDM)

CONDITIONS	DETAILS/RESULTS/ACTIONS
A1 CHECK CIRCUITS 29-AJ80 (OG) AND 29S-AJ86 (OG/BU) FOR VOLTAGE	
NOTE: Cycle the ignition switch from OFF to RUN to enable the switched system power feature.	
<p>1</p>  <p>2</p>  <p>DDM C501a</p> <p>3</p>  <p>4</p>	<p>4</p> <p>Measure the voltage between DDM C501a pin 11, circuit 29-AJ80 (OG),</p>



A0006301

harness side and ground; and between DDM C501a pin 12, circuit 29S-AJ86 (OG/BU), harness side and ground.

- Is the voltage greater than 10 volts?

→ **Yes**
GO to [A2](#).

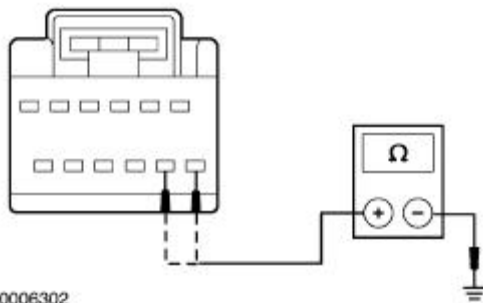
→ **No**
REPAIR the circuit. TEST the system for normal operation.

A2 CHECK CIRCUITS 31-AJ80B (BK/OG) AND 91-AJ80 (BN/BU) FOR OPENS

1



2



A0006302

2 Measure the resistance between DDM C501a pin 7, circuit 91-AJ80 (BN/BU), harness side and ground; and between DDM C501a pin 8, circuit 31-AJ80B (BK/OG), harness side and ground.

- Is the resistance less than 5 ohms?

→ **Yes**
REFER to [Section 418-00](#).

→ **No**
REPAIR the circuits in question. TEST the system for normal operation.

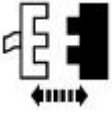
PINPOINT TEST B: NO COMMUNICATION WITH THE REAR ELECTRONIC MODULE (REM)

CONDITIONS	DETAILS/RESULTS/ACTIONS
B1 CHECK CIRCUIT 29-DK31 (OG/BK) FOR VOLTAGE	

1

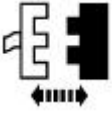


2



REM C420d

3

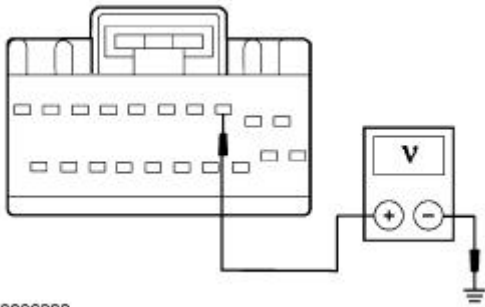


REM C420c

4



5



A0006299

5 Measure the voltage between REM C420d pin 3, circuit 29-DK31 (OG/BK), harness side and ground.

• Is the voltage greater than 10 volts?

→ Yes
GO to [B2](#).

→ No
REPAIR the circuit. TEST the system for normal operation.

B2 CHECK CIRCUITS 29S-DK31 (OG/BK), 31-DK30D (BK), 31-DK30E (BK), 31-DK30F (BK), 31-DK30G (BK) AND 31-DK30H (BK/OG), FOR OPENS

1



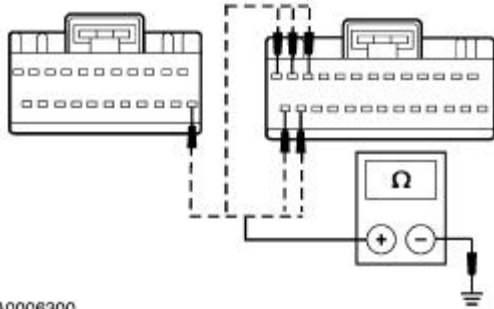
2



REM C420b

3

3 Using the following table, measure the



A0006300

resistance between REM connectors,
harness side and ground:

REM	Pin	Circuit
C420c	13	29S-DK31 (OG/BK)
C420c	12	31-DK30E (BK)
C420c	11	31-DK30D (BK)
C420c	26	31-DK30G (BK)
C420c	25	31-DK30F (BK)
C420b	12	31-DK30H (BK/OG)

● Is the resistance less than 5 ohms?


→ Yes

REFER to [Section 418-00](#).

→ No

REPAIR the circuit(s) in question. TEST the system for normal operation.

PINPOINT TEST C: ALL DOOR LOCKS ARE INOPERATIVE — FROM DRIVER DOOR SWITCH

CONDITIONS	DETAILS/RESULTS/ACTIONS
C1 RETRIEVE THE RECORDED DTCS FROM BOTH CONTINUOUS AND ON-DEMAND SELF-TEST — DDM	<p>1 Use the recorded DDM DTCs from the continuous and on-demand self-test.</p> <p>● Are any DDM DTCs recorded?</p> <p>→ Yes If DTC B1309 or DTC B1341, GO to C4.</p> <p>For all other DDM DTCs, REFER to the DDM Diagnostic Trouble Code (DTC) Index.</p> <p>→ No GO to C2.</p>
C2 CHECK DRIVER DOOR LOCK SWITCH AND CIRCUITS — MONITOR THE DDM PID DR_LOCK AND DR_UNLK	
NOTE: Cycle the ignition switch from OFF to RUN to enable the switched system power feature.	
<p>1</p>  <p>2</p>	



NGS

3



4



4

Monitor the DDM PIDs DR_LOCK and DR_UNLK, while locking and unlocking the driver power door lock switch.

- Do the DDM PID values agree with the driver power door lock switch positions?

→ Yes

INSTALL a new DDM. For additional information, REFER to [Section 419-10](#). REPEAT the self-test. CLEAR the DTCs.

→ No

If the PID(s) read YES at all times GO to [C3](#).

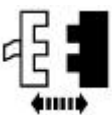
If the PID(s) read NO at all times GO to [C5](#).

C3 CHECK DRIVER POWER DOOR LOCK SWITCH

1



2



Driver Power Door Lock Switch C505

3

Carry out the driver power door lock switch component test. Refer to Wiring Diagrams Section 700-09-00, Component Testing.

- Is the driver power door lock switch OK?

→ Yes

GO to [C4](#).

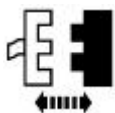
→ No

INSTALL a new driver power door lock switch. REFER to [Section 501-14A](#).

REPEAT the self-test. CLEAR the DTCs.

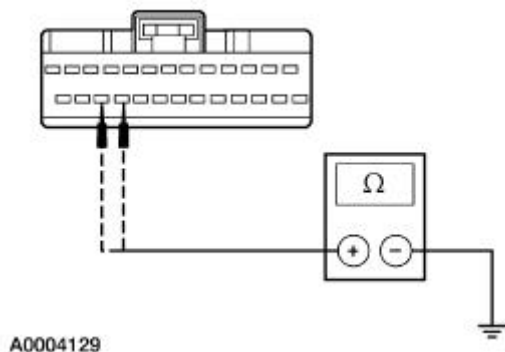
C4 CHECK CIRCUITS 8-AA10 (WH/BK) AND 8-AA11 (WH/VT) FOR SHORT TO GROUND

1



DDM C501d

2



2

Measure the resistance between DDM C501d pin 23, circuit 8-AA10 (WH/BK), harness side and ground; and between DDM C501d pin 24, circuit 8-AA11 (WH/VT), harness side and ground.

- Are the resistances greater than 10,000 ohms?

→ **Yes**
INSTALL a new DDM. REFER to [Section 419-10](#). REPEAT the self-test. CLEAR the DTCs.

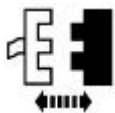
→ **No**
REPAIR the circuit(s) in question. REPEAT the self-test. CLEAR the DTCs.

C5 CHECK DRIVER POWER DOOR LOCK SWITCH

1



2



Driver Power Door Lock Switch C505

3

Carry out the driver power door lock switch component test. Refer to Wiring Diagrams Section 700-09-00, Component Testing.

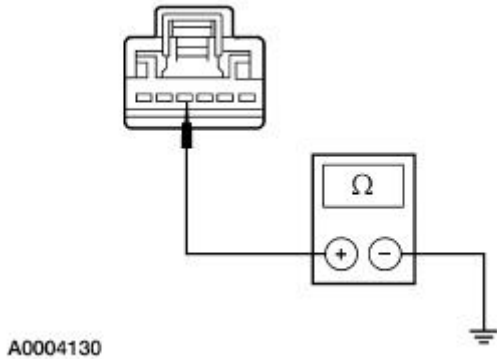
- Is the driver power door lock switch OK?

→ **Yes**
GO to [C6](#).

→ **No**
INSTALL a new driver power door lock switch. REFER to [Section 501-14A](#).
REPEAT the self-test. CLEAR the DTCs.

C6 CHECK CIRCUIT 31-LH28 (BK) FOR OPEN

1



1 Measure the resistance between driver power door lock switch C505 pin 4, circuit 31-LH28 (BK), harness side and ground.

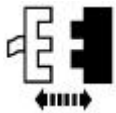
● Is the resistance less than 5 ohms?

→ **Yes**
GO to [C7](#).

→ **No**
REPAIR the circuit. REPEAT the self-test. CLEAR the DTCs.

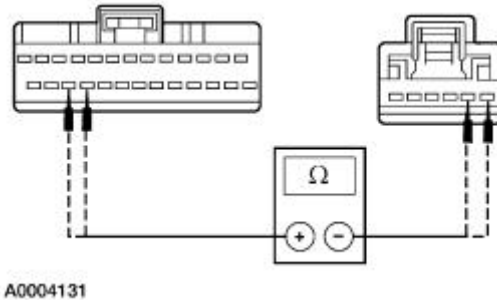
C7 CHECK CIRCUITS 8-AA10 (WH/BK) AND 8-AA11 (WH/VT) FOR OPEN

1



DDM C501d

2



2 Measure the resistance between DDM C501d pin 23, circuit 8-AA10 (WH/BK), harness side and driver power door lock switch C505 pin 1, circuit 8-AA10 (WH/BK), harness side; and between DDM C501d pin 24, circuit 8-AA11 (WH/VT), harness side and driver power door lock switch C505 pin 2, circuit 8-AA11 (WH/VT), harness side.





● Are the resistances less than 5 ohms?

→ **Yes**
INSTALL a new DDM. REFER to [Section 419-10](#). REPEAT the self-test. CLEAR the DTCs.

→ **No**

REPAIR the circuit(s) in question.
 REPEAT the self-test. CLEAR the DTCs.

PINPOINT TEST D: ALL DOOR LOCKS ARE INOPERATIVE — FROM PASSENGER DOOR SWITCH

CONDITIONS	DETAILS/RESULTS/ACTIONS
<p>D1 RETRIEVE THE RECORDED DTCS FROM BOTH CONTINUOUS AND ON-DEMAND SELF-TEST — REM</p>	<p>1 Use the recorded REM DTCs from the continuous and on-demand self-test.</p> <ul style="list-style-type: none"> ● Are any REM DTCs recorded? <p>→ Yes For DTC B1300 or B1310, GO to D3.</p> <p>For all other REM DTCs, REFER to the REM Diagnostic Trouble Code (DTC) Index.</p> <p>→ No GO to D2.</p>
<p>D2 CHECK PASSENGER DOOR LOCK SWITCH AND CIRCUITS — MONITOR THE REM PID PD_LOCK AND PD_UNLK</p>	<p>NOTE: Cycle the ignition switch from OFF to RUN to enable the switched system power feature.</p>
<p>1</p>  <p>2</p>  <p>NGS</p> <p>3</p>  <p>4</p> 	<p>4 Monitor the REM PIDs PD_LOCK and PD_UNLK, while locking and unlocking the passenger door using the passenger power door lock switch.</p> <ul style="list-style-type: none"> ● Do the REM PID values agree with the passenger power door lock switch positions? <p>→ Yes INSTALL a new REM. REFER to Section</p>

[419-10](#). REPEAT the self-test. CLEAR the DTCs.

→ **No**
If the PID(s) read YES at all times GO to [D3](#).

If the PID(s) read NO at all times GO to [D5](#).

D3 CHECK PASSENGER POWER DOOR LOCK SWITCH

1



2



Passenger Power Door Lock Switch C605

3 Carry out the passenger power door lock switch component test. Refer to Wiring Diagrams Section 700-09-00, Component Testing.

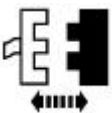
● **Is the passenger power door lock switch OK?**

→ **Yes**
GO to [D4](#).

→ **No**
INSTALL a new passenger power door lock switch. REFER to [Section 501-14A](#). REPEAT the self-test. CLEAR the DTCs.

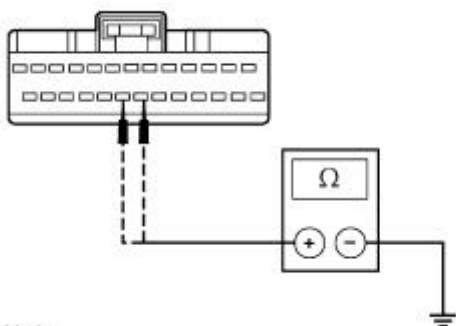
D4 CHECK CIRCUITS 8-AA20 (WH/BU) AND 8-AA21 (WH/GN) FOR SHORT TO GROUND

1



REM C420c

2



A0004041

2 Measure the resistance between REM C420c pin 20, circuit 8-AA20 (WH/BU), harness side and ground; and between REM C420c pin 21, circuit 8-AA21 (WH/GN), harness side and ground.

- Are the resistances greater than 10,000 ohms?

→ **Yes**
 INSTALL a new REM. REFER to [Section 419-10](#) . REPEAT the self-test. CLEAR the DTCs.

→ **No**
 REPAIR the circuit(s) in question. REPEAT the self-test. CLEAR the DTCs.

D5 CHECK PASSENGER POWER DOOR LOCK SWITCH

1



2



Passenger Power Door Lock Switch C605

3 Carry out the passenger power door lock switch component test. Refer to Wiring Diagrams Section 700-09-00, Component Testing.

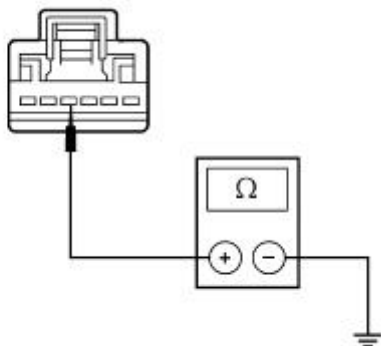
- Is the passenger power door lock switch OK?

→ **Yes**
 GO to [D6](#) .

→ **No**
 INSTALL a new passenger power door lock switch. REFER to [Section 501-14A](#) . REPEAT the self-test. CLEAR the DTCs.

D6 CHECK CIRCUIT 31-LH42 (BK) FOR OPEN

1



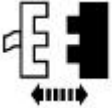
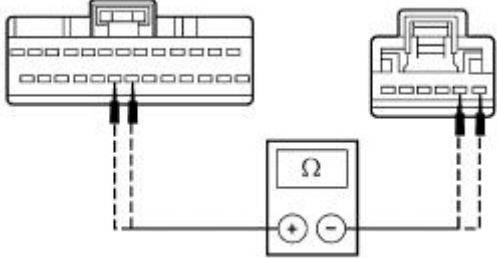
A0004130

1 Measure the resistance between passenger power door lock switch C605 pin 4, circuit 31-LH42 (BK), harness side and ground.

- Is the resistance less than 5 ohms?

	<p>→ Yes GO to D7.</p> <p>→ No REPAIR the circuit. REPEAT the self-test. CLEAR the DTCs.</p>
--	--

D7 CHECK CIRCUITS 8-AA20 (WH/BU) AND 8-AA21 (WH/GN) FOR OPEN

<p>1</p>  <p>REM C420c</p> <p>2</p>  <p>A0004113</p>	<p>2 Measure the resistance between REM C420c pin 20, circuit 8-AA20 (WH/BU), harness side and passenger power door lock switch C605 pin 1, circuit 8-AA20 (WH/BU), harness side; and between REM C420c pin 21, circuit 8-AA21 (WH/GN), harness side and passenger power door lock switch C605 pin 2, circuit 8-AA21 (WH/GN), harness side.</p> <p>● Are the resistances less than 5 ohms?</p> <p>→ Yes INSTALL a new REM. REFER to Section 419-10. REPEAT the self-test. CLEAR the DTCs.</p> <p>→ No REPAIR the circuit(s) in question. REPEAT the self-test. CLEAR the DTCs.</p>
--	--

PINPOINT TEST E: ALL DOOR LOCKS ARE INOPERATIVE — FROM DRIVER DOOR LOCK CYLINDER

CONDITIONS	DETAILS/RESULTS/ACTIONS
E1 RETRIEVE THE RECORDED DTCS FROM BOTH CONTINUOUS AND ON-DEMAND SELF-TEST — DDM	<p>1 Use the recorded DDM DTCs from the continuous and on-demand self-test.</p> <p>● Are any DDM DTCs recorded?</p> <p>→ Yes For DTC B2112 or DTC B2116, GO to E3.</p> <p>For all other DDM DTCs, REFER to the</p>

DDM Diagnostic Trouble Code (DTC) Index.

→ **No**
GO to [E2](#).

E2 CHECK DRIVER DOOR LOCK CYLINDER AND CIRCUITS — MONITOR THE DDM PID DRLKCYL AND DR_DSRM

NOTE: Cycle the ignition switch from OFF to RUN to enable the switched system power feature.

1



2



NGS

3



4



4

Monitor the DDM PIDs DRLKCYL AND DR_DSRM, while locking and unlocking the driver door using the driver door lock cylinder.

5

● **Do the DDM PID values agree with the driver door lock cylinder positions?**

→ **Yes**

INSTALL a new DDM. REFER to [Section 419-10](#). REPEAT the self-test. CLEAR the DTCs.

→ **No**

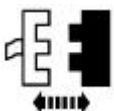
GO to [E3](#).

E3 CHECK CIRCUITS 31S-AA78 (BK/BU) AND 31S-AA79 (BK/WH) FOR SHORT TO GROUND

1



2

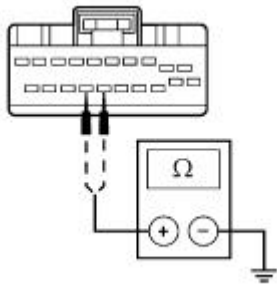


DDM C501c

3

3

Measure the resistance between DDM



A0003773

C501c pin 16, circuit 31S-AA78 (BK/BU), harness side and ground; and between DDM C501c pin 17, circuit 31S-AA79 (BK/WH), harness side and ground.

- Are the resistances greater than 10,000 ohms?

→ **Yes**
GO to [E5](#).

→ **No**
GO to [E4](#).

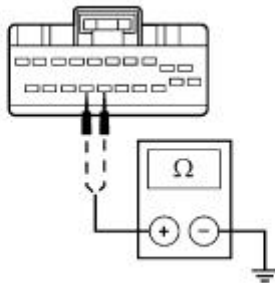
E4 CHECK DRIVER DOOR LOCK ACTUATOR FOR SHORT TO GROUND

1



Driver Door Lock Actuator C525

2



A0003773

2 Measure the resistance between DDM C501c pin 16, circuit 31S-AA78 (BK/BU), harness side and ground; and between DDM C501c pin 17, circuit 31S-AA79 (BK/WH), harness side and ground.

- Are the resistances greater than 10,000 ohms?

→ **Yes**
INSTALL a new driver door lock actuator. REFER to [Section 501-14A](#). REPEAT the self-test. CLEAR the DTCs.

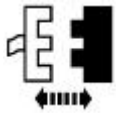
→ **No**
REPAIR the circuit(s) in question. REPEAT the self-test. CLEAR the DTCs.

E5 CHECK DDM FOR INTERNAL SHORT TO GROUND

1

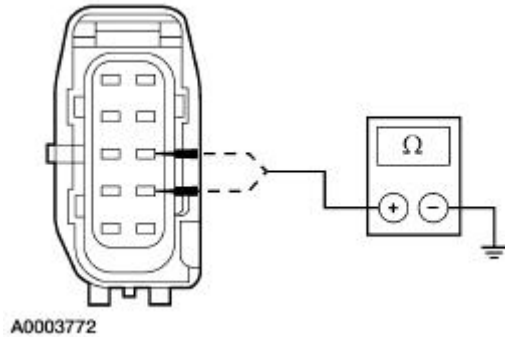


2



Driver Door Lock Actuator C525

3



3

Measure the resistance between driver door lock actuator C525 pin 7, circuit 31S-AA78 (BK/BU), harness side and ground; and between driver door lock actuator C525 pin 5, circuit 31S-AA79 (BK/WH), harness side and ground.

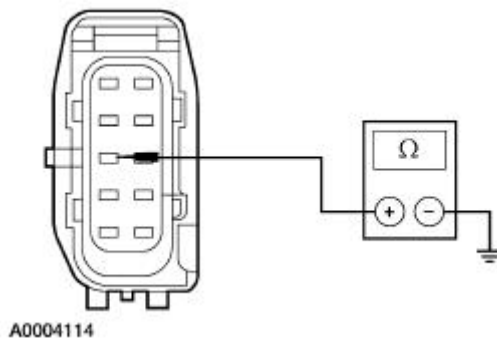
- Are the resistances greater than 10,000 ohms?

→ **Yes**
GO to [E6](#).

→ **No**
INSTALL a new DDM. REFER to [Section 419-10](#). REPEAT the self-test. CLEAR the DTCs.

E6 CHECK CIRCUIT 31-AA58 (BK) FOR OPEN

1



1

Measure the resistance between driver door lock actuator C525 pin 6, circuit 31-AA58 (BK), harness side and ground.

- Is the resistance less than 5 ohms?

→ **Yes**
GO to [E7](#).

→ **No**
REPAIR the circuit. REPEAT the self-test. CLEAR the DTCs.

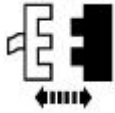
E7 CHECK DRIVER SET AND RESET SWITCH

1



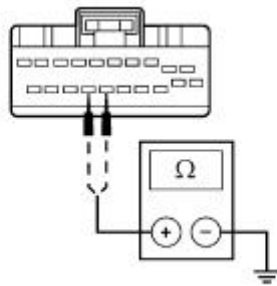
Driver Door Lock Actuator C525

2



DDM C501c

3



A0003773

3

Measure the resistance between DDM C501c pin 16, circuit 31S-AA78 (BK/BU), harness side and ground, while turning the key cylinder to the SET position; and between DDM C501c pin 17, circuit 31S-AA79 (BK/WH), harness side and ground, while turning the key cylinder to the RESET position.

- Are the resistances less than 5 ohms?

→ Yes

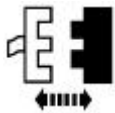
INSTALL a new DDM. REFER to [Section 419-10](#). REPEAT the self-test. CLEAR the DTCs.

→ No

GO to [E8](#).

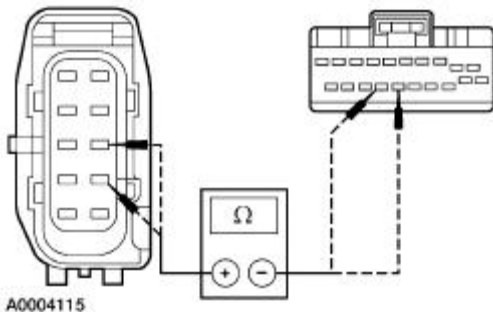
E8 CHECK CIRCUITS 31S-AA78 (BK/BU) AND 31S-AA79 (BK/WH) FOR OPEN

1



Driver Door Lock Actuator C525

2



A0004115

2

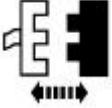
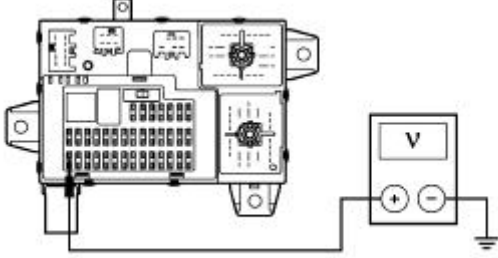


Measure the resistance between DDM C501c pin 16, circuit 31S-AA78 (BK/BU), harness side and driver door lock actuator C525 pin 7, circuit 31S-AA78 (BK/BU), harness side; and between DDM C501c pin 17, circuit 31S-AA79 (BK/WH), harness side and driver door lock actuator C525 pin 5, circuit 31S-AA79 (BK/WH), harness side.

- Are the resistances less than 5 ohms?

→ **Yes**
 INSTALL a new driver door lock actuator.
 REFER to [Section 501-14A](#) . REPEAT
 the self-test. CLEAR the DTCs.

→ **No**
 REPAIR the circuit(s) in question.
 REPEAT the self-test. CLEAR the DTCs.

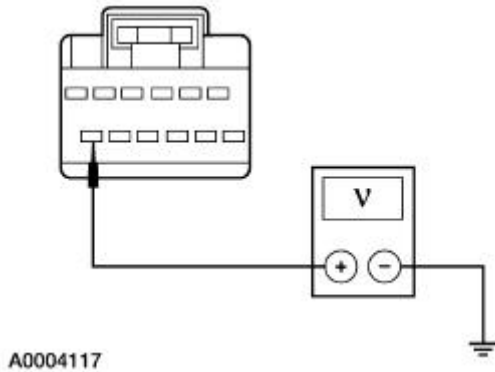
PINPOINT TEST F: A SINGLE DOOR LOCK IS INOPERATIVE — DRIVER DOOR

CONDITIONS	DETAILS/RESULTS/ACTIONS
F1 CHECK CENTRAL JUNCTION BOX FUSE (CJB) 222 (10A) FOR VOLTAGE	
NOTE: Cycle the ignition switch from OFF to RUN to enable the switched system power feature.	
<p>1</p>  <p>CJB Fuse 222 (10A)</p> <p>2</p>  <p>A0004116</p>	<p>2</p> <p>Measure the voltage between CJB Fuse 222 (10A) pin 1, circuit 30-DD3 (RD/OG), component side and ground.</p> <ul style="list-style-type: none"> • Is the voltage greater than 10 volts? <p>→ Yes RECONNECT the CJB Fuse 222 (10A).GO to F2.</p> <p>→ No REPAIR circuit 30-DD3 (RD/OG). REPEAT the self-test. CLEAR the DTCs.</p>
F2 CHECK CIRCUIT 29S-AJ86 (OG/BU) FOR OPEN	
<p>1</p>  <p>2</p>  <p>DDM C501a</p>	

3



4



4 Measure the voltage between DDM C501a pin 12, circuit 29S-AJ86 (OG/BU), harness side and ground.

• Is the voltage greater than 10 volts?

→ Yes
GO to [F3](#).

→ No
REPAIR the circuit. REPEAT the self-test.
CLEAR the DTCs.

F3 CHECK DRIVER DOOR LOCK OPERATION USING ACTIVE COMMANDS

1



2



DDM C501a

3



NGS

4



5



5 Trigger the DDM active commands DD LOCK and DD UNLOCK ON and OFF.

• Do the DDM active commands DD

LOCK and DD UNLOCK operate correctly?

- **Yes**
INSTALL a new DDM. REFER to [Section 419-10](#) . REPEAT the self-test. CLEAR the DTCs.
- **No**
GO to [F4](#) .

F4 CHECK DDM LOCK AND UNLOCK OUTPUTS USING ACTIVE COMMANDS

1



2

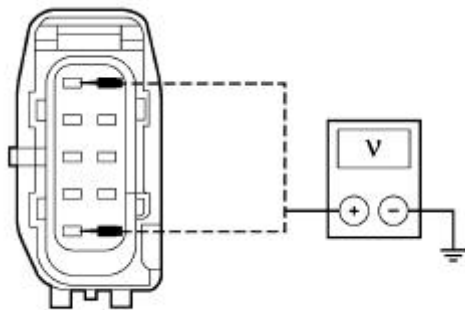


Driver Door Lock Actuator C525

3



4



A0004118

- 4 Measure the voltage between driver power door lock actuator C525 pin 2, circuit 33-AA10 (YE/BK), harness side and ground, while triggering the DDM active command DD LOCK to ON; and measure the voltage between driver power door lock actuator C525 pin 10, circuit 32-AA11 (WH/VT), harness side and ground, while triggering the DDM active command DD UNLOCK to ON.

● **Are the voltages greater than 10 volts?**

- **Yes**
INSTALL a new door lock actuator. REFER to [Section 501-14A](#) . REPEAT the self-test. CLEAR the DTCs.
- **No**
GO to [F5](#) .

F5 CHECK CIRCUITS 33-AA10 (YE/BK) AND 32-AA11 (WH/VT) FOR OPEN

1

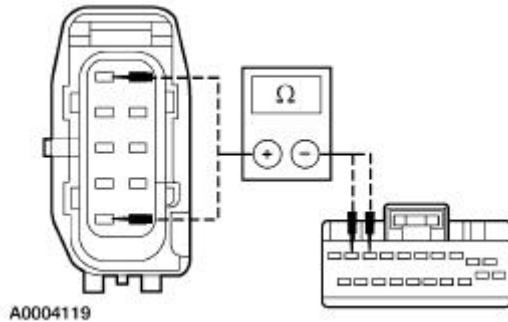


2



DDM C501c

3



3

Measure the resistance between driver power door lock actuator C525 pin 2, circuit 33-AA10 (YE/BK), harness side and DDM C501c pin 8, circuit 33-AA10 (YE/BK) harness side; and between driver power door lock actuator C525 pin 10, circuit 32-AA11 (WH/VT) harness side and DDM C501c pin 9, circuit 32-AA11 (WH/VT) harness side.

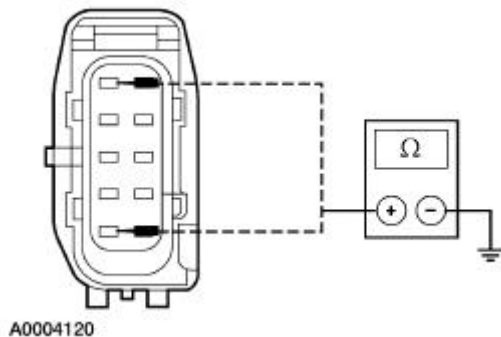
- Are the resistances less than 5 ohms?

→ **Yes**
GO to [F6](#).

→ **No**
REPAIR the circuit(s) in question.
REPEAT the self-test. CLEAR the DTCs.

F6 CHECK CIRCUITS 33-AA10 (YE/BK) AND 32-AA11 (WH/VT) FOR SHORT TO GROUND

1



1

Measure the resistance between driver power door lock actuator C525 pin 2, circuit 33-AA10 (YE/BK), harness side and ground; and between driver power door lock actuator C525 pin 10, circuit 32-AA11 (WH/VT), harness side and ground.


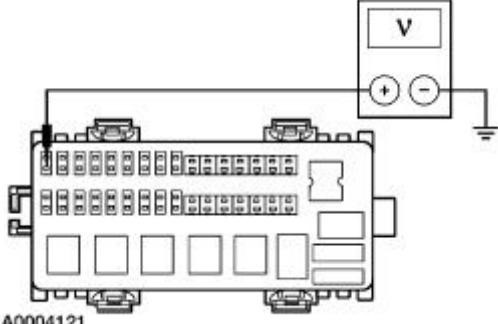

- Are the resistances greater than 10,000 ohms?

→ **Yes**
INSTALL a new DDM. REFER to [Section 419-10](#). REPEAT the self-test. CLEAR the DTCs.

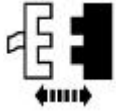
→ **No**
REPAIR the circuit(s) in question.
REPEAT the self-test. CLEAR the DTCs.

PINPOINT TEST G: MORE THAN ONE DOOR LOCK IS INOPERATIVE

— PASSENGER DOOR, RIGHT REAR DOOR, AND LEFT REAR DOOR

CONDITIONS	DETAILS/RESULTS/ACTIONS
G1 RETRIEVE THE RECORDED DTCS FROM BOTH CONTINUOUS AND ON-DEMAND SELF-TEST — REM	
	<p>1 Use the recorded REM DTCs from the continuous and on-demand self-test.</p> <ul style="list-style-type: none"> ● Are any DTCs recorded? <p>→ Yes REFER to the REM Diagnostic Trouble Code (DTC) Index.</p> <p>→ No GO to G2.</p>
G2 CHECK BATTERY JUNCTION BOX (BJB) FUSE 401 (15A) FOR VOLTAGE	
NOTE: Cycle the ignition switch from OFF to RUN to enable the switched system power feature.	
<p>1</p>  <p>BJB Fuse 401 (15A)</p> <p>2</p>  <p>A0004121</p>	<p>2 Measure the voltage between BJB Fuse 401 (15A) pin 1, component side and ground.</p> <ul style="list-style-type: none"> ● Is the voltage greater than 10 volts? <p>→ Yes RECONNECT the BJB Fuse 401 (15A). GO to G3.</p> <p>→ No REPAIR the BJB. REPEAT the self-test. CLEAR the DTCs.</p>
G3 CHECK CIRCUIT 29S-DK31 (OG/BK) FOR OPEN	
<p>1</p> 	

2

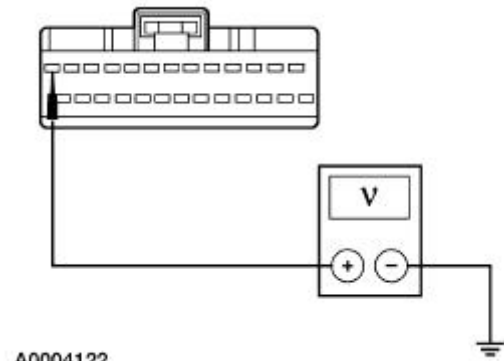


REM 420c

3



4



A0004122

4

Measure the voltage between REM C420c pin 13, circuit 29S-DK31 (OG/BK), harness side and ground.

● Is the voltage greater than 10 volts?

→ **Yes**
GO to [G4](#).

→ **No**
REPAIR circuit 29S-DK31 (OG/BK).
REPEAT the self-test. CLEAR the DTCs.

G4 CHECK REM OUTPUT USING ACTIVE COMMANDS

1



2



REM 420c

3



NGS

4



5



5

Trigger the REM active commands LR LOCK and LR UNLOCK ON and OFF while observing the passenger, right rear and left rear lock actuators.

- Do the REM active commands LR LOCK and LR UNLOCK operate correctly?

→ Yes

INSTALL a new REM. REFER to [Section 419-10](#). REPEAT the self-test. CLEAR the DTCs.

→ No

If only an individual lock does not operate, REFER to Symptom Chart.

If two or more do not operate, GO to [G5](#).

G5 CHECK CIRCUITS 33-AA2 (YE/RD), 32-AA1 (WH/RD), 33-AA15 (YE/GN) AND 32-AA16 (WH/BK) FOR SHORT TO GROUND

1

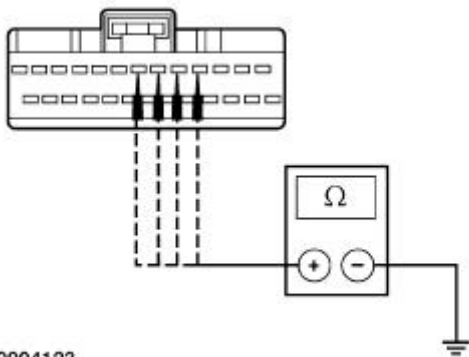


2



REM C420c

3



A0004123

3

Measure the resistance between the REM connector, harness side and ground as follows:

Connector Pin	Circuit
C420c Pin 5	33-AA2 (YE/RD)
C420c Pin 6	32-AA1 (WH/RD)
C420c Pin 4	33-AA15 (YE/GN)
C420c Pin 7	32-AA16 (WH/BK)

- Are the resistances greater than 10,000 ohms?

→ Yes





INSTALL a new REM. REFER to [Section 419-10](#). REPEAT the self-test. CLEAR the DTCs.

→ No

REPAIR the circuit(s) in question.

REPEAT the self-test. CLEAR the DTCs.

PINPOINT TEST H: MORE THAN ONE DOOR LOCK IS INOPERATIVE — PASSENGER DOOR AND RIGHT REAR DOOR

CONDITIONS	DETAILS/RESULTS/ACTIONS
H1 RETRIEVE THE RECORDED DTCs FROM BOTH CONTINUOUS AND ON-DEMAND SELF-TEST — REM	<p>1 Use the recorded REM DTCs from the continuous and on-demand self-test.</p> <ul style="list-style-type: none">● Are any DTCs recorded? <p>→ Yes REFER to the REM Diagnostic Trouble Code (DTC) Index.</p> <p>→ No GO to H2.</p>
H2 CHECK REM OUTPUT USING ACTIVE COMMANDS	
<p>1</p>  <p>2</p>  <p>NGS</p> <p>3</p>  <p>4</p> 	<p>4 Trigger the REM active commands LR LOCK and LR UNLOCK ON and OFF while observing the passenger and right rear lock actuators.</p> <ul style="list-style-type: none">● Do the REM active commands LR LOCK and LR UNLOCK operate correctly? <p>→ Yes INSTALL a new REM. REFER to Section 419-10. REPEAT the self-test. CLEAR the DTCs.</p> <p>→ No GO to H3.</p>

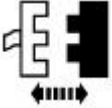
H3 CHECK REM OUTPUT TO PASSENGER AND RIGHT REAR LOCK ACTUATORS

NOTE: Disconnect the inoperative lock actuator. If both actuators are inoperative you must disconnect both actuators.

1

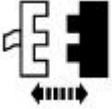


2



Right Rear Door Lock Actuator C804

3

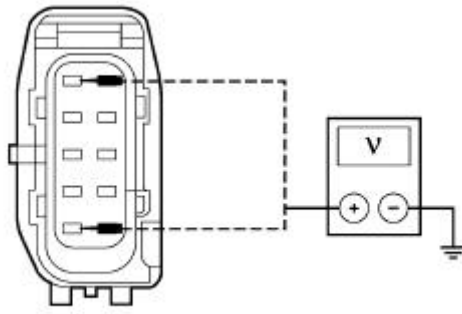


Passenger Door Lock Actuator C609

4

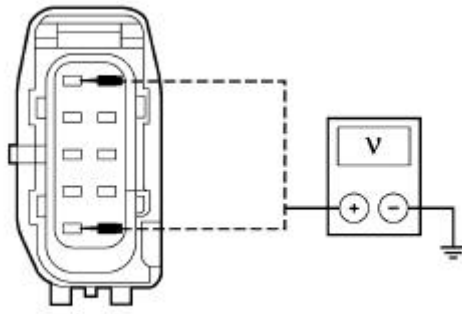


5



A0004118

6



A0004118

5

Measure the voltage between passenger door lock actuator C609 pin 2, circuit 33-AA20 (YE/BU), harness side and ground, while triggering the REM active command LR LOCK to ON; and measure the voltage between passenger door lock actuator C609 pin 10, circuit 32-AA21 (WH/GN), harness side and ground, while triggering the REM active command LR UNLOCK to ON.

6

Measure the voltage between right rear door lock actuator C804 pin 2, circuit 33-AA25 (YE/RD), harness side and ground, while triggering the REM active command LR LOCK to ON; and measure the voltage between right rear door lock actuator C804 pin 10, circuit 32-AA26 (WH/BU), harness side and ground, while triggering the REM active command LR UNLOCK to ON.

- Are the voltages greater than 10 volts?

→ Yes

INSTALL a new door lock actuator(s). REFER to [Section 501-14A](#). REPEAT

the self-test. CLEAR the DTCs.

→ **No**
GO to [H4](#).

H4 CHECK CIRCUITS 33-AA20 (YE/BU), 32-AA21 (WH/GN), 33-AA25 (YE/RD) AND 32-AA26 (WH/BU) FOR OPEN

NOTE: Disconnect the inoperative lock actuator. If both actuators are inoperative you must disconnect both actuators.

1

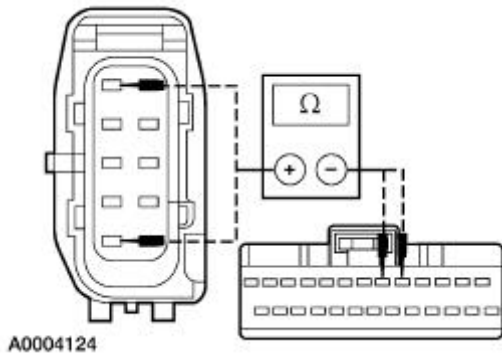


2



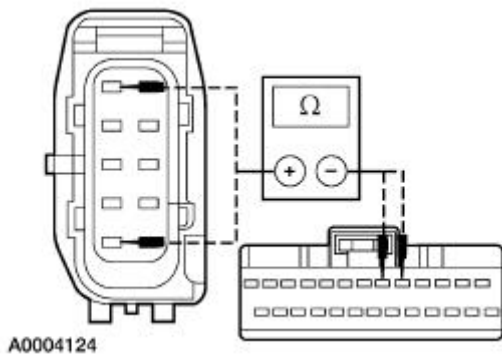
REM C420c

3



A0004124

4



A0004124

3 Measure the resistance between passenger door lock actuator C609 pin 2, circuit 33-AA20 (YE/BU), harness side and REM C420c pin 5, circuit 33-AA25 (YE/RD), harness side; and between passenger door lock actuator C609 pin 10, circuit 32-AA21 (WH/GN), harness side and REM C420c pin 6, circuit 32-AA26 (WH/BU), harness side.

4 Measure the resistance between right rear door lock actuator C804 pin 2, circuit 33-AA25 (YE/RD), harness side and REM C420c pin 5, circuit 33-AA25 (YE/RD), harness side; and between rear door lock actuator C804 pin 10, circuit 32-AA26 (WH/BU), harness side and REM C420c pin 6, circuit 32-AA26 (WH/BU), harness side.

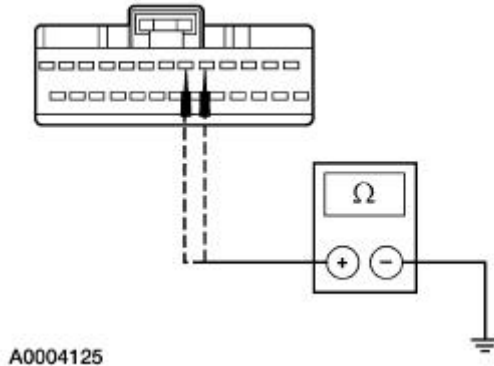
● **Are the resistances less than 5 ohms?**

→ **Yes**
GO to [H5](#).


→ **No**
REPAIR the circuit(s) in question.
REPEAT the self-test. CLEAR the DTCs.

H5 CHECK CIRCUITS 33-AA25 (YE/RD) AND 32-AA26 (WH/BU) FOR SHORT TO GROUND

NOTE: Disconnect the inoperative lock actuator. If both actuators are inoperative you must disconnect both actuators.

<div style="border: 1px solid black; padding: 5px; margin-bottom: 10px;">1</div>  <p style="margin-top: 20px;">A0004125</p>	<div style="border: 1px solid black; padding: 5px; margin-bottom: 10px;">1</div> <p>Measure the resistance between REM C420c pin 5, circuit 33-AA25 (YE/RD) harness side and ground; and between REM C420c pin 6, circuit 32-AA26 (WH/BU), harness side and ground.</p> <ul style="list-style-type: none"> ● Are the resistances greater than 10,000 ohms? <p>→ Yes INSTALL a new REM. REFER to Section 419-10. REPEAT the self-test. CLEAR the DTCs.</p> <p>→ No REPAIR the circuit(s) in question. REPEAT the self-test. CLEAR the DTCs.</p>
--	--

PINPOINT TEST I: A SINGLE DOOR LOCK IS INOPERATIVE — LEFT REAR DOOR

CONDITIONS	DETAILS/RESULTS/ACTIONS
I1 RETRIEVE THE RECORDED DTCS FROM BOTH CONTINUOUS AND ON-DEMAND SELF-TEST — REM	<div style="border: 1px solid black; padding: 5px; margin-bottom: 10px;">1</div> <p>Use the recorded REM DTCs from the continuous and on-demand self-test.</p> <ul style="list-style-type: none"> ● Are any DTCs recorded? <p>→ Yes REFER to the REM Diagnostic Trouble Code (DTC) Index.</p> <p>→ No GO to I2.</p>
I2 CHECK REM OUTPUT USING ACTIVE COMMANDS	
<div style="border: 1px solid black; padding: 5px; margin-bottom: 10px;">1</div> 	<div style="border: 1px solid black; padding: 5px; margin-bottom: 10px;">2</div>



NGS

3



4



4 Trigger the REM active commands LR LOCK and LR UNLOCK ON and OFF while observing the left rear lock actuator.

- Do the REM active commands LR LOCK and LR UNLOCK operate correctly?

→ Yes
INSTALL a new REM. REFER to [Section 419-10](#). REPEAT the self-test. CLEAR the DTCs.

→ No
GO to [13](#).

13 CHECK REM OUTPUT TO LEFT REAR LOCK ACTUATOR

1



2

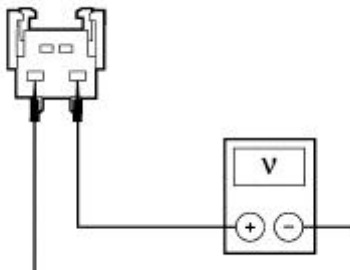


Left Rear Door Lock Actuator C704

3



4



A0005706

4 Measure the voltage between left rear door lock actuator C704 pin 2, circuit 33-AA15 (YE/GN), harness side and ground, while triggering the REM active command LR LOCK to ON; and measure the voltage between left rear door lock actuator C704 pin 10, circuit 32-AA16 (WH/BK), harness side and ground, while triggering the REM active command LR UNLOCK to ON.

- Are the voltages greater than 10

volts?

→ **Yes**
INSTALL a new door lock actuator.
REFER to [Section 501-14A](#). REPEAT
the self-test. CLEAR the DTCs.

→ **No**
GO to [14](#).

14 CHECK CIRCUITS 33-AA15 (YE/GN) AND 32-AA16 (WH/BK) FOR OPEN

1

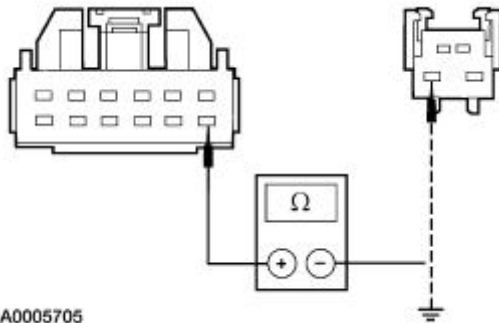


2



REM C420c

3



3 Measure the resistance between left rear door lock actuator C704 pin 2, circuit 33-AA15 (YE/GN), harness side and REM C420c pin 4, circuit 33-AA15 (YE/GN), harness side; and between left rear door lock actuator C704 pin 10, circuit 32-AA16 (WH/BK), harness side and REM C420c pin 7, circuit 32-AA16 (WH/BK), harness side.

● **Are the resistances less than 5 ohms?**

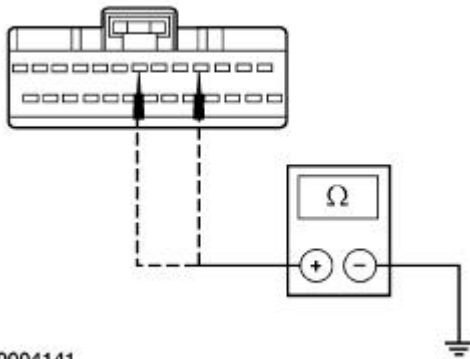
→ **Yes**
GO to [15](#).

→ **No**
REPAIR the circuit(s) in question.
REPEAT the self-test. CLEAR the DTCs.

15 CHECK CIRCUITS 33-AA15 (YE/GN) AND 32-AA16 (WH/BK) FOR SHORT TO GROUND

1

1 Measure the resistance between REM C420c pin 4, circuit 33-AA15 (YE/GN), harness side and ground; and between REM C420c pin 7, circuit 32-AA16 (WH/BK), harness side and ground.



A0004141

- Are the resistances greater than 10,000 ohms?

- **Yes**
INSTALL a new REM. REFER to [Section 419-10](#). REPEAT the self-test. CLEAR the DTCs.
- **No**
REPAIR the circuit(s) in question. REPEAT the self-test. CLEAR the DTCs.

PINPOINT TEST J: THE LUGGAGE COMPARTMENT DOOR IS INOPERATIVE — FROM RELEASE SWITCH

CONDITIONS	DETAILS/RESULTS/ACTIONS
J1 RETRIEVE THE RECORDED DTCs FROM BOTH CONTINUOUS AND ON-DEMAND SELF-TEST — REM	<p>1 Use the recorded REM DTCs from the continuous and on-demand self-test.</p> <ul style="list-style-type: none"> • Are any DTCs recorded? <p>→ Yes For DTC B1551, GO to J3.</p> <p>For all other DTCs, REFER to the REM Diagnostic Trouble Code (DTC) Index.</p> <p>→ No GO to J2.</p>
J2 CHECK REM OUTPUT USING ACTIVE COMMANDS	
NOTE: Cycle the ignition switch from OFF to RUN to enable the switched system power feature.	
<p>1</p> <p>2</p>	



NGS

3



4



4 Trigger the REM active command RELEASE ON.

- Does the REM active command RELEASE operate correctly?

→ Yes
GO to [J3](#).

→ No
GO to the Symptom Chart.

J3 CHECK LUGGAGE COMPARTMENT RELEASE SWITCH INPUT TO REM

NOTE: Cycle the ignition switch from OFF to RUN to enable the switched system power feature.

1



2



NGS

3



4



4 Monitor the REM PID DLIDRLS.

5 Depress and release the luggage compartment release switch.

- Does the REM PID DLIDRLS agree with the luggage compartment release switch position?

→ Yes
INSTALL a new REM. REFER to [Section](#)

[419-10](#). REPEAT the self-test. CLEAR the DTCs.

→ **No**
REM PID DLIDRLS indicates ON GO to [J4](#).

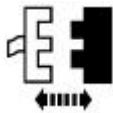
REM PID DLIDRLS indicates OFF GO to [J6](#).

J4 CHECK LUGGAGE COMPARTMENT RELEASE SWITCH

1



2



Luggage Compartment Release Switch C207

1 Monitor the REM PID DLIDRLS.

- Did the REM PID DLIDRLS change from ON to OFF?

→ **Yes**
INSTALL a new luggage compartment release switch. REPEAT the self-test. CLEAR the DTCs.

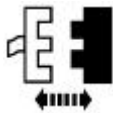
→ **No**
GO to [J5](#).

J5 CHECK CIRCUIT 8-AA30 (WH) FOR SHORT TO GROUND

1



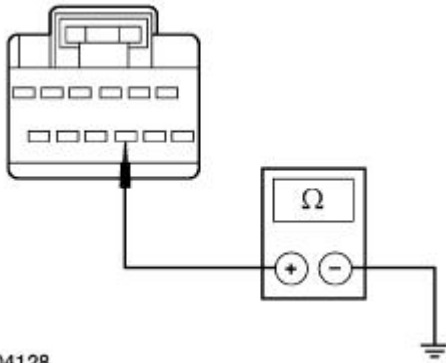
2



REM C420a

3

3 Measure the resistance between REM C420a pin 9, circuit 8-AA30 (WH), harness side and ground.



A0004128

- Is the resistance greater than 10,000 ohms?

- **Yes**
INSTALL a new REM. REFER to [Section 419-10](#). REPEAT the self-test. CLEAR the DTCs.
- **No**
REPAIR the circuit. REPEAT the self-test. CLEAR the DTCs.

J6 CHECK CIRCUIT 8-AA30 (WH) FOR OPEN

1

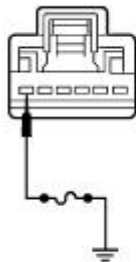


Luggage Compartment Release Switch C207

2



3



A0004135

- 2 Monitor the REM PID DLIDRLS.
- 3 Connect a 10A fused jumper between luggage compartment release switch C207 pin 6, circuit 8-AA30 (WH), harness side and ground, while monitoring the REM PID DLIDRLS.

- Did the REM PID DLIDRLS change from OFF to ON?

- **Yes**
GO to [J7](#).
- **No**
REPAIR the circuit. REPEAT the self-test.

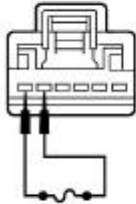
CLEAR the DTCs.

J7 CHECK LUGGAGE COMPARTMENT RELEASE SWITCH

1



2



A0004136

1

Monitor the REM PID DLIDRLS.

2

Connect a 10A fused jumper between luggage compartment release switch C207 pin 6, circuit 8-AA30 (WH), harness side and luggage compartment release switch C207 pin 5, circuit 31-AA30 (BK), harness side, while monitoring the REM PID DLIDRLS.

● **Did the REM PID DLIDRLS change from OFF to ON?**

→ **Yes**

INSTALL a new luggage compartment release switch. REPEAT the self-test. CLEAR the DTCs.

→ **No**

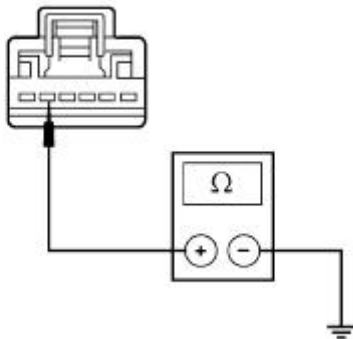
GO to [J8](#).

J8 CHECK CIRCUIT 31-AA30 (BK) FOR OPEN

1



2



A0004137

2

Measure the resistance between luggage compartment release switch C207 pin 5, circuit 31-AA30 (BK), harness side and ground.





● **Is the resistance less than 5 ohms?**

→ **Yes**

INSTALL a new REM. REFER to [Section 419-10](#). REPEAT the self-test. CLEAR the DTCs.

→ **No**
REPAIR the circuit. REPEAT the self-test.
CLEAR the DTCs.

PINPOINT TEST K: THE LUGGAGE COMPARTMENT DOOR IS INOPERATIVE — FROM RELEASE SWITCH AND REMOTE TRANSMITTER

CONDITIONS	DETAILS/RESULTS/ACTIONS
<p>NOTE: The luggage compartment key cylinder will not arm/disarm the perimeter alarm. Once armed, the perimeter alarm can only be disarmed using the remote transmitter or the driver door lock cylinder switch.</p>	
<p>K1 RETRIEVE THE RECORDED DTCS FROM BOTH CONTINUOUS AND ON-DEMAND SELF-TEST — REM</p>	
	<p>1 Use the recorded REM DTCs from the continuous and on-demand self-test.</p> <ul style="list-style-type: none"> ● Are any DTCs recorded? <p>→ Yes REFER to the REM Diagnostic Trouble Code (DTC) Index.</p> <p>→ No GO to K2.</p>
<p>K2 CHECK REM OUTPUT USING ACTIVE COMMANDS</p>	
<p>NOTE: Cycle the ignition switch from OFF to RUN to enable the switched system power feature.</p>	
<p>1</p>  <p>2</p>  <p>NGS</p> <p>3</p>  <p>4</p> 	<p>4 Trigger the REM active command RELEASE ON.</p> <ul style="list-style-type: none"> ● Does the luggage compartment unlock?

- **Yes**
INSTALL a new REM. REFER to [Section 419-10](#) . REPEAT the self-test. CLEAR the DTCs.
- **No**
GO to [K3](#) .

K3 CHECK LUGGAGE COMPARTMENT RELEASE SWITCH INPUT TO REM

NOTE: Cycle the ignition switch from OFF to RUN to enable the switched system power feature.

1



1

Monitor the REM PID DLIDRLS.

2

Depress and release the luggage compartment release switch.

- **Does the REM PID DLIDRLS agree with the luggage compartment release switch position?**

→ **Yes**

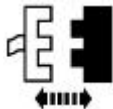
GO to [K4](#) .

→ **No**

INSTALL a new REM. REFER to [Section 419-10](#) . REPEAT the self-test. CLEAR the DTCs.

K4 CHECK LUGGAGE COMPARTMENT RELEASE SWITCH INPUT TO REM

1

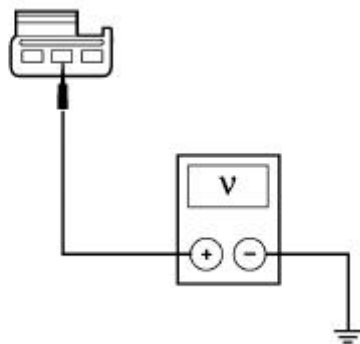


Luggage Compartment Release Solenoid C430

2



3



A0004138

2

Trigger the REM active command RELEASE ON.

3

Measure the voltage between the luggage compartment release solenoid C430 pin 2, circuit 29S-AA83 (OG), harness side and ground.

- **Is the voltage greater than 10 volts?**

→ **Yes**
GO to [K5](#).

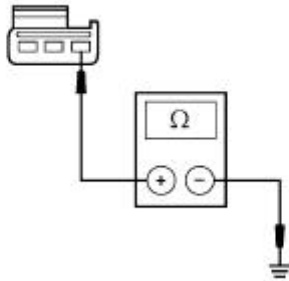
→ **No**
GO to [K6](#).

K5 CHECK CIRCUIT 31-AA83 (BK/OG) FOR OPEN

1



2



A0008423

2 Measure the resistance between the luggage compartment release solenoid C430 pin 1, circuit 31-AA83 (BK/OG), harness side and ground.

● **Is the resistance less than 5 ohms?**

→ **Yes**
INSTALL a new luggage compartment release solenoid. REPEAT the self-test. CLEAR the DTCs.

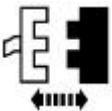
→ **No**
REPAIR the circuit. REPEAT the self-test. CLEAR the DTCs.

K6 CHECK CIRCUIT 29S-AA83 (OG) FOR OPEN

1



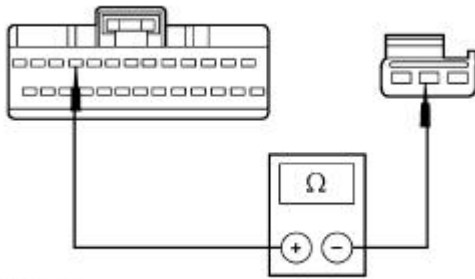
2



REM C420c

3

3 Measure the resistance between REM C420c pin 10, circuit 29S-AA83 (OG) harness side and luggage compartment release solenoid C430 pin 2, circuit 29S-AA83 (OG), harness side.



A0004140

● Is the resistance less than 5 ohms?

→ **Yes**
GO to [K7](#).

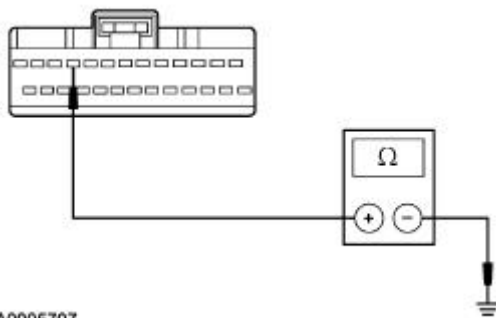
→ **No**
REPAIR the circuit. REPEAT the self-test.
CLEAR the DTCs.

K7 CHECK CIRCUIT 29S-AA83 (OG) FOR SHORT TO GROUND

1



2



A0005707

2 Measure the resistance between REM C420c pin 10, circuit 29S-AA83 (OG) harness side and ground.

● Is the resistance greater than 10,000 ohms?

→ **Yes**
INSTALL a new REM. REFER to [Section 419-10](#). REPEAT the self-test. CLEAR the DTCs.

→ **No**
REPAIR the circuit. REPEAT the self-test.
CLEAR the DTCs.

PINPOINT TEST L: THE DOORS DO NOT LOCK AND UNLOCK USING THE REMOTE TRANSMITTER

CONDITIONS	DETAILS/RESULTS/ACTIONS
------------	-------------------------

L1 CHECK THE DOOR LOCKS AT THE DRIVER DOOR LOCK SWITCH

1 Check the locks from the driver door lock switch.

- Do the doors lock and unlock?

→ **Yes**
GO to [L2](#).

→ **No**
GO to [Pinpoint Test C](#).

L2 CHECK REMOTE TRANSMITTER BUTTONS WITH NGS TESTER

1



2



NGS

3



4



4 Monitor the DDM FUNCTION TEST TIC/DATA, while pressing the lock, then the unlock button on the remote transmitter.

- Does the data received indicate LOCK, then UNLOCK?

→ **Yes**
INSTALL a new DDM. REFER to [Section 419-10](#). REPEAT the self-test. CLEAR the DTCs.

→ **No**
GO to [L3](#).

L3 CHECK THE BATTERY IN REMOTE TRANSMITTER

1

1 Install a new battery in the remote transmitter.


2





2 Monitor the DDM FUNCTION TEST TIC/DATA, while pressing the lock, then the unlock button on the remote transmitter.

- Does the data received indicate LOCK, then UNLOCK?

→ **Yes**
TEST all remote transmitter functions. REPEAT the self-test. CLEAR the DTCs.

	<p>→ No GO to L4.</p>
<p>L4 CHECK THE PROGRAMMING OF THE REMOTE TRANSMITTER</p>	
<p>2</p> 	<p>1 Reprogram the remote transmitter; REFER to Programming—Remote Keyless Entry Transmitter.</p> <p>2 Monitor the DDM FUNCTION TEST TIC/DATA, while pressing the lock, then the unlock button on the remote transmitter.</p> <p>● Does the data received indicate LOCK, then UNLOCK?</p> <p>→ Yes Fault found as remote transmitter not programmed. REPEAT the self-test. CLEAR the DTCs.</p> <p>→ No PROGRAM a new remote transmitter to the vehicle. REFER to Programming—Remote Keyless Entry Transmitter. REPEAT the self-test. CLEAR the DTCs.</p>

PINPOINT TEST M: THE MEMORY SEAT DOES NOT OPERATE CORRECTLY USING THE REMOTE TRANSMITTER

CONDITIONS	DETAILS/RESULTS/ACTIONS
<p>M1 CHECK THE MEMORY SET SWITCH</p>	
	<p>1 Operate the memory seat using the memory set switch.</p> <p>● Does the memory seat operate correctly?</p> <p>→ Yes GO to M2.</p> <p>→ No REFER to Section 501-10.</p>
<p>M2 CHECK REMOTE TRANSMITTER BUTTONS WITH NGS TESTER</p>	
<p>1</p>  <p>2</p>  <p>NGS</p> <p>3</p>	



4



4 Monitor the DDM FUNCTION TEST TIC/DATA, while pressing the lock, then the unlock button on the remote transmitter.

● Does the data received indicate LOCK, then UNLOCK?

→ **Yes**
INSTALL a new DDM. REFER to [Section 419-10](#). REPEAT the self-test. CLEAR the DTCs.

→ **No**
GO to [M3](#).

M3 CHECK THE BATTERY IN REMOTE TRANSMITTER

2



1 Install a new battery in the remote transmitter.

2 Monitor the DDM FUNCTION TEST TIC/DATA, while pressing the lock, then the unlock button on the remote transmitter.

● Does the data received indicate LOCK, then UNLOCK?

→ **Yes**
TEST all the remote transmitter functions. REPEAT the self-test. CLEAR the DTCs.

→ **No**
GO to [M4](#).

M4 CHECK THE PROGRAMMING OF THE REMOTE TRANSMITTER

2



1 Reprogram the remote transmitter; refer to [Programming—Remote Keyless Entry Transmitter](#).





2 Monitor the DDM FUNCTION TEST TIC/DATA, while pressing the lock, then the unlock button on the remote transmitter.

● Does the data received indicate LOCK, then UNLOCK?

→ **Yes**
The remote transmitter was not programmed. REPEAT the self-test. CLEAR the DTCs.

→ **No**
PROGRAM a new remote transmitter to the vehicle. REFER to [Programming—Remote Keyless Entry Transmitter](#). REPEAT the self-test. CLEAR the DTCs.

PINPOINT TEST N: THE AUTO-LOCK DOES NOT OPERATE CORRECTLY

CONDITIONS	DETAILS/RESULTS/ACTIONS
N1 RETRIEVE THE RECORDED DTCS FROM BOTH CONTINUOUS AND ON-DEMAND SELF-TEST — FEM	<p>1 Verify that the Auto-lock feature is ON using the Message Center (MCM) Module. If the Auto-lock feature is OFF, switch to ON and retest</p> <p>2 Use the recorded FEM DTCs from the continuous and on-demand self-test.</p> <p>● Are any FEM DTCs recorded?</p> <p>→ Yes For DTC U1041, carry out the ABS self-test. REFER to Section 206-09A. For DTC U1059, REFER to Powertrain Control/Emissions Diagnosis (PC/ED) manual Section 3. For all other FEM DTCs, REFER to the FEM Diagnostic Trouble Code (DTC) Index.</p> <p>→ No GO to N2.</p>
N2 CHECK DRIVER DOOR AJAR PID D_DOOR	<p>1 </p> <p>2  NGS</p> <p>3 </p> <p>4 Close all doors and luggage compartment.</p> <p>5 </p> <p>5 Monitor the FEM driver door ajar PID D_DOOR.</p> <p>● Does the PID read AJAR?</p> <p>→ Yes REFER to Section 417-02.</p> <p>→ No GO to N3.</p>

N3 CHECK PASSENGER DOOR AJAR PID P_DOOR

1



1 Monitor the FEM passenger door ajar PID P_DOOR.

● Does the PID read AJAR?

→ **Yes**
REFER to [Section 417-02](#).

→ **No**
GO to [N4](#).

N4 CHECK LR DOOR AJAR PID LRDR_SW

1



1 Monitor the REM LR door ajar PID LRDR_SW.

● Does the PID read AJAR?

→ **Yes**
REFER to [Section 417-02](#).

→ **No**
GO to [N5](#).

N5 CHECK RIGHT REAR DOOR AJAR PID RRDR_SW

1



1 Monitor the REM RR door ajar PID RRDR_SW.

● Does the PID read AJAR?

→ **Yes**
REFER to [Section 417-02](#).

→ **No**
GO to [N6](#).

N6 CHECK LUGGAGE COMPARTMENT AJAR PID DECKLID


1




1 Monitor the REM luggage compartment ajar PID DECKLID.

● Does the PID read AJAR?

→ **Yes**
REFER to [Section 417-02](#).







	→ No GO to N7 .
N7 CHECK IGNITION SWITCH STATUS	
1 	1 Monitor the FEM ignition switch PID IGN_R. <ul style="list-style-type: none"> ● Does the PID read YES? → Yes INSTALL a new DDM. REFER to Section 419-10 . REPEAT the self-test. CLEAR the DTCs. → No REFER to Section 211-05 .


PINPOINT TEST O: THE SMART LOCK DOES NOT OPERATE CORRECTLY

CONDITIONS	DETAILS/RESULTS/ACTIONS
O1 CHECK COURTESY LIGHTS	
	1 Open the driver door. <ul style="list-style-type: none"> ● Do the courtesy lights illuminate? → Yes GO to O2 . → No REFER to Section 417-02 .
O2 CHECK WARNING CHIMES	
1 	1 Open the driver door. <ul style="list-style-type: none"> ● Do the warning chimes operate? → Yes INSTALL a new DDM. REFER to Section 419-10 . REPEAT the self-test. CLEAR the DTCs → No REFER to Section 413-09 .

PINPOINT TEST P: PANIC FEATURE IS INOPERATIVE

--	--

CONDITIONS	DETAILS/RESULTS/ACTIONS
P1 CHECK FEM INPUT	
<p>1 </p> <p>2  NGS</p> <p>3 </p> <p>4 </p>	<p>4 Monitor the FEM PID AL_1.</p> <p>5 Press the PANIC button.</p> <ul style="list-style-type: none"> ● Does the FEM PID indicate PANIC? <p>→ Yes REFER to Section 419-01A.</p> <p>→ No GO to P2.</p>
P2 CHECK THE REMOTE TRANSMITTER LUGGAGE COMPARTMENT RELEASE BUTTON WITH NGS TESTER	
<p>1 </p>	<p>1 Monitor the DDM FUNCTION TEST TIC/DATA, while pressing the luggage compartment release button on the remote transmitter.</p> <ul style="list-style-type: none"> ● Does last received data indicate TRUNK? <p>→ Yes INSTALL a new DDM. REFER to Section 419-10. REPEAT the self-test. CLEAR the DTCs.</p> <p>→ No GO to P3.</p>
P3 CHECK THE BATTERY IN THE REMOTE TRANSMITTER	
<p>2 </p>	<p>1 Install a new battery in the remote transmitter.</p> <p>2 Monitor the DDM FUNCTION TEST TIC/DATA, while pressing the luggage compartment release button on the remote transmitter.</p>

	<ul style="list-style-type: none"> ● Does last received data indicate TRUNK? <p>→ Yes TEST all remote transmitter functions. REPEAT the self-test. CLEAR the DTCs.</p> <p>→ No GO to P4.</p>
P4 CHECK THE PROGRAMMING OF THE REMOTE TRANSMITTER	
<p>2</p> 	<p>1 Reprogram the remote transmitter. Refer to Programming—Remote Keyless Entry Transmitter.</p> <p>2 Monitor the DDM FUNCTION TEST TIC/DATA, while pressing the decklid release button on the remote transmitter.</p> <ul style="list-style-type: none"> ● Does last received data indicate TRUNK? <p>→ Yes The remote transmitter was not programmed. REPEAT the self-test. CLEAR the DTCs.</p> <p>→ No PROGRAM a new remote transmitter to the vehicle. REFER to Programming—Remote Keyless Entry Transmitter. REPEAT the self-test. CLEAR the DTCs.</p>

PINPOINT TEST Q: THE LUGGAGE COMPARTMENT DOOR IS INOPERATIVE USING THE REMOTE TRANSMITTER

CONDITIONS	DETAILS/RESULTS/ACTIONS
<p>NOTE: The luggage compartment key cylinder will not arm/disarm the perimeter alarm. Once armed, the perimeter alarm can only be disarmed using the remote transmitter or the driver door lock cylinder switch.</p>	
<p>Q1 TEST LUGGAGE COMPARTMENT RELEASE AT THE LUGGAGE COMPARTMENT RELEASE SWITCH</p>	
	<p>1 Press the luggage compartment release switch.</p> <ul style="list-style-type: none"> ● Did the decklid open? <p>→ Yes GO to Q2.</p> <p>→ No GO to Pinpoint Test K.</p>
<p>Q2 CHECK THE REMOTE TRANSMITTER LUGGAGE COMPARTMENT RELEASE BUTTON WITH NGS TESTER</p>	
<p>1</p>	



2



NGS

3



4



4 Monitor the DDM FUNCTION TEST TIC/DATA, while pressing the luggage compartment release button on the remote transmitter.

• Does last received data indicate TRUNK?

→ Yes
INSTALL a new DDM. REFER to [Section 419-10](#). REPEAT the self-test. CLEAR the DTCs.

→ No
GO to [Q3](#).

Q3 CHECK THE BATTERY IN THE REMOTE TRANSMITTER

2



1 Install a new battery in the remote transmitter.

2 Monitor the DDM FUNCTION TEST TIC/DATA, while pressing the luggage compartment release button on the remote transmitter.

• Does last received data indicate TRUNK?

→ Yes
TEST all remote transmitter functions. REPEAT the self-test. CLEAR the DTCs.

→ No
GO to [Q4](#).

Q4 CHECK THE PROGRAMMING OF THE REMOTE TRANSMITTER

2




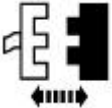


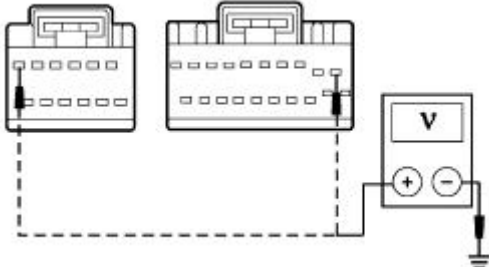
1 Reprogram the remote transmitter. Refer to [Programming—Remote Keyless Entry Transmitter](#).

2 Monitor the DDM FUNCTION TEST TIC/DATA, while pressing the luggage compartment release button on the remote transmitter.

• Does last received data indicate TRUNK?

- **Yes**
The remote transmitter was not programmed. REPEAT the self-test. CLEAR the DTCs.
- **No**
PROGRAM a new remote transmitter to the vehicle. REFER to [Programming—Remote Keyless Entry Transmitter](#). REPEAT the self-test. CLEAR the DTCs.

PINPOINT TEST R: NO COMMUNICATION WITH THE FRONT ELECTRONIC MODULE (FEM)

CONDITIONS	DETAILS/RESULTS/ACTIONS
R1 CHECK CIRCUITS 29-DK20 (OG/GN) AND 29S-DK22 (OG/YE) FOR VOLTAGE	
NOTE: Cycle ignition switch from OFF to RUN to enable the switched system power feature.	
<p>1 </p> <p>2  FEM C201c</p> <p>3  FEM C201f</p> <p>4 </p> <p>5 </p> <p>A0006297</p>	<p>5 Measure the voltage between FEM C201c pin 6, circuit 29-DK20 (OG/GN), harness side and ground; and between FEM C201f pin 1, circuit 29S-DK22 (OG/YE) harness side and ground.</p> <ul style="list-style-type: none"> ● Are the voltages greater than 10 volts? <p>→ Yes</p>

GO to [R2](#).

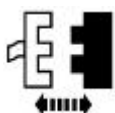
→ **No**
REPAIR the circuit(s) in question. TEST the system for normal operation.

R2 CHECK CIRCUITS 31-DK20 (BK/RD), 31-DK20A (BK/RD), 31-DK20B (BK/RD), 31-DK20C (BK/RD) AND 31-DK20D (BK/RD) FOR OPENS

1

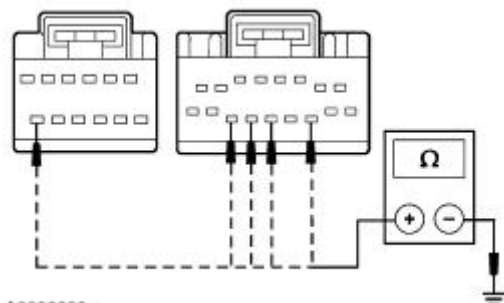


2



FEM C201a

3



3 Using the following table, measure the resistance between FEM connectors, harness side and ground:

FEM	Pin	Circuit
C201c	12	31-DK20 (BK/RD)
C201a	11	31-DK20A (BK/RD)
C201a	13	31-DK20B (BK/RD)
C201a	14	31-DK20C (BK/RD)
C201a	15	31-DK20D (BK/RD)


● **Is the resistance less than 5 ohms?**

→ **Yes**
REFER to [Section 418-00](#).

→ **No**
REPAIR the circuit(s) in question. TEST the system for normal operation.

Programming —Remote Keyless Entry Transmitter

Special Tool(s)

	Worldwide Diagnostic System (WDS) 418-F224, New Generation STAR (NGS) Tester 418-F052 or equivalent
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NOTE: All remote transmitters are programmable and must be set at the same time.

NOTE: To program (or reprogram) the remote transmitters into the driver door module (DDM), carry out the following steps:

1. Connect the New Generation STAR/Service Bay Diagnostic System (diagnostic tool/SBDS) tester. Turn the ignition from OFF to RUN.
2. From diagnostic tool/SBDS: Using the Ford Service Function (FSF) card, select SERVICE BAY FUNCTION.
3. Select DDM.
4. Select KEY FOB PROGRAMMING.
5. Press any button on the remote transmitter.
6. Select the FOB 1, 2, 3, or 4, and select STORE. It may be necessary to select CANCEL more than once to exit the menu.
7. Repeat steps five and six for additional transmitters.
8. **NOTE:** It may be necessary to select CANCEL more than once to exit the menu.

Select CANCEL to exit the menu.

General Specifications

Item	Specification
RH wiper blade adjustment tolerance	12mm (.47in)
LH wiper blade adjustment tolerance	10mm (.39in)

Torque Specifications

Description	Nm	lb-ft	lb-in
Battery ground cable	10	—	89
Degas bottle bolts	10	—	89
Mounting arm and pivot shaft bolts	12	9	—
Pivot arm nuts	25	18	—
Strut support brace bolts	20	15	—
Windshield washer fluid reservoir bolt	6	—	53
Windshield wiper motor bolts	12	9	—
Windshield wiper motor crank bolt	12	9	—

Wipers And Washers




The wiper and washer system consists of:

- pivot arms
 - mounting arm and pivot shaft
 - windshield wiper motor
 - windshield washer fluid pump
 - headlamp washer fluid pump (if equipped)
 - windshield washer fluid reservoir
 - front electronic module (FEM)
 - rear electronic module (REM)
 - rain sensor module (RSM) (if equipped)
-

Wipers And Washers

Refer to Wiring Diagrams Section [501-16](#) for schematic and connector information.

Special Tool(s)

 ST2332-A	Worldwide Diagnostic System (WDS) 418-F224, New Generation STAR (NGS) Tester 418-F052, or equivalent diagnostic tool
 ST1137-A	73III Automotive Meter 105-R0057 or equivalent
 ST1453-A	Alternator, Regulator, Battery and Starter Tester (ARBST) 010-00725 or equivalent

Principles of Operation

Wipers and Washers

The wiper and washer systems are controlled by the front electronic module (FEM). The wiper/washer portion of the multifunction switch is hardwired to the FEM. When the switch is moved to the desired position, the FEM processes this information and outputs the appropriate command(s) to one of three relays. The relays control the wiper high and low motor speeds and washer pump actuation.

Intermittent wiper speed control can vary dependent upon vehicle speed. This is accomplished by the FEM receiving vehicle speed information from the anti-lock brake control module and throttle position status from the powertrain control module (PCM). When the wiper switch is in any of the intermittent positions, the FEM will process the information from the PCM and anti-lock brake control module and decrease the wiper delay time as vehicle speed increases.

Rain Sensor Wiper Function—Rain Sensor Module

The rain sensor module (RSM) is located on the inside of the windshield below the interior rear view mirror and the direct pattern of the wiper blades, if equipped. When the ignition switch is turned to the RUN position, the RSM starts monitoring both the DELAY/WASH and the wiper mode circuits. When the multifunction switch is placed into the INT and AUTO positions, the rain sensor takes control of the mode circuit. In dry conditions the RSM keeps the mode circuit at the correct voltage for the OFF position. In the presence of moisture the RSM directs the mode circuit into individual low pulse, or continuous LOW or HIGH operation, based on the amount of moisture.

Low Washer Fluid Level Lamp/Indicator

The low washer fluid lamp/indicator feature is controlled by the FEM and instrument cluster. The low washer fluid switch is hardwired to the FEM. If fluid is low, the FEM will send a message via the standard corporate protocol (SCP) communication network to the instrument cluster. The instrument cluster will then process the message and output an audible and visual warning. If equipped with a message center, a warning message will be displayed. For additional information, refer to [Section 413-08](#).

Heated Wiper Park

The heated wiper park feature is controlled by the dual automatic temperature control (DATC) module. For additional information, refer to [Section 501-11](#).

Inspection and Verification

1. Verify the customer concern by operating the windshield wiper and washer system to duplicate the condition.
2. Visually inspect for the obvious signs of mechanical or electrical damage; refer to the following chart.

Visual Inspection Chart

Mechanical	Electrical
<ul style="list-style-type: none"> ● Wiper blade ● Binding wiper pivot arm ● Binding wiper mounting arm and pivot shaft ● Empty washer reservoir ● Washer hoses 	<ul style="list-style-type: none"> ● Underhood auxiliary junction box (AJB) <ul style="list-style-type: none"> Fuses: <ul style="list-style-type: none"> ■ 102 (10A) ■ 120 (30A) ● Battery junction box (BJB) Fuses: <ul style="list-style-type: none"> ■ 422 (20A) ■ 423 (30A) ■ 424 (30A) ■ 425 (40A) ■ 427 (30A) ■ 432 (30A) ● Central junction box (CJB) Fuse 205 (5A) ● Wiper motor ● Washer pump ● Connectors or connections ● Circuitry ● Multifunction switch ● Wire harness routing ● FEM ● Instrument cluster

3. If the fault is not visually evident, connect the diagnostic tool to the data link connector (DLC) located beneath the instrument panel and select the vehicle to be tested from the diagnostic tool menu. If the diagnostic tool does not communicate with the vehicle:
 - check that the program card is correctly installed.
 - check the connections to the vehicle.
 - check the ignition switch position.

4. If the diagnostic tool still does not communicate with the vehicle, refer to the diagnostic tool manual.
5. Carry out the DATA LINK DIAGNOSTICS test. If the diagnostic tool responds with:
 - CKT914, CKT915, or CKT70 = ALL ECUS NO RESP/NOT EQUIP, refer to [Section 418-00](#).
 - NO RESP/NOT EQUIP for FEM, go to Pinpoint Test A.
 - SYSTEM PASSED, retrieve and record the continuous diagnostic trouble codes (DTCs), erase the continuous DTCs and carry out the self-test diagnostics for the generic electronic module.
6. If the DTCs retrieved are related to the concern, go to FEM Diagnostic Trouble Code (DTC) Index to continue diagnostics.
7. If no DTCs related to the concern are retrieved, proceed to Symptom Chart.

FEM Diagnostic Trouble Code (DTC) Index

DTC	Description	Source	Action
B1319	Driver Door Ajar Circuit Failure	FEM	REFER to Section 417-02 .
B1327	Passenger Door Ajar Circuit Failure	FEM	REFER to Section 417-02 .
B1342	ECU Is Defective	FEM	CLEAR the DTC. REPEAT the FEM self-test. If DTC B1342 is retrieved, INSTALL a new FEM. REFER to Section 419-10 . CLEAR the DTCs. REPEAT the self-test.
B1438	Wiper Mode Select Switch Circuit Failure	FEM	GO to Pinpoint Test D .
B1446	Wiper Park Sense Circuit Failure	FEM	GO to Pinpoint Test B .
B1479	Wiper Washer Fluid Level Sensor Circuit Failure	FEM	REFER to Section 413-01 .
B1499	Lamp Turn Signal Left Circuit Failure	FEM	REFER to Section 417-01 .
B1501	Lamp Turn Signal Left Circuit Short to Battery	FEM	REFER to Section 417-01 .
B1503	Lamp Turn Signal Right Circuit Failure	FEM	REFER to Section 417-01 .
B1505	Lamp Turn Signal Right Circuit Short to Battery	FEM	REFER to Section 417-01 .
B1519	Hood Switch Circuit Failure	FEM	REFER to Section 419-01A.
B1567	Lamp Headlamp High-Beam Circuit Failure	FEM	REFER to Section 417-01 .
B1676	Battery Pack Voltage Out of Range	FEM	REFER to Section 414-00 .
B1794	Lamp Headlamp Low-Beam Circuit Failure	FEM	REFER to Section 417-01 .
B2214	Window Passenger Front Up Switch Short to Battery	FEM	REFER to Section 501-11 .

B2215	Window Passenger Front Down Switch Short to Battery	FEM	REFER to Section 501-11 .
B2312	Mirror Passenger Horizontal Feedback Potentiometer Circuit Failure	FEM	REFER to Section 501-09 .
B2316	Mirror Passenger Vertical Feedback Potentiometer Circuit Failure	FEM	REFER to Section 501-09 .
B2443	Powertrain Performance Mode Switch Circuit Failure	FEM	Not Used
B2477	Module Configuration Failure	FEM	REFER to Section 418-01 .
C1284	Oil Pressure Switch Failure	FEM	REFER to Section 413-01 .
C1446	Brake Switch Circuit Failure	FEM	REFER to Section 413-01 .
C1924	VAPS Solenoid Actuator Output Circuit Short to Ground	FEM	REFER to Section 211-00 .
C1925	VAPS Solenoid Actuator Return Circuit Failure	FEM	REFER to Section 211-00 .
U1027	SCP (J1850) Invalid or Missing Data for Engine RPM	PCM	CARRY OUT the PCM self-test. REFER to the Powertrain Control/Emissions Diagnosis (PC/ED) manual.
U1041	SCP (J1850) Invalid or Missing Data for Vehicle Speed	ABS	CARRY OUT the ABS self-test. REFER to Section 206-09A .
U1059	SCP (J1850) Invalid or Missing Data for Transmission / Transaxle / PRNDL	PCM	CARRY OUT the PCM self-test. REFER to the Powertrain Control/Emissions Diagnosis (PC/ED) manual.
U1218	SCP (J1850) Invalid or Missing Data for External Lamps	ICM	CARRY OUT the ICM self-test. REFER to Section 413-01 .
U1222	SCP (J1850) Invalid or Missing Data for Interior Lamps	ICM	CARRY OUT the ICM self-test. REFER to Section 413-01 .
U1227	SCP (J1850) Invalid or Missing Data for Body Status Request	ICM	CARRY OUT the ICM self-test. REFER to Section 413-01 .

FEM Parameter Identification (PID) Index

PID	Description	Expected Value
AL_EVT1	Last 8 Alarm Events	DROPEN, HOODTR, IGNTAM, PANIC, T_AJAR, RR_SD, LR_SD, P_DOOR, D_DOOR, RADIO, WINDO, ULTRS, NOEVNT, BB_SND
AL_EVT2	Last 8 Alarm Events	DROPEN, HOODTR, IGNTAM, PANIC, T_AJAR, RR_SD, LR_SD, P_DOOR, D_DOOR, RADIO, WINDO, ULTRS, NOEVNT, BB_SND
AL_EVT3	Last 8 Alarm Events	DROPEN, HOODTR, IGNTAM, PANIC, T_AJAR, RR_SD, LR_SD, P_DOOR, D_DOOR, RADIO, WINDO, ULTRS,

		NOEVNT, BB_SND
AL_EVT4	Last 8 Alarm Events	DROPEN, HOODTR, IGNTAM, PANIC, T_AJAR, RR_SD, LR_SD, P_DOOR, D_DOOR, RADIO, WINDO, ULTRS, NOEVNT, BB_SND
AL_EVT5	Last 8 Alarm Events	DROPEN, HOODTR, IGNTAM, PANIC, T_AJAR, RR_SD, LR_SD, P_DOOR, D_DOOR, RADIO, WINDO, ULTRS, NOEVNT, BB_SND
AL_EVT6	Last 8 Alarm Events	DROPEN, HOODTR, IGNTAM, PANIC, T_AJAR, RR_SD, LR_SD, P_DOOR, D_DOOR, RADIO, WINDO, ULTRS, NOEVNT, BB_SND
AL_EVT7	Last 8 Alarm Events	DROPEN, HOODTR, IGNTAM, PANIC, T_AJAR, RR_SD, LR_SD, P_DOOR, D_DOOR, RADIO, WINDO, ULTRS, NOEVNT, BB_SND
AL_EVT8	Last 8 Alarm Events	DROPEN, HOODTR, IGNTAM, PANIC, T_AJAR, RR_SD, LR_SD, P_DOOR, D_DOOR, RADIO, WINDO, ULTRS, NOEVNT, BB_SND
CCNT	Number Of Continuous DTCs In Module	one count per bit
D_DOOR	Left Front Door Ajar Switch	CLOSED, AJAR
FLUID_1	Brake Fluid Level Switch #1	OFF, ON
HOOD_SW	Hood Ajar Switch	CLOSED, AJAR
IGN_R	Ignition Switch -RUN Position	NO, YES
L_HIGH	Left High Beam Lamp Driver	Off---, Off-B-, On---, On-B-
L_LOW	Left Low Beam Lamp	Off---, Off-B-, On---, On-B-
LF_TURN	Left Front Turn Lamp	Off---, Off-B-, On---, On-B-
LMRKOUT	Left Front Marker Lamp	Off---, Off-B-, On---, On-B-
OILWRN	Oil Level Warning Lamp	Off---, On---
P_DN_SW	Passenger Down Activated	OFF, DOWN
P_DOOR	Passenger Door Ajar Switch	CLOSED, AJAR
P_UP_SW	Passenger Up Activated	OFF, UP
PRK_BRK	Parking Brake Switch Input	OFF, ON
PSMRPSH	Passenger Mirror Position Sensor (Left/Right)	#####
PSMRPSV	Passenger Mirror Position	#####
PSPWAMP	Power Window Passenger's Peak Motor Current	#####
PWM_DC1	PWM Duty Cycle #1	%
R_HIGH	Right High Beam Lamp Driver	Off---, Off-B-, On---, On-B-
R_LOW	Right Low Beam Lamp	Off---, Off-B-, On---, On-B-
RADIO_SW	Security Input Switch	OFF, ON

	Status	
RF_TURN	Right Front Turn Lamp	Off---, Off-B-, On---, On-B-
RMRKSTB	Right Front Marker Lamp	Off---, Off-B-, On---, On-B-
STLKOUT	Steering Column Lock Ground Output	OFF, ON
VBAT	Battery Voltage	Volts
WFLUID	Washer Fluid Level	LOW, OK
WPMODE	Wiper Control Mode Select	WASH, OPEN, INVLD, OFF, INTVL1, INTVL2, INTVL3, INTVL4, INTVL5, INTVL6, INTVL7, LOW, HIGH
WPPRKS	Windshield Wiper Park Sense	notPRK, PARKED

FEM Active Command Index

Active Command	Display	Action
BACKLIGHTING INTENSITY CONTROL COMMAND	ILLUM	%
BRAKE SYSTEM CONTROL COMMAND	SHFT LOCK	OFF, ON
EXTERIOR LAMP CONTROL	PARKLAMPS	OFF, ON
FRONT WINDOW CONTROL	RR UP	OFF, ON
FRONT WINDOW CONTROL	PR DOWN	OFF, ON
FRONT WINDSHIELD WIPER/WASHER	SPEED RLY	OFF, ON
FRONT WINDSHIELD WIPER/WASHER	WASH RLY	OFF, ON
FRONT WINDSHIELD WIPER/WASHER	WIPER RLY	OFF, ON
HEAD/CORNERING LAMP CONTROL	HIGH BEAM	OFF, ON
HEAD/CORNERING LAMP CONTROL	LOW BEAM	OFF, ON
INDICATOR LAMP CONTROL	NON MIL	OFF, ON
LAMP CONTROL COMMAND	HDLMPWSH	OFF, ON
POWER MIRROR CONTROL	PR DOWN	OFF, ON
POWER MIRROR CONTROL	PR LEFT	OFF, ON
POWER MIRROR CONTROL	PR RIGHT	OFF, ON
POWER MIRROR CONTROL	PR UP	OFF, ON
STEERING COLUMN CONTROL COMMAND	LOCK_GND	OFF, ON
TURN SIGNAL AND MARKER LAMPS	HAZARD	OFF, ON
VAPS II OUTPUT PULSE CONTROL	VAPSIIOUT	%

SSP Relay Index

Relay	Fuse	Controlled System(s)
SSP1	BJB Fuse 427 (30A)	<ul style="list-style-type: none"> ● Driver power door lock (FEM) ● LH high beam headlamps (FEM) ● RF park/turn/side marker lamps (FEM)

		<ul style="list-style-type: none"> ● RH low beam headlamp ● Driver exterior rear view mirror ● LF park/turn/side marker lamps (FEM)
SSP2	BJB Fuse 432 (30A)	<ul style="list-style-type: none"> ● LH low beam headlamp (FEM) ● RH high beam headlamps (FEM) ● Passenger exterior rear view mirror (FEM) ● Switch illumination backlighting
SSP3	BJB Fuse 424 (30A)	<ul style="list-style-type: none"> ● High mounted stoplamp (REM) ● RR park/stoplamps (REM) ● Reversing lamps (REM) ● LR turn signals (REM) ● Interior courtesy and demand lighting (FEM)
SSP4	BJB Fuse 423 (30A)	<ul style="list-style-type: none"> ● LR park/stoplamps (REM) ● RR turn signals (REM) ● All passenger door locks (REM) ● License lamps ● Luggage compartment release solenoid/switch ● Fuel door release solenoid/switch ● Luggage compartment lamp

When diagnosing an SSP relay, check that all systems for that relay are inoperative. REFER to [Section 417-01](#).

Symptom Chart

Symptom Chart

Condition	Possible Sources	Action
<ul style="list-style-type: none"> ● No communication with the front electronic module (FEM) 	<ul style="list-style-type: none"> ● BJB Fuses 425 (40A) and 422 (20A). ● Front electronic module (FEM). 	<ul style="list-style-type: none"> ● GO to Pinpoint Test A.
<ul style="list-style-type: none"> ● The wipers are inoperative 	<ul style="list-style-type: none"> ● Underhood AJB Fuse 120 (30A). ● CJB Fuse 226 (3A). ● Windshield wiper relay. ● Wiper park relay. ● Wiper high/low relay. ● Multifunction switch. ● Circuitry. ● Wiper motor. ● FEM. ● Rain sensor module (If equipped). 	<ul style="list-style-type: none"> ● GO to Pinpoint Test B.
<ul style="list-style-type: none"> ● The wipers stay on continuously 	<ul style="list-style-type: none"> ● Wiper park relay. ● Wiper high/low relay. ● Multifunction switch. ● Circuitry. ● Wiper motor. ● FEM. ● Rain sensor module (If equipped). 	<ul style="list-style-type: none"> ● GO to Pinpoint Test C.
<ul style="list-style-type: none"> ● The high/low wiper speeds do not operate correctly 	<ul style="list-style-type: none"> ● Wiper high/low relay. ● Multifunction switch. ● Circuitry. 	<ul style="list-style-type: none"> ● GO to Pinpoint Test D.



	<ul style="list-style-type: none"> ● FEM. ● Rain sensor module (If equipped). 	
<ul style="list-style-type: none"> ● The wash and wipe function does not operate correctly 	<ul style="list-style-type: none"> ● Multifunction switch. ● Circuitry. ● FEM ● Rain sensor module (If equipped). 	<ul style="list-style-type: none"> ● GO to Pinpoint Test E.
<ul style="list-style-type: none"> ● The washer pump is inoperative/on continuously 	<ul style="list-style-type: none"> ● Underhood AJB Fuse 102 (10A). ● Washer pump relay. ● Circuitry. ● Pump motor. ● FEM. 	<ul style="list-style-type: none"> ● GO to Pinpoint Test F.
<ul style="list-style-type: none"> ● The speed dependent interval mode does not operate correctly 	<ul style="list-style-type: none"> ● Wiper park relay. ● Multifunction switch. ● Circuitry. ● Wiper motor. ● FEM. ● Rain sensor module (If equipped). 	<ul style="list-style-type: none"> ● GO to Pinpoint Test G.
<ul style="list-style-type: none"> ● The low washer fluid indicator does not operate correctly 	<ul style="list-style-type: none"> ● Multifunction switch. ● Circuitry. ● FEM. 	<ul style="list-style-type: none"> ● REFER to Section 413-01.
<ul style="list-style-type: none"> ● The rain moisture sensitive function does not operate correctly 	<ul style="list-style-type: none"> ● CJB Fuse 216 (5A). ● Multifunction switch. ● Circuitry. ● Rain sensor module. 	<ul style="list-style-type: none"> ● GO to Pinpoint Test H.

Pinpoint Tests



CAUTION: Electronic modules are sensitive to electrical charges. If exposed to these charges, damage may result.

PINPOINT TEST A: NO COMMUNICATION WITH THE FRONT ELECTRONIC MODULE (FEM)

CONDITIONS	DETAILS/RESULTS/ACTIONS
A1 CHECK CIRCUITS 29-DK20 (OG/GN) AND 29S-DK22 (OG/YE) FOR VOLTAGE	
NOTE: Cycle ignition switch from OFF to RUN to enable the switched system power feature.	
<p>1</p>  <p>2</p>  <p>FEM C201c</p>	

3

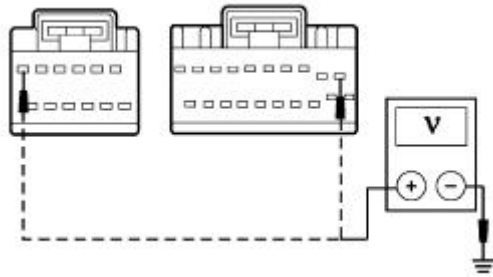


FEM C201f

4



5



A0006297

5

Measure the voltage between FEM C201c pin 6, circuit 29-DK20 (OG/GN), harness side and ground; and between FEM C201f pin 1, circuit 29S-DK22 (OG/YE) harness side and ground.

• Are the voltages greater than 10 volts?

→ **Yes**
GO to [A2](#).

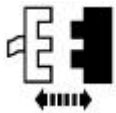
→ **No**
REPAIR the circuit(s) in question. TEST the system for normal operation.

A2 CHECK CIRCUITS 31-DK20 (BK/RD), 31-DK20A (BK/RD), 31-DK20B (BK/RD), 31-DK20C (BK/RD) AND 31-DK20D (BK/RD) FOR OPENS

1



2



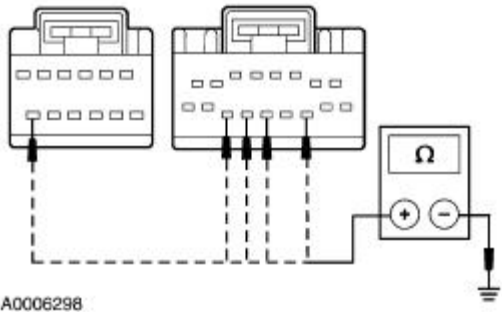
FEM C201a

3

3

Using the following table, measure the resistance between FEM connectors, harness side and ground:

FEM	Pin	Circuit
C201c	12	31-DK20 (BK/RD)
C201a	11	31-DK20A (BK/RD)
C201a	13	31-DK20B (BK/RD)
C201a	14	31-DK20C (BK/RD)





C201a | 15 | 31-DK20D (BK/RD)

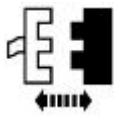
● Is the resistance less than 5 ohms?

→ **Yes**
REFER to [Section 418-00](#).

→ **No**
REPAIR the circuit(s) in question. TEST the system for normal operation.

PINPOINT TEST B: THE WIPERS ARE INOPERATIVE

CONDITIONS	DETAILS/RESULTS/ACTIONS
B1 CHECK THE FEM PID WPMODE	
<p>1</p> 	<p>2</p> <p>Monitor the FEM PID WPMODE, while activating the multifunction switch to the OFF, Low, High, Pulse, Intermittent, and Positions 1 through 7.</p> <p>● Do the FEM PID WPMODE values agree with the multifunction switch position?</p> <p>→ Yes GO to B10.</p> <p>→ No If equipped with rain sensor module, GO to B2. Otherwise GO to B3.</p>
B2 CHECK THE RAIN SENSOR MODULE	
<p>1</p>  <p>2</p>	



Rain Sensor Module C914 (If equipped)

3



4 Monitor the FEM PID WPMODE, while activating the multifunction switch to the OFF, Low, Medium, High, Pulse, intermittent, and positions 1 through 7.

- Do the wiper FEM PID WPMODE values agree with the multifunction switch?

→ Yes
INSTALL a new rain sensor module. REFER to [Module—Rain Sensor](#) in this section. TEST the system for normal operation.

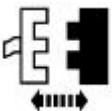
→ No
GO to [B3](#).

B3 CHECK THE MULTIFUNCTION SWITCH OPERATION

1



2



Multifunction Switch C202

3 Carry out the multifunction switch component test. Refer to Wiring Diagrams Section 700–09.

- Is the multifunction switch OK?

→ Yes
GO to [B4](#).

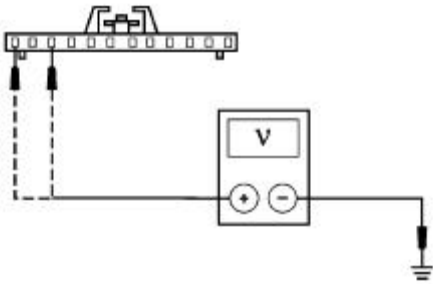
→ No
INSTALL a new multifunction switch. REFER to [Section 211-05](#). TEST the system for normal operation.

B4 CHECK VOLTAGE TO THE MULTIFUNCTION SWITCH

1



2



A0006307

2

Measure the voltage between multifunction switch C202 pin1, circuit (OG/GN) harness side and ground; and between multifunction switch C202 pin 3, circuit (BU/WH), harness side and ground.

• Are the voltages greater than 10 volts?

→ Yes
GO to [B5](#).

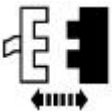
→ No
GO to [B8](#).

B5 CHECK THE MULTIFUNCTION SWITCH FOR SHORT TO POWER

1



2

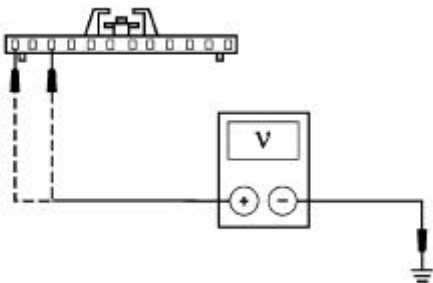


FEM C201f

3



4



A0006307

4

Measure the voltage between multifunction switch C202 pin1, circuit (OG/GN) harness side and ground; and between multifunction switch C202 pin 3, circuit (BU/WH), harness side and ground.

• Are the voltages greater than 10 volts?

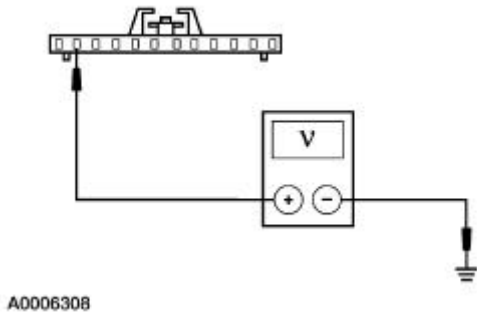
→ **Yes**

REPAIR the circuit(s) in question. TEST the system for normal operation.

→ **No**
GO to [B6](#).

B6 CHECK CIRCUIT 7-KA19 (YE/BK) FOR SHORT TO POWER

1



1

Measure the voltage between multifunction switch C202 pin 2, circuit (BN/WH), harness side and ground.

● **Is the voltage greater than 10 volts?**

→ **Yes**
REPAIR the circuit. TEST the system for normal operation.

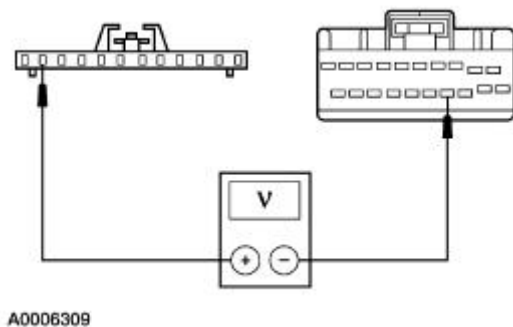
→ **No**
GO to [B7](#).

B7 CHECK CIRCUIT 7-KA19 (YE/BK) AND CIRCUIT 7-KA1 (YE/RD) FOR AN OPEN

1



2



2

Measure the resistance between multifunction switch C202 pin 2, circuit (BN/WH), harness side and FEM C201f pin 14, circuit 7-KA1 (YE/RD), harness side.

● **Is the resistance less than 5 ohms?**

→ **Yes**
INSTALL a new FEM. REFER to [Section 419-10](#). TEST the system for normal operation.

→ **No**
REPAIR the circuit(s) in question. TEST the system for normal operation.

B8 CHECK CIRCUITS 7-KA1 (YE/BK), 8-KA2 (WH/RD) AND 10-KA3 (GY/VT) FOR OPENS

1



2



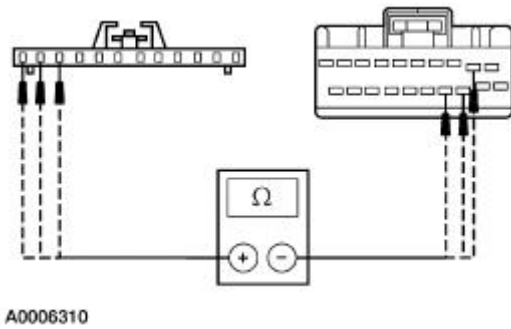
FEM C201f

3



Multifunction Switch C202

4



4 Using the following table measure the resistance between multifunction switch C202 harness side and FEM C201f harness side:

Multifunction Switch C202	FEM C201f
pin 1, circuit (OG/GN)	pin 2, circuit 8-KA2 (WH/RD)
pin 2, circuit (BN/WH)	pin 14, circuit 7-KA1 (YE/BK)
pin 3, circuit (BU/WH)	pin 13, circuit 10-KA3 (GY/VT)

● Is the resistance less than 5 ohms?

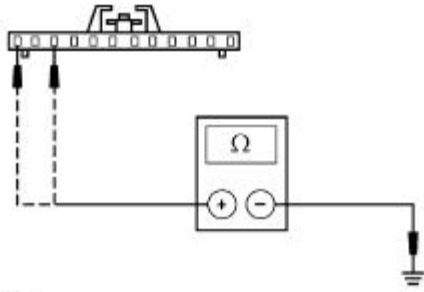
→ **Yes**
GO to [B9](#).

→ **No**
REPAIR the circuit(s) in question. TEST the system for normal operation.

B9 CHECK WIPER DELAY AND WIPER MODE CIRCUITS FOR SHORTS TO GROUND

1

1 Measure the resistance between multifunction switch C202 pin 1, (OG/GN) harness side and ground; and between multifunction switch C202 pin 3, (BU/WH) harness side and ground.



A0006315

- Is the resistance greater than 10,000 ohms?

→ **Yes**

INSTALL a new FEM. REFER to [Section 419-10](#). CLEAR the DTCs. REPEAT the self-test.

→ **No**

REPAIR the circuit(s) in question. CLEAR the DTCs. REPEAT the self-test.

B10 CHECK CIRCUIT 91S-KA39 (BN/YE) FOR VOLTAGE

1



2

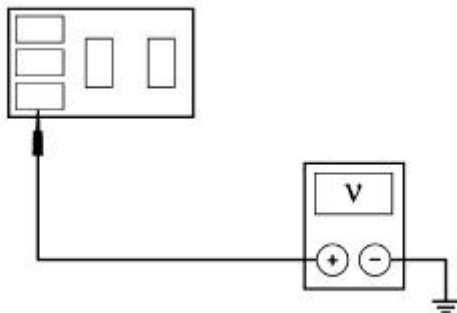


Underhood AJB Wiper Park Relay

3



4



A0003784

- 4 Measure the voltage between wiper park relay C1002 pin 2, Circuit 91S-KA39 (BN/YE), harness side and ground.

- Is the voltage greater than 10 volts?

→ **Yes**

GO to [B11](#).

→ **No**
GO to [B12](#).

B11 CHECK CIRCUIT 91S-KA39 (BN/YE) FOR SHORT TO POWER

1



2

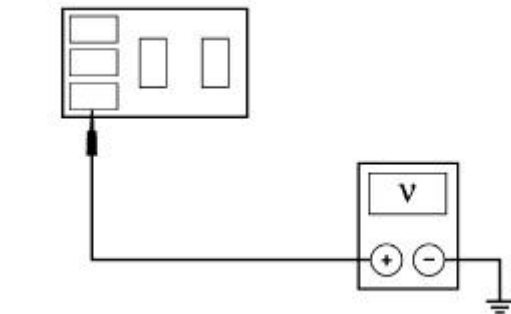


FEM C201b

3



4



A0003784

4 Measure the voltage between wiper park relay C1002 Pin 2, Circuit 91S-KA39 (BN/YE), harness side and ground.

● Is the voltage greater than 10 volts?

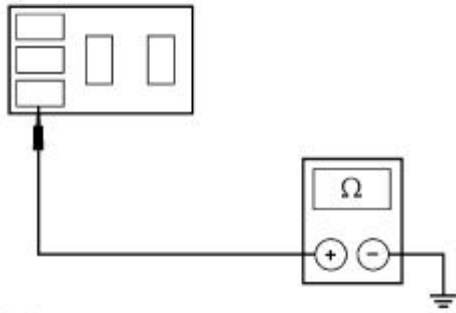
→ **Yes**
REPAIR the circuit. TEST the system for normal operation.

→ **No**
INSTALL a new FEM. REFER to [Section 419-10](#). TEST the system for normal operation.

B12 ACTIVATE WIPER PARK RELAY COMMAND AND TEST FOR GROUNDING FROM FEM

1

1 Trigger the FEM active command WIPER RLY to ON, while measuring the resistance between wiper park relay C1002 Pin 2, Circuit 91S-KA39 (BN/YE), harness side and ground.



A0003785

● Is the resistance less than 5 ohms?

→ **Yes**
GO to [B14](#).

→ **No**
GO to [B13](#).

B13 CHECK CIRCUIT 91S-KA39 (BN/YE) FOR AN OPEN

1

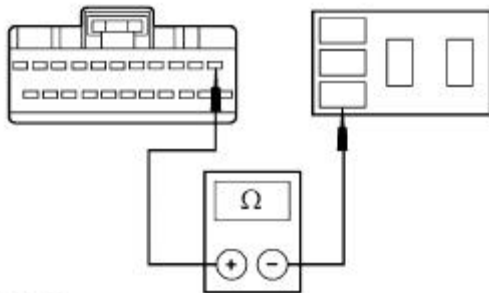


2



FEM C201b

3



A0003786

3 Measure the resistance between wiper park relay C1002 Pin 2, Circuit 91S-KA39 (BN/YE), harness side and FEM C201b Pin 1, Circuit 91S-KA39 (BN/YE), harness side.

● Is the resistance less than 5 ohms?

→ **Yes**
INSTALL a new FEM. REFER to [Section 419-10](#). TEST the system for normal operation.

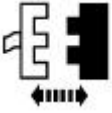
→ **No**
REPAIR the circuit. TEST the system for normal operation.

B14 CHECK UNDERHOOD AJB FUSE 120 (30A) FOR VOLTAGE

1



2

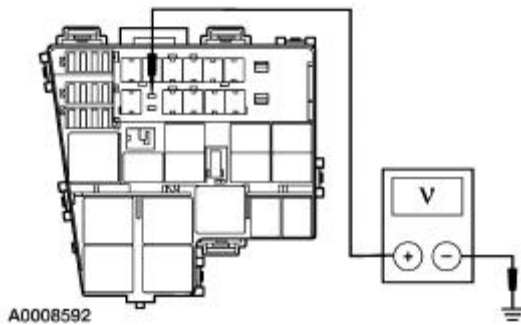


Underhood AJB Fuse 120 (30A)

3



4



4 Measure the voltage between underhood AJB Fuse 120 (30 A) input side and ground.

• Is the voltage greater than 10 volts?

→ **Yes**
GO to [B15](#).

→ **No**
REPAIR the power source. TEST the system for normal operation.

B15 CHECK BETWEEN UNDERHOOD AJB FUSE 120 (30A) AND WIPER PARK RELAY FOR OPENS

1



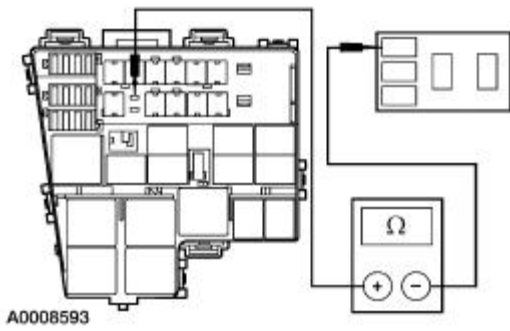
2



Underhood AJB Wiper Park Relay

3

3 Measure the resistance between underhood AJB Fuse 120 (30A), input side, and wiper park relay C1002 Pin 1.



● Is the resistance less than 5 ohms?

→ **Yes**
 INSTALL a new underhood AJB Fuse 120 (30A), GO to [B16](#).

→ **No**
 INSTALL a new underhood AJB. TEST the system for normal operation.

B16 CHECK CIRCUIT 75-KA39 (YE/BK) FOR VOLTAGE

1

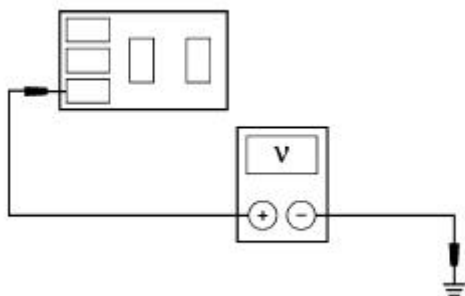


Windshield Wiper Relay C1009

2



3



3 Measure the voltage between windshield wiper relay C1009 pin 2, circuit 75-KA39 (YE/BK) and ground.

● Is the voltage greater than 10 volts?

→ **Yes**
 GO to [B20](#).

→ **No**
 GO to [B17](#).

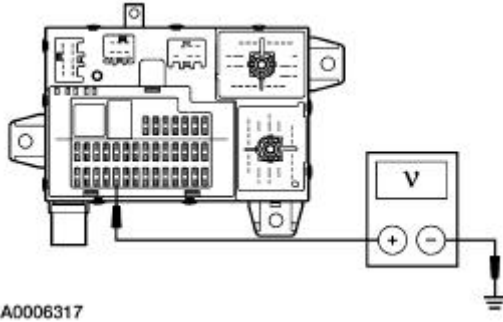
B17 CHECK CIRCUIT 75-DD1 (YE) FOR VOLTAGE

1



CJB Fuse 226 (3A)

2



2

Measure the voltage between CJB fuse 226 (3A) input side and ground.

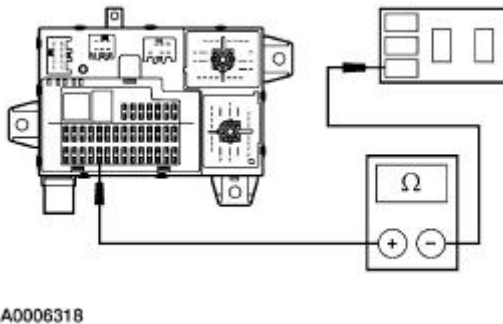
• Is the voltage greater than 10 volts?

→ **Yes**
GO to [B18](#).

→ **No**
GO to [B19](#).

B18 CHECK CIRCUIT 75-KA39 (YE/BK) FOR OPENS

1



1

Measure the resistance between windshield wiper relay C1009 pin 3, circuit 75-KA39 (YE/BK), and CJB fuse 226 (3A), circuit 75-KA39 (YE/BK) output side.

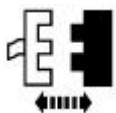
• Is the resistance less than 5 ohms?

→ **Yes**
INSTALL a new AJB. TEST the system for normal operation.

→ **No**
REPAIR the circuit. TEST the system for normal operation.

B19 CHECK CIRCUIT 75-DD1 (YE) FOR OPENS

1

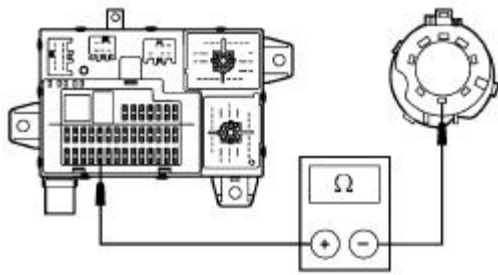


Ignition Switch C250

2

2

Measure the resistance between ignition



A0008595

switch C250 pin 4, circuit 75-DD1 (YE), harness side and CJB fuse 226 (3A), circuit 75-DD1 (YE) input side.

● Is the resistance less than 5 ohms?

→ **Yes**
INSTALL a new CJB. TEST the system for normal operation.

→ **No**
REPAIR the circuit. TEST the system for normal operation.

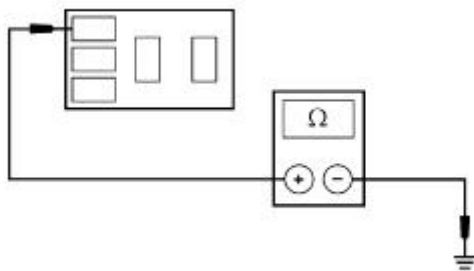
B20 CHECK CIRCUIT 31-KA39 (BK/RD) FOR OPENS

1



Windshield Wiper Relay C1009

2



A0006326

2

Measure the resistance between windshield wiper relay C1009 pin 1, circuit 31-KA39 (BK/RD), harness side and ground.

● Is the resistance less than 5 ohms?

→ **Yes**
GO to [B21](#).

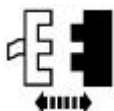
→ **No**
REPAIR the circuit. TEST the system for normal operation.

B21 CHECK WIPER PARK AND WIPER HIGH/LOW RELAYS

1



2



Underhood AJB Wiper High/Low Relay C1001

3 Carry out the wiper park and wiper high/low relay component tests. Refer to the Wiring Diagrams Section 700–09.

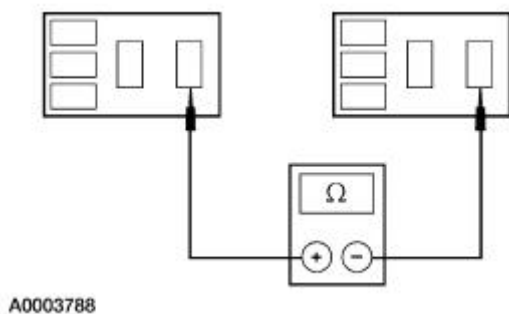
- Are the wiper park and wiper high/low relays OK?

→ **Yes**
GO to [B22](#).

→ **No**
INSTALL a new relay(s) as necessary.
TEST the system for normal operation.

B22 CHECK CIRCUIT 75S-KA12 (YE/VT) FOR OPENS

1



1 Measure the resistance between wiper park relay C1002 pin 3, circuit 75S-KA12 (YE/VT), harness side and wiper high/low relay C1001 pin 3, circuit 75S-KA12 (YE/VT), harness side.

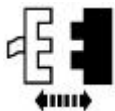
- Is the resistance less than 5 ohms?

→ **Yes**
GO to [B23](#).

→ **No**
REPAIR the circuit. TEST the system for normal operation.

B23 CHECK AJB FOR OPENS

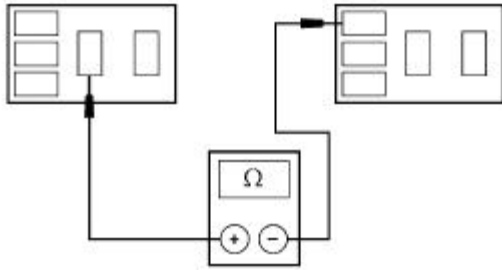
1



Wiper Run/Park Relay C1002

2

2 Measure the resistance between wiper run/park relay C1002 pin 1, harness side and wiper run/park relay C1002 pin 5, harness side



A0006320

● Is the resistance less than 5 ohms?

→ **Yes**
GO to [B24](#).

→ **No**
INSTALL a new AJB. TEST the system for normal operation.

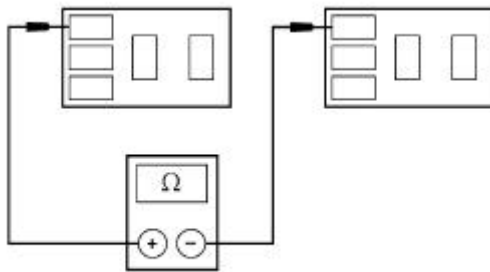
B24 CHECK AJB BETWEEN WIPER PARK AND WIPER HIGH/LOW RELAYS FOR OPENS

1



Wiper Run/Park Relay C1002

2



A0006321

2 Measure the resistance between wiper run/park relay C1002 pin 1, harness side and wiper high/low relay C1001 pin 1, harness side

● Is the resistance less than 5 ohms?

→ **Yes**
GO to [B25](#).

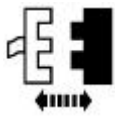
→ **No**
INSTALL a new AJB. TEST the system for normal operation.

B25 CHECK CIRCUIT 31S-KA12 (BK/WH) FOR VOLTAGE

1



2

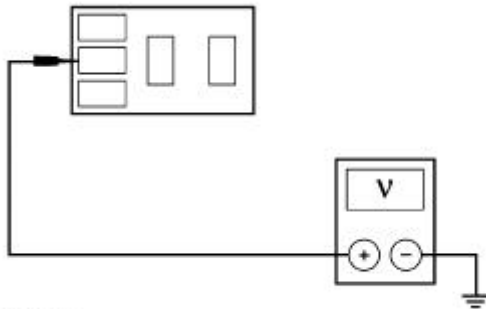


Wiper Motor C125

3



4



A0003790

4 Measure the voltage between wiper park relay C1002 Pin 4, Circuit 31S-KA12 (BK/WH), harness side and ground.

• Is the voltage greater than 10 volts?

→ Yes
GO to [B26](#).

→ No
GO to [B27](#).

B26 CHECK CIRCUITS 31S-KA12 (BK/WH), 31S-KA1 (BK/YE), AND 31S-KA8 (BK/BU) FOR SHORTS TO POWER

1



2



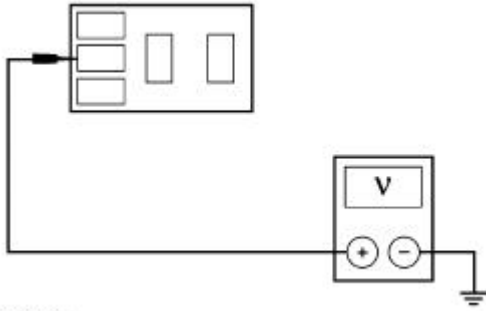
FEM C201b

3



4

4 Measure the voltage between wiper park relay C1002 Pin 4, Circuit 31S-KA12 (BK/WH), harness side and ground.



A0003790

● Is the voltage greater than 10 volts?

→ **Yes**
REPAIR the circuit(s) in question. CLEAR the DTCs. REPEAT the self-test.

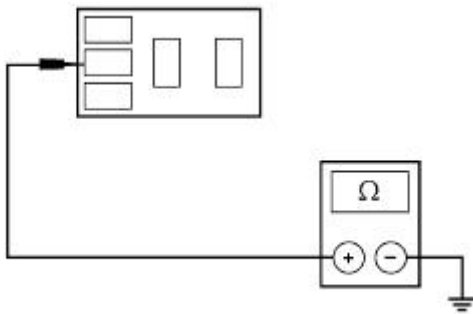
→ **No**
INSTALL a new FEM. REFER to [Section 419-10](#). TEST the system for normal operation.

B27 CHECK CIRCUIT 31S-KA12 (BK/WH) FOR CONTINUITY

1



2



A0003791

2 Measure the resistance between wiper park relay C1002 Pin 4, Circuit 31S-KA12 (BK/WH), harness side and ground.

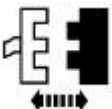
● Is the resistance greater than 10,000 ohms?

→ **Yes**
GO to [B29](#).

→ **No**
GO to [B28](#).

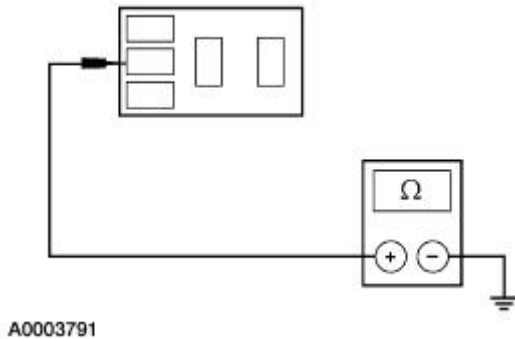
B28 CHECK CIRCUIT 31S-KA12 (BK/WH), 31S-KA1 (BK/YE) AND 31S-KA8 (BK/BU) FOR SHORTS TO GROUND

1



FEM C201b

2



2

Measure the resistance between wiper park relay C1002 Pin 4, Circuit 31S-KA12 (BK/WH), harness side and ground.

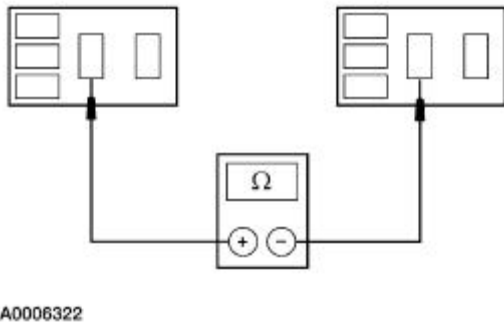
● Is the resistance greater than 10,000 ohms?

→ **Yes**
INSTALL a new FEM. REFER to [Section 419-10](#). TEST the system for normal operation.

→ **No**
REPAIR Circuit 31S-KA12 (BK/WH), Circuit 31S-KA1 (BK/YE) or Circuit 31S-KA8 (BK/BU). CLEAR the DTCs. REPEAT the self-test.

B29 CHECK CIRCUIT 75S-KA2 (YE/RD) BETWEEN WIPER RUN/PARK AND WINDSHIELD WIPER RELAYS FOR OPENS

1



1

Measure the resistance between wiper run/park relay C1002 pin 5, circuit 75S-KA2 (YE/RD) harness side and windshield wiper relay C1009 pin 5, circuit 75S-KA1 (YE/BK) harness side.

● Is the resistance less than 5 ohms?

→ **Yes**
GO to [B30](#).

→ **No**
REPAIR the circuit(s) in question. TEST the system for normal operation.

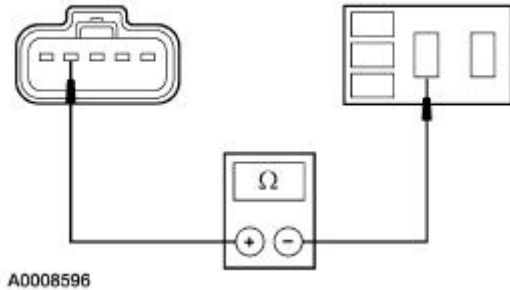
B30 CHECK CIRCUITS 75S-KA2 (YE/RD) AND 30-KA9 (RD/OG) BETWEEN WIPER MOTOR AND WINDSHIELD WIPER RELAYS FOR OPENS

1



Wiper Motor C125

2



2

Measure the resistance between wiper run/park relay C1002 pin 5, circuit 75S-KA2 (YE/RD), harness side and windshield wiper motor C125 pin 4, circuit 30-KA9 (RD/OG), harness side.

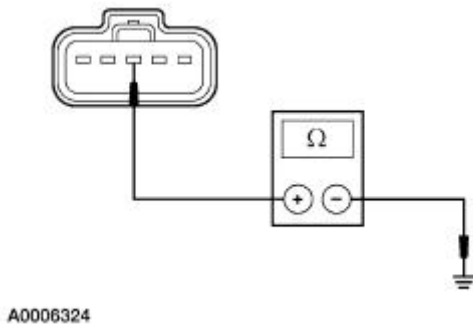
● Is the resistance less than 5 ohms?

→ **Yes**
GO to [B31](#).

→ **No**
REPAIR the circuit(s) in question. TEST the system for normal operation.

B31 CHECK CIRCUIT 31-KA9 (BK) FOR OPENS

1



1



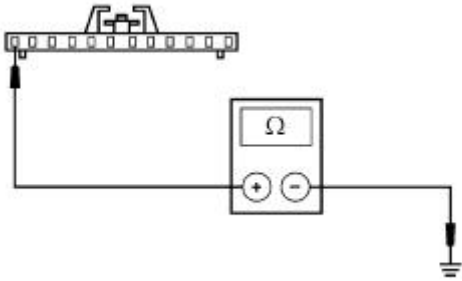
Measure the resistance between wiper motor C125 Pin 3, Circuit 31-KA9 (BK), harness side and ground.

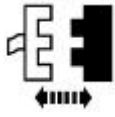
● Is the resistance less than 5 ohms?

→ **Yes**
CHECK the wiper motor; REFER to Component Test in this section. If the wiper motor does not pass the test, INSTALL a new wiper motor, REFER to [Windshield Wiper Motor](#) in this section. TEST the system for normal operation.

→ **No**
REPAIR the circuit. TEST the system for normal operation.

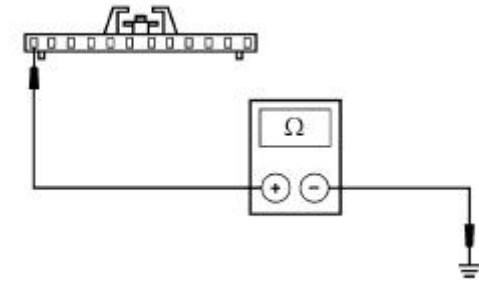
PINPOINT TEST C: THE WIPERS STAY ON CONTINUOUSLY

CONDITIONS	DETAILS/RESULTS/ACTIONS
C1 CHECK THE MULTIFUNCTION SWITCH OPERATION	
<p>1 </p> <p>2 </p> <p>Multifunction Switch C202</p>	<p>3 Carry out the multifunction switch component test. Refer to Wiring Diagrams Section 700–09.</p> <ul style="list-style-type: none"> ● Is the multifunction switch OK? <p>→ Yes GO to C2.</p> <p>→ No INSTALL a new multifunction switch. REFER to Section 211-05. TEST the system for normal operation.</p>
C2 CHECK CIRCUIT 8–KA41 (WH/GN), 8–KA19 (WH/BK) AND 8–KA2 (WH/RD) FOR SHORTS TO GROUND	
<p>1 </p> <p>A0006327</p>	<p>1 Measure the resistance between multifunction switch C202 pin 1, (OG/GN), harness side and ground.</p> <ul style="list-style-type: none"> ● Is the resistance greater than 10,000 ohms? <p>→ Yes GO to C5.</p> <p>→ No If equipped with moisture sensitive wipers GO to C3. All others GO to C4.</p>
C3 CHECK FOR A FAULTY RAIN SENSOR MODULE	
<p>1</p>	



Rain Sensor Module C914

2



A0006327

2

Measure the resistance between multifunction switch C202 pin 1, (OG/GN), harness side and ground.

● Is the resistance greater than 10,000 ohms?

→ **Yes**
INSTALL a new rain sensor module. REFER to [Module—Rain Sensor](#) in this section.

→ **No**
GO to [C4](#).

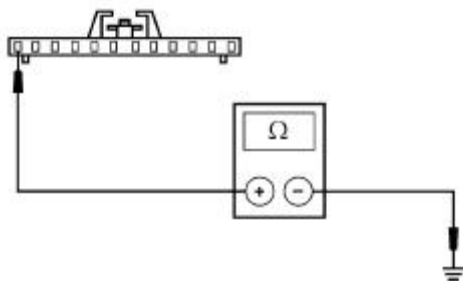
C4 CHECK CIRCUITS 8-KA2 (WH/RD), 8-KA19 (WH/BK) AND 8-KA41 (WH/GN) FOR SHORTS TO GROUND

1



FEM C201f

2



A0006327

2

Measure the resistance between multifunction switch C202 pin 1, (OG/GN), harness side and ground.

● Is the resistance greater than 10,000 ohms?

→ **Yes**
INSTALL a new FEM. REFER to [Section 419-10](#). TEST the system for normal operation.

→ **No**
REPAIR circuit(s) in question. TEST the system for normal operation.

C5 CHECK WIPER PARK AND WIPER HIGH/LOW RELAYS

- 1 Remove the AJB wiper park and wiper high/low relays.
- 2 Carry out the relay component test. Refer to Wiring Diagrams Section 700–09.

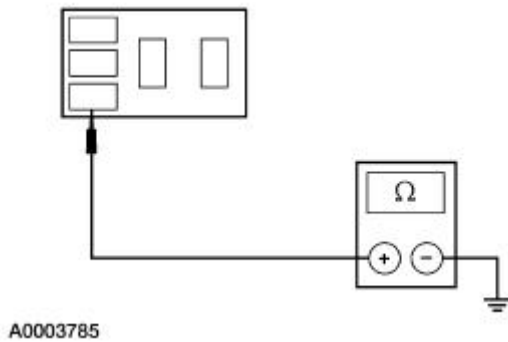
● **Are both relays OK?**

→ **Yes**
GO to [C6](#).

→ **No**
INSTALL a new relay(s). TEST the system for normal operation.

C6 CHECK CIRCUIT 91S-KA39 (BN/YE) FOR CONTINUITY

1



- 1 Measure the resistance between wiper park relay C1002 Pin 2, Circuit 91S-KA39 (BN/YE), harness side and ground.

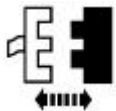
● **Is the resistance greater than 10,000 ohms?**

→ **Yes**
GO to [C8](#).

→ **No**
GO to [C7](#).

C7 CHECK CIRCUIT 91S-KA39 (BN/YE) FOR SHORTS TO GROUND

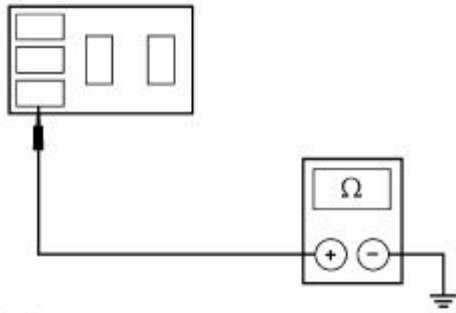
1



FEM C201b

2

- 2 Measure the resistance between wiper park relay C1002 Pin 2, Circuit 91S-KA39 (BN/YE), harness side and ground.



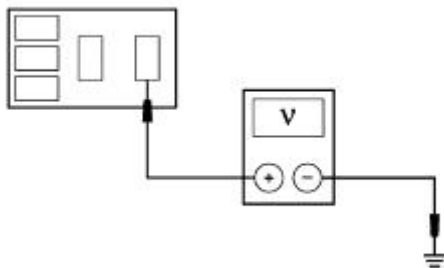
A0003785

- Is the resistance greater than 10,000 ohms?

- **Yes**
INSTALL a new FEM. REFER to [Section 419-10](#). TEST the system for normal operation.
- **No**
REPAIR the circuit. TEST the system for normal operation.

C8 CHECK CIRCUIT 75S-KA12 (YE/VT) FOR SHORTS TO BATTERY

1



A0006325

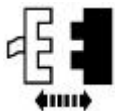
- 1 Measure the voltage between wiper park relay C1002 pin 3, circuit 75S-KA12 (YE/VT) and ground.

- Is the voltage greater than 10 volts?

- **Yes**
REPAIR the circuit. TEST the system for normal operation.
- **No**
GO to [C9](#).

C9 CHECK CIRCUIT 75S-KA11 (YE/BK) AND CIRCUIT 75S-KA10 (YE/GN) FOR SHORT TO BATTERY

1

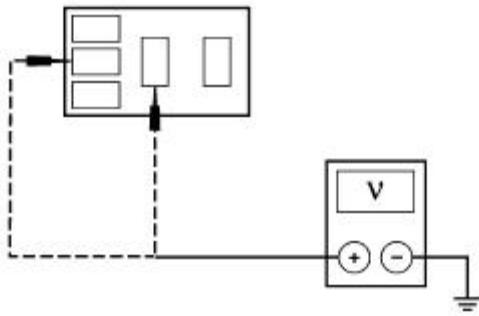


Wiper Motor C125

2



3



A0003793

3

Measure the voltage between wiper high/low relay C1001 pin 4, circuit 75S-KA10 (YE/GN), harness side and ground; and between wiper high/low relay C1001 pin 5, circuit 75S-KA11 (YE/BK), harness side and ground.

• Is the voltage greater than 10 volts?


→ **Yes**

REPAIR circuit(s) in question. TEST the system for normal operation.

→ **No**

INSTALL a new FEM. REFER to [Section 419-10](#). TEST the system for normal operation.

PINPOINT TEST D: THE HIGH/LOW WIPER SPEEDS DO NOT OPERATE CORRECTLY

CONDITIONS	DETAILS/RESULTS/ACTIONS
D1 CHECK THE FEM PID WPMODE	
	<p>1 Monitor the FEM PID WPMODE, while activating the multifunction switch to the high and low positions.</p> <p>• Do the FEM PID WPMODE values agree with the multifunction switch positions?</p> <p>→ Yes GO to D2.</p> <p>→ No GO to D3.</p>
D2 ACTIVATE THE FRONT WINDSHIELD WIPER/WASHER COMMAND	
<p>1</p> 	<p>2 Trigger the FEM active command</p>

SPEED RLY to the LOW and HIGH speeds.

- **Do the wipers work in LOW and HIGH?**

→ **Yes**
INSTALL a new FEM. REFER to [Section 419-10](#). TEST the system for normal operation.

→ **No**
GO to [D6](#).

D3 CHECK THE MULTIFUNCTION SWITCH OPERATION

1



2



Multifunction Switch C202

3 Carry out the multifunction switch component test. Refer to Wiring Diagrams Section 700–09.

- **Is the multifunction switch OK?**

→ **Yes**
If equipped with moisture sensitive wipers. GO to [D4](#).

All others GO to [D5](#).

→ **No**
INSTALL a new multifunction switch. REFER to [Section 211-05](#). TEST the system for normal operation.

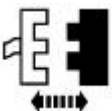
D4 CHECK RAIN SENSOR MODULE

1



Multifunction Switch C202

2



Rain Sensor Module C914

3



4



4

Monitor the FEM PID WPMODE while activating the multifunction switch to the high and low positions.

- Does the FEM PID WPMODES agree with the multifunction switch positions?

→ Yes

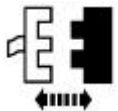
INSTALL a new rain sensor module. REFER to [Module—Rain Sensor](#) in this section. TEST the system for normal operation.

→ No

GO to [D5](#).

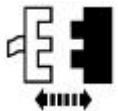
D5 CHECK CIRCUITS 8-KA2 (WH/RD), 8-KA19 (WH/GN) AND 8-KA41 (WH/GN) FOR SHORTS TO GROUND

1



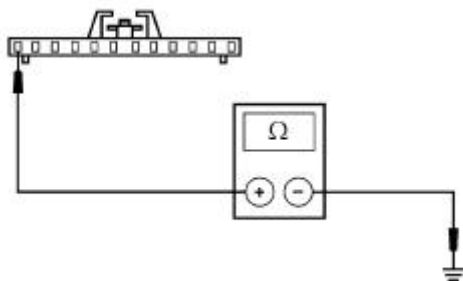
FEM C201f

2



Multifunction Switch C202

3



A0006327

3

Measure the resistance between multifunction switch C202 pin 1, circuit (OG/GN), harness side and ground.

- Is the resistance greater than 10,000 ohms?

→ Yes

INSTALL a new FEM. REFER to [Section 419-10](#). TEST the system for normal operation.

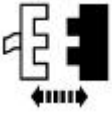
→ **No**
REPAIR circuit(s) in question. TEST the system for normal operation.

D6 CHECK WIPER HIGH/LOW RELAY PIN 2 FOR VOLTAGE

1



2

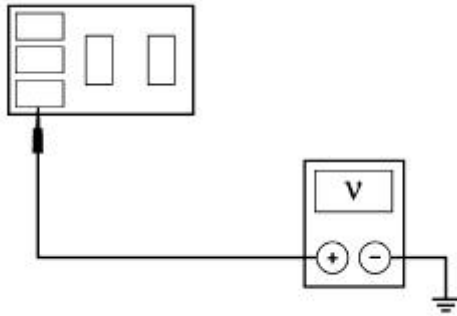


Underhood AJB Wiper HIGH/LOW Relay

3



4



A0003784

4 Measure the voltage between wiper high/low relay C1001 pin 2, circuit 91S-KA16 (BN/GN), harness side and ground.

● Is the voltage greater than 10 volts?

→ **Yes**
GO to [D7](#).

→ **No**
GO to [D8](#).

D7 CHECK CIRCUIT 91S-KA16 (BN/GR) FOR SHORTS TO POWER

1



2

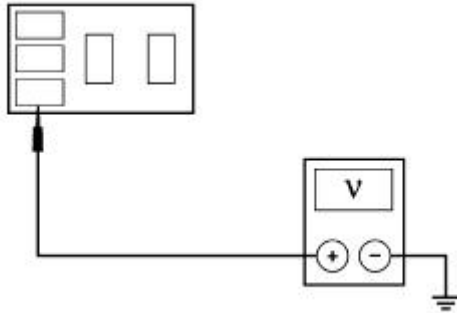


FEM C201b

3



4



A0003784

- 4 Measure the voltage between wiper high/low relay C1001 pin 2, circuit 91S-KA16 (BN/GN), harness side and ground.

● Is the voltage greater than 10 volts?

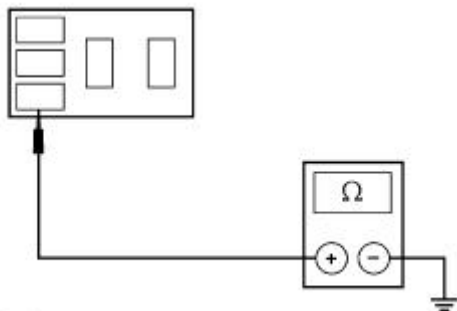
- **Yes**
REPAIR the circuit. TEST the system for normal operation.
- **No**
INSTALL a new FEM. REFER to [Section 419-10](#). TEST the system for normal operation.

D8 CHECK WIPER HIGH/LOW RELAY PIN 2 FOR CONTINUITY TO GROUND

1



2



A0003785

- 2 Measure the resistance between wiper high/low relay C1001 pin 2, circuit 91S-KA16 (BN/GN), harness side and ground.

● Is the resistance greater than 10,000 ohms?

- **Yes**
GO to [D10](#).
- **No**
GO to [D9](#).

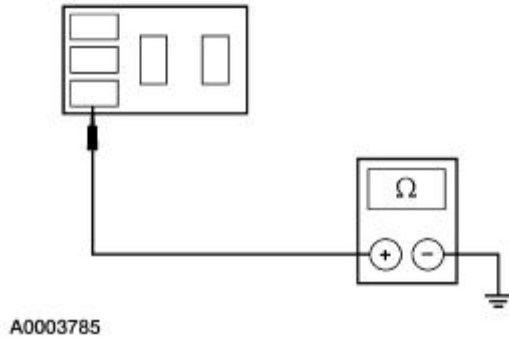
D9 CHECK CIRCUIT 91S-KA16 (BN/GN) FOR SHORTS TO GROUND

1



FEM C201b

2



2

Measure the resistance between wiper high/low relay C1001 pin 2, circuit 91S-KA16 (BN/GN), harness side and ground.

● Is the resistance greater than 10,000 ohms?

→ Yes

INSTALL a new FEM. REFER to [Section 419-10](#). TEST the system for normal operation.

→ No

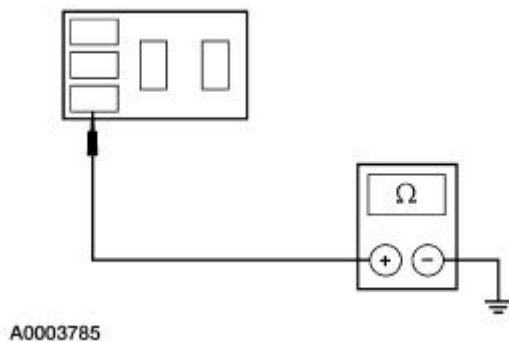
REPAIR the circuit. TEST the system for normal operation.

D10 ACTIVATE WIPER HIGH/LOW RELAY

1



2



2

Trigger the FEM active command SPEED RLY to ON, while measuring the resistance between wiper high/low relay C1001 Pin 2, Circuit 91S-KA16 (BN/GN) and ground.

● Is the resistance less than 5 ohms?

→ Yes

GO to [D11](#).

→ No

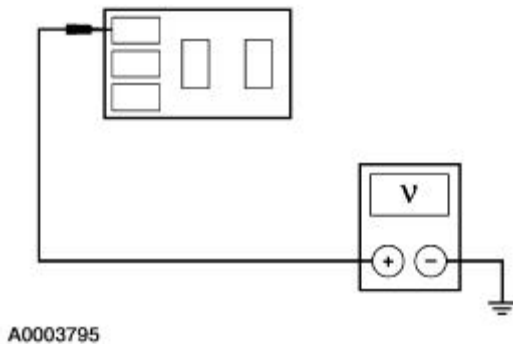
GO to [D14](#).

D11 CHECK UNDERHOOD AJB WIPER HIGH/LOW RELAY

- 1 Carry out the wiper high/low relay component test. Refer to Wiring Diagrams Section 700–09.
- Is the wiper high/low relay OK?
- **Yes**
GO to [D12](#).
- **No**
INSTALL a new wiper high/low relay.
TEST the system for normal operation.

D12 CHECK WIPER HIGH/LOW RELAY PIN 1 FOR VOLTAGE

1



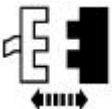
- 1 Measure the voltage between wiper high/low relay C1001 Pin 1, harness side and ground.
- Is the voltage greater than 10 volts?
- **Yes**
GO to [D13](#).
- **No**
INSTALL a new underhood AJB. TEST the system for normal operation.

D13 CHECK CIRCUITS 75S-KA10 (YE/GN) AND 75S-KA11 (YE/BK) FOR OPENS

1



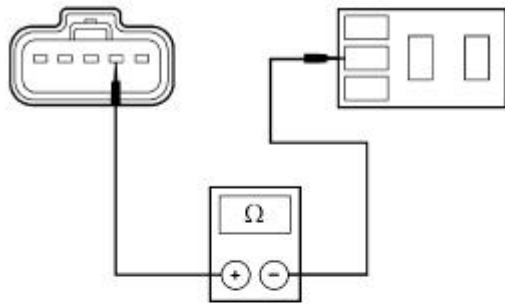
2



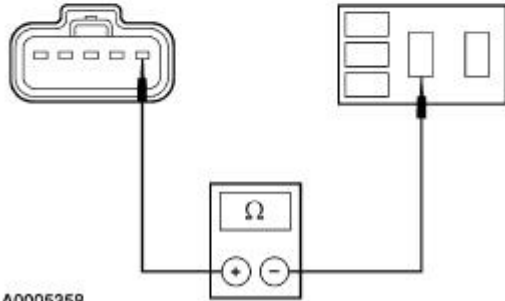
Wiper Motor C125

3

- 3 Measure the resistance between wiper high/low relay C1001 pin 4, circuit 75S-KA10 (YE/GN), harness side and wiper motor C125 pin 4, circuit 75S-KA10 (YE/GN), harness side; and between wiper high/low relay C1001 pin 5, circuit 75S-KA11 (YE/BK), harness side and wiper motor C125 Pin 5, circuit 75S-



A0005358



KA11 (YE/BK), harness side.

- Is the resistance greater than 10,000 ohms?

→ Yes

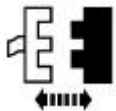
CHECK the wiper motor; REFER to Component Test. If the wiper motor does not pass the test, INSTALL a new wiper motor, REFER to [Windshield Wiper Motor](#) in this section. TEST the system for normal operation.

→ No

REPAIR circuit(s) in question. TEST the system for normal operation.

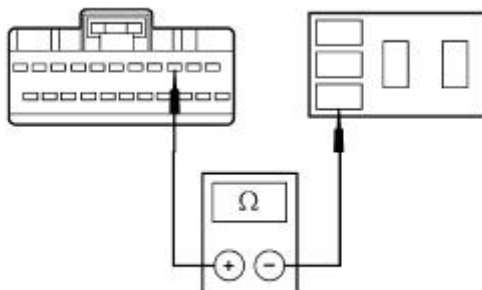
D14 CHECK CIRCUIT 91S-KA16 (BN/GN) FOR OPENS

1



FEM C201b

2





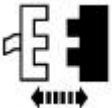
A0003796

2

Measure the resistance between wiper high/low relay C1001 pin 2, circuit 91S-KA16 (BN/GN), harness side and FEM C201b pin 3, circuit 91S-KA16 (BN/GN), harness side.

	<ul style="list-style-type: none"> ● Is the resistance less than 5 ohms? <p>→ Yes INSTALL a new FEM. REFER to Section 419-10. TEST the system for normal operation.</p> <p>→ No REPAIR the circuit. TEST the system for normal operation.</p>
--	--

PINPOINT TEST E: THE WASH AND WIPE FUNCTION DOES NOT OPERATE CORRECTLY

CONDITIONS	DETAILS/RESULTS/ACTIONS
E1 MONITOR THE FEM PID WPMODE	
<p>1</p> 	<p>2</p> <p>Monitor the FEM PID WPMODE while activating the wash and wipe functions.</p> <ul style="list-style-type: none"> ● Do the FEM PID WPMODE values agree with the multifunction switch positions? <p>→ Yes GO to E6.</p> <p>→ No If equipped with moisture sensitive wipersGO to E2. All othersGO to E3.</p>
E2 CHECK RAIN SENSOR MODULE	
<p>1</p>  <p>2</p>  <p>Rain Sensor Module C914</p>	<p>3</p> <p>Monitor the FEM PID WPMODE while activating the wash and wipe functions.</p> <ul style="list-style-type: none"> ● Do the FEM PID WPMODE values

agree with the multifunction switch positions?

→ **Yes**
INSTALL a new rain sensor module.
REFER to [Module—Rain Sensor](#) in this section. TEST the system for normal operation.

→ **No**
GO to [E3](#).

E3 CHECK THE MULTIFUNCTION SWITCH OPERATION

1



Multifunction Switch C202

2 Carry out the multifunction switch component test. Refer to Wiring Diagrams Section 700–09.

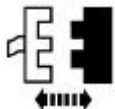
● **Is the multifunction switch OK?**

→ **Yes**
GO to [E4](#).

→ **No**
INSTALL a new multifunction switch.
REFER to [Section 211-05](#). TEST the system for normal operation.

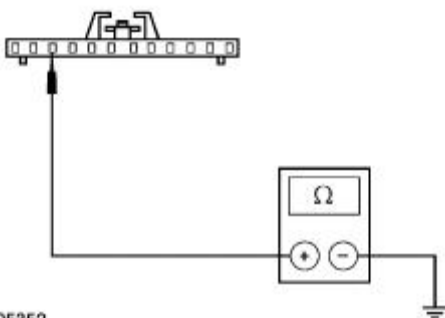
E4 CHECK CIRCUITS 10-KA3 (GY/VT), 10-KA19 (GY/BK) AND 10-KA41 (GY/OG) FOR SHORTS TO GROUND

1



FEM C201f

2



A0005352

2 Measure the resistance between multifunction switch C202 pin 3, circuit (BU/WH), harness side and ground.

● **Is the resistance greater than 10,000 ohms?**

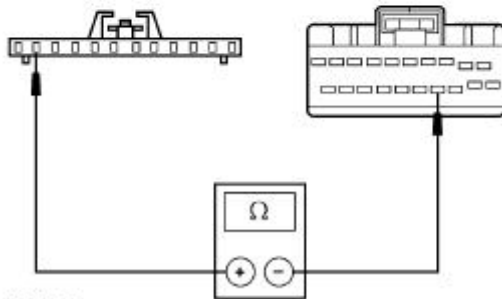
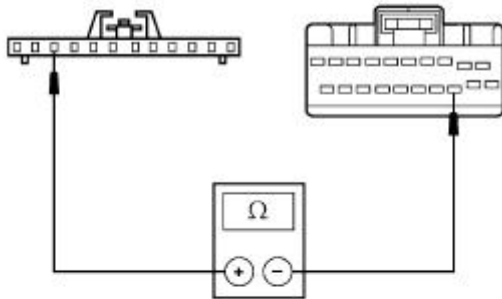
→ **Yes**

GO to [E5](#).

→ **No**
REPAIR circuit(s) in question. TEST the system for normal operation.

E5 CHECK CIRCUITS 10-KA3 (GY/VT), 10-KA19 (GY/BK) AND 10-KA41 (GY/OG) FOR OPENS

1



A0006686

1

Measure the resistance between multifunction switch C202 pin 3, circuit (BU/WH), harness side and FEM C201f pin 13, circuit 10-KA3 (GY/VT); and between multifunction switch C202 pin 2, circuit (BN/WH), harness side and FEM C201f pin 14, circuit 7-KA1 (YE), harness side.

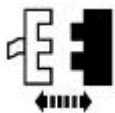
● **Is the resistance less than 5 ohms?**

→ **Yes**
GO to [E6](#).

→ **No**
REPAIR the circuit(s) in question. TEST the system for normal operation.

E6 CHECK CIRCUITS 31S-KA8 (BK/BU) AND 31S-KA1 (BK/YE) FOR OPENS

1

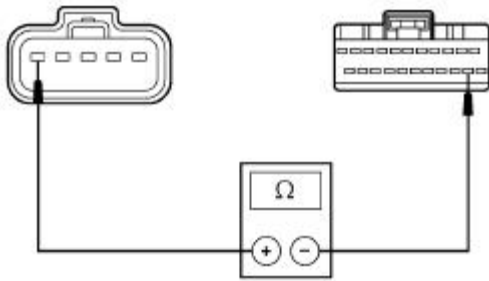


FEM C201b

2

2

Measure the resistance between wiper motor C125 pin 5, circuit 31S-KA1 (BK/YE), and FEM C201b pin 13, circuit 31S-KA8 (BK/BU).



A0008597

- Is the resistance less than 5 ohms?



→ **Yes**

INSTALL a new FEM. REFER to [Section 419-10](#). CLEAR the DTCs. REPEAT the self-test.

→ **No**

REPAIR the circuit(s) in question. TEST the system for normal operation.

PINPOINT TEST F: THE WASHER PUMP IS INOPERATIVE/ON CONTINUOUSLY

CONDITIONS	DETAILS/RESULTS/ACTIONS
F1 VERIFY THE WASHER PUMP SYMPTOM	
<p>1</p>  <p>2</p> 	<p>3 NOTE: If the wipers are also inoperative, REFER to the Symptom Chart. If the wash and wipe function does not operate correctly, REFER to Pinpoint Test E.</p> <p>Verify if the washer pump is never ON or if the pump is always ON.</p> <ul style="list-style-type: none"> ● Is the washer pump always on? <p>→ Yes GO to F12.</p> <p>→ No GO to F2.</p>

F2 ACTIVATE THE WASHER PUMP

1 Trigger the FEM active command WASH RLY to ON.

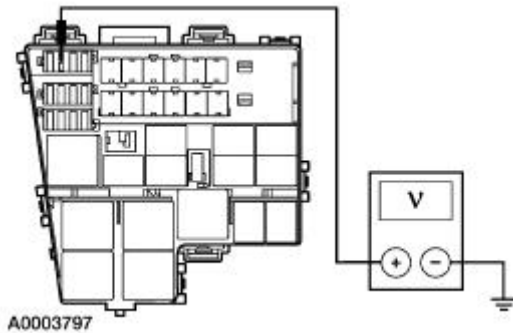
● **Did the washer pump work?**

→ **Yes**
INSTALL a new FEM. REFER to [Section 419-10](#). TEST the system for normal operation.

→ **No**
GO to [F3](#).

F3 CHECK FOR VOLTAGE AT UNDERHOOD AJB FUSE 102 (10A)

2



1 Remove the underhood AJB Fuse 102 (10A).

2 Measure the voltage between underhood AJB Fuse 102 (10A) input side and ground.

● **Is the voltage greater than 10 volts?**

→ **Yes**
GO to [F4](#).

→ **No**
REPAIR the power source. TEST the system for normal operation.

F4 CHECK WASHER PUMP RELAY

1



Washer Pump Relay C1004

2 Carry out the washer pump relay component tests. Refer to the Wiring Diagrams Section 700–09.

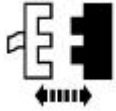
● **Did the washer relay pass the component test?**

→ **Yes**
GO to [F5](#).

→ **No**
INSTALL a new relay. TEST the system for normal operation.

F5 CHECK CIRCUITS 31-KA42A (RD/BK) AND 30-KA43 (RD/WH) FOR OPENS

1

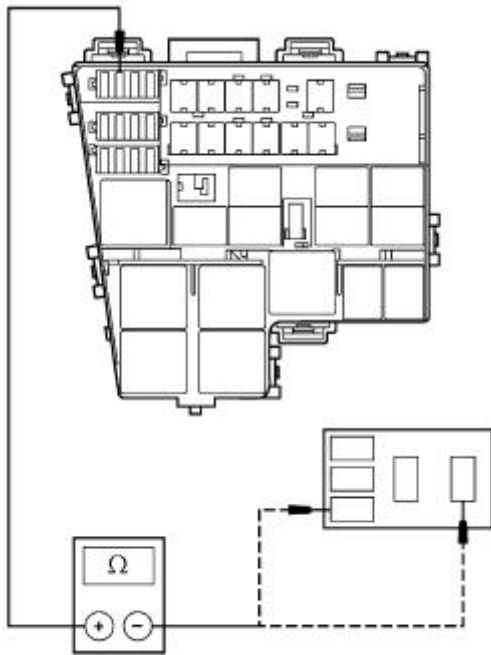


Underhood AJB Fuse 102 (10A)

2



3



A0006329

3 Measure the resistance between underhood AJB fuse 102 (10A) output side, circuit 30-KA42 (RD) and washer pump relay C1004 pin 3, circuit 30-KA42A (RD/BK) harness side; and between underhood AJB fuse 102 (10A) output side, circuit 30-KA42 (RD) and washer pump relay C1004 pin 2, circuit 30-KA43 (RD/WH) harness side.

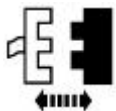
● **Is resistance less than 5 ohms?**

→ **Yes**
GO to [F6](#).

→ **No**
REPAIR circuit(s) in question. TEST the system for normal operation.

F6 CHECK CIRCUIT 15S-KA7 (GN/WH) FOR OPENS

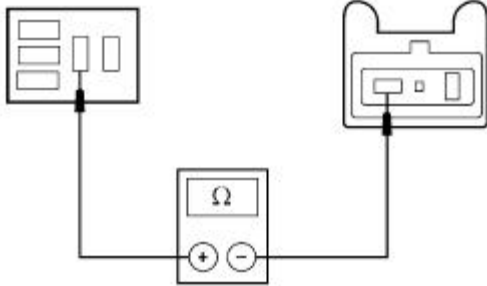
1



Washer Pump Motor C137

2

2 Measure the resistance between washer



A0008598

pump motor C137 pin 2, circuit 15S-KA7 (GN/WH), harness side and washer pump relay C1004 pin 5, circuit 15S-KA7 (GN/WH) harness side.

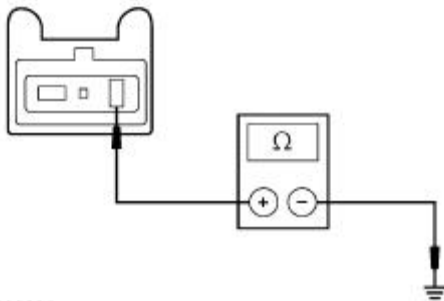
● Is the resistance less than 5 ohms?

→ **Yes**
GO to [F7](#).

→ **No**
REPAIR the circuit. TEST the system for normal operation.

F7 CHECK CIRCUIT 31-KA7 (BK/WH) FOR OPENS

1



A0006331

1

Measure the resistance between washer pump motor C137 pin 1, circuit 31S-KA7 (BK/WH), harness side and ground.

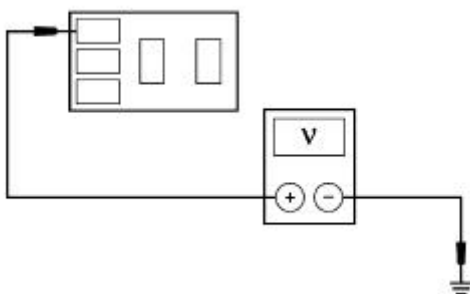
● Is the resistance less than 5 ohms?

→ **Yes**
INSTALL underhood AJB fuse 102 (10A).
GO to [F8](#).

→ **No**
REPAIR the circuit. TEST the system for normal operation.

F8 CHECK CIRCUIT 31S-KA43 (BK/WH) FOR SHORT TO POWER

1



A0006332

1

Measure the voltage between windshield washer relay C1004 pin 1, circuit 31S-KA43 (BK/WH), harness side and ground.

● Is the voltage greater than 10 volts?

→ **Yes**
GO to [F9](#).

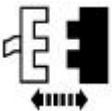
→ **No**
GO to [F10](#).

F9 CHECK CIRCUIT 31S-KA43 (BK/WH) FOR SHORT TO POWER

1



2

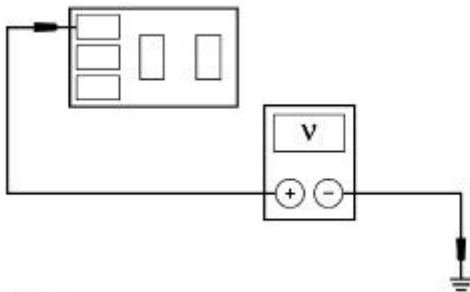


FEM C201b

3



4



A0006332

4 Measure the voltage between windshield washer relay C1004 pin 1, circuit 31S-KA43 (BK/WH), harness side and ground.

● Is the voltage greater than 10 volts?

→ **Yes**
REPAIR the circuit. TEST the system for normal operation.

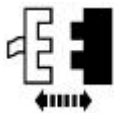
→ **No**
INSTALL a new FEM. REFER to [Section 419-10](#). TEST the system for normal operation.

F10 CHECK CIRCUIT 31S-KA43 (RD/WH) FOR OPEN

1

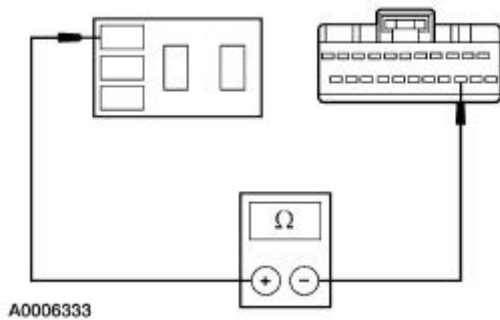


2



FEM C201b

3



3

Measure the resistance between windshield washer relay C1004 pin 1, circuit 31S-KA43 (BK/WH), harness side and FEM C201b pin 14, circuit 31S-KA43 (BK/WH), harness side.

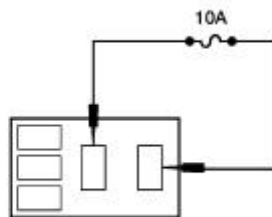
● Is the resistance less than 5 ohms?

→ **Yes**
GO to [F11](#).

→ **No**
REPAIR the circuit. TEST the system for normal operation.

F11 CHECK WINDSHIELD WASHER PUMP

1



1

Using a fused (10A) jumper wire, jumper windshield washer relay C1004 pin 3, circuit 30-KA42 (RD/BK), harness side and windshield washer relay C1004 pin 5, circuit 15S-KA7 (GN/WH), harness side.

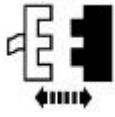
● Does the washer pump turn ON?

→ **Yes**
INSTALL a new FEM. REFER to [Section 419-10](#). TEST the system for normal operation.

→ **No**
INSTALL a new washer pump motor. Refer to [Washer Pump and Reservoir](#) in this section.

F12 CHECK WASHER PUMP RELAY

1



Washer Pump Relay C1004

2 Carry out the washer pump relay component tests. Refer to the Wiring Diagrams Section 700–09.

• Did the washer relay pass the component test?

→ Yes
GO to [F13](#).

→ No
INSTALL a new relay. TEST the system for normal operation.

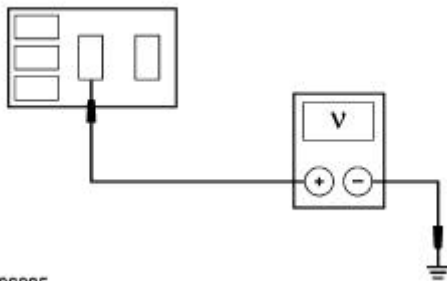
F13 CHECK CIRCUIT 15S-KA7 (GN/WH) FOR SHORT POWER

1



Washer Pump Motor C137

2



2 Measure the voltage between washer pump relay C1004 pin 5, circuit 15S-KA7 (GN/WH), harness side and ground.

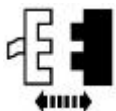
• Is the voltage greater than 10 volts?

→ Yes
REPAIR the circuit. TEST the system for normal operation.

→ No
GO to [F14](#).

F14 ISOLATE FEM AND CIRCUIT 31S-KA43 (BK/WH) FOR SHORTS TO GROUND

2



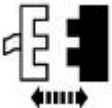


FEM C201b

1 Verify motor is running.

	<ul style="list-style-type: none"> ● Did washer pump motor stop running? <p>→ Yes INSTALL a new FEM. REFER to Section 419-10. TEST the system for normal operation.</p> <p>→ No REPAIR the circuit. TEST the system for normal operation.</p>
--	---

PINPOINT TEST G: THE SPEED DEPENDENT INTERVAL MODE DOES NOT OPERATE CORRECTLY

CONDITIONS	DETAILS/RESULTS/ACTIONS
G1 CHECK THE FEM PID WPMODE	
<p>1</p> 	<p>2</p> <p>Monitor the FEM PID WPMODE, while activating the intermittent washers through all speeds (positions) at the multifunction switch.</p> <ul style="list-style-type: none"> ● Do the FEM PID WPMODE values agree with the multifunction switch position? <p>→ Yes GO to G7.</p> <p>→ No If equipped with moisture sensitive wipers. GO to G2.</p> <p>All others GO to G3.</p>
G2 CHECK THE RAIN SENSOR MODULE	
<p>1</p>  <p>2</p>  <p>Rain Sensor Module C914</p> <p>3</p>	



4 Monitor the FEM PID WPMODE, while activating the intermittent washers through all speeds (positions) at the multifunction switch.

- Do the FEM PID WPMODE values agree with the multifunction switch position?

→ **Yes**
INSTALL a new rain sensor module. REFER to [Module—Rain Sensor](#) in this section. TEST the system for normal operation.

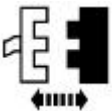
→ **No**
GO to [G3](#).

G3 CHECK THE MULTIFUNCTION SWITCH OPERATION

1



2



Multifunction Switch C202

3



4 Carry out the multifunction switch component test. Refer to the Wiring Diagrams Section 700–09.

- Is the multifunction switch OK?

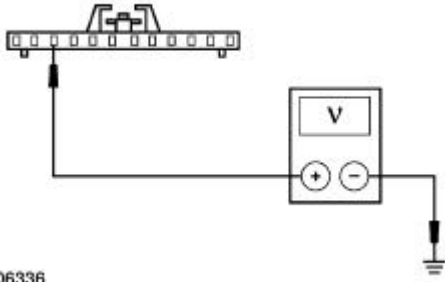
→ **Yes**
GO to [G4](#).

→ **No**
INSTALL a new multifunction switch. REFER to [Section 211-05](#). TEST the system for normal operation.

G4 CHECK CIRCUITS 10–KA3 (GY/VT), 10–KA19 (GY/BK) AND 10–KA41 (GY/OG) FOR VOLTAGE

1

1 Measure the voltage between multifunction switch C202 pin 3, (BU/WH), harness side and ground.



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● Is the voltage greater than 10 volts?

→ **Yes**
GO to [G5](#).

→ **No**
GO to [G6](#).

G5 CHECK CIRCUITS 10-KA3 (GY/VT), 10-KA19 (GY/BK) AND 10-KA41 (GY/OG) FOR SHORTS TO POWER

1



2

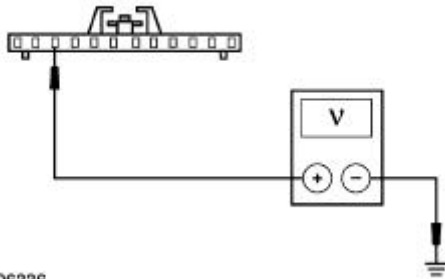


FEM C201f

3



4



A0006336

4 Measure the voltage between multifunction switch C202 pin 3, circuit (BU/WH), harness side and ground.

● Is the voltage greater than 10 volts?

→ **Yes**
REPAIR the circuit(s) in question. TEST the system for normal operation.

→ **No**

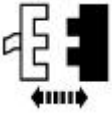
INSTALL a new FEM. REFER to [Section 419-10](#). TEST the system for normal operation.

G6 CHECK CIRCUITS 10-KA3 (GY/VT), 10-KA19 (GY/BK) AND 10-KA41 (GY/OG) FOR OPENS

1

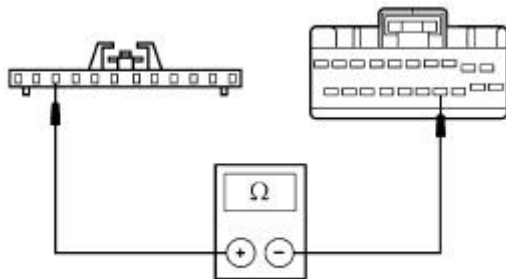


2



FEM C201f

3



A0006680

3 Measure the resistance between multifunction switch pin 3, circuit (BU/WH), harness side and FEM C201f pin 13, circuit 10-KA3 (GY/VT), harness side.

● Is the resistance less than 5 ohms?

→ **Yes**
INSTALL a new FEM. REFER to [Section 419-10](#). TEST the system for normal operation.

→ **No**
REPAIR the circuit(s) in question. TEST the system for normal operation.

G7 MONITOR THE FEM PID WPPRKS

1



2 Trigger the FEM active command WIPER RLY ON and OFF while monitoring the FEM PID WPPRKS.

● Did the PID change from PARKED to notPRK?

→ **Yes**
INSTALL a new FEM. REFER to [Section 419-10](#). TEST the system for normal operation.

→ **No**
GO to [G8](#).

G8 CHECK WIPER PARK RELAY

- 1 Remove the underhood AJB wiper park relay.
- 2 Carry out the relay component test. Refer to the Wiring Diagrams Section 700-09.

● **Is the wiper park relay OK?**

→ **Yes**
GO to [G9](#).

→ **No**
INSTALL a new wiper park relay. TEST the system for normal operation.

G9 CHECK THE WIPER MOTOR

1



2

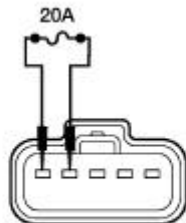


Wiper Motor C125

3



4



A0003780

- 4 Monitor the FEM PID WPPRKSX while connecting a (20 A) fused jumper wire between wiper motor C125 pin 5, circuit 31S-KA1 (BK/YE), harness side and wiper motor C125 pin 4, circuit 75S-KA9 (YE/BU), harness side.

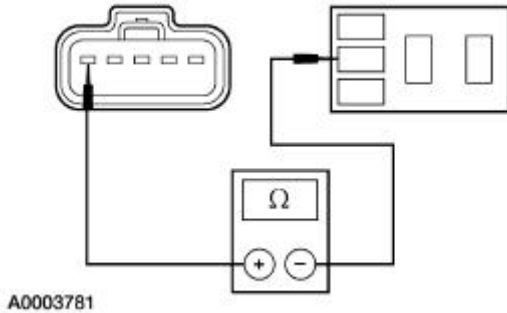
● **Did the PID change from notPRK to PARKED?**

→ **Yes**
INSTALL a new wiper motor. REFER to [Windshield Wiper Motor](#) in this section. TEST the system for normal operation.

→ **No**
GO to [G10](#).

G10 CHECK CIRCUITS 31S-KA1 (BK/YE) AND 31S-KA12 (BK/WH) FOR OPENS

1



1 Measure the resistance between the wiper park relay C1002 Pin 4, Circuit 31S-KA12 (BK/WH), harness side and wiper motor C125 pin 5, circuit 31S-KA1 (BK/YE), harness side.

● **Is the resistance less than 5 ohms?**

→ **Yes**
GO to [G11](#).

→ **No**
REPAIR the circuit(s) in question. TEST the system for normal operation.

G11 CHECK CIRCUIT 31S-KA8 (BK/BU) FOR OPENS

1

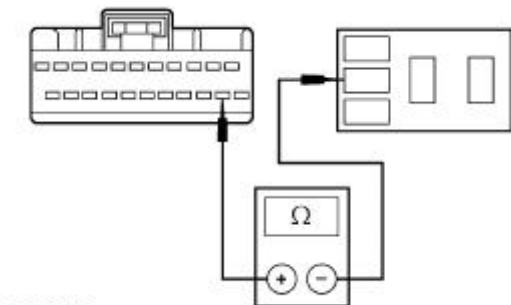


2



FEM C201b

3



3 Measure the resistance between the wiper park relay C1002 pin 4, circuit 31S-KA12 (BK/WH), harness side and FEM C201b pin 13, circuit 31S-KA8 (BK/BU), harness side.

● **Is the resistance less than 5 ohms?**

→ **Yes**
INSTALL a new FEM. REFER to [Section 419-10](#). TEST the system for normal operation.

→ **No**
REPAIR the circuit(s) in question. TEST the system for normal operation.

PINPOINT TEST H: THE RAIN MOISTURE SENSITIVE FUNCTION DOES NOT OPERATE CORRECTLY

CONDITIONS	DETAILS/RESULTS/ACTIONS
H1 RETRIEVE THE FEM DIAGNOSTIC TROUBLE CODES	
	<p>1 Using recorded results from the FEM self-test.</p> <ul style="list-style-type: none"> ● Are any DTCs recorded? <p>→ Yes GO to the FEM Diagnostic Trouble Code (DTC) Index.</p> <p>→ No GO to H2.</p>
H2 QUICK VISUAL CHECKS	
	<p>1 Check if the rain sensor module is mounted correctly.</p> <ul style="list-style-type: none"> ■ Interior side of the windshield. ■ Near and behind the mirror. ■ The optical windows must be within the wiper pattern. <p>2 Check if the rain sensor module connector is in place.</p> <p>3 Check if the green slides are fully closed.</p> <p>4 Check presence and proper coupling of silicon pads (About 80% of pad area should form a seal to the glass).</p> <p>5 Check if brackets are in place (not broken off the windscreen).</p> <p>6 Check windscreen, over the optical windows, for cracks, scratches, covered, etc.</p> <p>7 Make sure multifunction switch was set in AUTO, in order for the moisture sensitive wiper function to work.</p> <ul style="list-style-type: none"> ● Does everything check out OK? <p>→ Yes</p>

GO to [H3](#).

→ **No**
REPAIR as necessary. TEST the system for normal operation.

H3 VERIFY WIPER AUTO FUNCTION

1 Verify the moisture sensitive wiper system is continuously wiping when the multifunction switch is placed in AUTO.

- **Do wipers wipe continuously when switch is placed in AUTO?**

→ **Yes**
GO to [H10](#).

→ **No**
GO to [H4](#).

H4 VERIFY SYMPTOM

1 Verify if the wipers are totally inoperative or working erratically.


- **Are the wipers totally inoperative?**

→ **Yes**
GO to [H5](#).

→ **No**
REMOVE rain sensor module, clean the interior windshield glass and RE-INSTALL. For additional information, refer to [Module—Rain Sensor](#) in this section. TEST system for normal operation.

H5 CHECK THE FEM PID WPMODE

1



2 Monitor the FEM PID WPMODE, while activating the multifunction switch to the AUTO position.

- **Do the wiper FEM PID WPMODE values agree with the multifunction switch?**

→ **Yes**
GO to [H7](#).

→ **No**
GO to [H6](#).

H6 CHECK THE FEM PID WPMODE WHILE SELECTING OTHER POSITIONS WITH THE MULTIFUNCTION SWITCH

1 Monitor the FEM PID WPMODE, while activating the multifunction switch positions 2 through 7.

- Do the wiper FEM PID WPMODE values agree with the multifunction switch?

→ **Yes**
INSTALL a new multifunction switch. REFER to [Section 211-05](#). TEST the system for normal operation.

→ **No**
GO to the Symptom Chart for further diagnosis.

H7 CHECK RAIN SENSOR MODULE CIRCUIT 20-AD15 (PK) FOR VOLTAGE

1

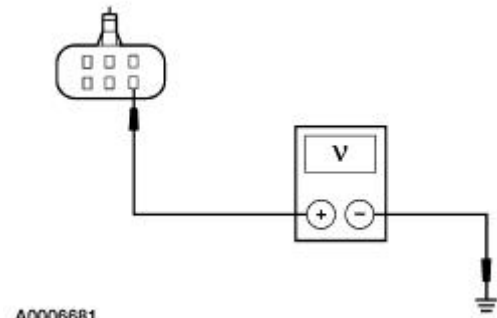


Rain Sensor Module C914

2



3



A0006681

3 Measure the voltage between the rain sensor module C914 pin 6, circuit 20-AD15 (PK), harness side and ground.

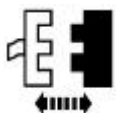
- Is the voltage greater than 10 volts?

→ **Yes**
GO to [H9](#).

→ **No**
GO to [H8](#).

H8 CHECK CJB FUSE 216 (5A) VOLTAGE SUPPLY

1

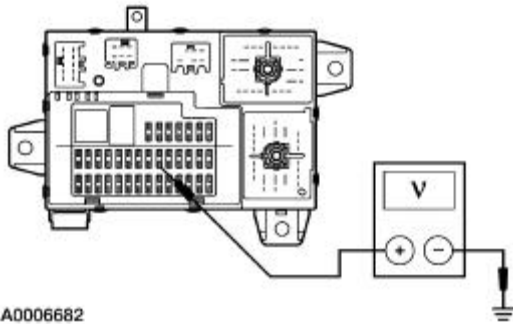


CJB Fuse 216 (5A)

2



3



A0006682

3 Measure the voltage between CJB Fuse 216 (5A) input side and ground.

• Is the voltage greater than 10 volts?

→ **Yes**
REPAIR the circuit(s) in question. TEST the system for normal operation.

→ **No**
INSTALL a new CJB power supply. TEST the system for normal operation.

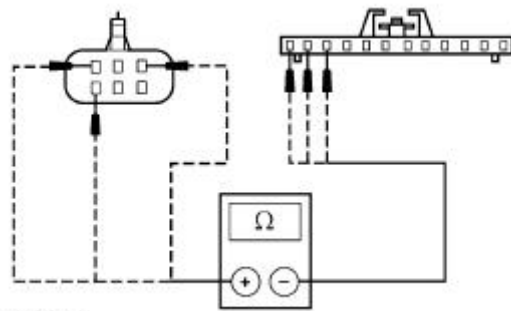
H9 CHECK CIRCUITS 7-KA41 (YE/GN), 8-KA41 (WH/GN) AND 10-KA41 (GY/OG) FOR AN OPEN

1



Multifunction Switch C220

2




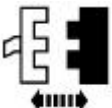
A0006684

2 Using the following table measure the resistance between multifunction switch C220 harness side and rain sensor module C914 harness side:

Multifunction Switch C220	Rain Sensor Module C914
pin 1, circuit (OG/GN)	pin 1, circuit 8-KA41 (WH/GN)
pin 2, circuit (BN/WH)	pin 4, circuit 7-KA41 (YE/GN)
pin 3, circuit (BU/WH)	pin 3, circuit 10-KA41 (GY/OG)

• Is the resistance less than 5 ohms?

→ **Yes**
INSTALL a new rain sensor module. For additional information, refer to [Module—Rain Sensor](#) in this section .

	<p>→ No REPAIR the circuit(s) in question. TEST the system for normal operation.</p>
<p>H10 VERIFY CONTINUOUSLY RUNNING WIPERS</p>	
	<p>1 Verify if the moisture sensitive wipers system is continuously wiping in interval #1 speed (longest delay time) or running in a higher speed when in AUTO.</p> <ul style="list-style-type: none"> ● Are wipers running in a higher speed? <p>→ Yes GO to H11 .</p> <p>→ No INSTALL a new rain sensor module. For additional information, refer to Module—Rain Sensor in this section.</p>
<p>H11 CHECK THE RAIN SENSOR MODULE</p>	
<p>1</p>  <p>3</p>  <p>Rain Sensor Module C914</p>	<p>2 Select AUTO with the multifunction switch.</p> <ul style="list-style-type: none"> ● Did the wipers turn off? <p>→ Yes INSTALL a new rain sensor module. REFER to Module—Rain Sensor in this section. TEST the system for normal operation.</p> <p>→ No GO to Pinpoint Test C .</p>

Component Test

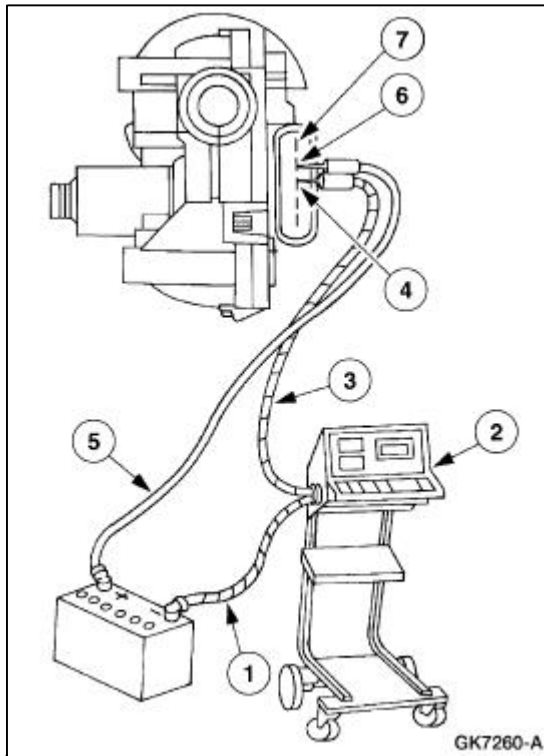
Windshield Wiper Motor



CAUTION: Do not handle the wiper motor abusively when diagnosing the wiper operations. Failure to follow this caution may result in damage to the motor magnets and will make the wiper motor inoperative. Rough handling of new replacement wiper motors may also

damage the motor magnets.

Use Alternator, Regulator, Battery and Starter Tester (ARBST) to test the wiper motor on the vehicle.



To test the wiper motor, disconnect the windshield wiper mounting arm and pivot shaft from the windshield wiper motor; refer to [Pivot Arm](#).

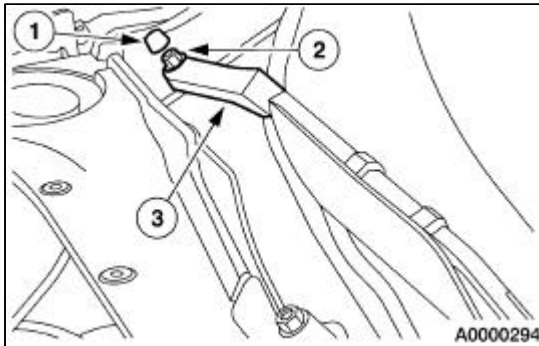
Disconnect the wiper motor. Connect the (1) green lead from (2) (ARBST) to the battery negative (-) post. Connect the (3) red lead from ARBST to the wiper motor (4) common brush terminal (terminal 3).

Test the low speed mode by connecting a (5) cable from the battery positive (+) post to the (6) low speed brush terminal (terminal 4) and measure the current draw. If the current draw is greater than 3.5 amperes, install a new windshield wiper motor.

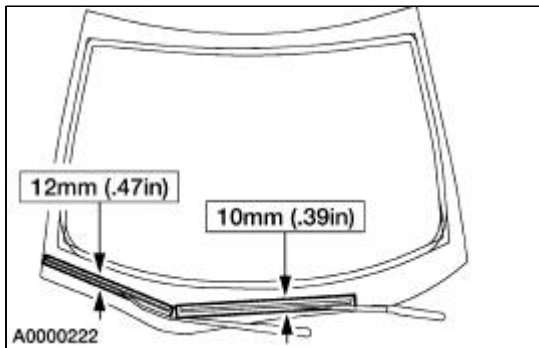
Test the high speed mode by connecting a cable from the battery positive (+) post to the (7) high speed brush terminal (terminal 5) and measure the current draw. If the current draw is greater than 5.5 amperes, install a new wiper motor.

Wiper Blade and Pivot Arm Adjustment

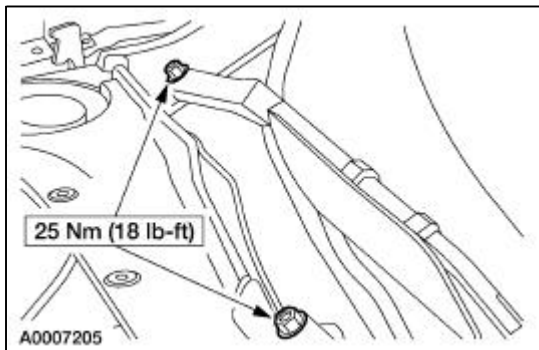
1. Cycle and park the windshield wipers.
2. Remove the pivot arm(s).
 1. Remove the pivot arm nut cover(s).
 2. Remove the nut(s).
 3. Remove the pivot arm(s).



3. Install the wiper blade and pivot arm onto the pivot shaft and align the blade to the silver dots in the windshield.



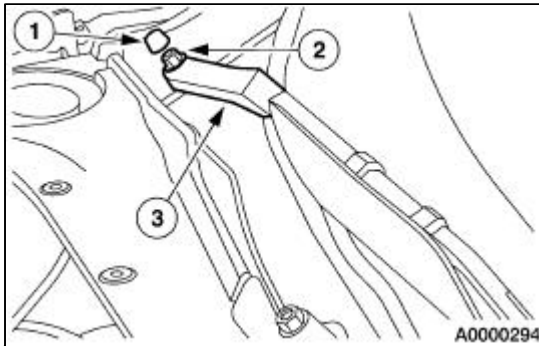
4. Tighten the windshield wiper pivot arm nut(s).
 - Install the pivot arm nut cover(s).



Pivot Arm

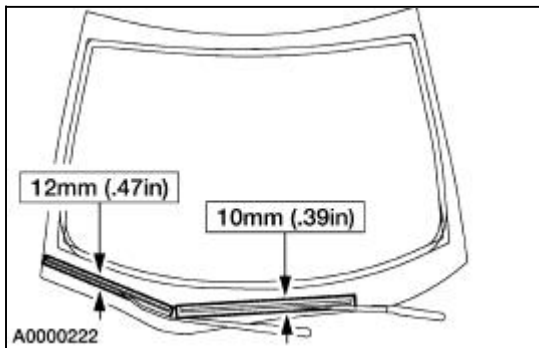
Removal

1. Remove the pivot arm (RH shown, LH similar).
 1. Remove the pivot arm nut cover.
 2. Remove the nut.
 3. Remove the pivot arm.

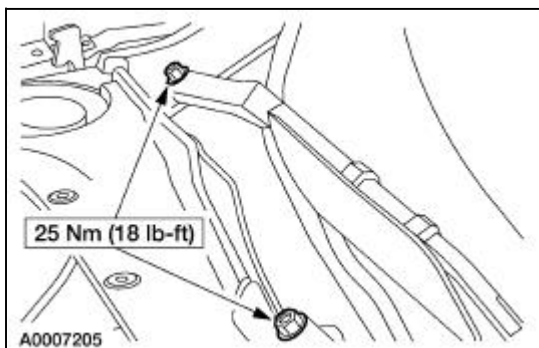


Installation

1. Cycle and park the windshield wipers.
2. Install the wiper blade and pivot arm onto the pivot shaft and align the blade to the silver dots in the windshield.




3. Tighten the windshield pivot arm nuts.
 - Install the pivot arm nut covers.



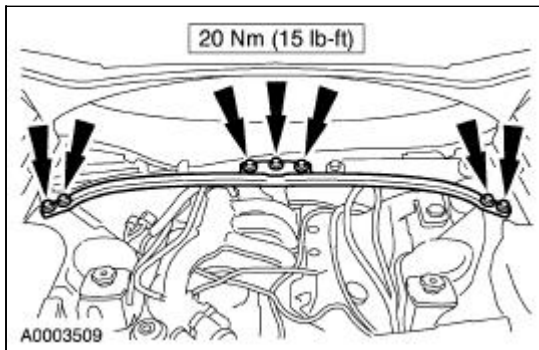
Mounting Arm and Pivot Shaft

Removal and Installation

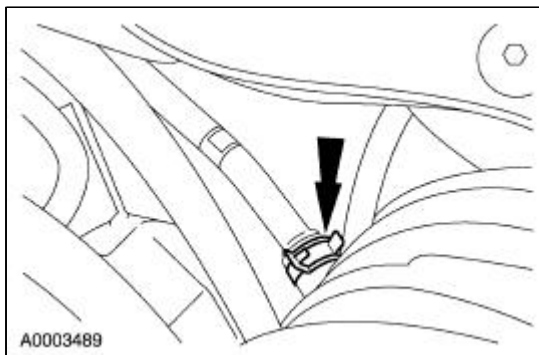
1.  **CAUTION:** The windshield wiper system has an auto park feature. It is necessary to disconnect the battery.

Disconnect the battery ground cable. For additional information, refer to [Section 414-01](#).

2. Remove the cowl top vent panels. For additional information, refer to [Section 501-02](#).
3. Remove the bolts and the strut tower support brace.

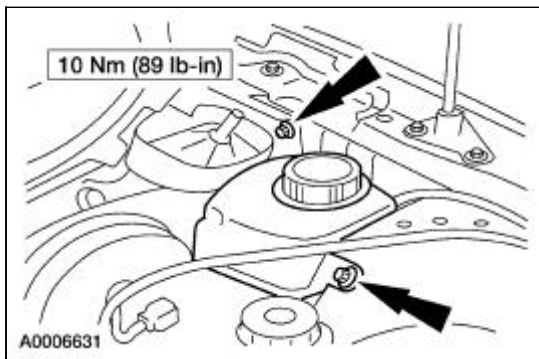


4. Partially drain the engine cooling system. For additional information, refer to [Section 303-03](#).
5. Disconnect the degas return hose from the degas return tube.

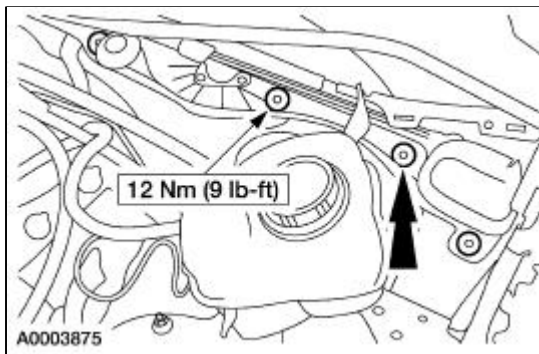


6. **NOTE:** When positioning the degas bottle aside it will be necessary to reroute the degas bottle lower hose in front of the brake booster.

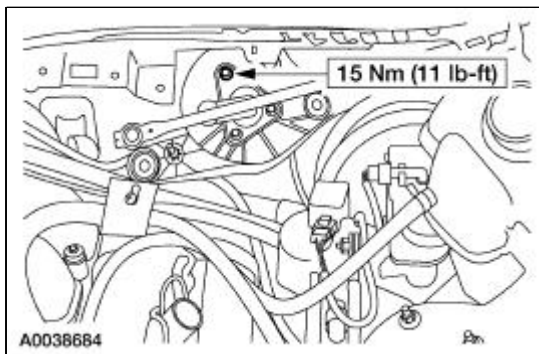
Remove the bolts and position the degas bottle aside.



7. Remove the windshield wiper mounting arm and pivot shaft bolts.



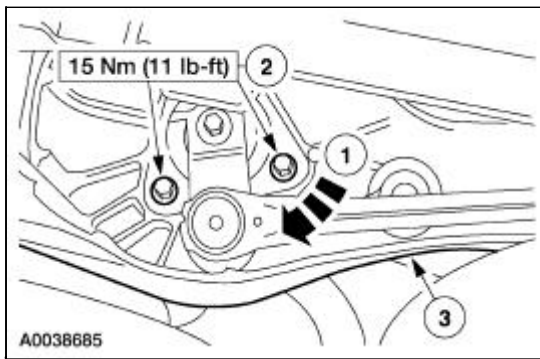
8. Disconnect the drain boot from the windshield wiper mounting arm and pivot shaft assembly.
9. Position the windshield wiper mounting arm and pivot shaft assembly aside, and loosen the upper windshield wiper motor bolt.



10. Remove the windshield wiper mounting arm and pivot shaft assembly.
 1. Rotate wiper output arm to the six o'clock position.
 2. Remove the lower wiper motor bolts.
 3. **NOTE:** It is necessary to rotate the bottom of the windshield wiper mounting arm and pivot shaft assembly upward.

Remove the windshield wiper mounting arm and pivot shaft assembly.

- Disconnect the electrical connector.

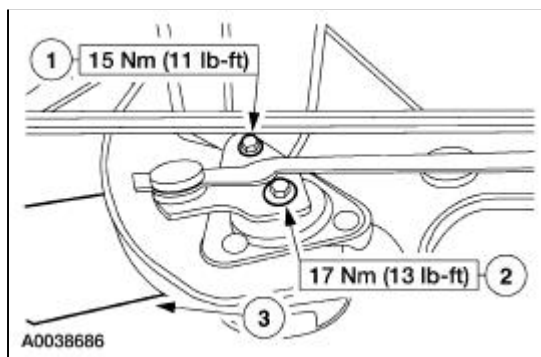


11. To install, reverse the removal procedure.

Windshield Wiper Motor

Removal and Installation

1. Remove the windshield wiper mounting arm and pivot shaft (17566) assembly; refer to [Mounting Arm and Pivot Shaft](#) in this section.
2. Remove the windshield wiper motor (17508).
 1. Remove the bolt.
 2. Remove the windshield wiper motor crank bolt.
 3. Remove the windshield wiper motor.



3. To install, reverse the removal procedure.

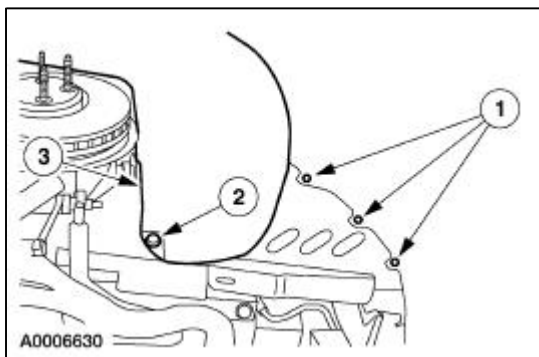
Washer Pump and Reservoir

Removal and Installation

1.  **CAUTION:** Do not make electrical connections prior to filling the windshield washer reservoir. Do not operate the windshield washer pump prior to filling the windshield washer reservoir.

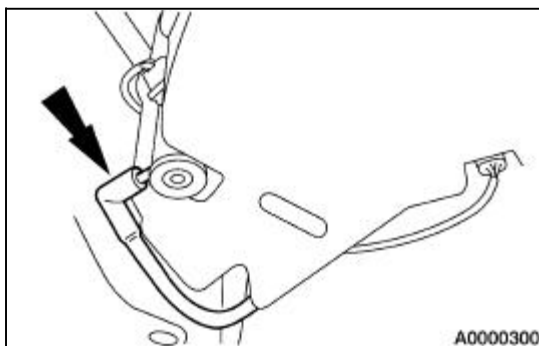
Disconnect the battery ground cable. Refer to [Section 414-01](#).

2. Remove the RF wheel and tire assembly. For additional information, refer to [Section 204-04](#).
3. Position RF fender splash shield aside.
 1. Remove the screws.
 2. Remove the pin-type retainers.
 3. Position the RF splash shield aside.

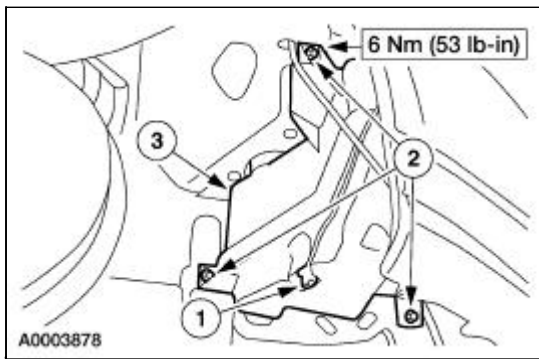


4. **NOTE:** Windshield washer fluid should be collected in a container after the windshield washer hose is disconnected.

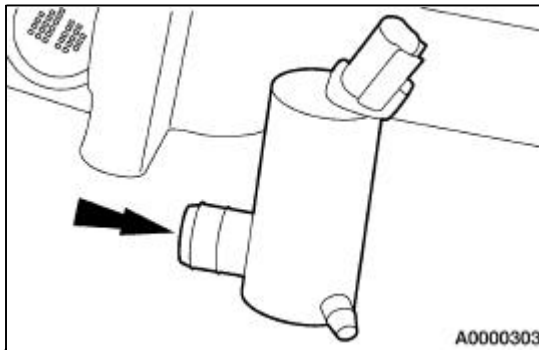
Disconnect the washer hose.



5. Remove the washer fluid reservoir.
 1. Disconnect the two electrical connectors.
 2. Remove the bolts.
 3. Remove the washer reservoir.



6. If necessary remove the windshield washer pump and if equipped remove the headlamp washer pump.



7. To install, reverse the removal procedure.
-

Module —Rain Sensor

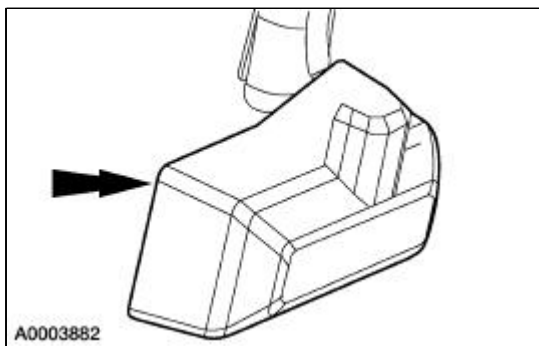
Removal and Installation

1. **NOTE:** To avoid damage to the rain sensor module cover, push up on the cover while rotating the top of the cover toward the rear of the vehicle.

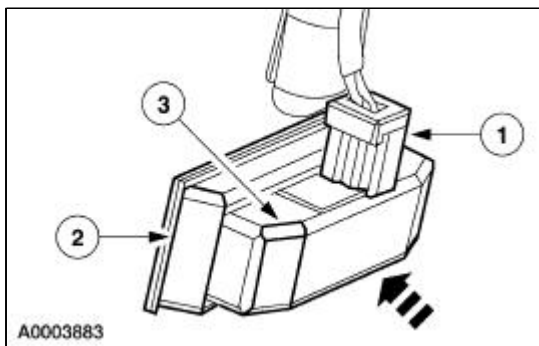
NOTE: Prior to installing the rain sensor module, the windshield glass area between the rain sensor module brackets must be cleaned.

NOTE: When installing the rain sensor module, it is necessary to apply inward pressure on the module prior to locking the rain sensor module retaining slides in place.

Remove the rain sensor module cover (17D550).



2. Remove the rain sensor module 17D547.
 1. Pull the latch on the connector away from the harness and disconnect the electrical connector.
 2. **NOTE:** When removing the rain sensor module, it is necessary to apply inward pressure on the module prior to releasing the rain sensor module retaining slides.
- Release the rain sensor module retaining slides.
3. Remove the rain sensor module.



3. To install, reverse the removal procedure.

Torque Specifications

Description	Nm	lb-in
Roof opening panel assembly bolts	10	89
Roof opening glass assembly screws	4	35
Roof opening panel control module bolts	3	27
Roof opening panel motor assembly bolts	6	53

Roof Opening Panel

The roof opening panel consists of the following components:



- Left sight shield
- Right sight shield
- Water trough
- Roof opening panel opening shield
- Roof opening panel assembly
- Roof opening panel track and rail assembly
- Roof opening panel control module
- Roof opening panel motor assembly
- Roof opening glass assembly
- Roof opening glass seal

The roof opening panel is available as an option. The roof opening panel control module controls the roof opening panel. The roof opening panel may be operated from the roof opening panel switch or the global open and close function.

Roof Opening Panel

Refer to Wiring Diagrams Section [501-17](#), Roof Opening Panel for schematic and connector information.

Special Tool(s)

 ST1137-A	73III Automotive Meter 105-R0057 or equivalent
 ST1217-A	New Generation STAR Tester 418-F048 (007-00500) or equivalent

Principles of Operation

Roof Opening Panel Control Module

Battery power is continuously supplied to the roof opening panel control module. However, the roof opening panel will only operate from the roof opening panel switch with the ignition switch in the RUN or ACCY position. The global open and close feature is controlled by two circuits from the rear electronic module (REM). The two circuits must be at ground potential before the roof opening panel control module will acknowledge the roof opening panel switch. When the ignition switch is turned to RUN or ACCY, the REM provides ground to these circuits.

The roof opening panel control module incorporates soft stops at the end of all travel positions. The roof opening panel control module monitors the internal switches to determine the roof opening glass position and the soft stops. The internal switches are activated by the roof opening panel motor rotation.

The roof opening panel control module supplies the power and ground to the roof opening panel motor depending on the ordered function. Power is supplied to the roof opening panel motor for a maximum of 12 seconds. Under normal operation, position is monitored by the roof opening panel control module and power is removed from the roof opening panel motor as soon as the roof opening panel reaches the commanded position.

Roof Opening Panel Switch

Four circuits connect the roof opening panel switch to the roof opening panel control module. One circuit is the common return. The other three are the control circuits open, close and tilt. The roof opening panel control module monitors these lines for voltage fluctuation to determine which function was selected.

With the ignition switch in the RUN or ACCY position, the roof opening panel supplies a five volt reference voltage to the three control lines. Activation of the roof opening panel switch connects one or more of these lines to the common return which pulls the line low. The roof opening panel control

module will sense the line or lines being connected to the common line and carry out the appropriate function.

The express open function connects the open and tilt circuits to the common return when the roof opening panel switch is moved rearward to the second detent position. The operator-controlled open function connects the open circuit to the common return. The close function connects the close circuit to the common causing the roof opening panel to close from a slide or vent position.

Global Open and Close

Two circuits connect the REM to the roof opening panel control module for these functions. Global open and close operation for the roof opening panel is controlled by one of these two circuits being grounded by the REM.

Global open and close operation is only available with the ignition in the OFF position and the ignition key removed.

When the ignition switch is in the RUN or ACCY position, the REM grounds both of these circuits allowing normal operation of the roof opening panel from the roof opening panel switch.

When global open or close operation is selected, the roof opening panel switch is not recognized by the roof opening panel control module throughout the operation and five seconds after the operation is completed.

With the ignition switch in the OFF position, the roof opening panel control module supplies a constant voltage to these two circuits. The roof opening panel control module monitors these lines for a low state, caused by the REM grounding the line, to determine the ordered global function by the REM.

Global open is commanded by the REM grounding control line two. Line one will remain at previous voltage.

Global close is commanded by the REM grounding control line one. Line two will remain at previous voltage.

If both lines have voltage, the roof opening panel will be inoperative.

The global open function is activated by:

- unlocking the driver door using the remote keyless entry transmitter. Within five seconds, press and hold the unlock button.
- unlocking the driver door using the driver door lock cylinder and the key. Hold the key in the unlock position.

The global close function is activated by:

- turning the driver door lock cylinder to the lock position and holding.

Global open and close operates as follows:

- With the roof opening glass in the flush position, activating global open will operate the roof opening glass to the full open position.
- With the roof opening glass in the open position, activating global close will close the roof opening glass to the flush position.
- If a global open is commanded within five seconds of a completed global operation, the roof opening panel control module will reverse the previous completed global operation. If the roof opening glass was globally closed from the vent position, a global open within five seconds

would tilt the roof opening glass back up.

- If the roof opening glass was globally closed from the slide open position, a global open within five seconds would slide the roof opening glass back open.

Inspection and Verification

1. Verify the customer concern by operating the system.
2. Visually inspect for obvious signs of mechanical or electrical damage.

Visual Inspection Chart

Mechanical	Electrical
<ul style="list-style-type: none"> ● Roof opening panel track and rail assembly ● Roof opening glass seal ● Roof opening glass adjustment ● Roof opening panel assembly timing 	<ul style="list-style-type: none"> ● Battery junction box (BJB) Fuse 416 (20A) ● Central junction box (CJB) Mini Fuse 207 (5A) ● Roof opening panel switch ● Roof opening panel motor assembly ● Rear electronics module (REM) ● Roof opening panel control module ● Wiring harness ● Loose or corroded connections

3. If the concern remains after the inspection, connect the New Generation STAR (NGS) Tester to the data link connector (DLC) located beneath the instrument panel and select the vehicle to be tested from the NGS Tester menu. If the NGS Tester does not communicate with the vehicle:
 - check that the program card is correctly installed.
 - check the connections to the vehicle.
 - check the ignition switch position.
4. If the NGS still does not communicate with the vehicle, refer to the New Generation STAR Tester manual.
5. Carry out the DATA LINK DIAGNOSTIC TEST. If the NGS responds with:
 - CKT914, CKT915 or CKT70 = ALL ECUS NO RESP/NOT EQUIP, refer to [Section 418-00](#).
 - NO RESP/NOT EQUIP for REM, go to Pinpoint Test A.
 - SYSTEM PASSED, retrieve and record the continuous diagnostic trouble codes (DTCs), erase the continuous DTCs and carry out self-test diagnostics for the REM.
6. If the DTCs retrieved are related to the concern, go to REM Diagnostic Trouble Code (DTC) Index to continue diagnostics.
7. If no DTCs related to the concern are retrieved, proceed to Symptom Chart to continue diagnostics.

REM Diagnostic Trouble Code (DTC) Index

DTC	Description	Source	Action
B1201	Fuel Sender Circuit Failure	REM	REFER to Section 413-01 .

B1300	Power Door Lock Circuit Failure	REM	REFER to Section 501-14B .
B1310	Power Door Unlock Circuit Failure	REM	REFER to Section 501-14B .
B1331	Decklid Ajar Rear Door Circuit Failure	REM	REFER to Section 417-02 .
B1335	Door Ajar RR Circuit Failure	REM	REFER to Section 417-02 .
B1342	ECU Is Defective	REM	CLEAR the DTC. RETRIEVE the DTCs. If DTC B1342 is retrieved, INSTALL a new REM. REFER to Section 419-10 . CLEAR the DTCs. REPEAT the self test.
B1483	Brake Pedal Input Circuit Failure	REM	REFER to Section 417-01 .
B1499	Lamp Turn Signal Left Circuit Failure	REM	REFER to Section 417-01 .
B1501	Lamp Turn Signal Left Circuit Short to Battery	REM	REFER to Section 417-01 .
B1503	Lamp Turn Signal Right Circuit Failure	REM	REFER to Section 417-01 .
B1505	Lamp Turn Signal Right Circuit Short to Battery	REM	REFER to Section 417-01 .
B1551	Decklid Release Circuit Failure	REM	REFER to Section 501-14B .
B1571	Door Ajar LR Circuit Failure	REM	REFER to Section 417-02 .
B1676	Battery Pack Voltage Out of Range	REM	REFER to Section 414-00 .
B2172	Inertia Switch Input Circuit Open	REM	REFER to Powertrain Control/Emissions Diagnosis (PC/ED) manual.
B2174	Window Driver Rear Remote Up Switch Short to Battery	REM	REFER to Section 501-11 .
B2178	Window Driver Rear Remote Down Switch Short to Battery	REM	REFER to Section 501-11 .
B2190	Window Passenger Rear Remote Up Switch Short to Battery	REM	REFER to Section 501-11 .
B2194	Window Passenger Rear Remote Down Switch Short to Battery	REM	REFER to Section 501-11 .
B2477	Module Configuration Failure	REM	REFER to Section 418-01 .
U1041	SCP (J1850) Invalid or Missing Data for Vehicle Speed	ABS	CARRY OUT the Anti-lock Brake Control Module (ABS) self-test. REFER to Section 206-09A , Section 206-09B , or Section 206-09C .
U1059	SCP (J1850) Invalid or Missing Data for Transmission/Transaxle/PRNDL	PCM	CARRY OUT the Powertrain Control Module (PCM) self-test. REFER to the Powertrain Control/Emissions Diagnosis (PC/ED) manual.
U1218	SCP (J1850) Invalid or Missing Data for External Lamps	ICM	CARRY OUT the Instrument Cluster self-test. REFER to Section 413-01 .

REM Parameter Identification (PID) Index

PID	Description	Expected Value
BOO	Brake Switch Input	OFF, ON
DECKLID	Decklid Ajar Switch	CLOSED, AJAR

DL_DSRM	Decklid Disarm	NO, YES
DLIDOUT	Decklid Driver	Off---, Off--G, Off-B-, Off-BG, OffO--, OffO-G, OffOB-, OffOBG, On---, On--G, On-B-, On-BG, OnO--, OnO-G, OnOB-, OnOBG
DLIDRLS	Deck Lid Release	OFF, ON
L_TAIL	Left and Right Tail Lamp	Off---, Off--G, Off-B-, Off-BG, OffO--, OffO-G, OffOB-, OffOBG, On---, On--G, On-B-, On-BG, OnO--, OnO-G, OnOB-, OnOBG
LMRKOUT	Left Marker Lamp Driver Output State	OFF, ON
LMRKSTB	Left Marker Lamp Driver Short To Battery	NO, YES
LR_TURN	Left and Right Rear Turn Lamp	Off---, Off--G, Off-B-, Off-BG, OffO--, OffO-G, OffOB-, OffOBG, On---, On--G, On-B-, On-BG, OnO--, OnO-G, OnOB-, OnOBG
LRDN_SW	Left Rear Window Down Switch	OFF, UP
LRDR_SW	Left Rear Door Ajar Switch	CLOSED, AJAR
LRUP_SW	Left Rear Window Up Switch	OFF, DOWN
PD_LOCK	Passenger Door Lock	NO, YES
PD_UNLK	Passenger Door Unlock	NOTLOC, LOCK
R_TAIL	Left and Right Tail Lamp	Off---, Off--G, Off-B-, Off-BG, OffO--, OffO-G, OffOB-, OffOBG, On---, On--G, On-B-, On-BG, OnO--, OnO-G, OnOB-, OnOBG
RR_TURN	Left and Right Rear Turn Lamp	Off---, Off--G, Off-B-, Off-BG, OffO--, OffO-G, OffOB-, OffOBG, On---, On--G, On-B-, On-BG, OnO--, OnO-G, OnOB-, OnOBG
RRDN_SW	Right Rear Window Down Switch	OFF, UP
RRDR_SW	Right Rear Door Ajar Switch	CLOSED, AJAR
RRUP_SW	Right Rear Window Up Switch	OFF, DOWN

REM Active Command Index

Active Command	Display	Action
EXTERIOR LAMP CONTROL	BACKUPLMP	OFF, ON
EXTERIOR LAMP CONTROL	H MNT STP	OFF, ON
EXTERIOR LAMP CONTROL	L STOP	OFF, ON
EXTERIOR LAMP CONTROL	PARKLAMPS	OFF, ON
EXTERIOR LAMP CONTROL	R DEF RLY	OFF, ON
EXTERIOR LAMP CONTROL	R FOG LMP	OFF, ON
EXTERIOR LAMP CONTROL	R STOP	OFF, ON

POWER WINDOW ENABLE COMMAND	PSGR RLY	OFF, ON
REAR DOOR LOCK CONTROL	LR LOCK	OFF, ON
REAR DOOR LOCK CONTROL	LR UNLOCK	OFF, ON
REAR DOOR LOCK CONTROL	RELEASE	OFF, ON
REAR WINDOW CONTROL	LR DOWN	OFF, ON
REAR WINDOW CONTROL	RR DOWN	OFF, ON
TURN SIGNAL AND MARKER LAMPS	HAZARD	OFF, ON

Symptom Chart


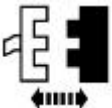
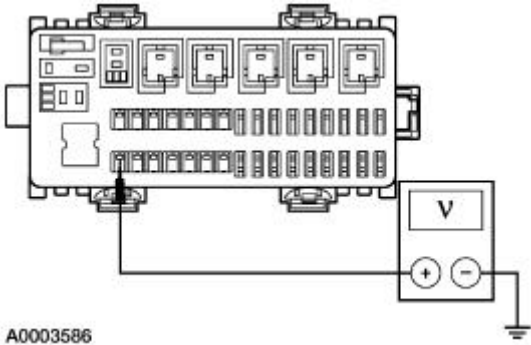
Symptom Chart

Condition	Possible Sources	Action
<ul style="list-style-type: none"> No communication with the rear electronic module (REM) 	<ul style="list-style-type: none"> BJB Fuse 425 (40A). CJB Mini Fuse 207 (5A). Circuitry. REM. 	<ul style="list-style-type: none"> GO to Pinpoint Test A.
<ul style="list-style-type: none"> The roof opening panel leaks 	<ul style="list-style-type: none"> Incorrect adjustment. Roof opening panel frame drain hoses. Roof opening glass seal. 	<ul style="list-style-type: none"> GO to Pinpoint Test B.
<ul style="list-style-type: none"> The roof opening panel is noisy during operation 	<ul style="list-style-type: none"> Roof opening glass assembly. Roof opening panel assembly. Roof opening panel motor assembly. 	<ul style="list-style-type: none"> GO to Pinpoint Test C.
<ul style="list-style-type: none"> The roof opening panel does not open or close 	<ul style="list-style-type: none"> BJB Fuse 416 (20A). Roof opening panel assembly. Roof opening panel control module. Roof opening panel motor assembly. REM. Roof opening panel switch. Circuitry. 	<ul style="list-style-type: none"> GO to Pinpoint Test D.
<ul style="list-style-type: none"> The roof opening panel does not open or close in vent position 	<ul style="list-style-type: none"> Roof opening panel control module. Roof opening panel switch. Circuitry. 	<ul style="list-style-type: none"> GO to Pinpoint Test E.
<ul style="list-style-type: none"> The roof opening panel does not stop in flush from any position 	<ul style="list-style-type: none"> Roof opening panel adjustment. Roof opening glass seal. Roof opening panel control module. 	<ul style="list-style-type: none"> GO to Pinpoint Test F.
<ul style="list-style-type: none"> The express open is inoperative 	<ul style="list-style-type: none"> Roof opening panel control module. 	<ul style="list-style-type: none"> GO to Pinpoint Test

	<ul style="list-style-type: none"> ● Roof opening panel switch. ● Circuitry. 	G.
<ul style="list-style-type: none"> ● The roof opening panel has excessive wind noise 	<ul style="list-style-type: none"> ● Incorrect adjustment. ● Roof opening glass seal. 	<ul style="list-style-type: none"> ● GO to Pinpoint Test H.

Pinpoint Tests

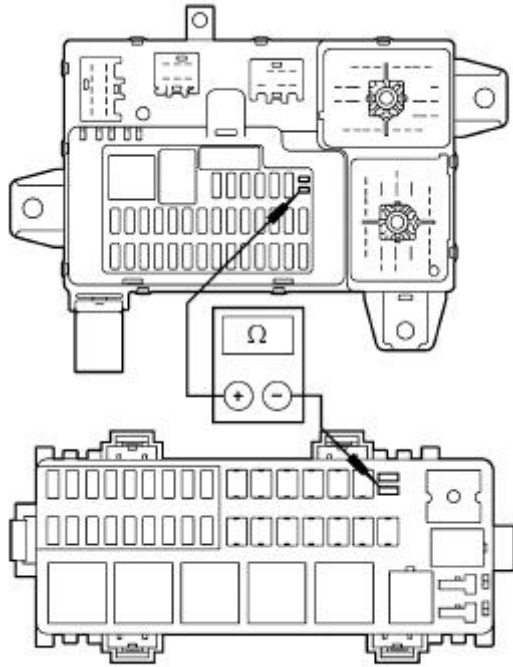
PINPOINT TEST A: NO COMMUNICATION WITH THE REAR ELECTRONIC MODULE (REM)

CONDITIONS	DETAILS/RESULTS/ACTIONS
A1 CHECK BJB FUSE 425 (40A) FOR POWER	
<p>1</p>  <p>2</p>  <p>BJB Fuse 425 (40A)</p> <p>3</p>  <p>A0003586</p>	<p>3</p> <p>Measure the voltage between BJB Fuse 425 (40A) pin 1, and ground.</p> <ul style="list-style-type: none"> ● Is the voltage greater than 10 volts? <p>→ Yes GO to A2.</p> <p>→ No REPAIR the power supply to BJB Fuse 425 (40A). TEST the system for normal operation.</p>
A2 CHECK CIRCUIT 30-DD1 (RD/YE) FOR AN OPEN	
<p>1</p>	



CJB Mini Fuse 207 (5A)

2



A0003615

2

Measure the resistance between BJB Fuse 425 (40A) pin 2, circuit 30-DD1 (RD/YE), and CJB Mini Fuse 207 (5A) pin 1, circuit 30-DD1 (RD/YE).

● Is the resistance less than 5 ohms?

→ **Yes**
REFER to [Section 418-00](#). TEST the system for normal operation.

→ **No**
REPAIR the circuit. TEST the system for normal operation.

PINPOINT TEST B: THE ROOF OPENING PANEL LEAKS

CONDITIONS	DETAILS/RESULTS/ACTIONS
B1 CHECK THE ROOF OPENING PANEL OPERATION	<p>1 Cycle the roof opening glass from the full-open position to the full-closed position.</p> <p>● Does the roof opening glass operate smoothly and close tightly?</p> <p>→ Yes GO to B2.</p> <p>→ No CHECK the roof opening glass adjustment. REFER to Height Adjustment. If</p>


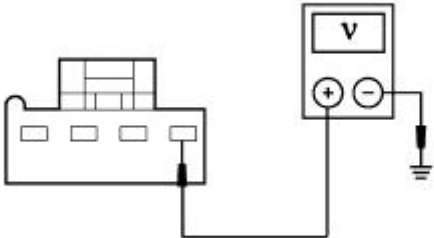
	the roof opening glass closes unevenly, CHECK the roof opening panel timing. REFER to Timing Adjustment . TEST the system for normal operation.
B2 CHECK THE ROOF OPENING PANEL FRAME DRAIN TUBES	
	<p>1 Gain access to the roof opening panel frame drain tubes.</p> <ul style="list-style-type: none"> ● Is there blockage or damage to the roof opening panel frame drain tubes? <p>→ Yes CLEAR the blockage or if necessary, INSTALL a new drain tube. TEST the system for normal operation.</p> <p>→ No GO to B3.</p>
B3 CHECK THE ROOF OPENING GLASS SEAL	
	<p>1 Actuate the roof opening glass to the full-open position.</p> <ul style="list-style-type: none"> ● Is the roof opening glass seal damaged? <p>→ Yes INSTALL a new roof opening glass seal. REFER to Glass—Roof Opening Assembly. TEST the system for normal operation.</p> <p>→ No REPAIR as necessary. TEST the system for normal operation.</p>

PINPOINT TEST C: THE ROOF OPENING PANEL IS NOISY DURING OPERATION

CONDITIONS	DETAILS/RESULTS/ACTIONS
C1 CHECK THE OPERATION OF THE ROOF OPENING GLASS	
	<p>1 Cycle the roof opening glass from the full-open to the full-closed position.</p> <ul style="list-style-type: none"> ● Is the roof opening glass loose? <p>→ Yes ADJUST the roof opening glass. REFER to Height Adjustment. TEST the system for normal operation.</p> <p>→ No GO to C2.</p>
C2 CHECK FOR OBSTRUCTIONS	
	<p>1 Check the roof opening panel track and rail assembly for foreign material, damage or looseness.</p> <ul style="list-style-type: none"> ● Is the roof opening panel obstructed or damaged? <p>→ Yes REMOVE the obstruction. If necessary, INSTALL a new roof opening panel</p>

	<p>track and rail assembly. REFER to Panel—Roof Opening Assembly . TEST the system for normal operation.</p> <p>→ No GO to C3 .</p>
<p>C3 CHECK THE ROOF OPENING PANEL MOTOR</p>	
	<p>1 Cycle the roof opening glass from the full-open to the full-closed position.</p> <ul style="list-style-type: none"> • Does the roof opening panel motor make excessive noise? <p>→ Yes CHECK the roof opening panel motor for the correct mounting. If necessary, INSTALL a new roof opening panel motor assembly. REFER to Motor—Roof Opening Panel Assembly . TEST the system for normal operation.</p> <p>If the roof opening panel opens or closes unevenly, ADJUST the roof opening panel timing. REFER to Timing Adjustment . TEST the system for normal operation.</p> <p>→ No CHECK the flushness. REFER to Height Adjustment . ADJUST the roof opening panel glass as necessary. TEST the system for normal operation.</p>

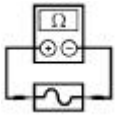
PINPOINT TEST D: THE ROOF OPENING PANEL DOES NOT OPEN OR CLOSE

CONDITIONS	DETAILS/RESULTS/ACTIONS
<p>D1 CHECK THE POWER SUPPLY TO THE ROOF OPENING PANEL CONTROL MODULE</p>	
<p>1</p>  <p>Roof Opening Panel Module C921b</p> <p>2</p>  <p>A0001447</p>	<p>2 Measure the voltage between roof opening panel control module C921b pin 1, circuit 30-AG12 (RD), harness side and ground.</p> <ul style="list-style-type: none"> • Is the voltage between 9 and 16 volts? <p>→ Yes GO to D4 .</p>

→ **No**
GO to [D2](#).

D2 CHECK CIRCUIT 30-AG12 (RD) FOR AN OPEN

1



BJB Fuse 416 (20A)

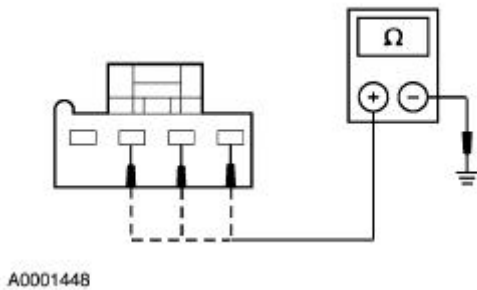
- **Is BJB Fuse 416 (20A) OK?**

→ **Yes**
REPAIR the circuit. TEST the system for normal operation.

→ **No**
GO to [D3](#).

D3 CHECK CIRCUITS 30-AG12 (RD), 32-AG6 (WH) AND 33-AG6 (YE) FOR A SHORT TO GROUND

1



1 Using the following table, measure the resistance between roof opening panel control module C921b pins, harness side and ground:

Pin	Circuit
1	30-AG12 (RD)
2	33-AG6 (YE)
3	32-AG6 (WH)

- **Are the resistances greater than 10,000 ohms?**

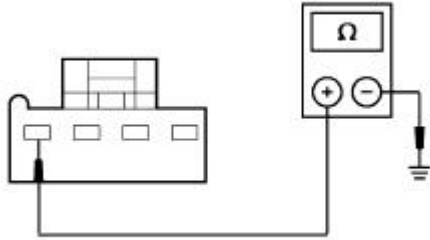
→ **Yes**
INSTALL a new BJB Fuse 416 (20A). TEST the system for normal operation. If BJB Fuse 416 (20A) opens again, INSTALL a new roof opening panel control module. REFER to [Module—Roof Opening Panel Control](#). TEST the system for normal operation.

→ **No**
REPAIR the circuit. TEST the system for normal operation.

D4 CHECK THE ROOF OPENING PANEL CONTROL MODULE GROUND

1

1 Measure the resistance between roof opening panel control module C921b pin 4, circuit 31-AG12 (BK/GN), harness side and ground.



A0001449

● Is the resistance less than 5 ohms?

→ **Yes**
GO to [D5](#).

→ **No**
REPAIR the circuit. TEST the system for normal operation.

D5 CHECK THE REM INPUT TO THE ROOF OPENING PANEL CONTROL MODULE

1

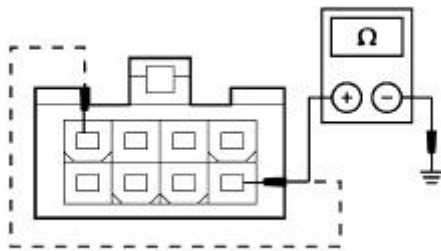


Roof Opening Panel Control Module C921a

2



3



A0001450

3 Measure the resistance between roof opening panel control module C921a pin 5, circuit 5-AG12 (BU/BK), harness side and ground; and between roof opening panel control module C921a pin 6, circuit 4-AG12 (GY/OG), harness side and ground.

● Are the resistances less than 5 ohms?

→ **Yes**
GO to [D7](#).

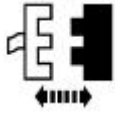
→ **No**
GO to [D6](#).

D6 CHECK CIRCUIT 5-AG12 (BU/BK) AND 4-AG12 (GY/OG) FOR AN OPEN

1

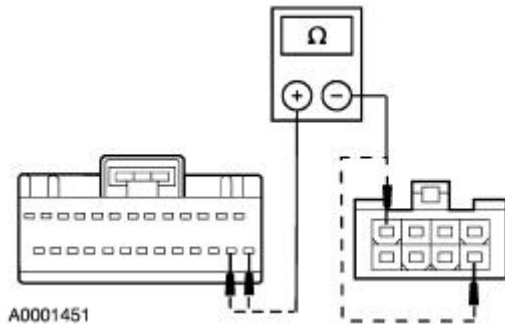


2



REM C420c

3



3

Measure the resistance between roof opening panel control module C921a pin 5, circuit 5-AG12 (BU/BK), harness side and REM C420c pin 14, circuit 5-AG12 (BU/BK), harness side; and between roof opening panel control module C921a pin 6, circuit 4-AG12 (GY/OG), harness side and REM C420c pin 15, circuit 4-AG12 (GY/OG), harness side.

● **Are the resistances less than 5 ohms?**

→ **Yes**

INSTALL a new REM. REFER to [Section 419-10](#). TEST the system for normal operation.

→ **No**

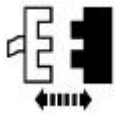
REPAIR the circuit. TEST the system for normal operation.

D7 CHECK CIRCUIT 5-AG12 (BU/BK) AND 4-AG12 (GY/OG) FOR A SHORT TO GROUND

1

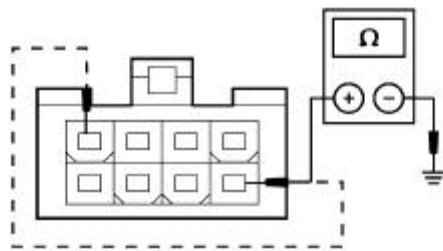


2



REM C420c

3



A0001450

3

Measure the resistance between roof opening panel control module C921a pin 5, circuit 5-AG12 (BU/BK), harness side and ground; and between roof opening panel control module C921a pin 6, circuit 4-AG12 (GY/OG), harness side and ground.

- Are the resistances greater than 10,000 ohms?

→ **Yes**
GO to [D8](#).

→ **No**
REPAIR the circuit. TEST the system for normal operation.

D8 CHECK THE ROOF OPENING PANEL CONTROL MODULE FOR REFERENCE VOLTAGE OUTPUT

1



2



REM C420c

3



Roof Opening Panel Control Module C921a

4

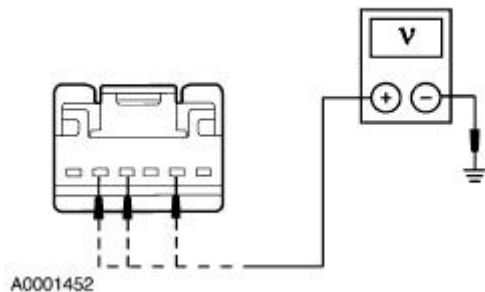


Roof Opening Panel Switch C912

5



6



6 Using the following table, measure the voltage between roof opening panel switch C912 pins, harness side and ground:

Pin	Circuit
4	32-AG12 (WH/GN)
2	32-AG10 (WH/BU)
5	33-AG10 (YE/BU)

- Are the voltages approximately 5 volts?

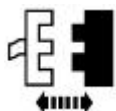
→ **Yes**

GO to [D9](#).

→ **No**
GO to [D10](#).

D9 CHECK THE ROOF OPENING PANEL SWITCH INPUT

1



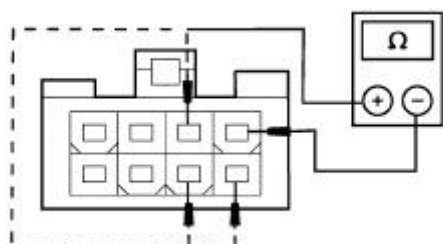
Roof Opening Panel Control Module C921a

2



Roof Opening Panel Switch C912

3



A0001453

3 Using the following table, measure the resistance between roof opening panel control module C921a pin 8, circuit 9-AG7 (BN/RD), harness side and roof opening panel control module pins, harness side, while the roof opening panel switch is activated to each position.

Pin	Circuit	Switch Position
4	32-AG10 (WH/BU)	Depress the switch to open (first detent position)
4	32-AG10 (WH/BU)	Depress the switch to express open (second detent position)
7	32-AG12 (WH/GN)	Depress the switch to tilt
7	32-AG12 (WH/GN)	Depress the switch to express open (second detent position)
3	33-AG10 (YE/BU)	Depress the switch to close

- Are the resistances greater than 10,000 ohms with the switch in the resting state and less than 5 ohms when activated?

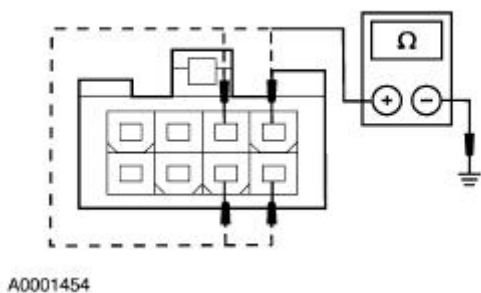
→ **Yes**
GO to [D12](#).

→ **No**
INSTALL a new roof opening panel switch. REFER to [Switch—Roof Opening Panel](#). TEST the system for normal

operation.

D10 CHECK CIRCUITS 9-AG7 (BN/RD), 32-AG12 (WH/GN), 32-AG10 (WH/BU) AND 33-AG10 (YE/BU) FOR A SHORT TO GROUND

1



1

Using the following table, measure the resistance between roof opening panel control module C921a pins, harness side and ground:

Pin	Circuit
3	33-AG10 (YE/BU)
4	32-AG10 (WH/BU)
7	32-AG12 (WH/GN)
8	9-AG7 (BN/RD)

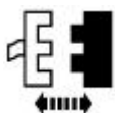
- Are the resistances greater than 10,000 ohms?

→ **Yes**
GO to [D11](#).

→ **No**
REPAIR the circuit. TEST the system for normal operation.

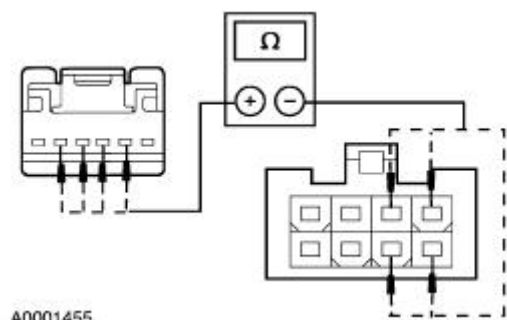
D11 CHECK CIRCUITS 9-AG7 (BN/RD), 32-AG12 (WH/G), 32-AG10 (WH/BU) AND 33-AG10 (YE/BU) FOR AN OPEN

1



Roof Opening Panel Switch C912

2



2

Using the following table, measure the resistance between roof opening panel control module C921a pins, harness side and the roof opening panel switch C912 pins, harness side:

Roof Opening Panel Control Module C921a Pin	Circuit	Roof Opening Panel Switch C912 Pin
3	33-AG10 (YE/BU)	5
4	32-AG10 (WH/BU)	2
7	32-AG12 (WH/GN)	4
8	9-AG7 (BN/RD)	3

- Are the resistances less than 5 ohms?

→ Yes

INSTALL a new roof opening panel switch. REFER to [Switch—Roof Opening Panel](#). TEST the system for normal operation.

→ No

REPAIR the circuit. TEST the system for normal operation.

D12 CHECK THE OUTPUT TO THE ROOF OPENING PANEL MOTOR ASSEMBLY

1



Roof Opening Panel Motor Assembly C920

2

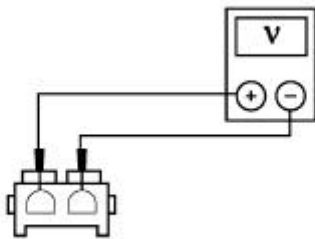


Roof Opening Panel Control Module C921a

3



4



A0001456

4

Measure the voltage between roof opening panel motor assembly C920 pin 1, circuit 32-AG6 (WH), harness side and roof opening panel motor assembly C920 pin 2, circuit 33-AG6 (YE), harness side.

5

Depress the roof opening panel switch to the open position; then the closed position.

- Is the voltage greater than 9 volts in both directions?

→ Yes

GO to [D14](#).

→ No

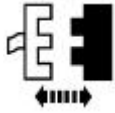
GO to [D13](#).

D13 CHECK CIRCUIT 32-AG6 (WH) AND 33-AG6 (YE) FOR AN OPEN

1

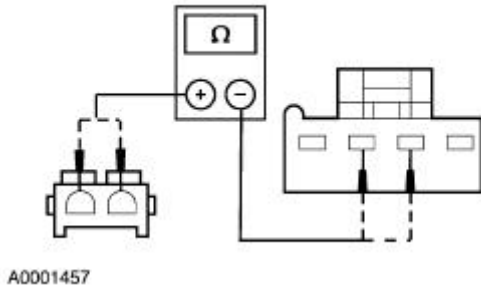


2



Roof Opening Panel Control Module C921b

3



3

Measure the resistance between roof opening panel control module C921b pin 3, circuit 32-AG6 (WH), harness side and roof opening panel motor assembly C920 pin 1, circuit 32-AG6 (WH), harness side; and between roof opening panel control module C921b pin 2, circuit 33-AG6 (YE), harness side and roof opening panel motor assembly C920 pin 2, circuit 33-AG6 (YE), harness side.

- Are the resistances less than 5 ohms?

→ Yes

INSTALL a new roof opening panel control module. REFER to [Module—Roof Opening Panel Control](#). TEST the system for normal operation.

→ No

REPAIR the circuit. TEST the system for normal operation.

D14 CHECK THE ROOF OPENING PANEL MOTOR ASSEMBLY

1



3



Roof Opening Panel Motor Assembly C920

4



2



Remove the roof opening panel motor assembly. For additional information, refer to [Motor—Roof Opening Panel Assembly](#).

5

Firmly hold the roof opening panel motor

	<p>making sure not to make contact with the motor gear.</p> <p>6 Depress the roof opening panel switch to the open position.</p> <ul style="list-style-type: none"> ● Does the roof opening panel motor operate? <p>→ Yes CHECK the roof opening panel for obstructions. If no obstructions are found, Install a new roof opening panel assembly. REFER to Panel—Roof Opening Assembly. TEST the system for normal operation.</p> <p>→ No INSTALL a new roof opening panel motor assembly. REFER to Motor—Roof Opening Panel Assembly. TEST the system for normal operation.</p>
--	--

PINPOINT TEST E: THE ROOF OPENING PANEL DOES NOT OPEN OR CLOSE IN VENT POSITION

CONDITIONS	DETAILS/RESULTS/ACTIONS
E1 CHECK THE ROOF OPENING PANEL OPEN/CLOSE OPERATION	
<p>1</p> 	<p>2 Depress the roof opening panel switch rearward and then forward.</p> <ul style="list-style-type: none"> ● Did the roof opening panel open and close? <p>→ Yes GO to E2.</p> <p>→ No GO to Pinpoint Test D.</p>
E2 CHECK THE ROOF OPENING PANEL VENT UP OPERATION	
<p>1</p> 	<p>2 Make sure the roof opening panel is in the flush position.</p> <p>3 Depress the roof opening panel switch</p>

up to the vent position.

- **Did the roof opening panel vent up?**

→ **Yes**

VERIFY the symptom. Circuit 33-AG10 (YE/BU) is used for close and vent down operation. If the roof opening panel is still inoperative in the vent down position, CHECK for loose connections, a binding roof opening panel track, a sticking switch or intermittent operation of the roof opening panel control module.

→ **No**

GO to [E3](#).

E3 CHECK THE ROOF OPENING PANEL EXPRESS OPERATION

1 Depress the roof opening panel switch rearward to the second detent position and release.

- **Did the roof opening panel express operation work correctly?**

→ **Yes**

INSTALL a new roof opening panel switch. REFER to [Switch—Roof Opening Panel](#). TEST the system for normal operation.

→ **No**

GO to [E4](#).

E4 CHECK FOR REFERENCE VOLTAGE TO THE ROOF OPENING PANEL SWITCH

1



2



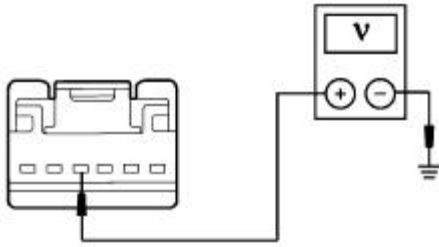
Roof Opening Panel Switch C912

3



4

4 Measure the voltage between roof opening panel switch C912 pin 4, circuit 32-AG12 (WH/GN), harness side and ground.



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● Is the voltage approximately 5 volts?

→ Yes
GO to [E7](#).

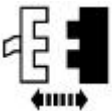
→ No
GO to [E5](#).

E5 CHECK CIRCUIT 32-AG12 (WH/GN) FOR AN OPEN

1

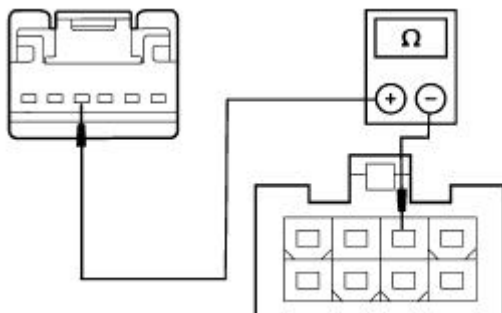


2



Roof Opening Panel Module C921a

3



A0001459

3 Measure the resistance between roof opening panel control module C921a pin 7, circuit 32-AG12 (WH/GN), harness side and roof opening panel switch C912 pin 4, circuit 32-AG12 (WH/GN), harness side.

● Is the resistance less than 5 ohms?

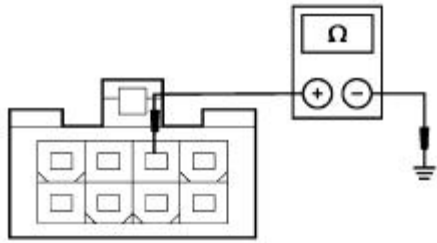
→ Yes
GO to [E6](#).

→ No
REPAIR the circuit. TEST the system for normal operation.

E6 CHECK CIRCUIT 32-AG12 (WH/GN) FOR A SHORT TO GROUND

1

1 Measure the resistance between roof opening panel control module C921a pin



A0001460

7, circuit 32-AG12 (WH/GN), harness side and ground.

- Is the resistance greater than 10,000 ohms?

→ **Yes**
 INSTALL a new roof opening panel control module. REFER to [Module—Roof Opening Panel Control](#). TEST the system for normal operation.

→ **No**
 REPAIR the circuit. TEST the system for normal operation.

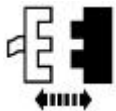
E7 CHECK THE INPUT TO THE ROOF OPENING PANEL CONTROL MODULE

1



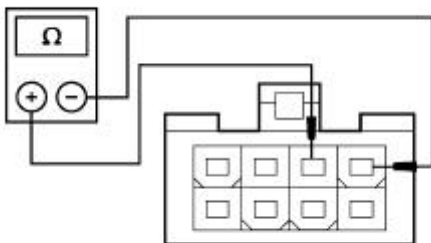
Roof Opening Panel Switch C912

2



Roof Opening Panel Control Module C921a

3



A0001461

3 Measure the resistance between roof opening panel control module C921a pin 7, circuit 32-AG12 (WH/GN), harness side and roof opening panel control module C921a pin 8, circuit 9-AG7 (BU/RD), harness side.

4 Depress the roof opening panel switch to the VENT position.

- Is the resistance less than 5 ohms?




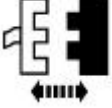
→ **Yes**
 INSTALL a new roof opening panel control module. REFER to [Module—Roof](#)

	<p>Opening Panel Control . TEST the system for normal operation.</p> <p>→ No INSTALL a new roof opening panel switch. REFER to Switch—Roof Opening Panel . TEST the system for normal operation.</p>
--	--

PINPOINT TEST F: THE ROOF OPENING PANEL DOES NOT STOP IN FLUSH FROM ANY POSITION

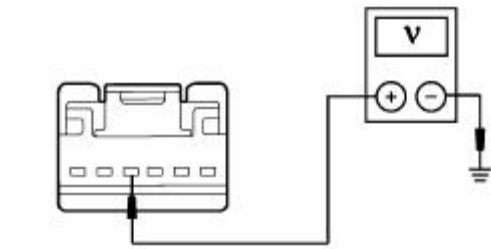
CONDITIONS	DETAILS/RESULTS/ACTIONS
F1 CHECK THE ROOF OPENING GLASS ADJUSTMENT	
	<p>1 Check the roof opening glass adjustment. Refer to Height Adjustment .</p> <ul style="list-style-type: none"> ● Is the roof opening glass adjusted correctly? <p>→ Yes GO to F2 .</p> <p>→ No ADJUST the roof opening glass as necessary. TEST the system for normal operation.</p>
F2 CHECK THE ROOF OPENING GLASS SEAL	
	<p>1 Inspect the roof opening glass seal for looseness, damage and correct installation.</p> <ul style="list-style-type: none"> ● Is the roof opening glass seal OK and installed correctly? <p>→ Yes GO to F3 .</p> <p>→ No REPAIR or INSTALL a new roof opening glass seal as necessary. REFER to Glass—Roof Opening Assembly . TEST the system for normal operation.</p>
F3 CHECK FOR OBSTRUCTION IN THE ROOF OPENING PANEL	
	<p>1 Inspect the roof opening panel assembly for obstructions in the track.</p> <ul style="list-style-type: none"> ● Are any obstructions found? <p>→ Yes REMOVE the obstruction. If necessary, INSTALL a new roof opening panel track and rail assembly. REFER to Panel—Roof Opening Assembly . TEST the system for normal operation.</p> <p>→ No INSTALL a new roof opening panel control module. REFER to Module—Roof Opening Panel Control . TEST the system for normal operation.</p>

PINPOINT TEST G: THE EXPRESS OPEN IS INOPERATIVE

CONDITIONS	DETAILS/RESULTS/ACTIONS
G1 CHECK THE ROOF OPENING PANEL OPEN/CLOSE OPERATION	
<p>1</p> 	<p>2 Depress the roof opening panel switch rearward and then forward.</p> <ul style="list-style-type: none"> ● Did the roof opening panel open and close? <p>→ Yes GO to G2.</p> <p>→ No GO to Pinpoint Test D.</p>
G2 CHECK THE ROOF OPENING PANEL VENT UP OPERATION	
<p>1</p> 	<p>2 Make sure the roof opening panel is in the flush position.</p> <p>3 Depress the roof opening panel switch up to the vent position.</p> <ul style="list-style-type: none"> ● Did the roof opening panel vent up? <p>→ Yes GO to G7.</p> <p>→ No GO to G3.</p>
G3 CHECK FOR REFERENCE VOLTAGE TO THE ROOF OPENING PANEL SWITCH	
<p>1</p>  <p>2</p>  <p>Roof Opening Panel Switch C912</p> <p>3</p>	



4



A0001458

4

Measure the voltage between roof opening panel switch C912 pin 4, circuit 32-AG12 (WH/GN), harness side and ground.

● Is the voltage approximately 5 volts?

→ Yes
GO to [G6](#).

→ No
GO to [G4](#).

G4 CHECK CIRCUIT 32-AG12 (WH/GN) FOR AN OPEN

1

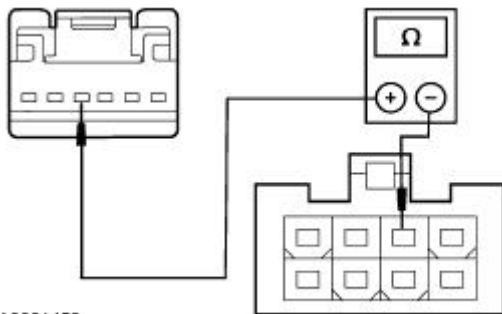


2



Roof Opening Panel Module C921a

3



A0001459

3

Measure the resistance between roof opening panel control module C921a pin 7, circuit 32-AG12 (WH/GN), harness side and roof opening panel switch C912 pin 4, circuit 32-AG12 (WH/GN), harness side.

● Is the resistance less than 5 ohms?

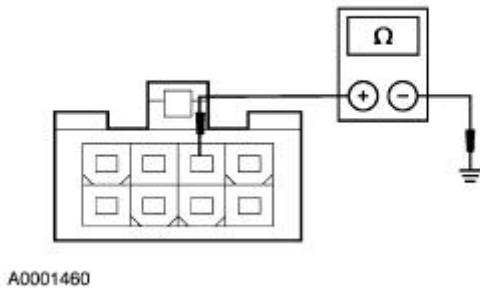
→ Yes
GO to [G5](#).

→ No
REPAIR the circuit. TEST the system for

normal operation.

G5 CHECK CIRCUIT 32-AG12 (WH/GN) FOR A SHORT TO GROUND

1



1

Measure the resistance between roof opening panel control module C921a pin 7, circuit 32-AG12 (WH/GN), harness side and ground.

- Is the resistance greater than 10,000 ohms?

→ Yes

INSTALL a new roof opening panel control module. REFER to [Module—Roof Opening Panel Control](#). TEST the system for normal operation.

→ No

REPAIR the circuit. TEST the system for normal operation.

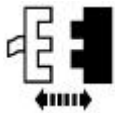
G6 CHECK THE INPUT TO THE ROOF OPENING PANEL CONTROL MODULE

1



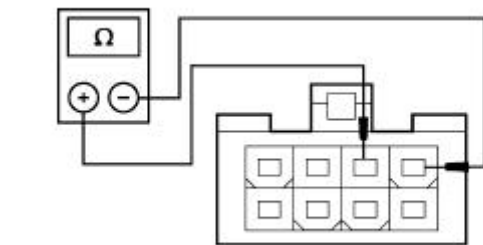
Roof Opening Panel Switch C912

2



Roof Opening Panel Control Module C921a

3



3

Measure the resistance between roof opening panel control module C921a pin 7, circuit 32-AG12 (WH/GN), harness side and roof opening panel control module C921a pin 8, circuit 9-AG7 (BU/RD), harness side.

4

Depress the roof opening panel switch to the vent position.

- Is the resistance less than 5 ohms?

→ **Yes**
INSTALL a new roof opening panel control module. REFER to [Module—Roof Opening Panel Control](#) . TEST the system for normal operation.

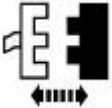
→ **No**
INSTALL a new roof opening panel switch. REFER to [Switch—Roof Opening Panel](#) . TEST the system for normal operation.

G7 CHECK FOR AN INTERMITTENT OPEN SIGNAL

1

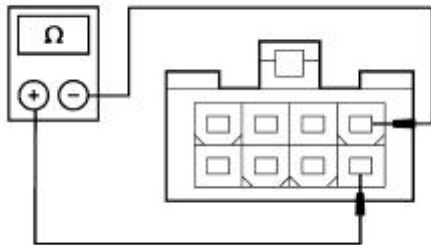


2



Roof Opening Panel Control Module C921a

3



A0001462

3 Measure the resistance between roof opening panel control module C921a pin 4, circuit 32-AG10 (WH/BU), harness side and roof opening panel control module C921a pin 8, circuit 9-AG7 (BU/RD), harness side.

4 Monitor the resistance as the roof opening panel is moved to the open (first detent) position, then express open (second detent) position.

- **Is the resistance continuously less than 5 ohms through the open position to the express open position?**

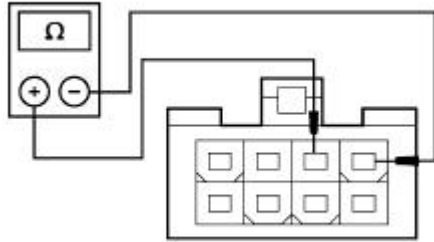
→ **Yes**
GO to [G8](#) .

→ **No**
INSTALL a new roof opening panel switch. REFER to [Switch—Roof Opening Panel](#) . TEST the system for normal operation.

G8 CHECK FOR AN INTERMITTENT EXPRESS OPEN SIGNAL

1

1 Measure the resistance between roof opening panel control module C921a pin



A0001461

7, circuit 32-AG12 (WH/GN), harness side and roof opening panel control module C921a pin 8, circuit 9-AG7 (BU/RD), harness side.

2 Monitor the resistance as the roof opening panel is moved to the open (first detent) position, then express open (second detent) position.

- **Is the resistance greater than 10,000 ohms in the open position and continuously less than 5 ohms in the express open position?**

→ **Yes**
 INSTALL a new roof opening panel control module. REFER to [Module—Roof Opening Panel Control](#). TEST the system for normal operation.

→ **No**
 INSTALL a new roof opening panel switch. REFER to [Switch—Roof Opening Panel](#). TEST the system for normal operation.

PINPOINT TEST H: THE ROOF OPENING PANEL HAS EXCESSIVE WIND NOISE

CONDITIONS	DETAILS/RESULTS/ACTIONS
H1 CHECK THE ROOF OPENING GLASS FIT	
	<p>1 Cycle the roof opening glass from the full-open to the full-closed position.</p> <p>2 Inspect the roof opening glass seal for correct fit or damage.</p> <ul style="list-style-type: none"> ● Is the roof opening glass seal OK? <p>→ Yes GO to H2.</p> <p>→ No INSTALL a new roof opening glass seal. REFER to Glass—Roof Opening Assembly. TEST the system for normal operation.</p>
H2 CHECK THE ROOF OPENING GLASS OPERATION	
	<p>1 Cycle the roof opening glass from the full-open to the full-closed position.</p>

- **Does the roof opening glass travel to the full-open and the full-closed position?**

→ **Yes**

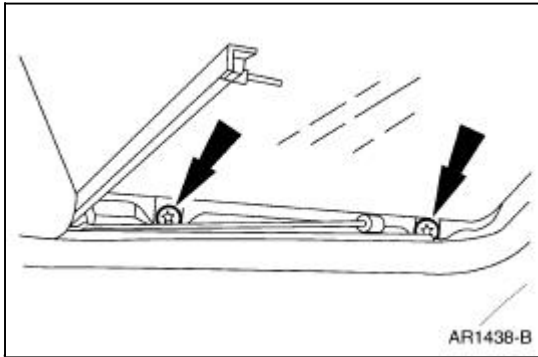
ADJUST the roof opening glass. REFER to [Height Adjustment](#) . If the roof opening glass closes unevenly, CHECK the roof opening panel timing. REFER to [Timing Adjustment](#) . TEST the system for normal operation.

→ **No**

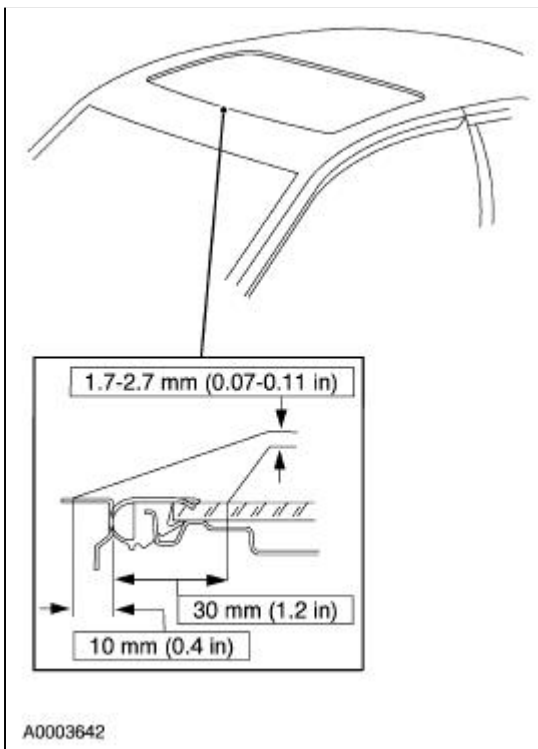
CHECK the roof opening glass seal. If necessary, INSTALL a new roof opening glass seal. REFER to [Glass—Roof Opening Assembly](#) . TEST the system for normal operation.

Height Adjustment

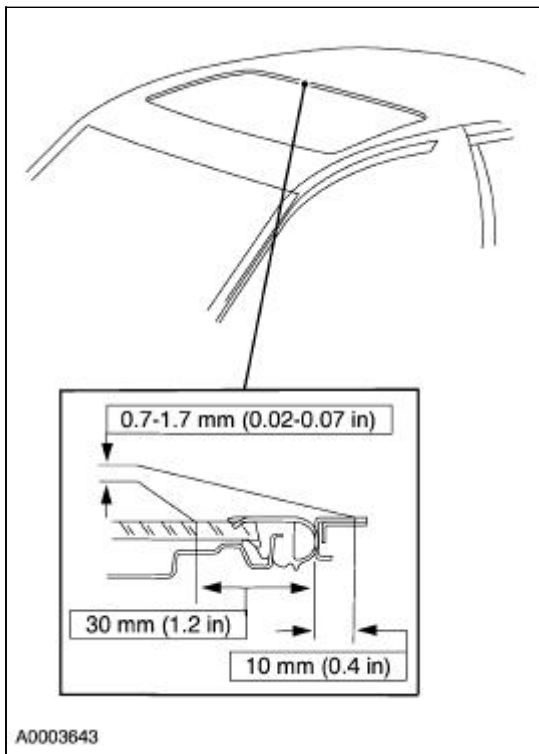
1. Operate the roof opening glass assembly to the closed position.
2. Swing the left sight shield and right sight shield rearward and loosen the screws on each side.



3. Adjust the front glass edge to between flush and 1.7 - 2.7 mm (0.07 - 0.11 in) low.

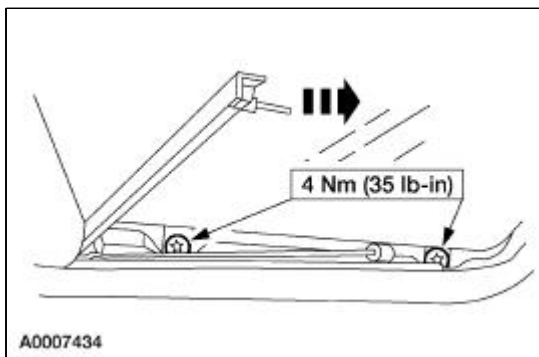


4. Adjust the rear glass edge to between flush and 0.7 - 1.7 mm (0.02 - 0.07 in) low.



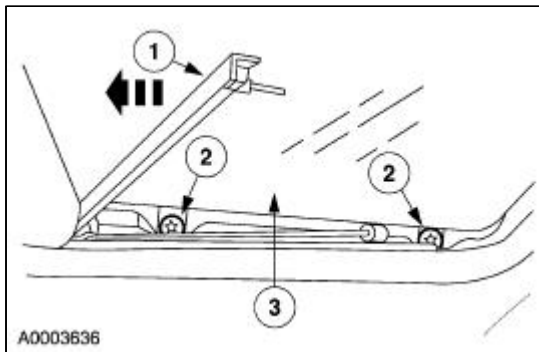
5. **NOTE:** Make sure to carefully align the sight shield to the snap retainer prior to positioning into place.

Tighten the four screws and swing the left and right sight shields forward and snap into place.

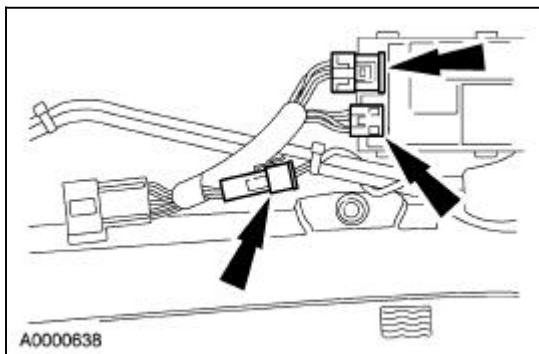


Timing Adjustment

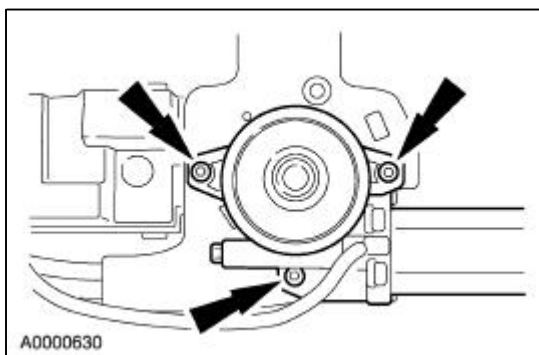
1. Remove the roof opening panel assembly. For additional information, refer to [Panel—Roof Opening Assembly](#) in this section.
2. Remove the roof opening glass assembly.
 1. Swing the left and right sight shields rearward.
 2. Remove the screws on each side.
 3. From the exterior of the vehicle, lift the roof opening glass assembly from the vehicle.



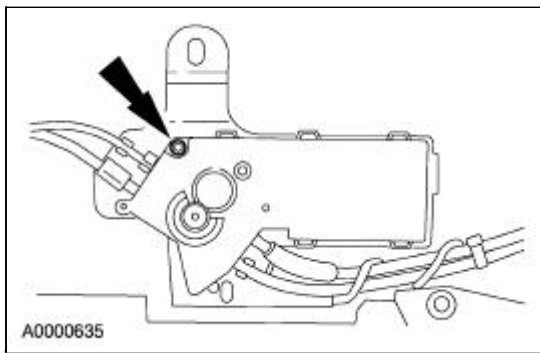
3. Disconnect the connectors.



4. Remove screws and the roof opening panel motor assembly.

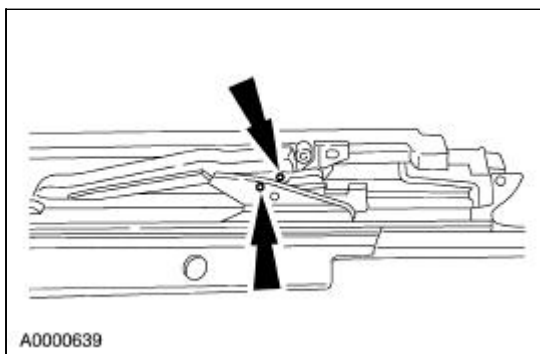


5. Remove the screw and the roof opening panel control module.

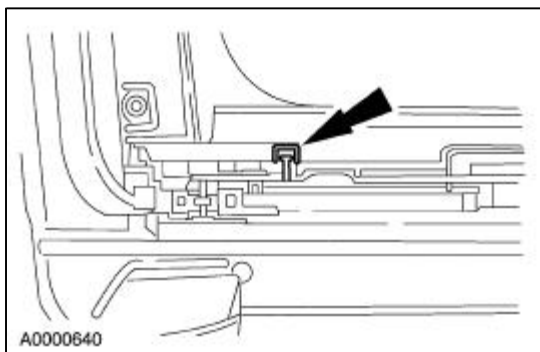


6. **NOTE:** It may be necessary to slightly separate the rail assembly to visually see the two alignment holes.

Align the holes in the mechanism on each side.



7. Make sure the flush locating pin is centered in the slot on each side.

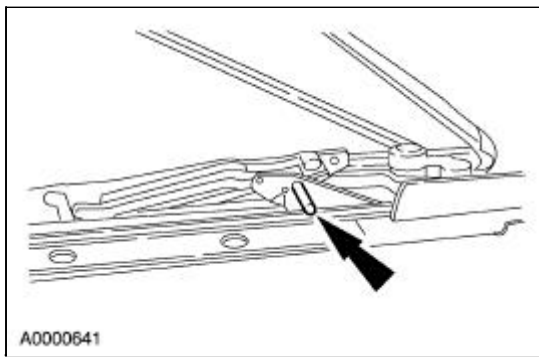


8. **NOTE:** The alignment pins must remain in place until the roof opening panel control module is installed.

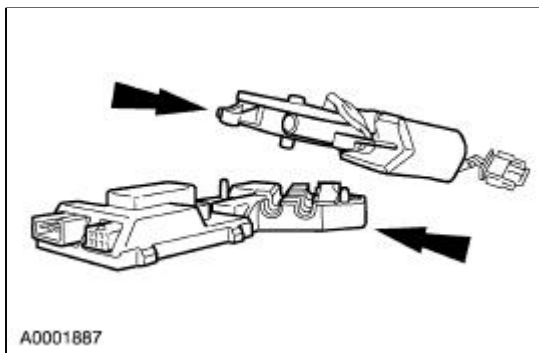
NOTE: A number 33 drill bit may be used as an alignment pin.

Install an alignment pin in the alignment hole in each side of the mechanism.

- The alignment pin should be approximately 2.83 mm (0.11 in) in diameter

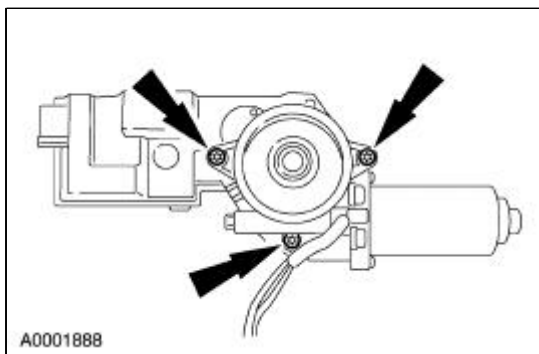


9. Position the roof opening panel motor assembly on the roof opening panel control module.

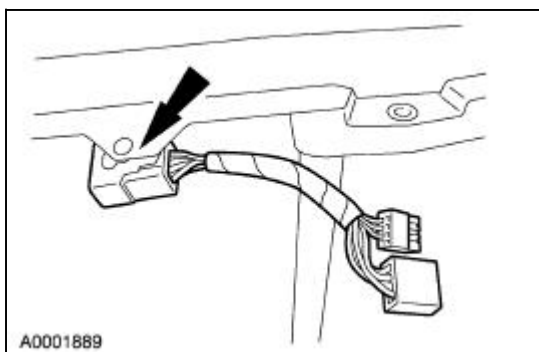


10.  **CAUTION: Do not snug or overtighten the roof opening panel mounting screws. Damage to the roof opening panel control module may result.**

Install the screws approximately two to three turns.

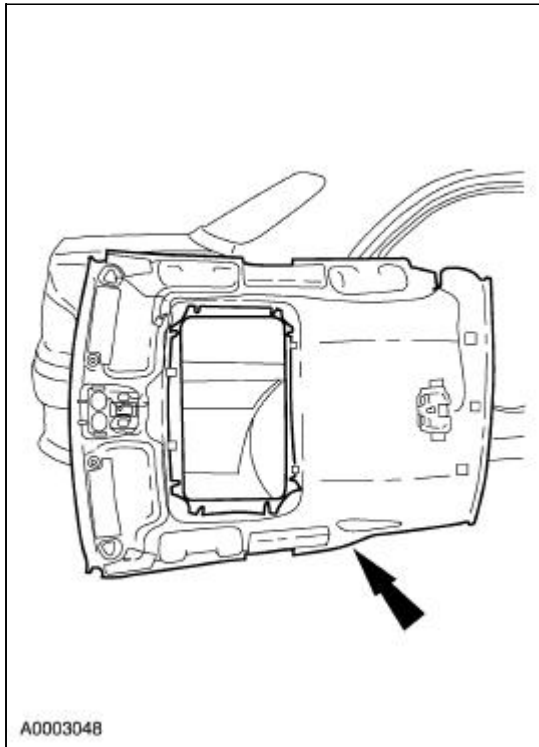


11. Remove the harness from the roof opening panel assembly.

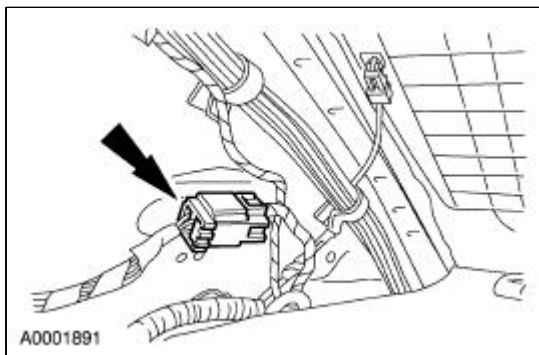


12. Position the headlining panel against the right rear quarter panel.

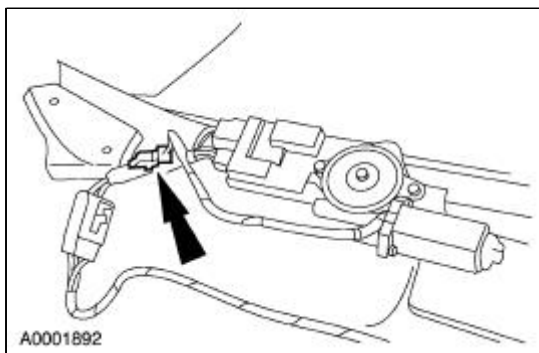
- The rear of the headliner should be towards the right rear door opening and the cloth side towards the vehicle.



13. Connect the headlining panel body harness connector at the right rear C-pillar.



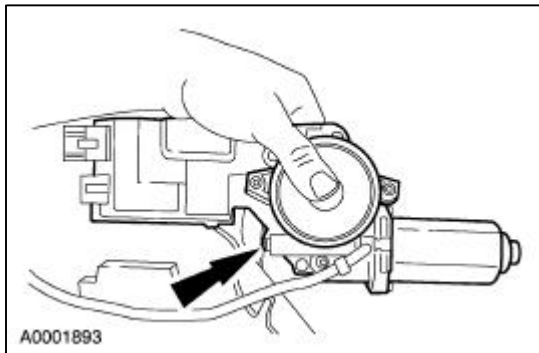
14. Connect the roof opening panel harness between the module motor assembly and the roof opening panel switch.



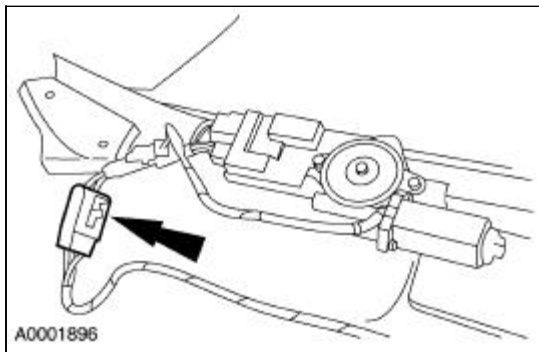
15. **NOTE:** Make sure the battery is fully charged.

Turn the ignition switch to RUN.

16. Firmly hold the roof opening panel control module and roof opening panel motor together.

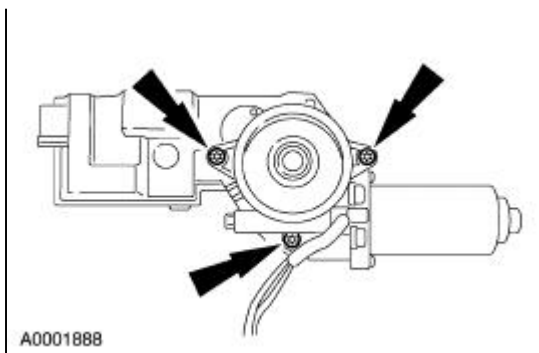


17. Operate the roof opening panel switch rearward (OPEN position) until the motor stops.
18. Operate the roof opening panel switch forward (CLOSE position) until the motor stops.
19. Disconnect the front body harness connector.

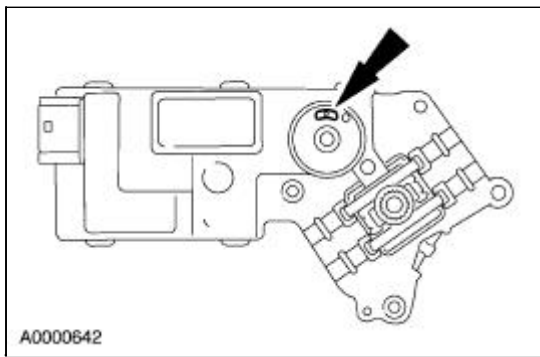


20. **NOTE:** Make sure the roof opening panel control module gear position is not altered.

Remove the screws.



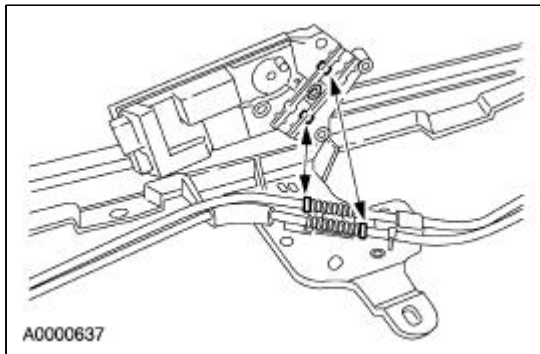
21. Make sure the alignment hole is visible in the view hole.



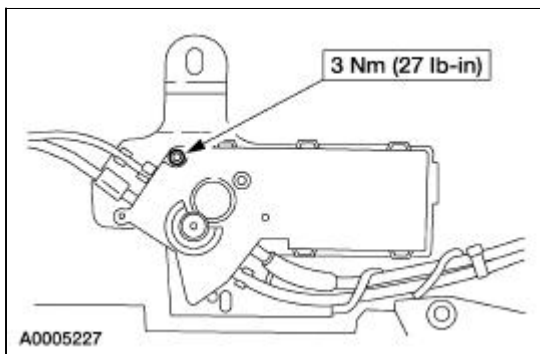
22. **NOTE:** Make sure the roof opening panel control module gear position is not altered.

Install the roof opening panel control module on the cable sleeves.

- Make sure the shoulder of each cable sleeve is correctly seated in the roof opening panel control module.

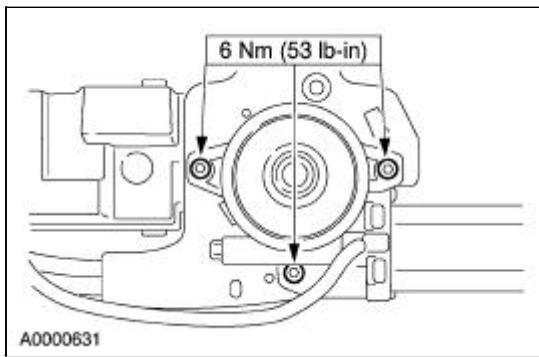


23. Make sure the roof opening panel control module is seated flush to the bracket and install the screw.

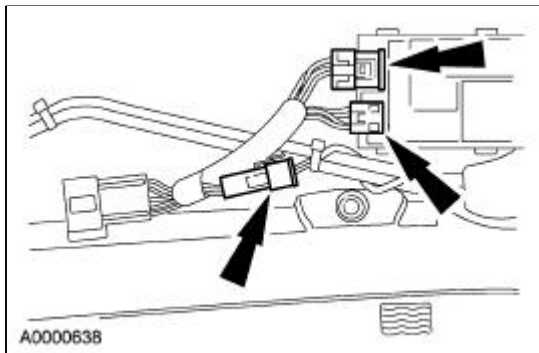


24. **NOTE:** Make sure the roof opening panel motor is correctly aligned and inserted into the control module. The roof opening panel motor should be sitting flush with the frame before installing the bolts.

Position the roof opening panel motor assembly and install the screws.

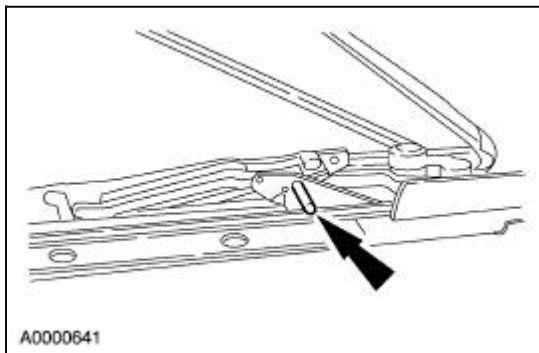


25. Connect the connectors.



26. Install the roof opening panel harness tie down and clip into place.

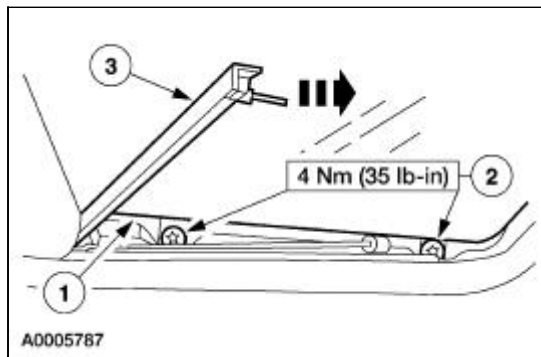
27. Remove the alignment pins from each side.



28. Install the roof opening glass assembly.

1. Install the roof opening glass assembly in place aligning screw holes.
2. Install the screws on each side.
3. **NOTE:** Make sure to carefully align the sight shield to the snap retainer prior to positioning into place.

Swing the left and right sight shields forward and snap into place.



29. Position the roof opening panel assembly near the headliner and connect the roof opening panel harness to the headliner harness.

30. **NOTE:** Make sure the battery is fully charged.

Operate the roof opening panel to the full open and full close position. Make sure both sides activate at the same time and the roof opening panel operates smoothly without jerking or binding. Make sure both sides reach flush at the same time.

31. Install the roof opening panel assembly. For additional information, refer to [Panel—Roof Opening Assembly](#) in this section.

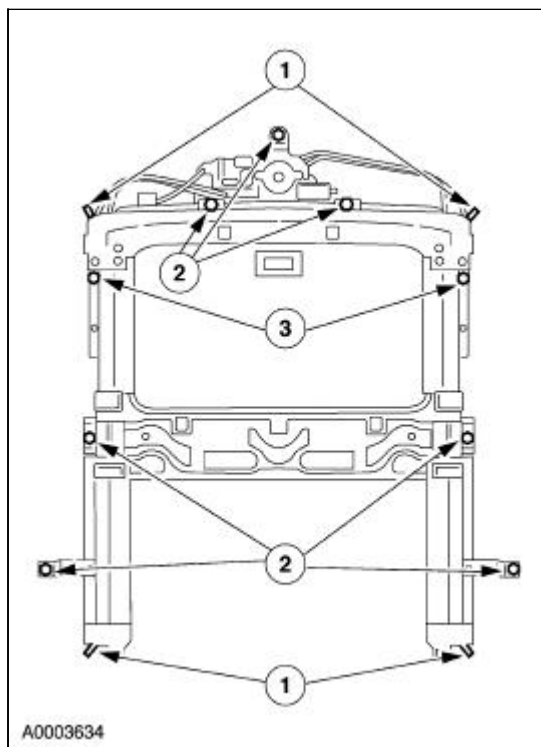
32. Adjust the roof opening glass height. For additional information, refer to [Height Adjustment](#) in this section.

Panel —Roof Opening Assembly

Removal

1. Remove the headliner. For additional information, refer to [Section 501-05](#).
2. Remove the roof opening panel assembly.
 1. Disconnect the drain tubes.
 2. Remove the bolts.
 3. **NOTE:** Support the roof opening panel assembly to prevent the unit from dropping.

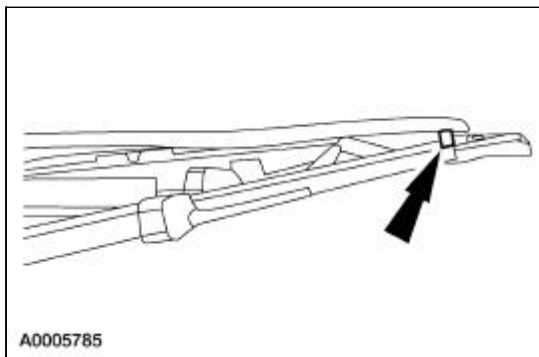
Remove the bolts.



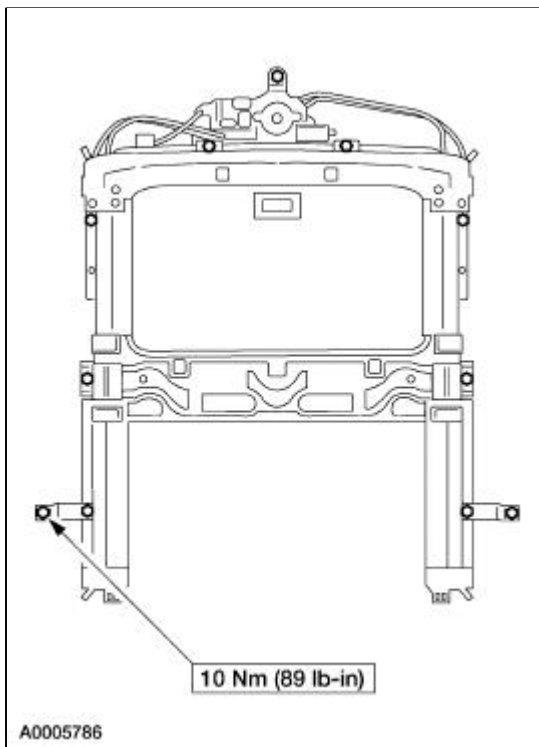
Installation

NOTE: The roof opening panel is available as an assembly or a track and rail assembly. The track and rail assembly must have the roof opening glass and the roof opening panel opening shield transferred from the old unit. The roof opening panel assembly can be installed without transferring parts from the old unit.

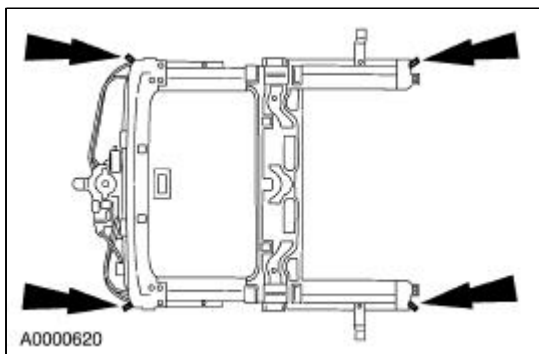
1. If necessary, transfer the roof opening glass assembly and the roof opening panel opening shield to the new roof opening panel assembly.
2. Install and support the roof opening panel assembly in the vehicle.
 - Make sure the alignment pins are correctly seated on each side.



3. Install the roof opening panel assembly bolts.



4. Connect the drain tubes.

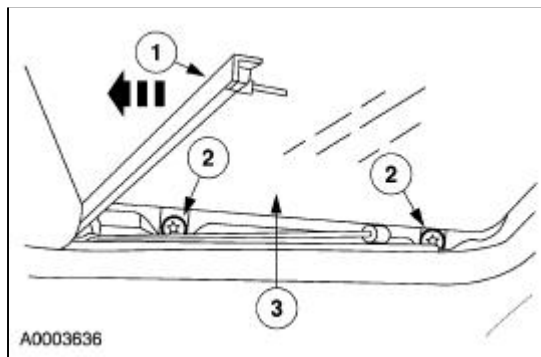


5. Install the headliner. For additional information, refer to [Section 501-05](#).
 6. Adjust the roof opening glass height. For additional information, refer to [Height Adjustment](#).
-

Glass —Roof Opening Assembly

Removal

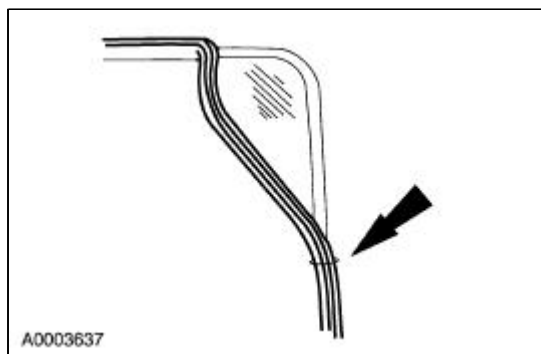
1. Operate the roof opening glass assembly to the closed position.
2. Remove the roof opening glass assembly.
 1. Swing the left and right sight shields rearward.
 2. Remove the four screws.
 3. From the exterior of the vehicle, lift the roof opening glass assembly from the vehicle.



3. Remove the roof opening glass seal.

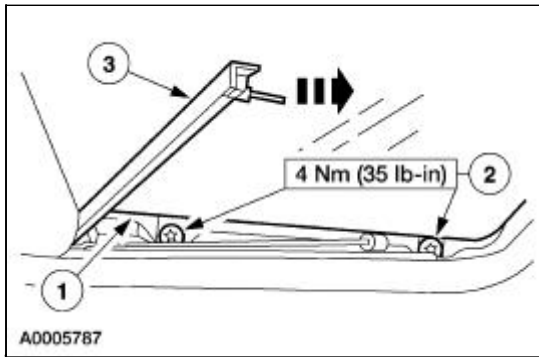
Installation

1. Install the roof opening glass seal.
 - Position the roof opening glass seal seam in the center of the passenger side of the roof opening glass.



2. Install the roof opening glass assembly.
 1. Install the roof opening glass assembly in place aligning screw holes.
 2. Install the four screws.
 3. **NOTE:** Make sure to carefully align the sight shield to the snap retainer prior to positioning into place.

Swing the left and right sight shields forward and snap into place.

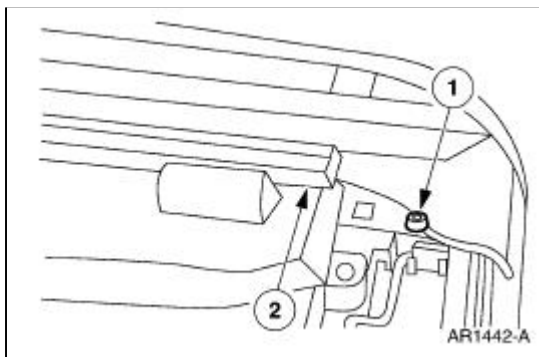


3. Adjust the roof opening glass height. For additional information, refer to [Height Adjustment](#).
-

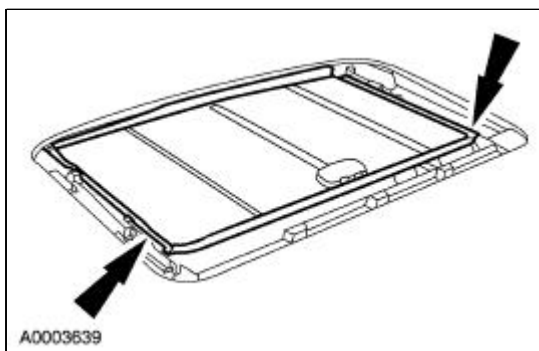
Opening Shield —Roof Opening Panel

Removal

1. Remove the roof opening glass assembly. For additional information, refer to [Glass—Roof Opening Assembly](#).
2. Remove the water trough.
 1. Remove the two screws.
 2. Remove the water trough.

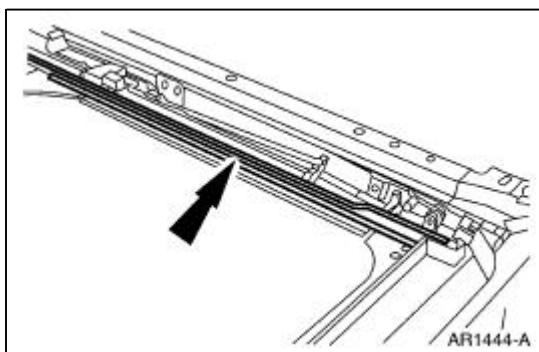


3. Pull the roof opening panel opening shield forward, lifting up slightly at the front openings until the front and rear tabs are disengaged from the track.

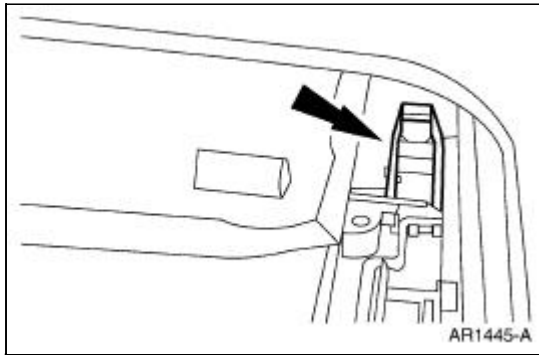


Installation

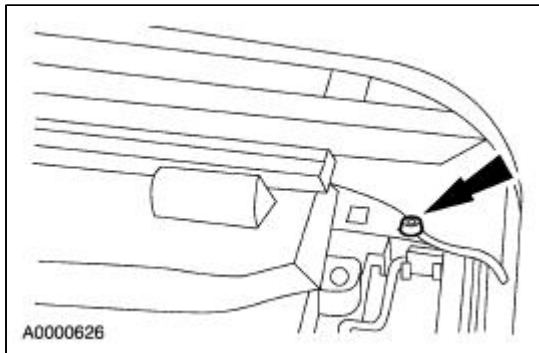
1. Insert the rear tabs into the track and slide the roof opening panel opening shield rearward until the front tabs insert into the track.



2. Install the water trough under the tab on each side.



3. Position the water trough and install the two screws.



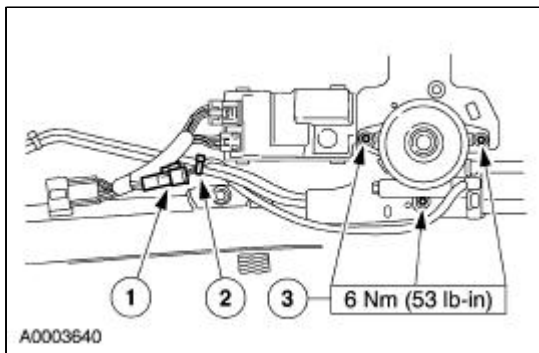
4. Install the roof opening glass assembly. For additional information, refer to [Glass—Roof Opening Assembly](#).
-

Motor —Roof Opening Panel Assembly

Removal and Installation

⚠ CAUTION: Make sure the roof opening glass assembly is not moved during motor removal or installation. The roof opening panel assembly timing may be affected and cause the roof opening panel assembly to bind or be damaged.

1. Remove the headliner. For additional information, refer to [Section 501-05](#).
2. Remove the roof opening panel motor assembly.
 1. Disconnect the electrical connector.
 2. Remove the tie strap.
 3. Remove the bolts.



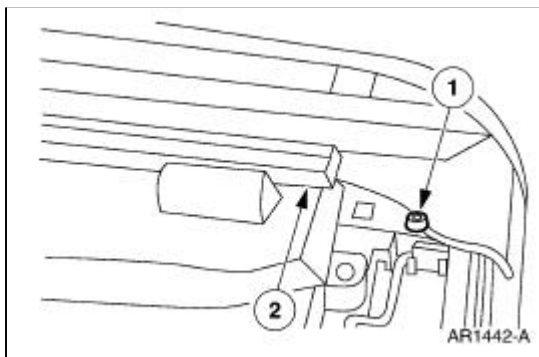
3. **NOTE:** If the roof opening glass assembly was moved while the roof opening panel motor was removed, the timing must be reset. Refer to [Timing Adjustment](#).

To install, reverse the removal procedure.

Trough Assembly

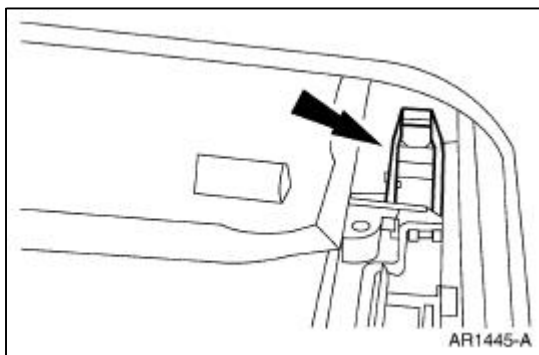
Removal

1. Remove the roof opening glass assembly. For additional information, refer to [Glass—Roof Opening Assembly](#).
2. Remove the water trough (5454022).
 1. Remove the two screws.
 2. Remove the water trough.

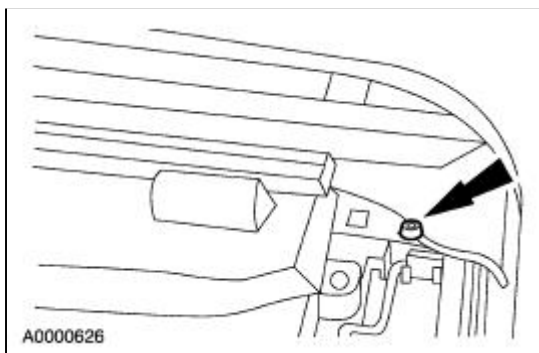


Installation

1. Install the water trough under the tab on each side.



2. Position the water trough and install the two screws.



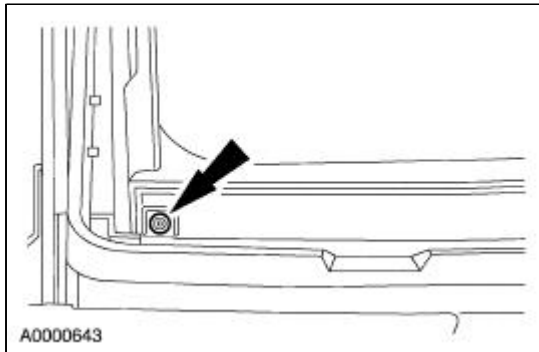
3. Install the roof opening glass assembly. For additional information, refer to [Glass—Roof](#)

[Opening Assembly](#).

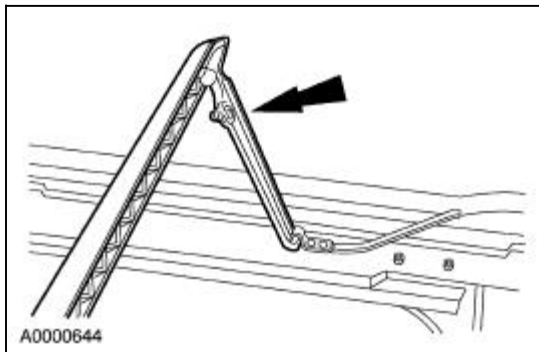
Air Deflector

Removal and Installation

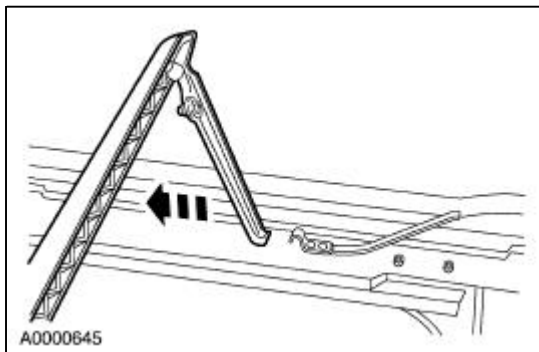
1. Move the roof opening glass assembly fully rearward.
2. Remove the two air deflector screws.



3. Move the air deflector to the complete vertical position.



4. Slide the air deflector rearward to unhook from the frame.

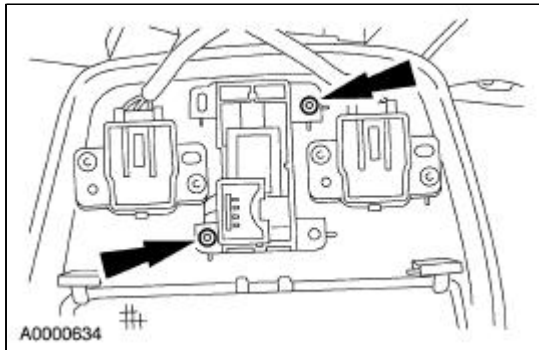


5. To install, reverse the removal procedure.

Switch —Roof Opening Panel

Removal and Installation

1. Position the dome/map lamp assembly aside.
2. Disconnect the electrical connector, remove the screws and the roof opening panel switch.



3. To install, reverse the removal procedure.
-

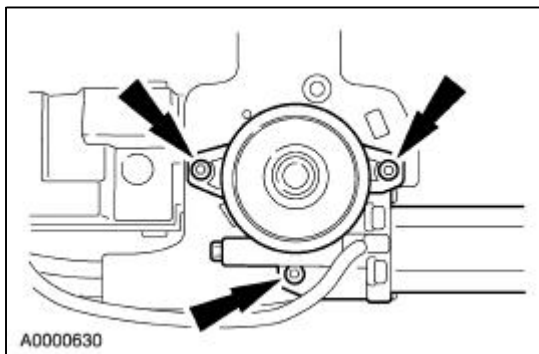
Module —Roof Opening Panel Control

Removal

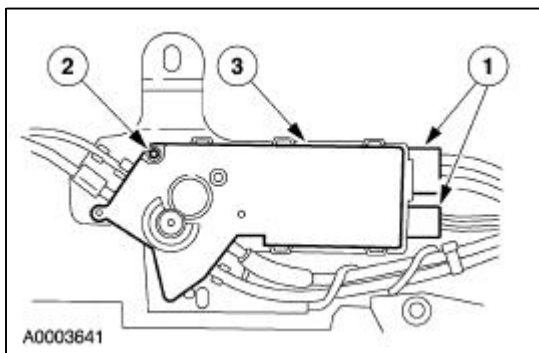
1. **NOTE:** Make sure the roof opening glass assembly is in the closed position.

Remove the roof opening panel assembly. For additional information, refer to [Panel—Roof Opening Assembly](#).

2. Remove the bolts and position the roof opening panel motor assembly aside.



3. Remove the roof opening panel control module.
 1. Disconnect the electrical connectors.
 2. Remove the screw.
 3. Remove the roof opening panel control module.



Installation

1. **NOTE:** Before a new roof opening panel control module can be installed, the roof opening panel and control module must be timed. The timing procedure will install the roof opening panel control module once the unit is timed.

Carry out the roof opening panel assembly timing. Refer to [Timing Adjustment](#).

Torque Specifications

Description	Nm	lb-ft	lb-in
Front bumper cover bracket bolts	7	—	62
Rear bumper cover nuts	7	—	62
Rear bumper cover bolts	7	—	62
Front bumper bolts (8mm)	25	18	—
Rear bumper bolts	23	17	—
Exhaust hanger bracket bolt	30	22	—
Front bumper bolts (6mm)	10	—	89

Bumpers

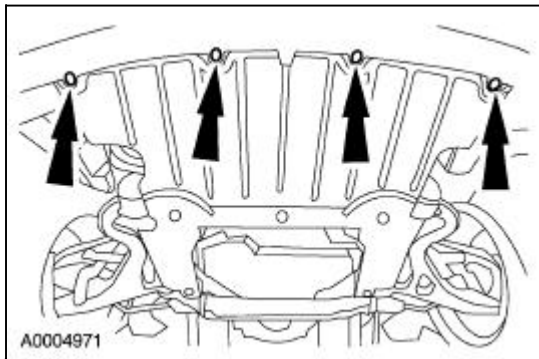
The bumper system consists of the following components:

- Front bumper cover (17D957)
 - Front bumper cover trim
 - Front bumper (17750)
 - Front bumper isolator (17E898)
 - Rear bumper cover (17K835)
 - Rear bumper cover trim
 - Rear bumper (17775)
 - Rear bumper isolator (17E899)
-

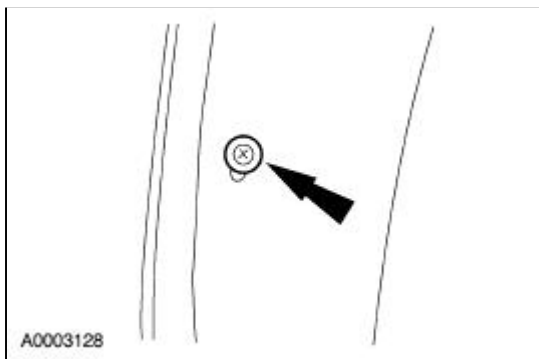
Bumper Cover —Front

Removal and Installation

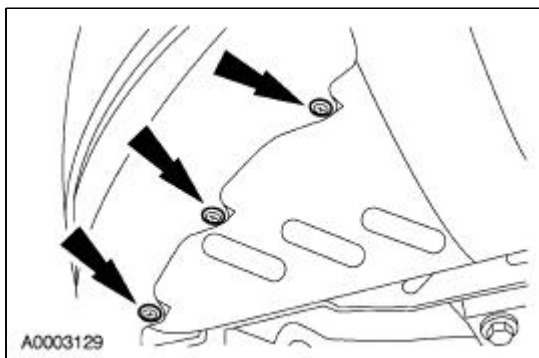
1. Remove the screws.



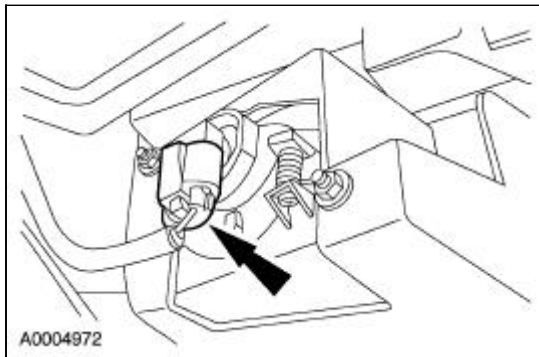
2. Remove the two screws from the inner fender splash shields.



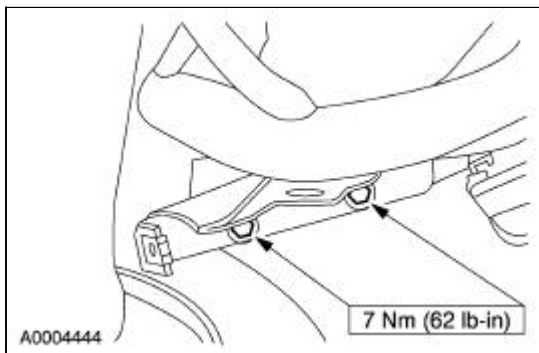
3. Remove the six screws from inner fender splash shields.



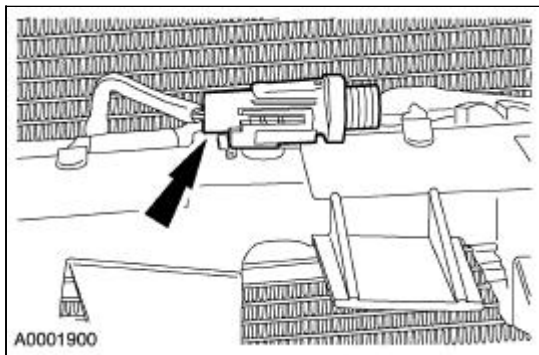
4. Disconnect the two fog lamp electrical connectors.



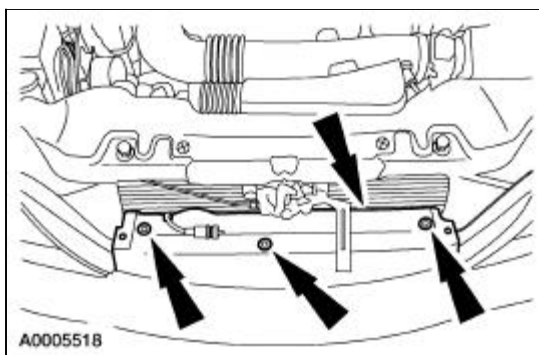
5. Disconnect the two side marker lamp electrical connectors.
6. Remove the four front bumper cover bracket bolts from the fenders.



7. Release the ambient air temperature sensor.

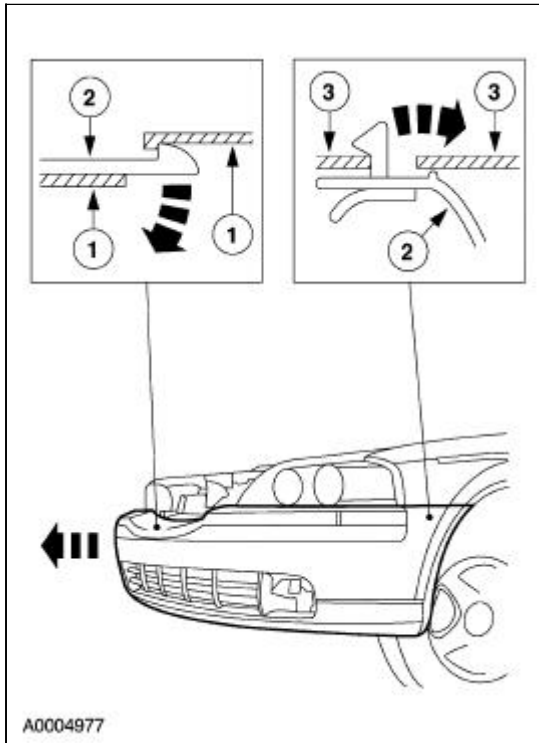


8. Remove the radiator grille opening cover at the top shelf of the bumper.



9. Remove the front bumper cover by pulling the center tabs downward and the outboard tabs on each side outward.

Item	Description
1	Grille opening panel reinforcement
2	Bumper cover
3	Fender



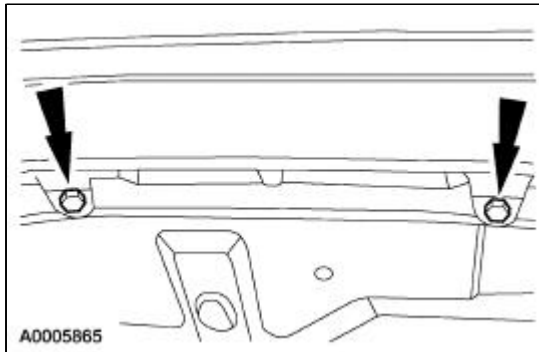
10. To install, reverse the removal procedure.

Bumper Cover —Rear

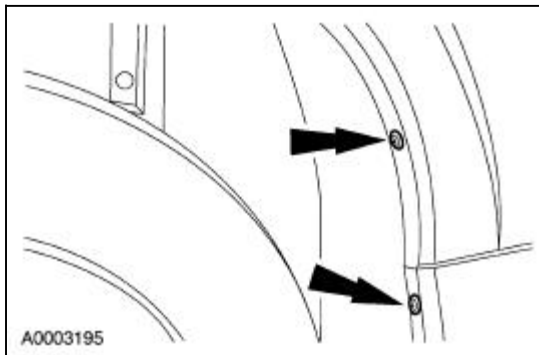
Removal and Installation

RH and LH Side

1. Remove the screws.

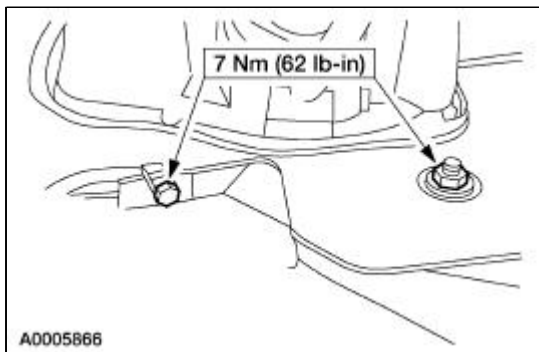


2. Remove the four inner fender screws.



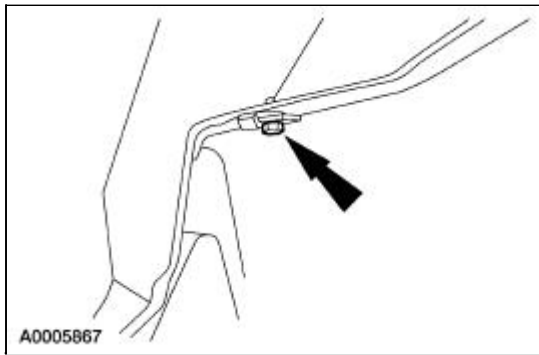
RH Side Only

3. Remove the rear bumper cover bolt and the nut located in the wheelwell area.



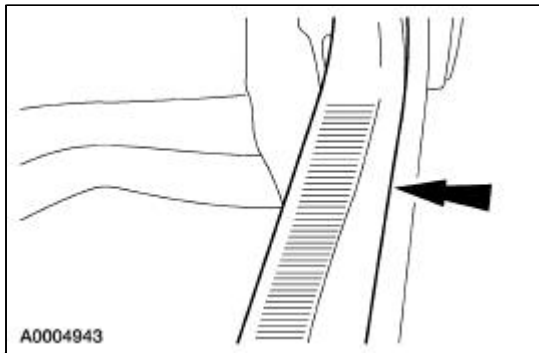
LH Side Only

4. Remove the rear bumper cover bolt.

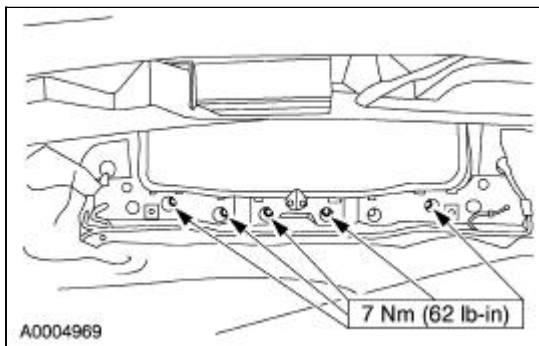


RH and LH Side

5. Remove the luggage compartment scuff plate.



6. Remove the luggage compartment back and side panel trim.
7. From the luggage compartment, remove the rear bumper cover nuts.

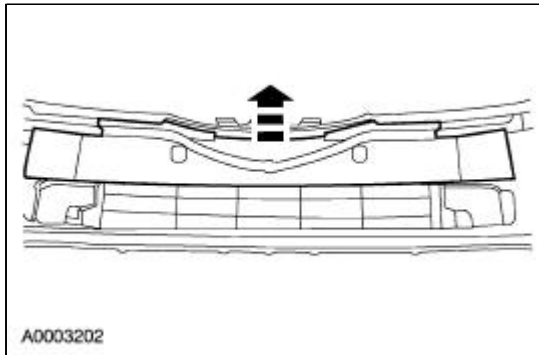


8. From the luggage compartment, remove the 10 rear bumper cover nuts (five each side).
 9. Remove the rear bumper cover.
 10. To install, reverse the removal procedure.
-

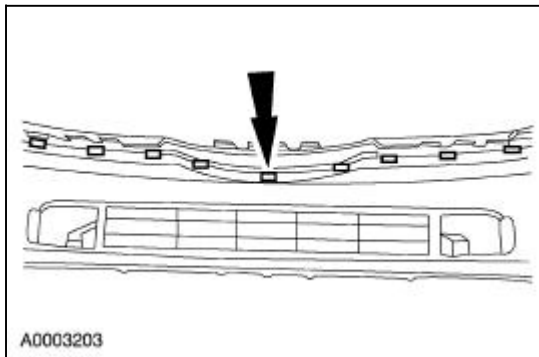
Bumper Cover —Trim, Front

Removal and Installation

1. Remove the front bumper cover. For additional information, refer to [Bumper Cover—Front](#).
2. Remove the retaining clips and the poly foam.



3. Remove the retaining clips and the trim.

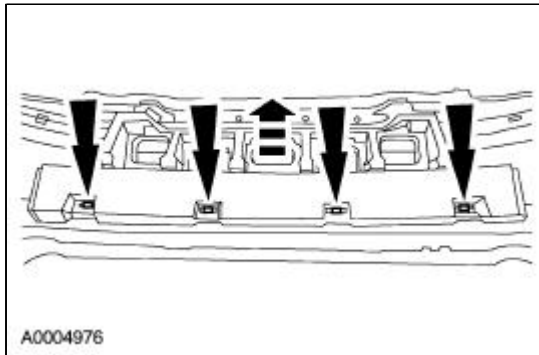


4. To install, reverse the removal procedure.
-

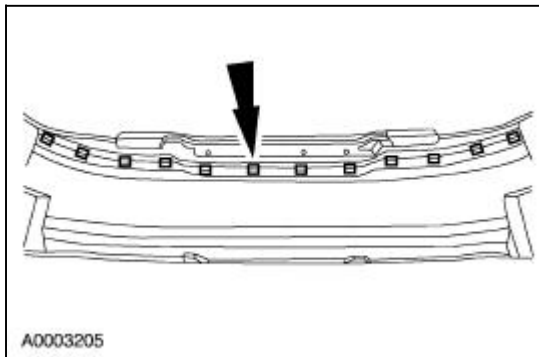
Bumper Cover —Trim, Rear

Removal and Installation

1. Remove the rear bumper cover. For additional information, refer to [Bumper Cover—Rear](#).
2. Remove the retaining clips and the poly foam.



3. Remove the retaining clips and the trim.

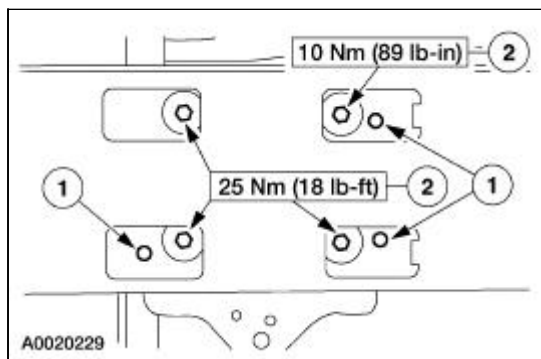


4. To install, reverse the removal procedure.

Bumper —Front

Removal

1. Remove the front bumper cover. For additional information, refer to [Bumper Cover—Front](#) in this section.
2. Disconnect the horn electrical connector.
3. Remove the front bumper.
 1. Drill out the six spot welds.
 2. Remove the eight bolts.



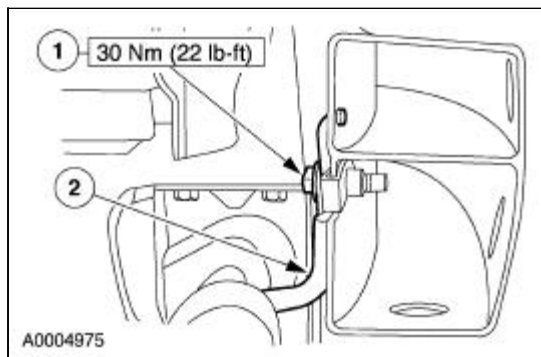
Installation

1. **NOTE:** Transfer the horns if required.
NOTE: Spot welding the bumper is not required.
To install, reverse the removal procedure.

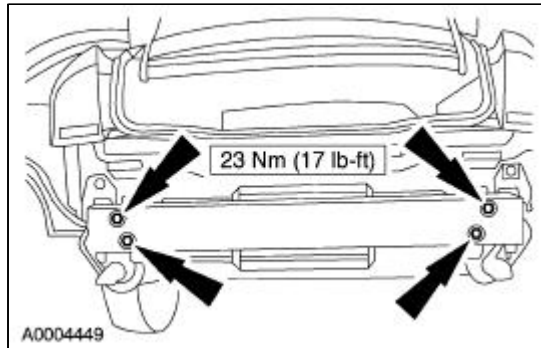
Bumper —Rear

Removal and Installation

1. Remove the rear bumper cover. For additional information, refer to [Bumper Cover—Rear](#).
2. Remove the exhaust hanger bracket.
 1. Remove the bolt.
 2. Remove the bracket.



3. Remove the bolts and the rear bumper.



4. To install, reverse the removal procedure.


Part Replacement Chart — Safety Belt With Damaged Weld Nut Anchor Plate Threads


Part Number	Description	Location
N808687–S190	Nut M10 x 1.5 x 8.6 hex flanged extrusion	Fr. D-ring
N802068–S424	Nut M10 x 1.5 hex flange locking	Fr. o/b
W701917–S309	Screw M10 x 1.5 x 21.5 T50 Torx, pia w/54602B82	Ht. adj
W705643–S409	Screw M10 x 1.5 x 18 hex flange shoulder, pia w/5461202, 3 pia w/seat kit	Fr. bkl
W700883–S409	Screw M10 x 1.5 T50 Torx, pia w/all retractors	Retr.
W704703–S408	Screw M10 – 1.5 x 34.0 pan head tapping, pia w/54611B68, 54611B69	Rr D-ring
W700883–S409	Screw M10 x 1.5 T50 Torx	Rr o/b
N800937–S190	Nut-M10 x 1.75 hex flanged locking	Rr i/b

Torque Specifications

Description	Nm	lb-ft	lb-in
D-ring bolt	40	30	—
D-ring nut	40	30	—
Front safety belt anchor nut	40	30	—
Front safety belt buckle bolt	40	30	—
Front safety belt nut	40	30	—
Height adjuster bolts	40	30	—
Rear outboard safety belt nuts	40	30	—
Rear safety belt anchor bolts	40	30	—
Rear safety belt buckle bolt	48	35	—
Rear seat bolster nut	11	8	—
Retractor bolt	40	30	—
Child safety seat tether anchor bolts	20	15	—
Steering column opening reinforcement bolts	9	—	80
Instrument panel tunnel brace bolts	20	15	—
Child safety seat tether anchor LATCH bolt	10	—	89

Safety Belt System

 **WARNING:** All safety belt assemblies including retractors, buckles, front seat belt buckle support assemblies (slide bar), if equipped, shoulder belt height adjusters, if equipped, child safety seat tether bracket assemblies, if equipped, and attaching hardware should be inspected after any collision. All belt assemblies should be installed new unless a qualified technician finds the assemblies show no damage and operate correctly. Belt assemblies not in use during a collision should also be inspected. New safety belt assemblies should be installed if either damage or incorrect operation is noted.

 **WARNING:** Each seating position in the vehicle has a specific safety belt assembly which consists of one buckle and one tongue. The safety belt assembly is designed to be used as a pair and is not to be used across seating positions.

The active restraint system consists of:

- the front safety belt retractors with pretensioners secured to the body under the B-pillar lower trim panel.
- the rear LH and RH safety belt retractors secured to the body behind the quarter trim panels.
- the rear center safety belt retractor secured to the body under the package tray trim panel.
- the front inboard buckle end secured to the front seat assembly.
- the rear LH, RH, and center buckle ends secured to the rear floor pan under the rear seat cushion.
- the safety belt shoulder height adjuster, attached at the B-pillar under the trim panel.
- the child safety seat tether anchors attached to the package tray under the trim panel.
- the child safety seat LATCH system, attached to the floor pan under the second row seating.

A continuous-loop, single retractor active restraint system is used on both the front and rear seat safety belt assemblies.

Pretensioner System

The front safety belt and retractor assembly uses a pretensioner system which works in conjunction with the front air bag system mounted in the steering wheel and instrument panel. When the front air bag system is deployed, the pretensioner in the retractor deploys, causing the retractor spool to rotate. The rotating spool action removes excess webbing from the safety belt assembly, tightening the webbing around the occupant.

New driver and front passenger seat belt system (including belt and retractor assembly, buckles, and height adjusters) must be installed if the vehicle is involved in a collision that results in deployment of the front air bags and safety belt pretensioners.

For diagnostic information, refer to [Section 501-20B](#).

For pretensioner retractor disposal information, refer to [Section 501-20B](#).

Safety Belt, Lap/Shoulder

While the vehicle is in motion, the combination lap and shoulder belt adjusts to the occupant's movement. However, if the vehicle is braked hard, cornered hard or if the vehicle receives an impact of 8 km/h (5 mph) or more, the lap and shoulder belt locks and helps reduce the occupant's forward movement.

Safety Belt, Buckle End—Front

The inboard front safety belt buckle end and outboard anchor is secured to the front seat. This allows the front safety belt buckle end and outboard anchor to move with the front seat.

Safety Belt, Lap/Shoulder—Dual Locking Mode



WARNING: Rear-facing infant seats should never be placed in the front seats.

The dual locking mode retractor on the shoulder belt portion of the combination lap/shoulder safety belt for the front seat passenger and rear seat passengers operates in two ways:

1. In the vehicle-sensitive (emergency locking) mode, the shoulder belt retractor will allow the occupant freedom of movement, locking tight only on hard braking, hard cornering or impacts of approximately 8 km/h (5 mph) or more. The front and rear outboard safety belt retractors can also be made to lock by pulling/jerking on the belt.
2. In the automatic locking mode, the shoulder belt retractor will be automatically locked and remain locked when the combination lap/shoulder safety belt is buckled and does not allow the occupant freedom of movement. This mode provides tight lap/shoulder belt fit on the occupant and on a child safety seat or infant carrier installation restraint.

When the combination lap/shoulder belt is unbuckled and allowed to retract completely, the retractor will switch to the vehicle sensitive (emergency locking) mode.

The automatic locking mode must be used when installing a child safety seat.

Lower Anchors and Tethers for Children (LATCH)

The Lower Anchors and Tethers for Children (LATCH) system is a standardized and uniform attachment system for installing child safety seats in passenger vehicles. LATCH-equipped child safety seats have two lower attachments that connect to the vehicle portion of the LATCH system.

The vehicle portion of the system consists of two brackets, with two attachment points (6 mm wires) welded to each bracket. The attachment points protrude from the biteline between the seat cushion and seat backrest of the second row seating.

If a child safety seat was in use during a collision, inspect the vehicle portion of the system for damage. If any of the attachment points (6 mm wires) are damaged, install a new LATCH bracket.

Safety Belt Warning System

The safety belt warning indicator illuminates and a chime sounds to remind the occupants to fasten

their safety belts.

The conditions of operation for the safety belt warning indicator and chime are as follows:

- If the driver safety belt is not buckled before the ignition switch is turned to RUN, then the safety belt warning indicator illuminates for one to two minutes and the warning chime sounds for four to eight seconds.
- If the driver safety belt is buckled while the warning indicator is illuminated and the reminder chime is sounding, then the safety belt warning indicator and reminder chime turn off.
- If the driver safety belt is buckled before the ignition switch is turned to RUN, then the safety belt warning indicator and reminder chime remain off.

Belt Minder

The Belt Minder feature is a supplemental warning to the safety belt warning function. This feature provides additional reminders to the driver that the driver's safety belt is unbuckled by intermittently sounding a chime and illuminating the safety belt warning lamp in the instrument cluster.

To activate or deactivate the Belt Minder feature, refer to [Section 413-09](#).

If...	Then...
The driver's safety belt is not buckled before the vehicle has reached at least 5 km/h (3 mph) and 1-2 minutes have elapsed since the ignition switch has been turned to ON...	The Belt Minder feature is activated — the safety belt warning light illuminates and the warning chime sounds for 6 seconds every 30 seconds, repeating for approximately 5 minutes or until the safety belt is buckled.
The driver's safety belt is buckled while the safety belt indicator light is illuminated and the safety belt warning chime is sounding...	The Belt Minder feature will not activate.
The driver's safety belt is buckled before the ignition switch is turned to the ON position...	The Belt Minder feature will not activate.

Safety Belt System

Inspection and Verification

1. Verify the customer's original concern by operating the active restraint system to duplicate the condition.
2. Inspect to determine if any of the following mechanical or electrical concerns apply:

Visual Inspection Chart

Mechanical	Electrical
<ul style="list-style-type: none"> ● Inspect the safety belt webbing for integrity. 	<ul style="list-style-type: none"> ● Open fuse. ● Bare, broken or disconnected wire. ● Connector not tightly engaged. ● Safety belt warning indicator lamp burned out or broken.

3. If the inspection reveals an obvious concern(s) that can be readily identified, repair the concern (s) as necessary.
4. If the concern remains after the inspection, determine the symptom. GO to [Symptom Chart](#).

Symptom Chart

Symptom Chart

Condition	Possible Sources	Action
<ul style="list-style-type: none"> ● The safety belt warning chime does not operate, the safety belt warning indicator lamp is OK 	<ul style="list-style-type: none"> ● Virtual image cluster (VIC). ● Circuitry. ● Driver seat module (DSM). 	<ul style="list-style-type: none"> ● REFER to Section 413-09.
<ul style="list-style-type: none"> ● The safety belt warning indicator lamp does not operate, the safety belt warning chime is OK 	<ul style="list-style-type: none"> ● Burned-out bulb. ● Circuitry. ● DSM. 	<ul style="list-style-type: none"> ● REFER to Section 413-01.
<ul style="list-style-type: none"> ● Neither the safety belt warning chime nor the safety belt warning indicator lamp operates 	<ul style="list-style-type: none"> ● Safety belt switch. ● DSM. ● Circuitry. 	<ul style="list-style-type: none"> ● REFER to Section 413-01.
<ul style="list-style-type: none"> ● Excessive pressure on the occupant during normal wear, the webbing cannot be extracted, excessive 	<ul style="list-style-type: none"> ● Front safety belt retractor and tongue. ● Rear safety 	<ul style="list-style-type: none"> ● CARRY OUT the Functional Test; REFER to Component Test in this section. INSTALL a

slack in webbing does not retract	belt retractor and tongue.	new safety belt retractor and tongue, if necessary.
<ul style="list-style-type: none"> ● Front safety belt and retractor does not function and a supplemental restraint system (SRS) fault code is present 	<ul style="list-style-type: none"> ● Pretensioner deployment. 	<ul style="list-style-type: none"> ● INSTALL a new driver and passenger safety belt system (including safety belt and retractor assembly, buckles, and height adjusters).


Component Test

Functional Test

1. **NOTE:** If the RH or the rear safety belts are to be tested, a passenger must be used.

Fasten the safety belts and proceed to a safe area.

2. Attain a speed of 8 km/h (5 mph).

3.  **WARNING: The driver and passenger must be prepared to brace themselves if the retractor does not lock.**


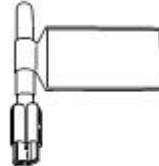
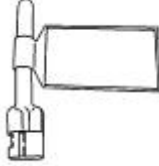
Test the safety belts.

1. Grasp the shoulder harness and prepare to lean forward.
 2. Make maximum brake application without a skid.
 3. **NOTE:** Do not jerk on the safety belt webbing when carrying out this test. Lean forward slightly when the brake application is made.
4. The safety belts should lock up with minimum webbing extension.
 5. If there is a lockup of both shoulder straps, the safety belt assemblies are functioning correctly. Should either or both retractors fail to lock up at the 8 km/h (5 mph) speed, repeat the test at a constant 24 km/h (15 mph) speed. (This test must be carried out with a RH front or rear passenger if the RH front or rear outboard safety belts are to be tested).
 6. **NOTE:** If either or both the shoulder belts do not lock up, the sheet metal in the retractor's mounting surface may need to be returned to its original shape and structural integrity.


If either or both shoulder belts do not lock up at the 24 km/h (15 mph) test, replace the suspect retractor with a new retractor.


Supplemental Restraint System (SRS) Deactivation and Reactivation

Special Tool(s)


 ST2502-A	Diagnostic Tool, Restraint System (1 Req'd) 418-F395
 ST2506-A	Diagnostic Tool, Restraint System (3 Req'd) 418-F088 (105-R0012)
 ST2507-A	Diagnostic Tool, Restraint System (2 Req'd) 418-133 (40-009)

Deactivation


 **WARNING:** Always wear safety glasses when repairing an air bag supplemental restraint system (SRS) vehicle and when handling an air bag module. This will reduce the risk of injury in the event of an accidental deployment.

 **WARNING:** Carry a live air bag module with the air bag and trim cover pointed away from your body. This will reduce the risk of injury in the event of an accidental deployment.

 **WARNING:** Do not set a live air bag module down with the trim cover face down. This will reduce the risk of injury in the event of an accidental deployment.

 **WARNING:** After deployment, the air bag surface can contain deposits of sodium hydroxide, a product of the gas generant combustion that is irritating to the skin. Wash your hands with soap and water afterwards.

 **WARNING:** Never probe the connectors on the air bag module. Doing so can result in air bag deployment, which can result in personal injury.

 **WARNING:** The safety belt buckle pretensioner and safety belt retractor pretensioner are pyrotechnic devices. Never probe a pretensioner electrical connector. Doing so could result in pretensioner or air bag deployment and could result in personal injury.



WARNING: Vehicle sensor orientation is critical for proper system operation. If a vehicle equipped with an air bag supplemental restraint system (SRS) is involved in a collision, inspect the sensor mounting bracket and wiring pigtail for deformation. Replace and properly position the sensor or any other damaged supplemental restraint system (SRS) components whether or not the air bag is deployed.



WARNING: The restraint system diagnostic tool is for restraint system service only. Remove from vehicle prior to road use. Failure to remove could result in injury and possible violation of vehicle safety standards.

NOTE: If a seat equipped with a seat mounted side air bag and/or a safety belt pretensioner (if equipped) system is being serviced, **the air bag system must be deactivated.**

NOTE: Restraint system diagnostic tools **MUST** be installed under the seats in the seat side air bag (if equipped) and safety belt pretensioner (if equipped) to floor connectors.

NOTE: Diagnostics or repairs are not to be performed on a seat equipped with a seat side air bag with the seat in the vehicle. Prior to attempting to diagnose or repair a seat concern when equipped with a seat side air bag, the seat must be removed from the vehicle and the restraint system diagnostic tools must be installed in the seat side air bag electrical connectors. **The restraint system diagnostic tools must be removed prior to operating the vehicle over the road.**

NOTE: After diagnosing or repairing an SRS, **the restraint system diagnostic tools must be removed before operating the vehicle over the road.**

NOTE: After diagnosing or repairing a seat system, **the restraint system diagnostic tools must be removed before operating the vehicle over the road.**

NOTE: The SRS must be fully operational and free of faults before releasing the vehicle to the customer.



- WARNING:** To avoid accidental deployment and possible personal injury, the backup power supply must be depleted before repairing or replacing any front or side air bag supplemental restraint system (SRS) components and before servicing, replacing, adjusting or striking components near the front or side air bag sensors, such as doors, instrument panel, console, door latches, strikers, seats and hood latches.

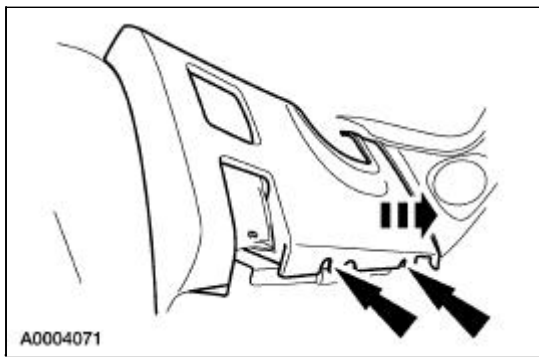
Please refer to the appropriate vehicle shop manual to determine location of the front air bag sensors.

The side air bag sensors are located at or near the base of the B-pillar.

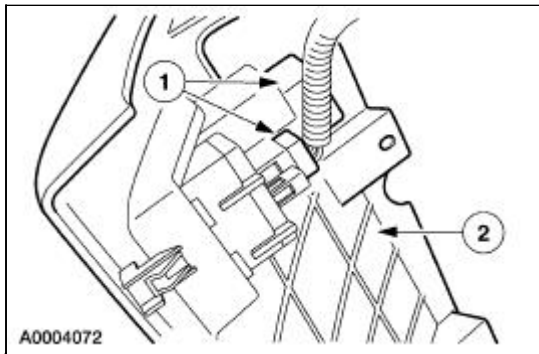
To deplete the backup power supply energy, disconnect the battery ground cable and wait at least one minute. Be sure to disconnect auxiliary batteries and power supplies (if equipped).

Disconnect the battery ground cable and wait at least one minute. For additional information, refer to [Section 414-01](#).

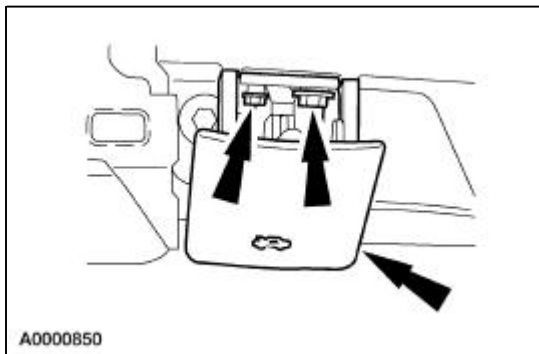
- Remove the two screws and pull out on the lower steering column opening finish panel enough to access the electrical connectors.



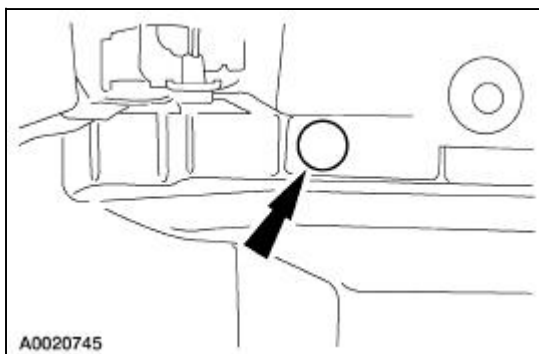
3. Remove the lower steering column opening finish panel.
 1. Disconnect the electrical connectors.
 2. Remove the lower steering column opening finish panel.



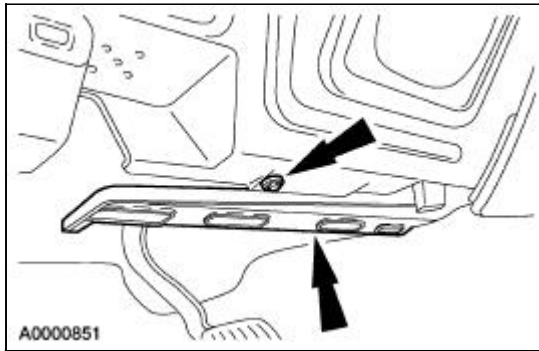
4. Remove the screws. Separate the hood latch release cable and handle assembly from the steering column opening reinforcement.



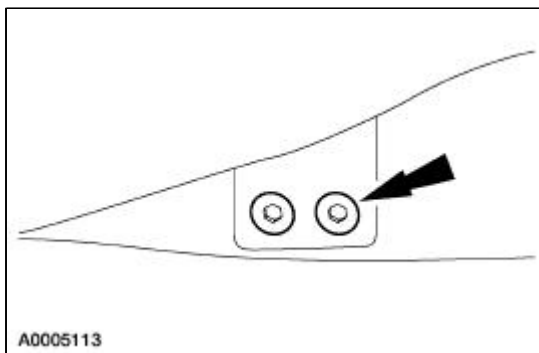
5. Remove the two pin-type retainers and the RH instrument panel insulator.
 - Disconnect the courtesy lamp.



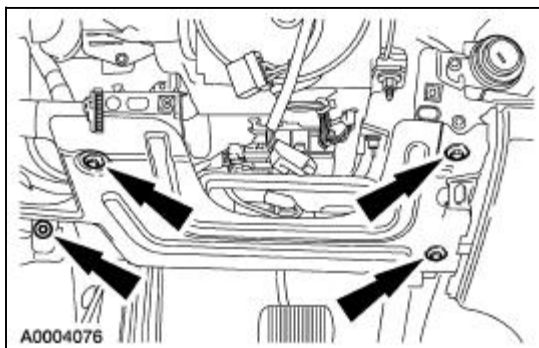
6. Remove the screw and the heater duct.



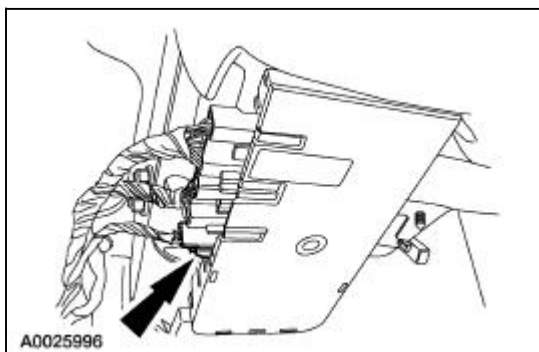
7. Loosen the two driver-side instrument panel tunnel brace bolts.
 - Position the carpet aside to gain access to the bolts.



8. Remove the screws and the steering column opening reinforcement.

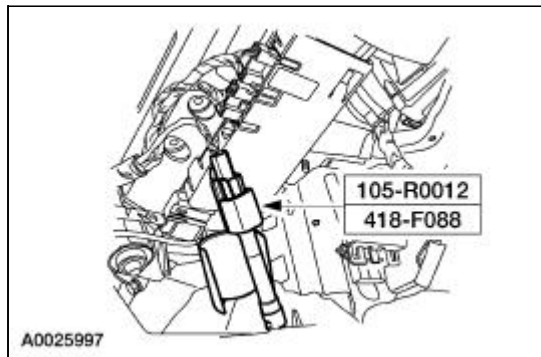


9. Disconnect the clockspring electrical connector at the base of the steering column.

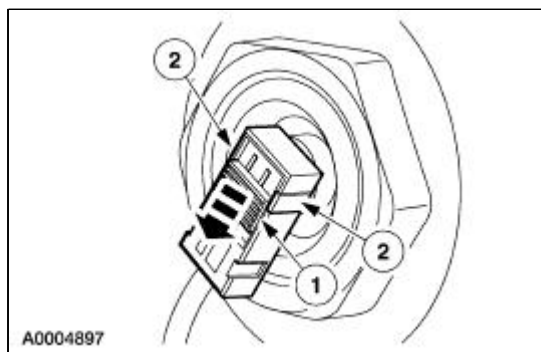


10. Attach the restraint system diagnostic tool to the vehicle harness side of the clockspring

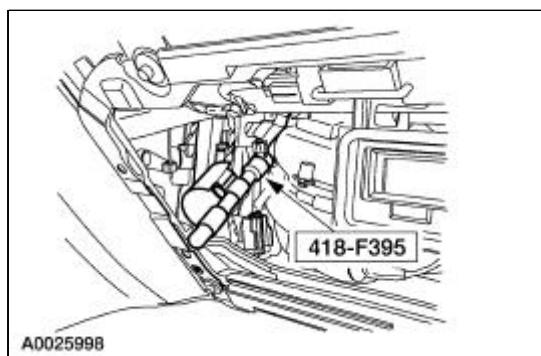
electrical connector.




11. Remove the glove compartment. For additional information, refer to [Section 501-12](#).
12. Disconnect the passenger air bag module electrical connector.
 1. Reaching into the glove box opening toward the center of the instrument panel, under the cross-car beam, slide and disengage the passenger air bag module electrical connector locking clip.
 2. Push in on the two release tabs and disconnect the passenger air bag module electrical connector.



13. Attach the restraint system diagnostic tool to the vehicle harness side of the passenger air bag electrical connector.



14. Connect the battery ground cable. For additional information, refer to [Section 414-01](#).
15. Move and tilt the front seats to their highest and most forward position.
16.  **WARNING:** To avoid accidental deployment and possible personal injury, the backup power supply must be depleted before repairing or replacing any front or side air bag supplemental restraint system (SRS) components and before servicing, replacing, adjusting or striking components near the front or side air bag sensors, such as doors,

instrument panel, console, door latches, strikers, seats and hood latches.

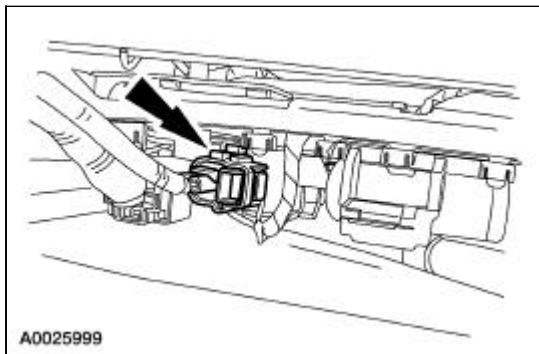
Please refer to the appropriate vehicle shop manual to determine location of the front air bag sensors.

The side air bag sensors are located at or near the base of the B-pillar.

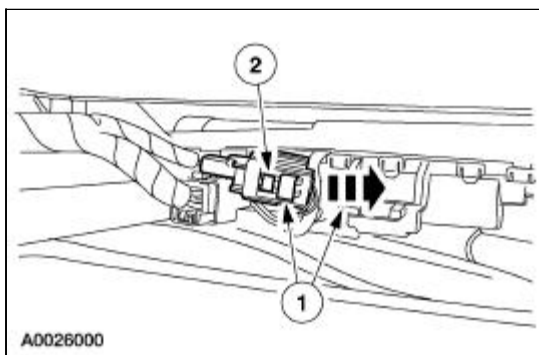
To deplete the backup power supply energy, disconnect the battery ground cable and wait at least one minute. Be sure to disconnect auxiliary batteries and power supplies (if equipped).

Disconnect the battery ground cable and wait at least one minute. For additional information, refer to [Section 414-01](#).

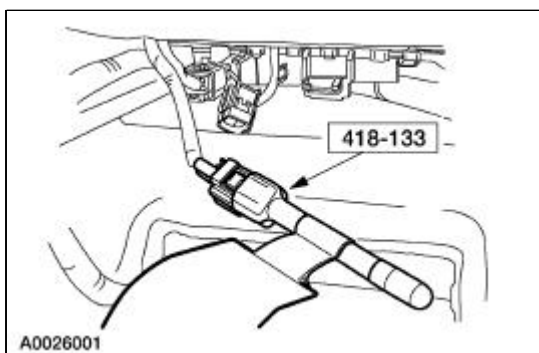
17. From under the passenger seat, release the tab on the connector bracket and remove the passenger seat side air bag electrical connector.



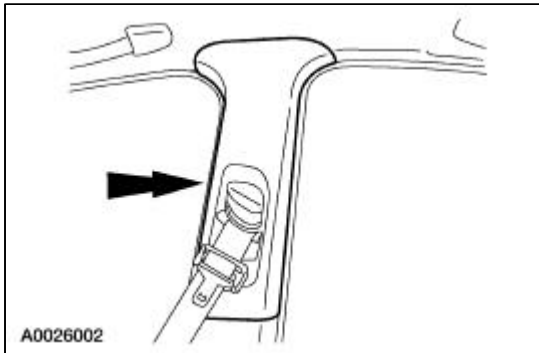
18. Disconnect the passenger seat side air bag electrical connector.
 1. Slide and disengage the passenger seat side air bag electrical connector locking clip.
 2. Push in to release the tab and disconnect the passenger seat side air bag electrical connector.



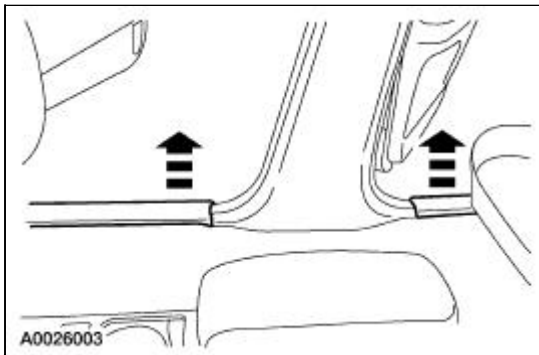
19. Attach the restraint system diagnostic tool to the passenger seat side air bag floor electrical connector.



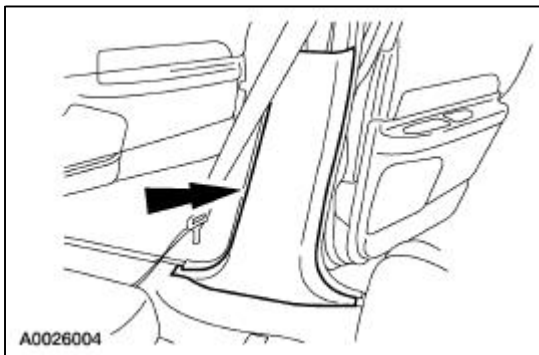
20. Remove the passenger side B-pillar weatherstripping.
21. Position the safety belt D-ring to its highest point.
22. Remove the passenger side B-pillar upper trim panel.



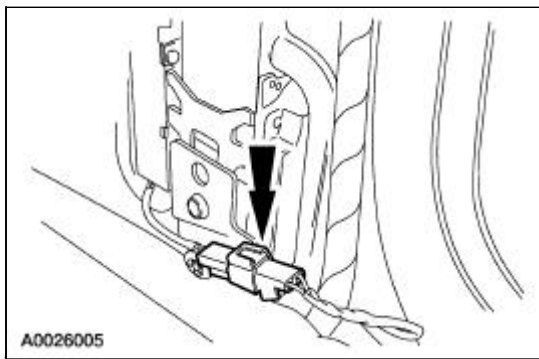
23. Remove the passenger side front and rear door scuff plates.



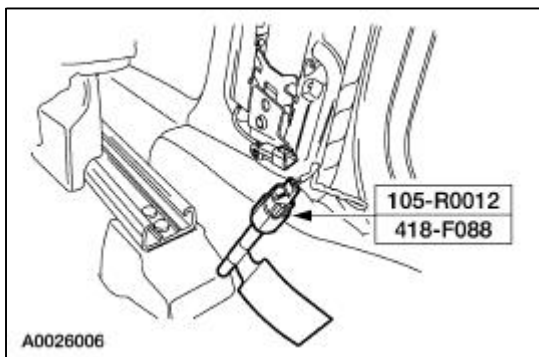
24. Remove the passenger side B-pillar lower trim panel.



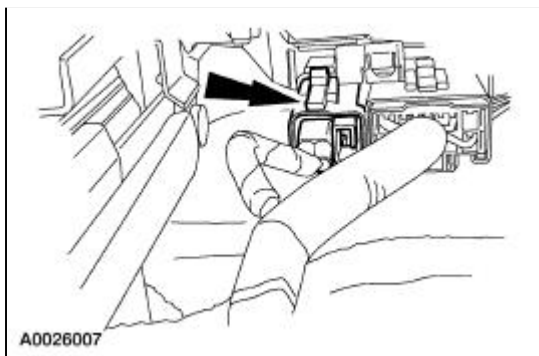
25. Disconnect the passenger side safety belt retractor pretensioner floor electrical connector.



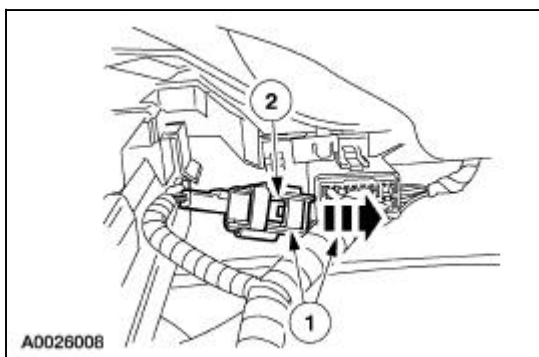
26. Attach the restraint system diagnostic tool to the passenger side safety belt retractor pretensioner floor electrical connector.



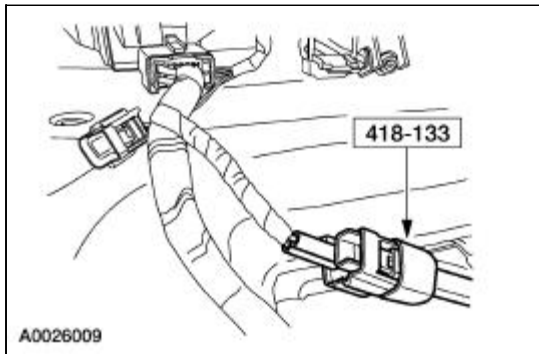
27. From under the driver seat, release the tab on the connector bracket and remove the driver seat side air bag electrical connector.



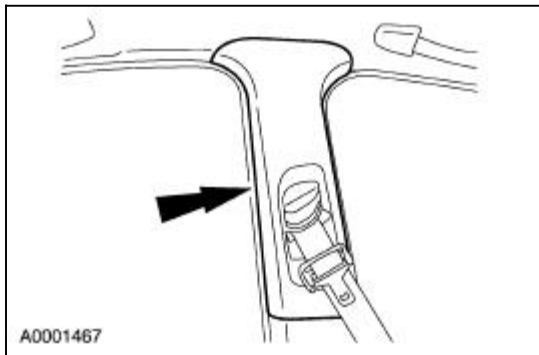
28. Disconnect the driver seat side air bag electrical connector.
1. Slide and disengage the driver seat side air bag electrical connector locking clip.
 2. Push down to release the tab and disconnect the driver seat side air bag electrical connector.



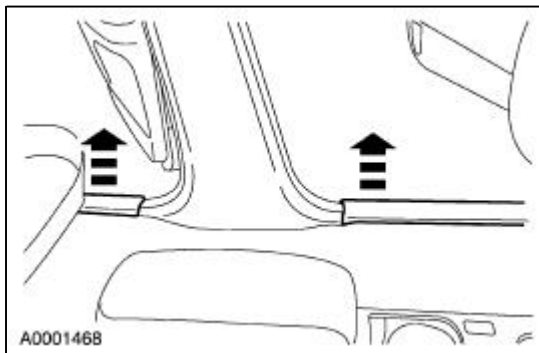
29. Attach the restraint system diagnostic tool to the driver seat side air bag floor electrical connector.



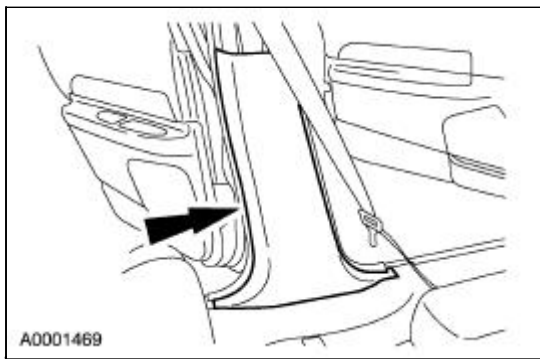
30. Remove the driver side B-pillar weatherstripping.
31. Position the safety belt D-ring to its highest point.
32. Remove the driver side B-pillar upper trim panel.



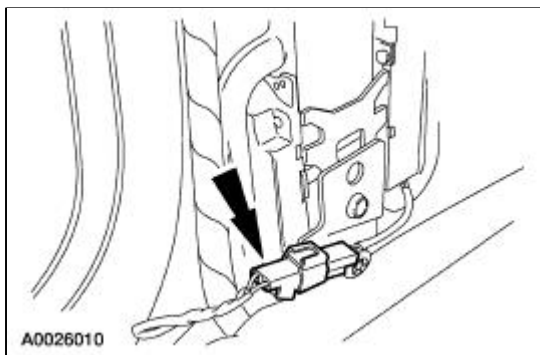
33. Remove the driver side front and rear door scuff plates.



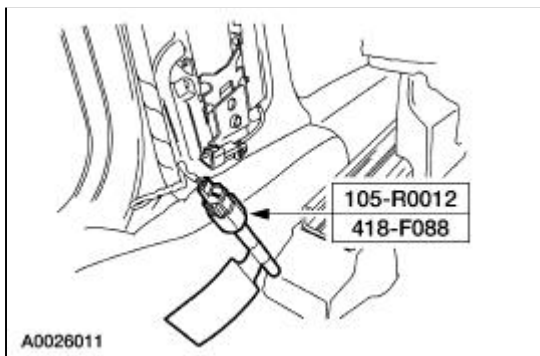
34. Remove the driver side B-pillar lower trim panel.



35. Disconnect the driver side safety belt retractor pretensioner electrical connector.



36. Attach the restraint system diagnostic tool to the driver side safety belt retractor pretensioner floor electrical connector.

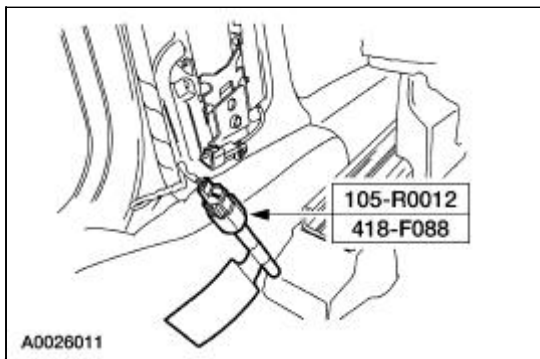


37. Connect the battery ground cable. For additional information, refer to [Section 414-01](#).
38. With the restraint system diagnostic tools installed at all deployable devices, prove out the supplemental restraint system (SRS). For additional information, refer to [Section 501-20B](#).
39. Disconnect the battery ground cable and wait at least one minute. For additional information, refer to [Section 414-01](#).

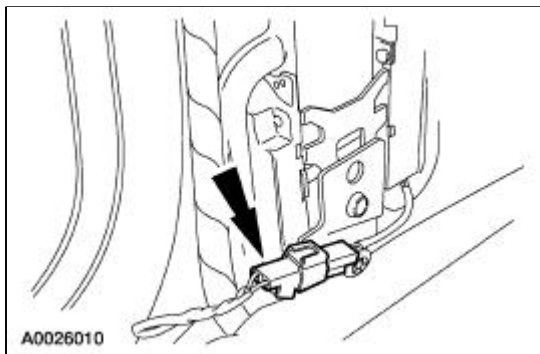
Reactivation

⚠️ WARNING: To reduce the risk of serious personal injury, read and follow all warnings and notes at the beginning of the deactivation procedure.

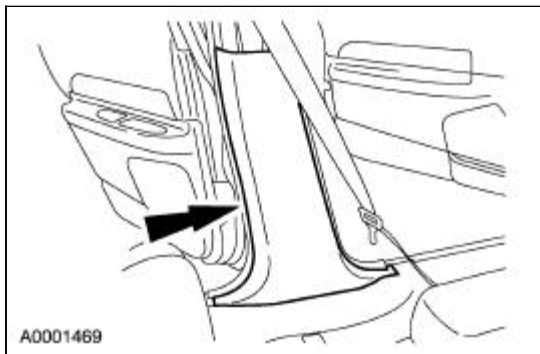
1. Remove the restraint system diagnostic tool from the driver side safety belt retractor pretensioner floor electrical connector.



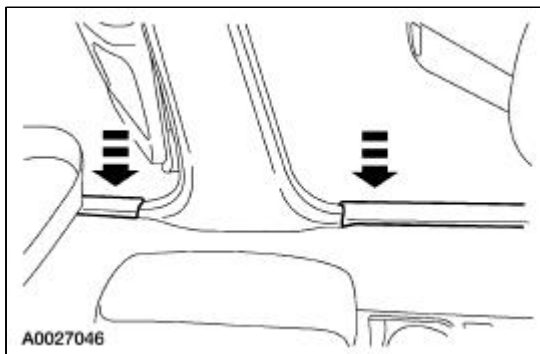
2. Connect the driver side safety belt retractor pretensioner electrical connector.



3. Install the driver side B-pillar lower trim panel.

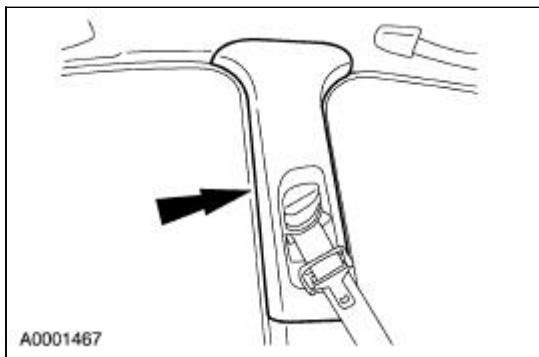


4. Install the driver side front and rear door scuff plates.

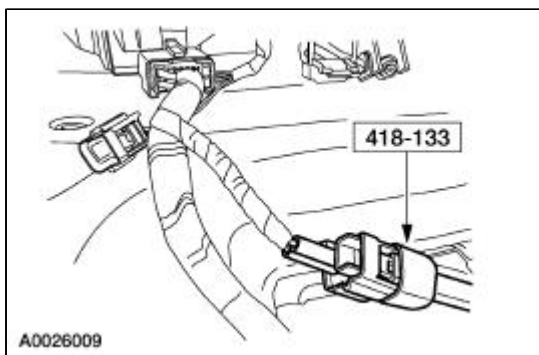


5. **NOTE:** Position the safety belt D-ring to its highest point.

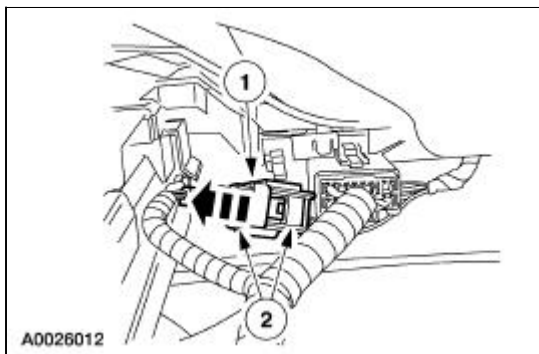
Install the driver side B-pillar upper trim panel.



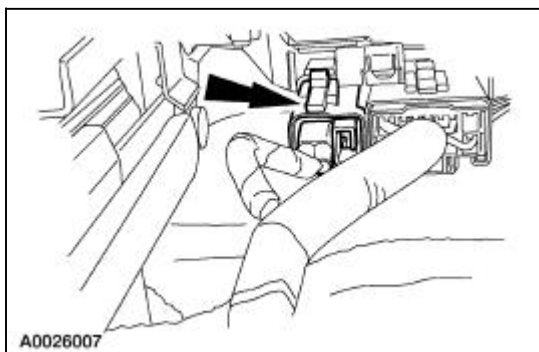
6. Install the driver side B-pillar weatherstripping.
7. Remove the restraint system diagnostic tool from the driver seat side air bag floor electrical connector.



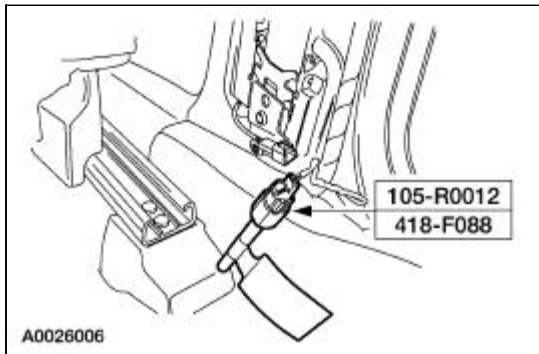
8. Connect the driver seat side air bag electrical connector.
 1. Connect the driver seat side air bag electrical connector.
 2. Slide and engage the driver seat side air bag electrical connector locking clip.



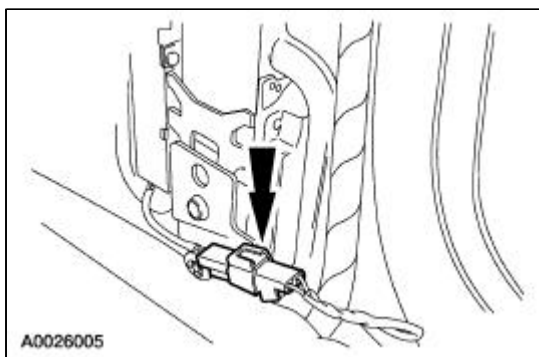
9. Install the driver seat side air bag electrical connector onto the connector bracket under the driver seat.



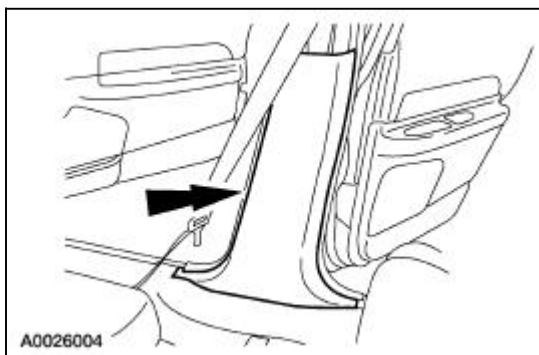
10. Remove the restraint system diagnostic tool from the passenger side safety belt retractor pretensioner electrical connector.



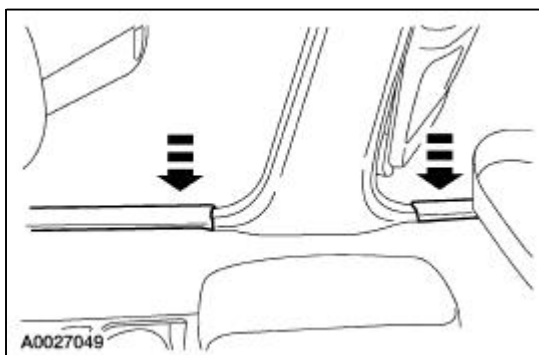
11. Connect the passenger side safety belt retractor pretensioner electrical connector.



12. Install the passenger side B-pillar lower trim panel.

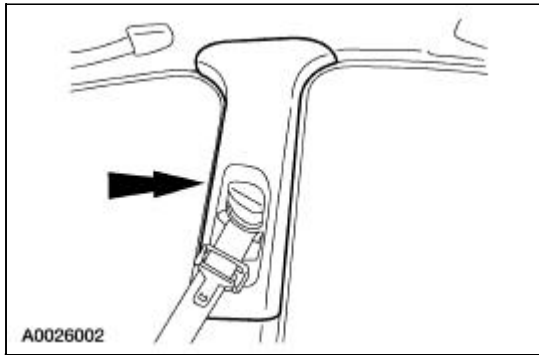


13. Install the passenger side front and rear door scuff plates.



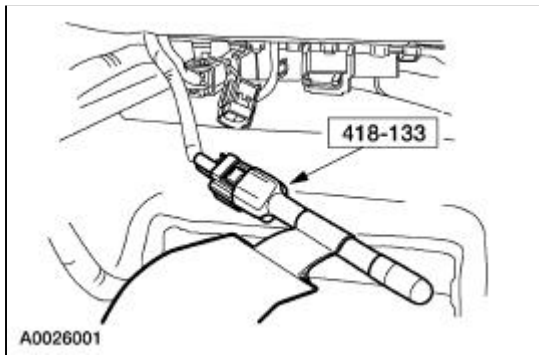
14. **NOTE:** Position the safety belt D-ring to its highest point.

Install the passenger side B-pillar upper trim panel.



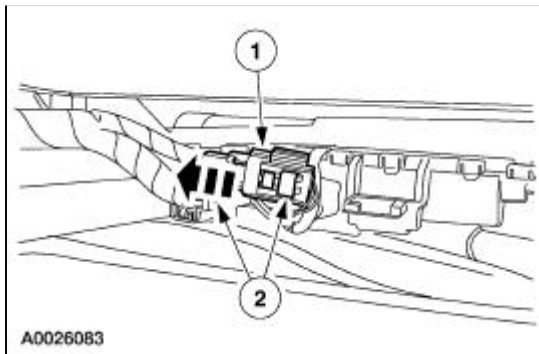
15. Install the passenger side B-pillar weatherstripping.

16. Remove the restraint system diagnostic tool from the passenger seat side air bag floor electrical connector.

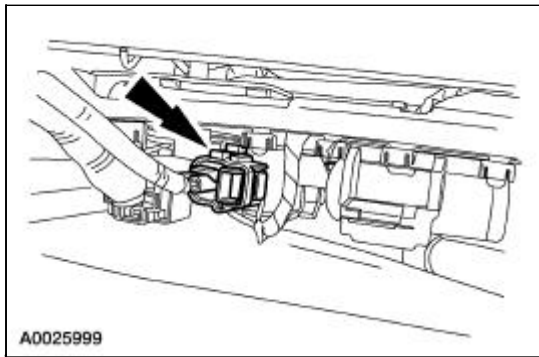


17. Connect the passenger seat side air bag electrical connector.

1. Connect the passenger seat side air bag electrical connector.
2. Slide and engage the passenger seat side air bag electrical connector locking clip.




18. Install the passenger seat side air bag electrical connector onto the connector bracket under the passenger seat.



19. Connect the battery ground cable. For additional information, refer to [Section 414-01](#).

20. Position the front seats rearward.

21.  **WARNING:** To avoid accidental deployment and possible personal injury, the backup power supply must be depleted before repairing or replacing any front or side air bag supplemental restraint system (SRS) components and before servicing, replacing, adjusting or striking components near the front or side air bag sensors, such as doors, instrument panel, console, door latches, strikers, seats and hood latches.

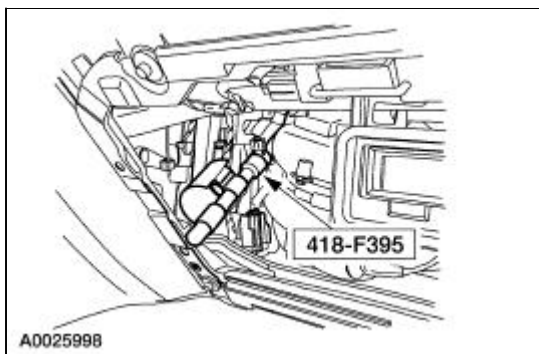
Please refer to the appropriate vehicle shop manual to determine location of the front air bag sensors.

The side air bag sensors are located at or near the base of the B-pillar.

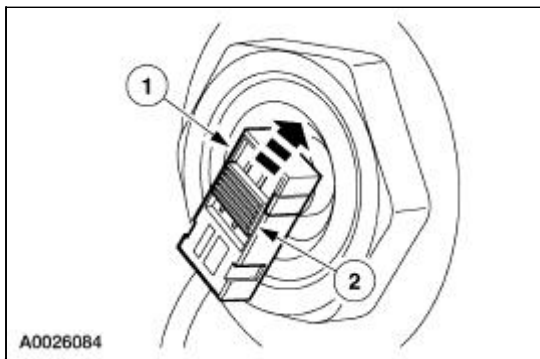
To deplete the backup power supply energy, disconnect the battery ground cable and wait at least one minute. Be sure to disconnect auxiliary batteries and power supplies (if equipped).

Disconnect the battery ground cable and wait at least one minute. For additional information, refer to [Section 414-01](#).

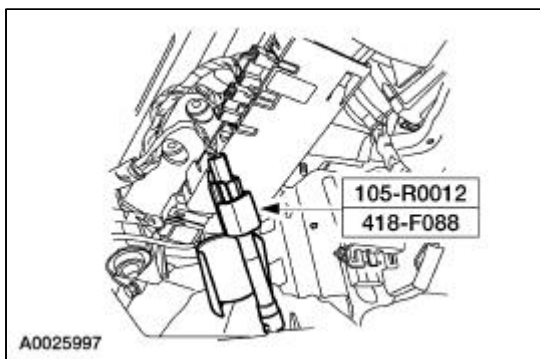
22. Remove the restraint system diagnostic tool from the vehicle harness side of the passenger air bag electrical connector.



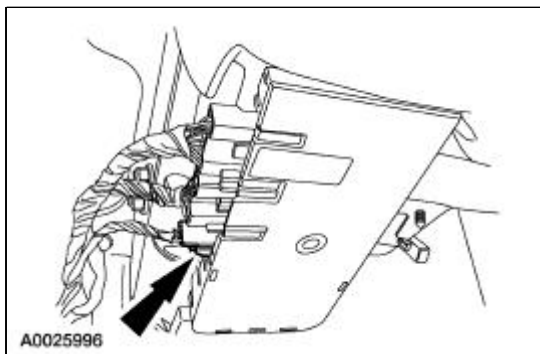
23. Connect the passenger air bag module electrical connector.
1. Reach into the glove box opening toward the center of the instrument panel, under the cross-car beam and connect the passenger air bag module electrical connector.
 2. Slide and engage the passenger air bag module electrical connector locking clip.



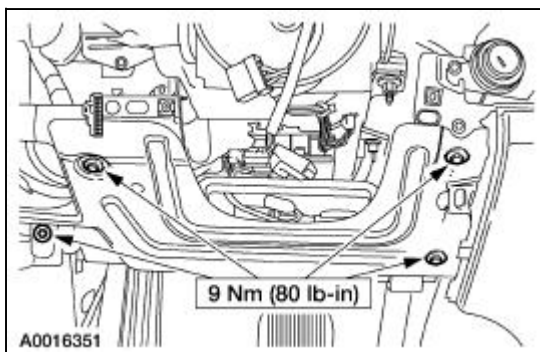
24. Install the glove compartment. For additional information, refer to [Section 501-12](#).
25. Remove the restraint system diagnostic tool from the vehicle harness side of the clockspring electrical connector.



26. Connect the clockspring electrical connector at the base of the steering column.

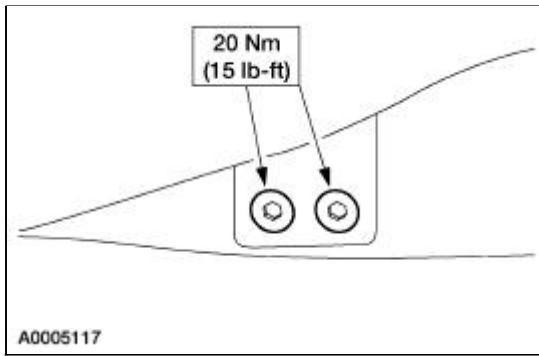


27. Position the steering column opening reinforcement and install the screws.

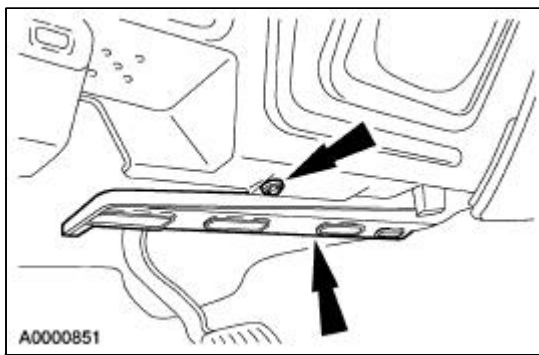


28. Tighten the two driver-side instrument panel tunnel brace bolts.

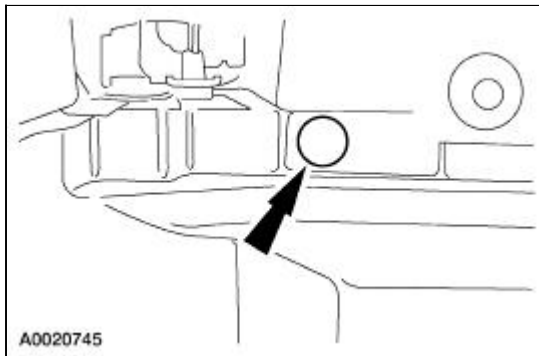
- Reposition the carpet.



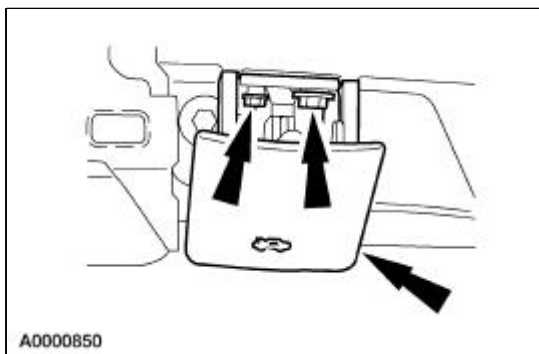
29. Position the heater duct and install the screw.



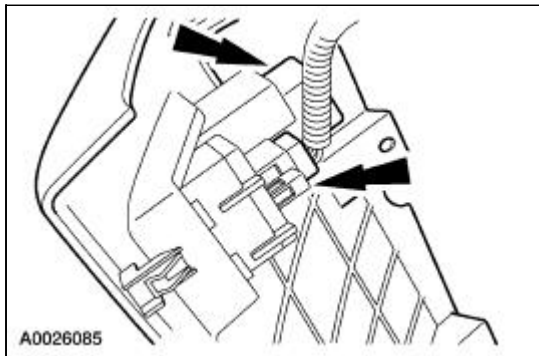
30. Install the RH instrument panel insulator and the two pin-type retainers.
- Connect the courtesy lamp.



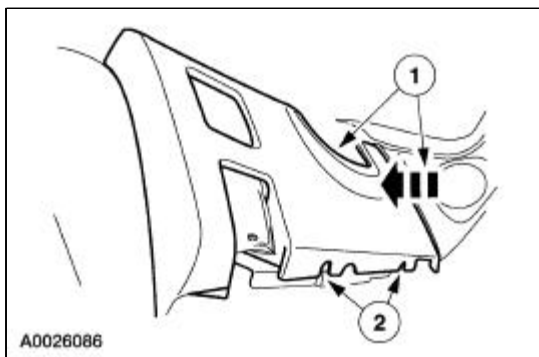
31. Position the hood latch release cable and handle assembly to the steering column opening reinforcement and install the screws.




32. Connect the electrical connectors to the switches in the lower steering column opening finish panel.



33. Install the lower steering column opening finish panel to the instrument panel.
1. Position the lower steering column opening finish panel to the instrument panel and push in, seating the retaining clips.
 2. Install the screws.



34. Connect the battery ground cable. For additional information, refer to [Section 414-01](#).

35.  **WARNING: The restraint system diagnostic tool is for restraint system service only. Remove from vehicle prior to road use. Failure to remove could result in injury and possible violation of vehicle safety standards.**

With all the restraint system diagnostic tools removed, prove out the supplemental restraint system (SRS). For additional information, refer to [Section 501-20B](#).

36. Check the active restraint system for correct operation. For additional information, refer to [Safety Belt System](#) in the Diagnosis and testing portion of this section.
-

Safety Belt Cleaning

1.  **WARNING: Do not bleach or re-dye the webbing, as the webbing may weaken.**

Clean the safety belt webbing only with a mild soap solution recommended for cleaning upholstery or carpets. Follow the instructions provided with the soap.

Safety Belt Maintenance



WARNING: All safety belt assemblies include retractors, buckles, front seat belt buckle support assemblies (slide bar), if equipped, shoulder belt height adjuster, if equipped, child safety seat tether bracket assemblies, if equipped, and attaching hardware should be inspected after any collision. All belt assemblies should be installed new unless a qualified technician finds the assemblies show no damage and operate correctly. Belt assemblies not in use during a collision should also be inspected. New safety belt assemblies should be installed if either damage or incorrect operation is noted.

1. The safety belt assemblies should be periodically inspected to make sure that they have not become damaged and that they remain in correct operating condition, particularly if they have been subjected to severe stress.
 2. Before installing the new safety belt assembly; the safety belt retaining areas must be inspected for damage and distortion. If the retaining points are damaged and distorted, the sheet metal must be reworked back to its original shape and structural integrity.
 3. Install the new safety belt(s) using the appropriate instructions. Carry out the Functional Test Procedure. For additional information, refer to [Safety Belt System](#) in this section.
-

Replacement of the Weld Nut and Reinforcement


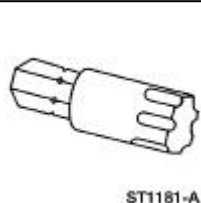
1. **NOTE:** If the safety belt anchor nuts or reinforcements are stripped or missing, a new nut/reinforcement plate must be installed.

Expose the suspect anchor point.

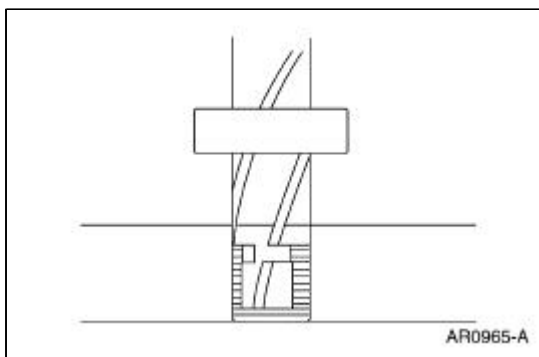
2. Drill out two 8 mm (5/16 inch) diameter access holes adjacent to the weld nut clearance hole.
 3. Thread a length of copper welding wire through the clearance hole and position to secure the weld nut and washer.
 4. Use MIG wire feed welder and plug weld a M10 weld nut and standard washer in place at the two 8 mm (5/16 inch) holes.
 5. Metal finish as necessary.
 6. Install the restraint system.
 7. Carry out the Functional Test. For additional information, refer to [Safety Belt System](#) in this section.
-

Safety Belt Shoulder Height Adjuster With Stripped Weld Nuts

Special Tool(s)

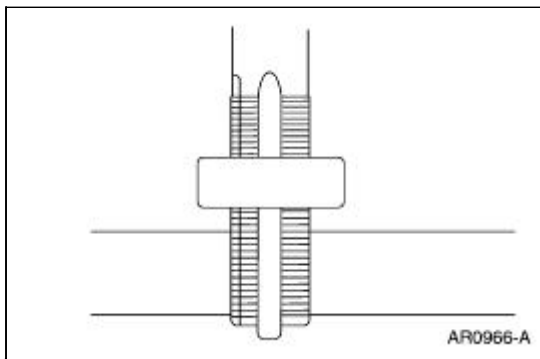
 <p>ST1657-A</p>	D-Ring Installation Kit 100-F012 (134-00018) or equivalent
 <p>ST1181-A</p>	Safety Belt Bolt Bit 501-010 (T77L-2100-A) or equivalent

1. Remove the shoulder safety belt height adjuster. For additional information, refer to [Height Adjuster—Front Shoulder Safety Belt](#) in this section.
2. Use the half-inch drill provided in the D-Ring Installation Kit to drill out the damaged threads in the upper pillar structure.

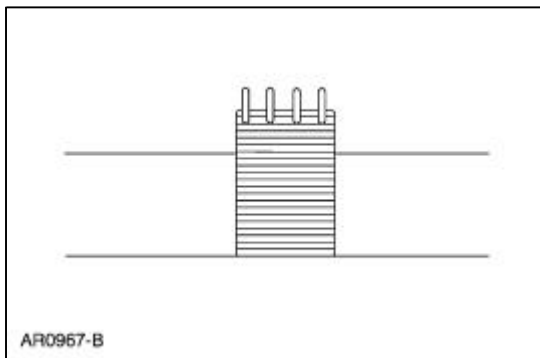


3. **NOTE:** After each rotation, back off the tap slightly to remove the new cuttings and be sure to blow out any chips before proceeding.

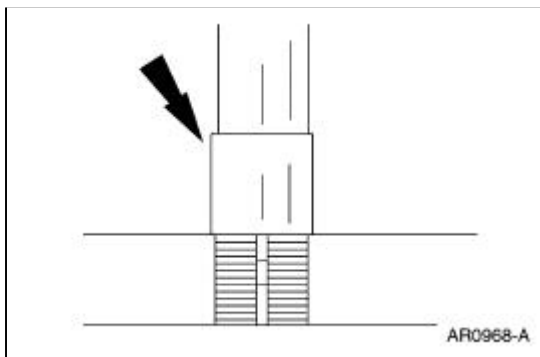
Apply a suitable lubricant to the M14x1.5 tap provided in the D-Ring Installation Kit and tap new threads.



4. Use a threaded insert (Part of #N807170-S190) provided in the D-Ring Installation Kit and screw it into the retapped hole until it is slightly below the surface.

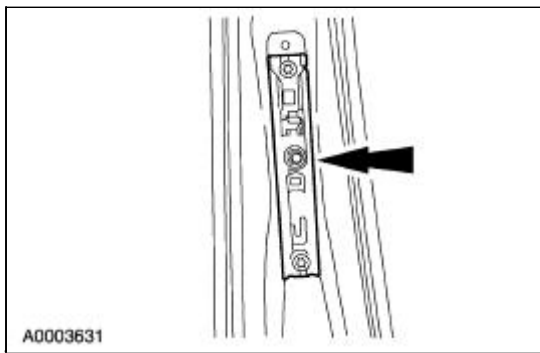


5. Use a hammer to lightly tap the installation tool provided in the D-Ring Installation Kit several times to seat the insert keys.

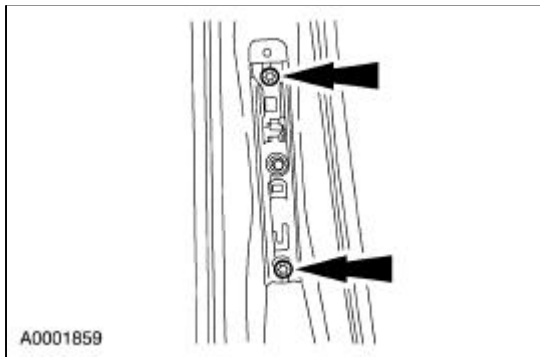


6. **NOTE:** If the shoulder safety belt height adjuster bolts are stripped, install a new height adjuster.

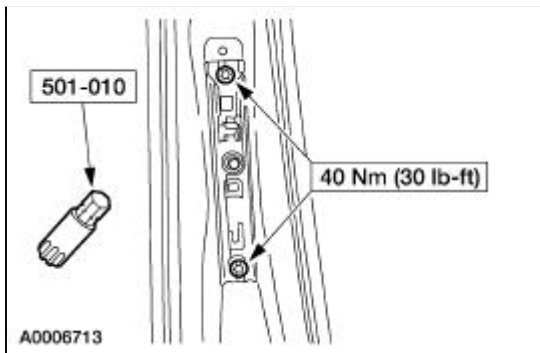
Insert the shoulder safety belt height adjuster in the opening of the upper B-pillar structure, making sure the shoulder belt height adjuster knob on the shoulder safety belt height adjuster is positioned above the D-ring attachment nut. (The tab is located at the top and is to be inserted in the hole provided in the B-pillar structure).



7. Hand tighten the height adjuster bolts until they are snug.

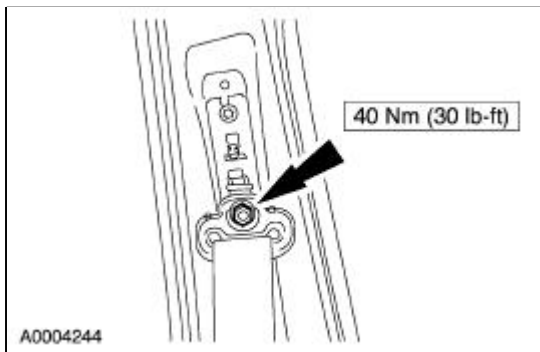


8. Using the special tool, tighten the height adjuster bolts.



9. **NOTE:** Make sure the D-ring rotates freely.

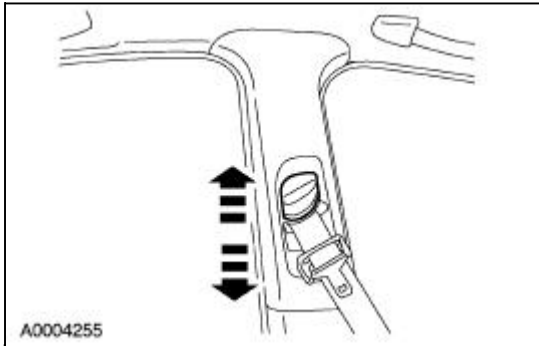
Install the safety belt D-ring and tighten the nut.



10. **NOTE:** Position the safety belt D-ring to its highest point before installing B-pillar trim.

Install the B-pillar trim.

11. Operate the front seat shoulder strap adjuster. Make sure it travels from top to bottom and locks correctly in each position.



12. Check the restraint system for correct operation.
-

Safety Belt Procedure After a Collision



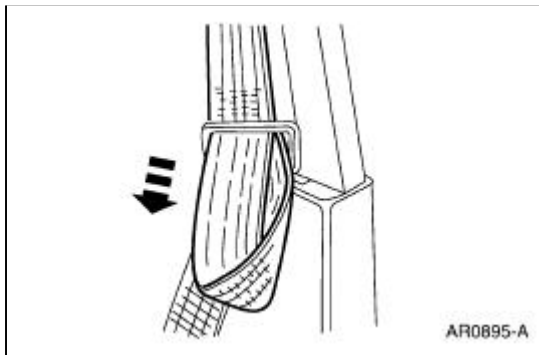
WARNING: All safety belt assemblies include retractors, buckles, front seat belt buckle support assemblies (slide bar), if equipped, shoulder belt height adjuster, if equipped, child safety seat tether bracket assemblies, if equipped, and attaching hardware should be inspected after any collision. All belt assemblies should be installed new unless a qualified technician finds the assemblies show no damage and operate correctly. Belt assemblies not in use during a collision should also be inspected. New safety belt assemblies should be installed if either damage or incorrect operation is noted.

NOTE: The driver and front passenger seat belt system (including belt and retractor assembly, buckles, and height adjusters) must be replaced if the vehicle is involved in a collision that results in deployment of the front air bags and safety belt pretensioners.

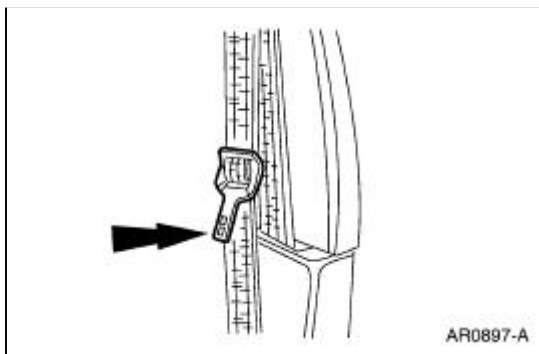
1. Before installing a new safety belt assembly, the safety belt attaching areas must be inspected for damage and distortion. If the attaching points are damaged and distorted, the sheet metal must be worked back to its original shape and structural integrity.
 2. Install the new safety belt(s). For additional information, refer to the procedure in this section. Carry out the Functional Test. For additional information, refer to [Safety Belt System](#) in this section.
-

Safety Belt Tongue Rotated on Belt

1. Grasp the belt tongue and pull the belt webbing down to form a loop through the slot in the tongue.


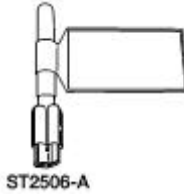
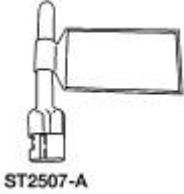



2. Rotate and fold the belt webbing over itself within the slot to remove the twist.
3. Pull the excess belt webbing back through the slot in the belt tongue.
4. Pull the excess belt webbing through the slot.
5. The safety belt tongue should face inward when completed.




Safety Belt Retractor and Pretensioner


Special Tool(s)

 ST2502-A	Diagnostic Tool, Restraint System (1 Req'd) 418-F395
 ST2506-A	Diagnostic Tool, Restraint System (3 Req'd) 418-F088 (105-R0012)
 ST2507-A	Diagnostic Tool, Restraint System (2 Req'd) 418-133 (40-009)
 ST1181-A	Safety Belt Bolt Bit 501-010 (T77L-2100-A)

Removal

 **WARNING:** The safety belt buckle pretensioner and safety belt retractor pretensioner are pyrotechnic devices. Always wear safety glasses when repairing an air bag equipped vehicle and when handling a safety belt buckle pretensioner or safety belt retractor pretensioner.


 **WARNING:** The safety belt buckle pretensioner and safety belt retractor pretensioner are pyrotechnic devices. Never probe an electrical connector pretensioner. Doing so could result in pretensioner or air bag deployment and could result in personal injury.

 **WARNING:** After deployment, the air bag surface could contain deposits of sodium hydroxide, a product of the gas gernerant combustion that is irritating to the skin. Wash your hands with soap and water afterwards.

 **WARNING:** Never probe the connectors on the air bag module. Doing so could result in air bag deployment which could result in personal injury.

NOTE: The driver side is shown, the passenger side is similar.

1. Prepare the vehicle for safety belt retractor and pretensioner removal.


1.  **WARNING:** To avoid accidental deployment and possible personal injury, the backup power supply must be depleted before repairing or replacing any front or side air bag supplemental restraint system (SRS) components and before servicing, replacing, adjusting or striking components near the front or side air bag sensors, such as doors, instrument panel, console, door latches, strikers, seats and hood latches.

Please refer to the appropriate vehicle shop manual to determine location of the front air bag sensors.

The side air bag sensors are located at or near the base of the B-pillar.

To deplete the backup power supply energy, disconnect the battery ground cable and wait at least one minute. Be sure to disconnect auxiliary batteries and power supplies (if equipped).

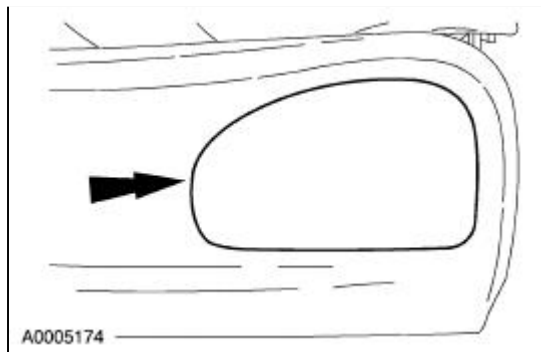
Disconnect the battery ground cable (14301) and wait at least one minute. For additional information, refer to [Section 414-01](#).

2.  **WARNING:** To reduce the risk of serious personal injury, read and follow all warnings, notes, and instructions in the supplemental restraint system (SRS) deactivation/reactivation procedure.

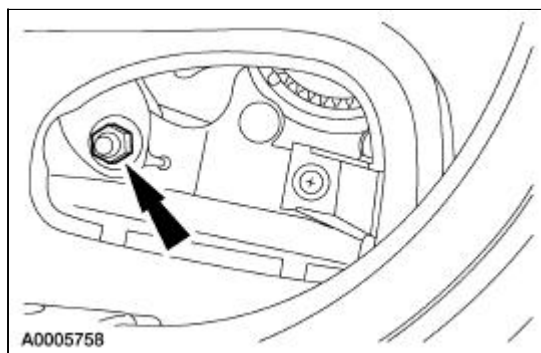
Deactivate the supplemental restraint system (SRS). For additional information, refer to [Supplemental Restraint System \(SRS\) Deactivation and Reactivation](#) in the General Procedures portion of this section.

2.  **CAUTION:** Do not use a screwdriver to remove the safety belt cover.

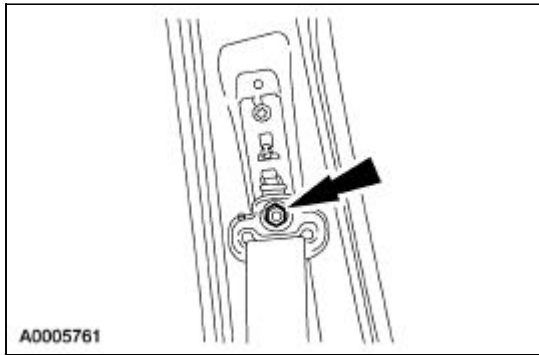
Remove the front safety belt anchor cover by placing fingers behind the cover and pushing outward.



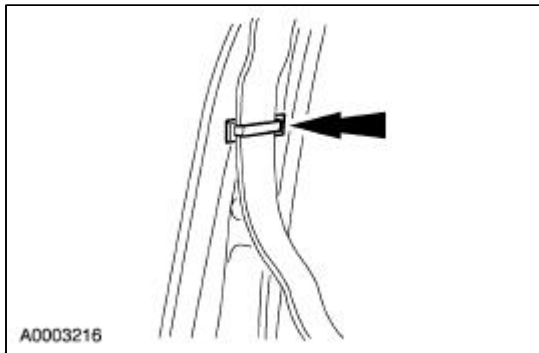
3. Remove the nut and the front safety belt anchor.



4. Remove the D-ring nut and route the safety belt out of the B-pillar trim panel.



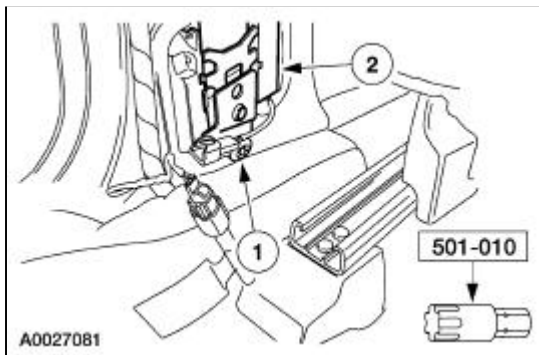
5. Remove the web guide.



6. **NOTE:** For pretensioner retractor disposal procedure, refer to [Section 501-20B](#).

Remove the safety belt retractor and pretensioner assembly.

1. Using the special tool, remove the bolt.
2. Remove the safety belt retractor and pretensioner.

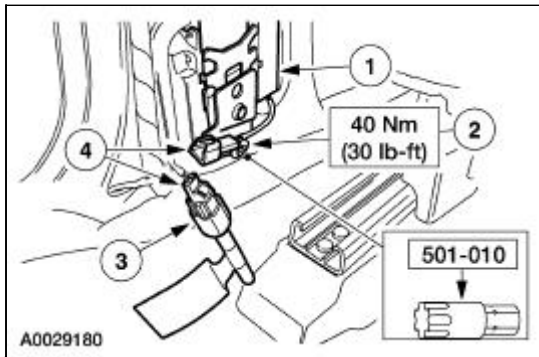


Installation




WARNING: To reduce the risk of serious personal injury, read and follow all warnings, cautions and notes at the beginning of the removal procedure.

1. Install the safety belt retractor and pretensioner assembly.
 1. Position the safety belt retractor and pretensioner.
 2. Using the special tool, install the bolt.
 3. Remove the restraint system diagnostic tool from the driver side safety belt retractor pretensioner electrical connector.
 4. Connect the electrical connector.



2. Connect the battery ground cable. For additional information, refer to [Section 414-01](#).
3. With the restraint system diagnostic tools still installed at the remaining deployable devices, prove out the supplemental restraint system (SRS). For additional information, refer to [Section 501-20B](#).

4.  **WARNING:** To avoid accidental deployment and possible personal injury, the backup power supply must be depleted before repairing or replacing any front or side air bag supplemental restraint system (SRS) components and before servicing, replacing, adjusting or striking components near the front or side air bag sensors, such as doors, instrument panel, console, door latches, strikers, seats and hood latches.

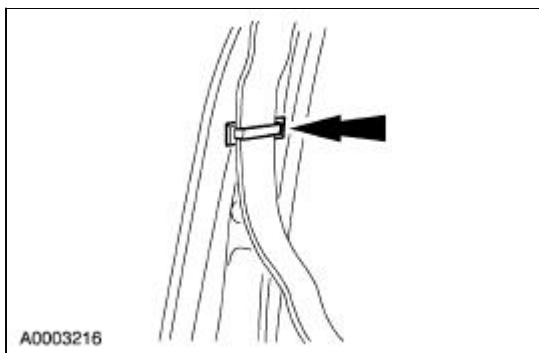
Please refer to the appropriate vehicle shop manual to determine location of the front air bag sensors.

The side air bag sensors are located at or near the base of the B-pillar.

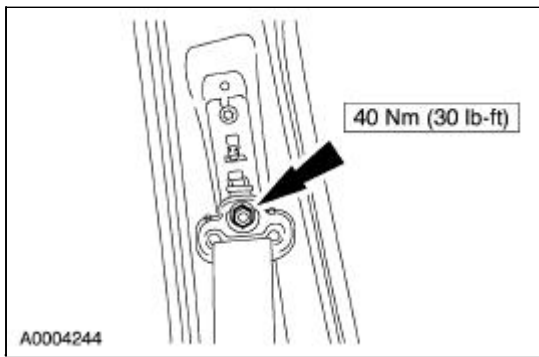
To deplete the backup power supply energy, disconnect the battery ground cable and wait at least one minute. Be sure to disconnect auxiliary batteries and power supplies (if equipped).

Disconnect the battery ground cable and wait at least one minute. For additional information, refer to [Section 414-01](#).

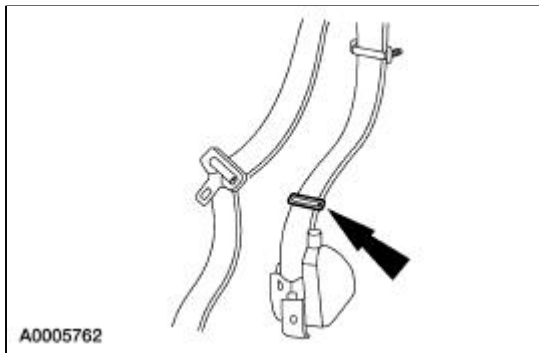
5. Install the web guide.



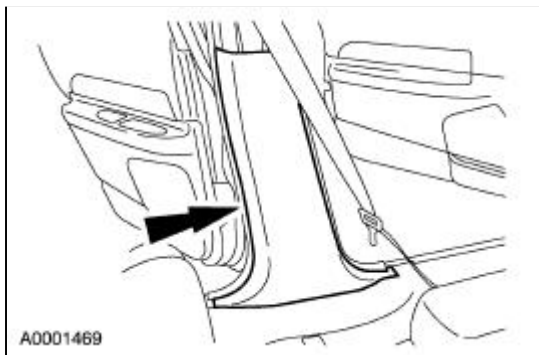
6. Install the D-ring and nut.



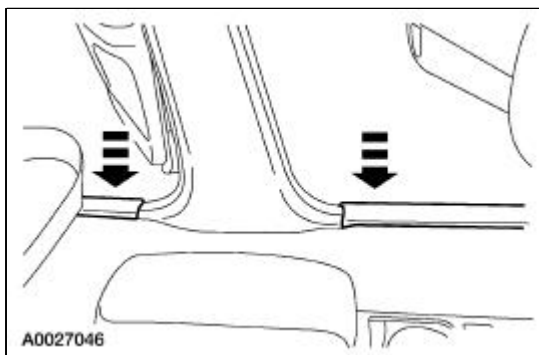
7. Remove the shipping clip from the safety belt webbing.



8. Install the B-pillar lower trim panel.

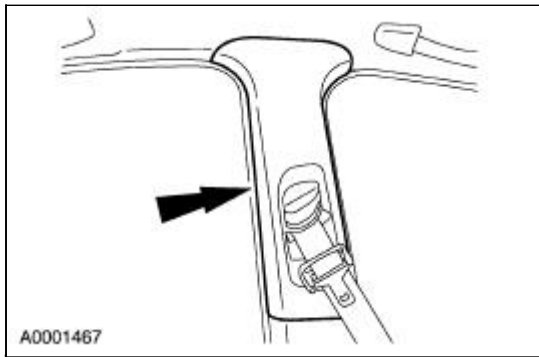


9. Install the driver side front and rear door scuff plates.

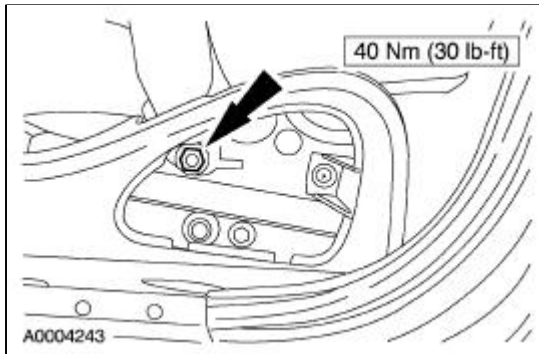


10. **NOTE:** Position the D-ring to its highest point.

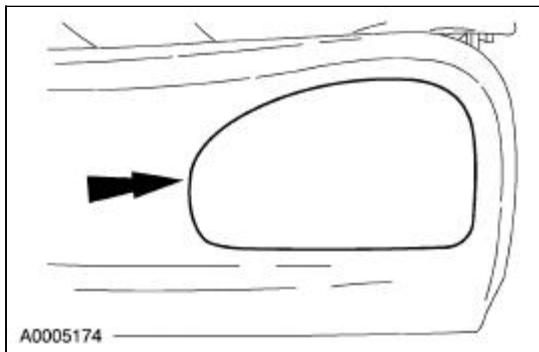
Route the safety belt through the B-pillar upper trim panel. Install the upper B-pillar trim panel.




11. Position the front safety belt anchor and install the nut.




12. Install the front safety belt anchor cover.



13. Restore the vehicle to operating condition.

1.  **WARNING: To reduce the risk of serious personal injury, read and follow all warnings, notes, and instructions in the supplemental restraint system (SRS) deactivation/reactivation procedure.**

Reactivate the supplemental restraint system (SRS). For additional information, refer to [Supplemental Restraint System \(SRS\) Deactivation and Reactivation](#) in the General Procedures portion of this section.

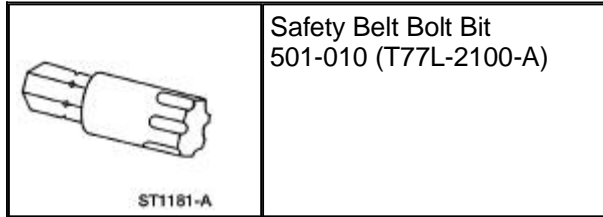
2.  **WARNING: The restraint system diagnostic tool is for restraint system service only. Remove from the vehicle prior to road use. Failure to remove could result in injury and possible violation of vehicle safety standards.**

With all the restraint system diagnostic tools removed, prove out the supplemental restraint system (SRS). For additional information, refer to [Section 501-20B](#).

3. Check the active restraint system for correct operation. For additional information, refer to [Safety Belt System](#).

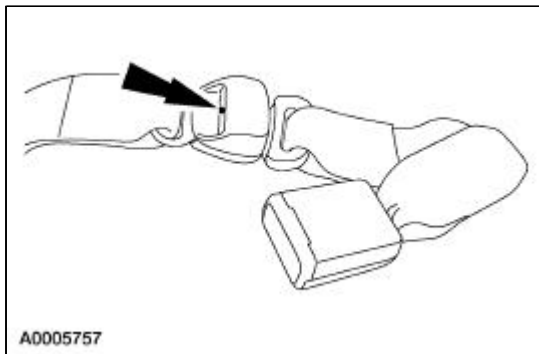
Retractor —Rear Center Safety Belt

Special Tool(s)

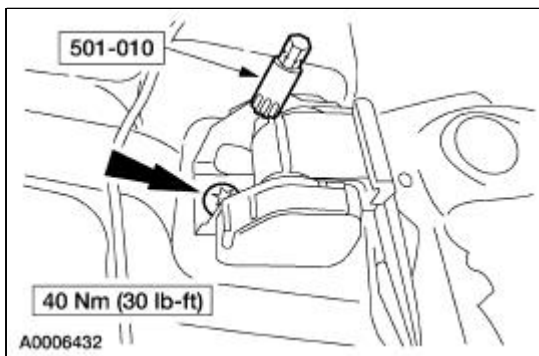


Removal

1. Using a suitable tool, release the mini-buckle.



2. Remove the retractor cover.
3. Using the special tool, remove the retractor.

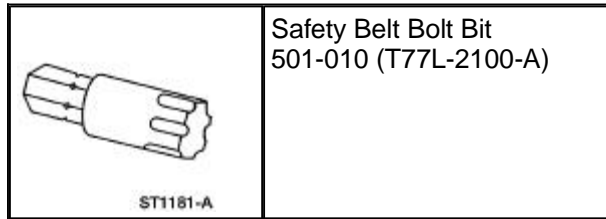


Installation

1. To install, reverse the removal procedure.
 - Check the restraint system for correct operation.

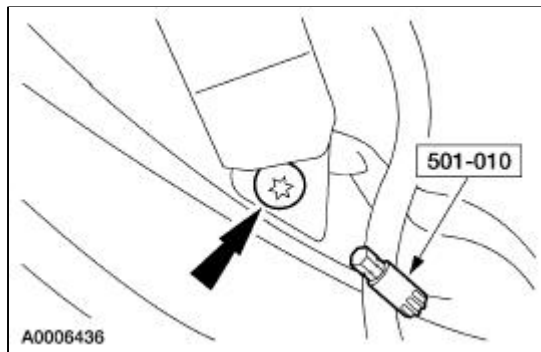
Retractor —Rear LH and RH Safety Belt

Special Tool(s)

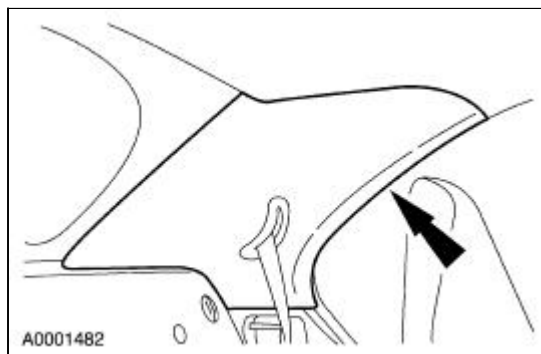


Removal

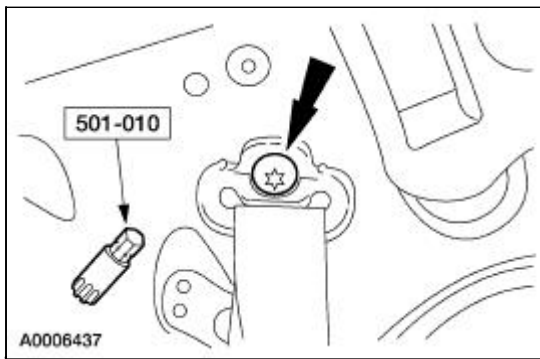
1. Remove the seat backrest rear side bolsters. For additional information, refer to [Section 501-10](#).
2. Using the special tool, remove the rear safety belt anchor bolt.



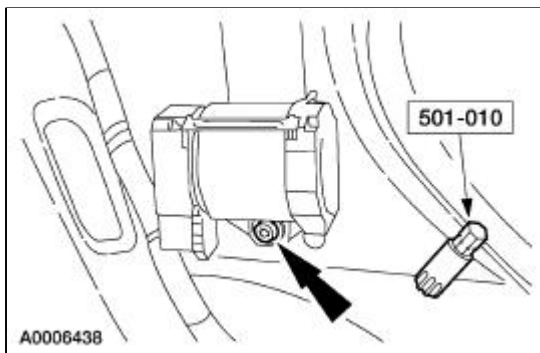
3. Remove the quarter trim panel.



4. Using the special tool, remove the D-ring bolt.

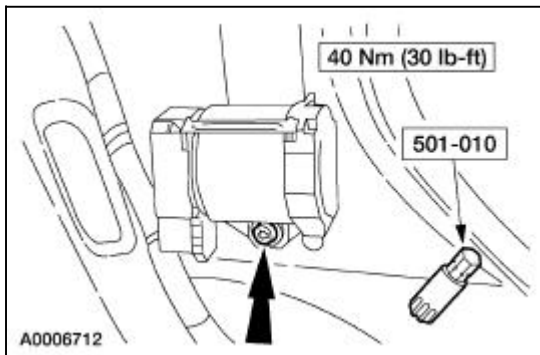


5. Using the special tool, remove the bolt and the retractor.

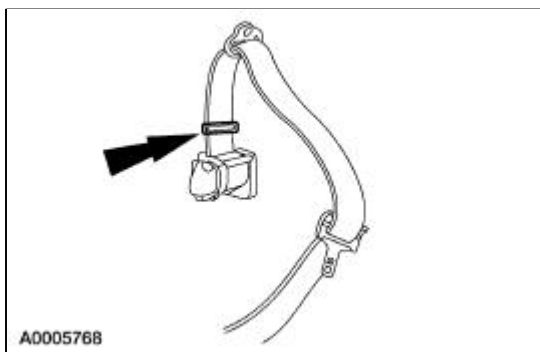


Installation

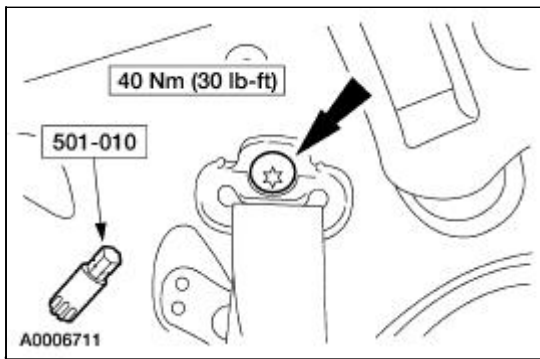
1. Using the special tool, install the retractor.



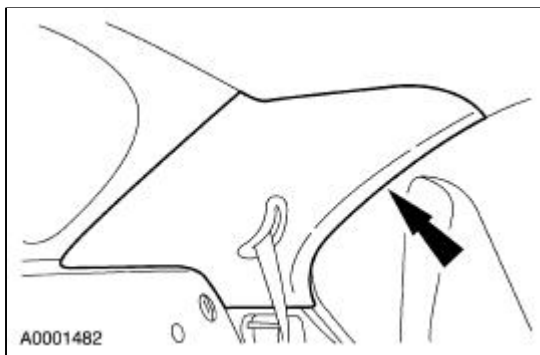
2. Remove the shipping clip from the safety belt webbing.



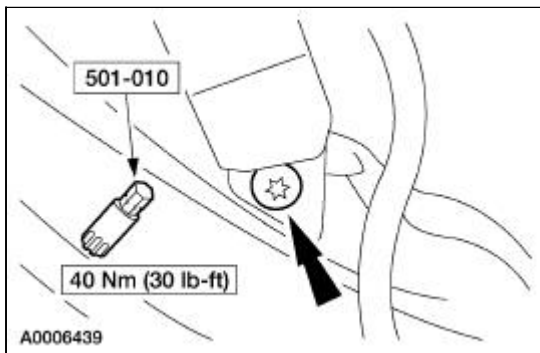
3. Using the special tool, install the D-ring bolt.



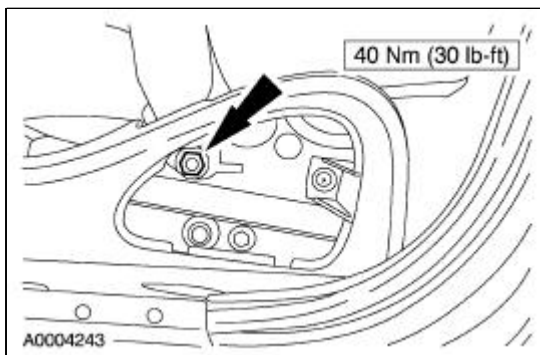
4. Install the rear quarter trim panel.



5. Using the special tool, install the rear safety belt anchor bolt.



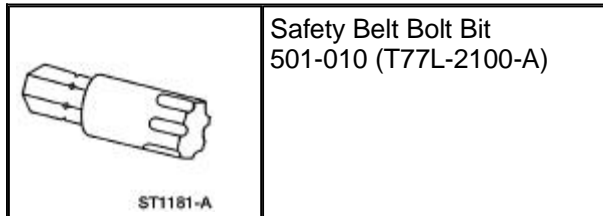
6. Install the seat backrest rear side bolsters. For additional information, refer to [Section 501-10](#).



7. Check the restraint system for correct operation.
-

Height Adjuster —Front Shoulder Safety Belt

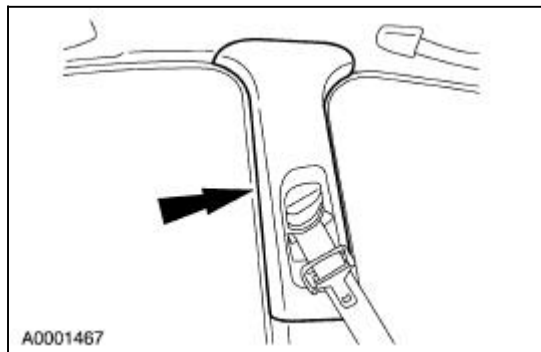
Special Tool(s)



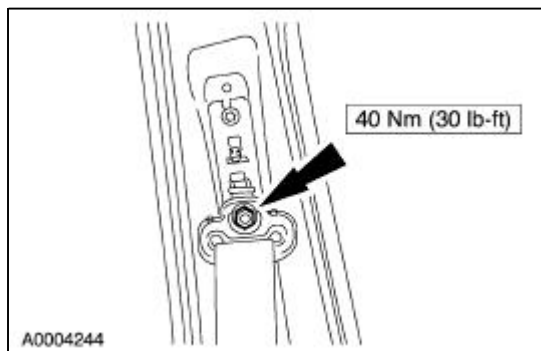
Removal and Installation

1. Pull back the weather-strip surrounding the upper B-pillar trim.
2. **NOTE:** Position the safety belt D-ring to its highest point.

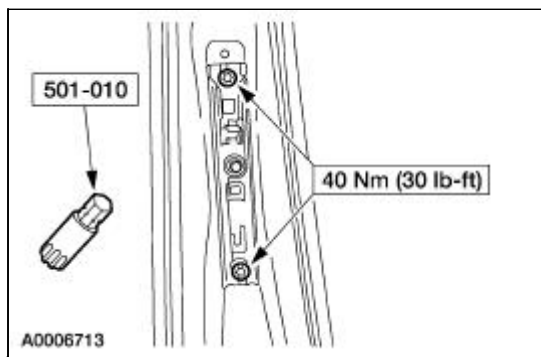
Remove the upper B-pillar trim.



3. Remove the D-ring nut.



4. Using the special tool, remove the height adjuster bolts.





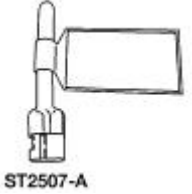
5. **NOTE:** Position the safety belt D-ring to its highest point.

To install, reverse the removal procedure.


- Check the restraint system for correct operation.
-

Safety Belt Buckle —Front

Special Tool(s)

 ST2502-A	Diagnostic Tool, Restraint System (1 Req'd) 418-F395
 ST2506-A	Diagnostic Tool, Restraint System (3 Req'd) 418-F088 (105-R0012)
 ST2507-A	Diagnostic Tool, Restraint System (2 Req'd) 418-133 (40-009)

Removal


 **WARNING:** Always wear safety glasses when repairing an air bag supplemental restraint system (SRS) vehicle and when handling an air bag module. This will reduce the risk of injury in the event of an accidental deployment.

 **WARNING:** After deployment, the air bag surface could contain deposits of sodium hydroxide, a product of the gas gernerant combustion that is irritating to the skin. Wash your hands with soap and water afterwards.

 **WARNING:** Never probe the connectors on the air bag module. Doing so could result in air bag deployment which could result in personal injury.

All vehicles

1. Prepare the vehicle for seat removal.


1.  **WARNING:** To avoid accidental deployment and possible personal injury, the backup power supply must be depleted before repairing or replacing any front or side air bag supplemental restraint system (SRS) components and before servicing, replacing, adjusting or striking components near the front or side air bag sensors, such as doors, instrument panel, console, door latches, strikers, seats and hood latches.

Please refer to the appropriate vehicle shop manual to determine location of the front air bag sensors.


The side air bag sensors are located at or near the base of the B-pillar.

To deplete the backup power supply energy, disconnect the battery ground cable and wait at least one minute. Be sure to disconnect auxiliary batteries and power supplies (if equipped).

Disconnect the battery ground cable (14301) and wait at least one minute. For additional information, refer to [Section 414-01](#).

2.  **WARNING: To reduce the risk of serious personal injury, read and follow all warnings, notes, and instructions in the supplemental restraint system deactivation/reactivation procedure.**

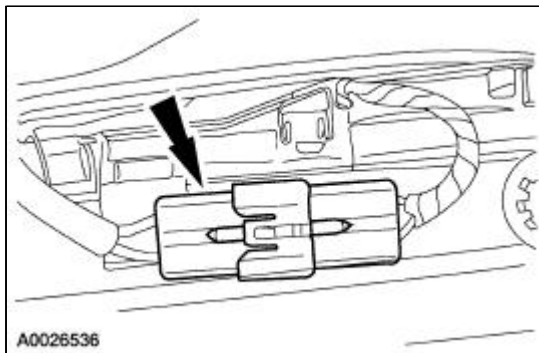
Deactivate the supplemental restraint system (SRS). For additional information, refer to [Supplemental Restraint System \(SRS\) Deactivation and Reactivation](#) in the General Procedures portion of this section.

3.  **WARNING: To reduce the risk of serious personal injury, read and follow all warnings, notes, and instructions in the seat removal and installation procedure.**

Remove the seat on the side with the affected safety belt buckle. For additional information, refer to [Section 501-10](#).

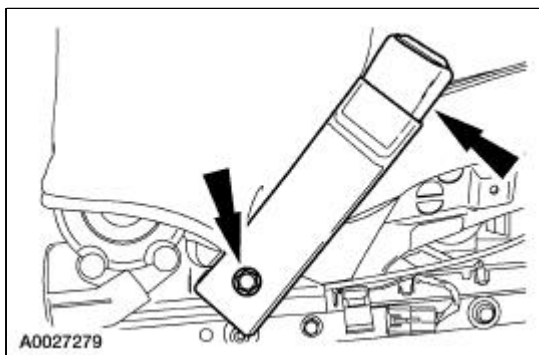
Driver seat only

2. Disconnect the safety belt buckle usage detection switch electrical connector.



All front safety belt buckles

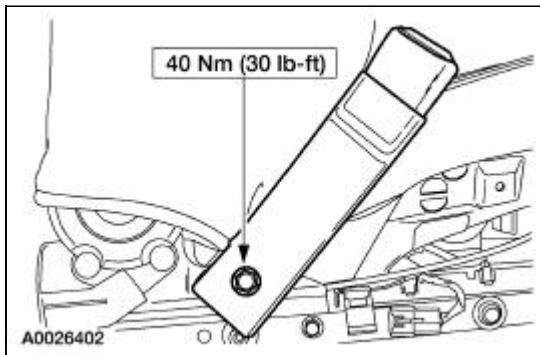
3. Remove the bolt and the safety belt buckle.



Installation

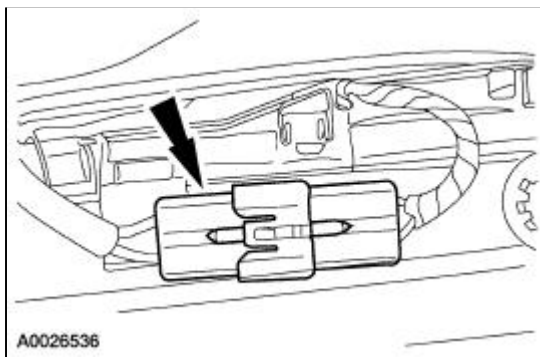
All front safety belt buckles

1. Position the safety belt buckle to the seat. Install the bolt.




Driver seat only


2. Connect the safety belt buckle usage detection switch electrical connector.




All vehicles

3. Restore the vehicle to operating condition.
 1.  **WARNING: To reduce the risk of serious personal injury, read and follow all warnings, notes, and instructions in the seat removal and installation procedure.**

Install the seat with the affected safety belt buckle. For additional information, refer to [Section 501-10](#).

2.  **WARNING: To reduce the risk of serious personal injury, read and follow all warnings, notes, and instructions in the supplemental restraint system (SRS) deactivation/reactivation procedure.**

Reactivate the supplemental restraint system (SRS). For additional information, refer to [Supplemental Restraint System \(SRS\) Deactivation and Reactivation](#) in the General Procedures portion of this section.

3.  **WARNING: The restraint system diagnostic tool is for restraint system service only. Remove from the vehicle prior to road use. Failure to remove could result in injury and possible violation of vehicle safety standards.**

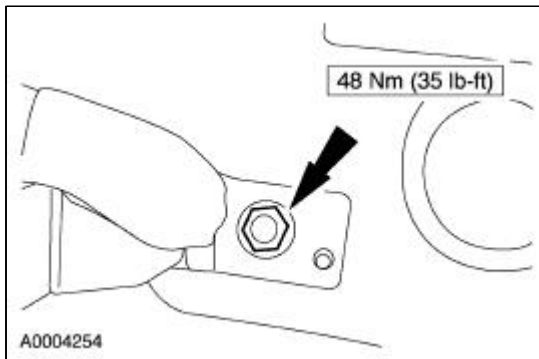
With all the restraint system diagnostic tools removed, prove out the supplemental restraint system (SRS). For additional information, refer to [Section 501-20B](#).

4. Check the active restraint system for correct operation. For additional information, refer to [Safety Belt System](#) in this section.

Safety Belt Buckle —Rear

Removal and Installation

1. Remove the rear seat cushion. For additional information, refer to [Section 501-10](#).
2. Remove the nut and the rear safety belt buckle.



3. To install, reverse the removal procedure.
 - Check the restraint system for correct operation.
-

Torque Specifications

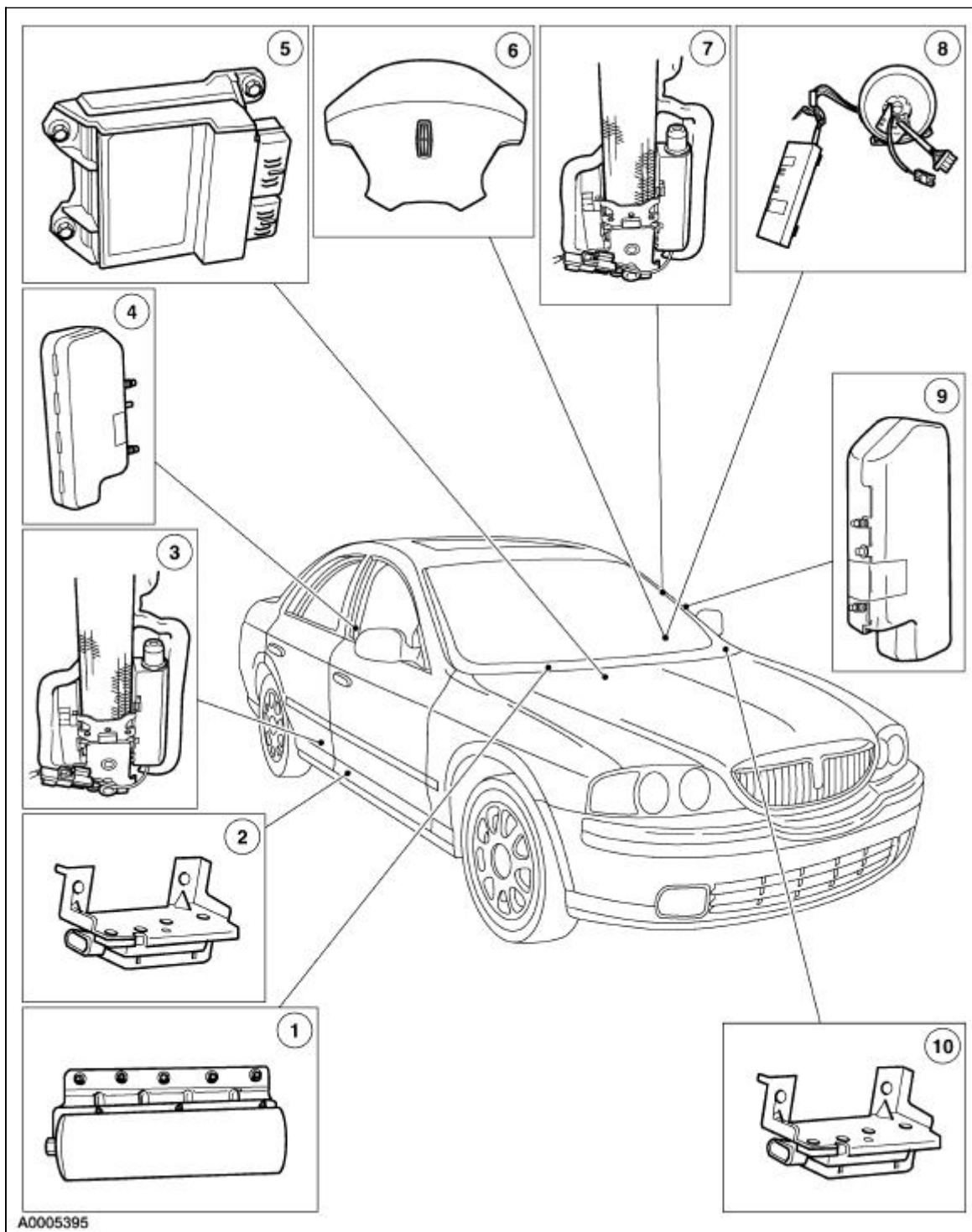
Description	Nm	lb-ft	lb-in
Passenger air bag module retaining nuts and bolts	9	—	80
Restraints control module (RCM) retaining bolts	12	9	—
Side impact sensor retaining bolts	12	9	—
Steering column retaining bolts	17	13	—
Driver air bag module retaining bolts	12	9	—
Side air bag module retaining bolts	9	—	80
Weld nut repair grounding screw (8 mm) (N802455-S190)	12	9	—
Grounding screw (6 mm) (N806327-S190)	12	9	—

Air Bag and Safety Belt Pretensioner Supplemental Restraint System (SRS)

The air bag supplemental restraint system (SRS) is designed to provide increased collision protection for front seat occupants in addition to that provided by the three-point safety belt system. Safety belt use is necessary to obtain the best occupant protection and to receive the full advantages of the SRS.

The air bag supplemental restraint system (SRS) components are shown in the following illustration.

Air Bag Supplemental Restraint System (SRS) Components



A0005395

Item	Part Number	Description
1	044A74	Passenger air bag module
2	14B345	Side impact sensor (RH)
3	611B08	Belt retractor pretensioner, passenger
4	611D10	Passenger side air bag module
5	14B321	Restraints control module (RCM)
6	043B13	Driver air bag module
7	611B09	Belt retractor pretensioner, driver
8	14A664	Clockspring

9	611D11	Driver side air bag module
10	14B345	Side impact sensor (LH)

Driver Air Bag Module

NOTE: References to the driver air bag module must not be confused with the seat-mounted air bag components of the supplemental restraint system (SRS).

The driver air bag module:

- is steering wheel mounted.
- will deploy upon receiving a signal from the RCM.
- has no subassemblies.

Clockspring

The clockspring:

- is mounted on the steering column, behind the steering wheel.
- provides a continuous electrical path from the driver air bag module to the restraints control module (RCM).

Driver Seat Side Air Bag Module

NOTE: References to side air bag modules refer to the seat-mounted and not to the steering wheel or instrument panel mounted air bag components of the supplemental restraint system (SRS).

The driver seat side air bag module:

- is installed as an assembly.
- is mounted in the driver seat back.

Passenger Seat Side Air Bag Module

NOTE: References to side air bag modules refer to the seat-mounted and not to the steering wheel or instrument panel mounted air bag components of the supplemental restraint system (SRS).

The passenger seat side air bag module:

- is installed as an assembly.
- is mounted in the passenger seat back.

Passenger Air Bag Module

NOTE: References to the passenger air bag module must not be confused with the seat-mounted air bag components of the supplemental restraint system (SRS).

The passenger air bag module:

- is installed as an assembly.
- is mounted in the passenger side of the instrument panel.

Safety Belt Pretensioners

As part of the supplemental restraint system (SRS), the safety belt retractors are equipped with pretensioners. The safety belt retractor pretensioners rotate the safety belt retractors to remove excess slack from the safety belt webbing. The pretensioners are activated by the restraints control module (RCM) when the module detects a crash event force exceeding a programmed limit.

Restraints Control Module (RCM)

The restraints control module (RCM) is mounted on the center tunnel under the instrument panel. The RCM performs the following functions:

- signals the inflators to deploy the air bags in the event of a deployable crash.
- activates the belt retractor pretensioners to remove slack from the safety belt webbing.
- monitors the air bag supplemental restraint system (SRS) for faults.
- illuminates the air bag indicator if a fault is detected.
- flashes the air bag indicator to indicate the lamp fault code (LFC) detected.
- communicates the current or historical diagnostic trouble codes (DTCs) through the data link connector (DLC).
- signals the instrument cluster to activate a chime if the air bag indicator is not available and another SRS fault exists.
- contains an internal safing sensor which is not serviced separately.

The RCM monitors the SRS for possible faults. If a fault is detected while the ignition switch is in the RUN position, the RCM will illuminate the air bag indicator located in the instrument cluster.

When the ignition is cycled (turned off and then on), the air bag indicator will remain lit for six seconds and then go out. If an SRS fault exists, the air bag indicator will then flash the two-digit LFC associated with that fault. The air bag indicator will flash the LFC five times, then remain illuminated for the rest of the key cycle. The RCM will also communicate the current and historical DTCs through the data link connector (DLC), using the New Generation Star (NGS) Tester. If the air bag indicator does not function, and the system detects a fault condition, the RCM will signal the instrument cluster to activate an audible chime. The chime is a series of five sets of five tone bursts. If the chime is heard, the SRS and the air bag indicator require repair.

LFCs are prioritized. If two or more faults occur at the same time, the fault having the highest priority will be displayed first. After that fault has been corrected, the next highest priority fault will be displayed.

The RCM includes a backup power supply. This feature provides sufficient backup power to deploy the air bags and belt retractor pretensioners in the event that the ignition circuit is damaged in a collision before the safing and air bag sensors determine that an air bag deployment is required. The backup

power supply will deplete its stored energy approximately one minute after the battery ground cable is disconnected.

Electrical System

The electrical system that supports the air bag supplemental restraint system (SRS):

- is powered from the battery through the ignition circuit.
- provides the electrical path from the restraints control module (RCM) to the SRS components.
- provides the electrical path from the RCM to the air bag indicator.
- provides the electrical path from the RCM to the data link connector (DLC).
- provides the electrical path from the RCM to the instrument cluster.

Sensors



WARNING: The restraints control module (RCM) orientation is critical for proper system operation. If a vehicle equipped with an air bag supplemental restraint system (SRS) has been involved in a collision in which the center tunnel area has been damaged, inspect the mounting and bracket for deformation. If damaged, the RCM must be replaced whether or not the air bags have deployed. In addition, make sure the area of the RCM mounting is restored to its original production configuration.


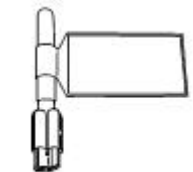
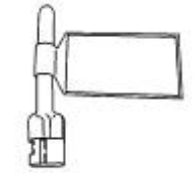


CAUTION: Sensors are repaired by replacement only. Do not attempt to determine whether a sensor is OK. Always replace the sensor even if it does not appear to be damaged.

For this vehicle the SRS employs four impact sensors. Two of the sensors are integral to the RCM and are not separately serviceable. In addition, there are two side impact sensors located at the base of the B-pillars. The RCM is mounted on the center tunnel under the instrument panel. Mounting orientation is critical for correct operation of all impact sensors.

Air Bag and Safety Belt Pretensioner Supplemental Restraint System (SRS)

Special Tool(s)

 ST2502-A	Diagnostic Tool, Restraint System (2 Req'd) 418-F395 (014-R1079)
 ST2506-A	Diagnostic Tool, Restraint System (3 Req'd) 418-F088 (105-R0012)
 ST2507-A	Diagnostic Tool, Restraint System (2 Req'd) 418-133 (40-009)

Restraint System Diagnostic Tool Warning

 **WARNING:** This tool is for restraint system service only. Remove from vehicle prior to road use. Failure to remove could result in injury and possible violation of vehicle safety standards.

Diagnosing Customer Concerns Without Hard Diagnostic Trouble Codes (DTCs)

If a lamp fault code (LFC) is reported by the customer but is not present when the vehicle comes in for repair, follow the Diagnostic Instructions procedure in this section to identify the intermittent diagnostic trouble code (DTC).

Once the DTC is known, read the Normal Operation section for the code involved.

- Follow the deactivation procedure in this section.
- Determine the location of components involved in creating that code.
- Carry out a thorough visual inspection of:
 - components.
 - connectors.
 - splices and wiring harnesses.

- pinched wires.
- worn insulation on conductors.
- opens, shorts or loosely mounted sensors.

Refer to Possible Causes, which lists the common concerns that relate to a particular code. Concerns are listed according to priority.

Diagnosing Customer Concerns with Hard Diagnostic Trouble Codes (DTCs)

Most air bag supplemental restraint system (SRS) diagnostic procedures will require the use of the deactivation and reactivation procedures in this section.

The deactivation and reactivation require the installation and removal of restraint system diagnostic tools. These procedures require removal of driver air bag module, and the disconnection of the passenger air bag module, driver side air bag module, passenger side air bag module, driver safety belt retractor pretensioner, and passenger safety belt retractor pretensioner. This reduces the risk of deployment of air bag modules and safety belt pretensioners while diagnostics are being carried out.

Restraint system diagnostic tools are required to carry out diagnosis and testing of the supplemental restraint system (SRS). It is not acceptable to short-circuit the air bag module connections with a jumper wire. If a jumper wire is used to short-circuit the air bag module connections, a lamp fault code (LFC) will be displayed.

Deactivation and Reactivation Procedures

There are two deactivation and reactivation procedures.

- One procedure requires removal of the front seats. This procedure will be used when diagnosing or repairing a seat side air bag concern. This procedure will also be used when diagnosing or repairing any in-seat or seat mounted component of a seat equipped with a seat side air bag.
- The other procedure does not require front seat removal during the diagnostic and repair process. This procedure will be used when diagnosing or repairing a concern that is not related to a seat equipped with a seat side air bag.

Deactivation Procedure — Seats Removed



WARNING: If the supplemental restraint system (SRS) is being serviced, the system must be deactivated and restraint system diagnostic tools must be installed. Refer to [Air Bag and Safety Belt Pretensioner Supplemental Restraint System \(SRS\)](#) in this section.


The air bag restraint system diagnostic tools must be removed and the air bag modules reconnected when the system is reactivated to avoid non-deployment in a collision, resulting in possible personal injury.

NOTE: Diagnostics or repairs are not to be performed on a seat equipped with a seat side air bag with the seat in the vehicle. Prior to attempting to diagnose or repair a seat concern when equipped with a seat side air bag, the seat must be removed from the vehicle and the restraint system diagnostic tools must be installed in the seat side air bag electrical connectors. **The restraint system diagnostic tools must be removed prior to operating the vehicle over the road.**

NOTE: After diagnosing or repairing an SRS, the restraint system diagnostic tools must be removed before operating the vehicle over the road.

NOTE: After diagnosing or repairing a seat system, the restraint system diagnostic tools must be removed before operating the vehicle over the road.


NOTE: The SRS must be fully operational and free of faults before releasing the vehicle to the customer.


1.  **WARNING:** To avoid accidental deployment and possible personal injury, the backup power supply must be depleted before repairing or replacing any front or side air bag supplemental restraint system (SRS) components and before servicing, replacing adjusting or striking components near the front or side air bag sensors, such as doors, instrument panel, console, door latches, strikers, seats and hood latches.

The side air bag sensors are located at or near the base of the B-pillar.

To deplete the backup power supply energy, disconnect the battery ground cable and wait at least one minute. Be sure to disconnect auxiliary batteries and power supplies (if equipped).

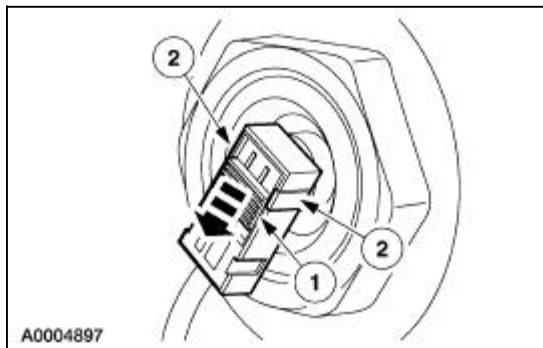
Disconnect the battery ground cable (14301). For additional information, refer to [Section 414-01](#).

2. Wait at least one minute for the backup power supply in the restraints control module (RCM) to deplete its stored energy.
3.  **WARNING:** Carry a live air bag module with the air bag and trim cover pointed away from your body. This will reduce the risk of injury in the event of an accidental deployment.

 **WARNING:** Do not set a live air bag module down with the trim cover face down. This will reduce the risk of injury in the event of an accidental deployment.

Remove the driver air bag module from the vehicle. For additional information, refer to [Driver Air Bag Module](#) in this section.

4. Attach a restraint system diagnostic tool 418-F395 to the clockspring side of the driver air bag module electrical connector.
5. Remove the glove compartment. For additional information, refer to [Section 501-12](#).



6. Disconnect the passenger air bag electrical connector.
 1. Reaching over the cross-car beam, slide the passenger air bag module electrical connector lock downward.

2. Squeeze the electrical connector locking tabs and pull the electrical connector from the passenger air bag module.
7. Attach a restraint system diagnostic tool 418-F395 to the harness side of the passenger air bag module electrical connector.
8. Remove the affected front seat(s). For additional information, refer to [Section 501-10](#).
9. Disconnect (if necessary) and attach a restraint system diagnostic tool 418-133 to the passenger side air bag module electrical connector.
10. Access the passenger safety belt retractor pretensioner in the passenger side B-pillar.
11. Disconnect the passenger side safety belt retractor pretensioner electrical connector.
12. Attach a restraint system diagnostic tool 418-F088 to the passenger safety belt retractor pretensioner electrical connector.
13. Disconnect (if necessary) and attach a restraint system diagnostic tool 418-133 to the driver side air bag electrical connector.
14. Access the driver safety belt retractor pretensioner in the driver side B-pillar.
15. Disconnect the driver safety belt retractor pretensioner electrical connector.
16. Attach a restraint system diagnostic tool 418-F088 to the driver safety belt retractor pretensioner electrical connector.
17. Reconnect the battery ground cable. For additional information, refer to [Section 414-01](#).

Reactivation Procedure — Seats Removed



WARNING: The air bag restraint system diagnostic tools must be removed and the air bag modules reconnected when the system is reactivated to avoid non-deployment in a collision, resulting in possible personal injury.



WARNING: To reduce the risk of serious personal injury, read and follow all warnings and notes at the beginning of the deactivation procedure.

1. Disconnect the battery ground cable. For additional information, refer to [Section 414-01](#).
2. Wait at least one minute for the backup power supply in the restraints control module (RCM) to deplete its stored energy.



3. **WARNING: The restraint system diagnostic tool is for restraint system service only. Remove from vehicle prior to road use. Failure to remove could result in injury and possible violation of vehicle safety standards.**


Remove the restraint system diagnostic tool from the driver side air bag module electrical connector.




4. **WARNING: The restraint system diagnostic tool is for restraint system service only. Remove from vehicle prior to road use. Failure to remove could result in injury and**

possible violation of vehicle safety standards.

Remove the restraint system diagnostic tool from the driver seat belt retractor pretensioner electrical connector.


5. Connect the driver seat belt retractor pretensioner electrical connector.
6. Install the driver side B-pillar trim panels.
7.  **WARNING: The restraint system diagnostic tool is for restraint system service only. Remove from vehicle prior to road use. Failure to remove could result in injury and possible violation of vehicle safety standards.**

Remove the restraint system diagnostic tool from the passenger side air bag electrical connector.

8.  **WARNING: The restraint system diagnostic tool is for restraint system service only. Remove from vehicle prior to road use. Failure to remove could result in injury and possible violation of vehicle safety standards.**


Remove the restraint system diagnostic tool from the passenger seat belt buckle pretensioner electrical connector.

9. Connect the passenger seat belt retractor pretensioner electrical connector.
10. Install the passenger side B-pillar trim panels.
11. Install the affected front seat(s). For additional information, refer to [Section 501-10](#).
12. Connect the driver and passenger side air bag module electrical connectors.

13.  **WARNING: The restraint system diagnostic tool is for restraint system service only. Remove from vehicle prior to road use. Failure to remove could result in injury and possible violation of vehicle safety standards.**

Remove the restraint system diagnostic tool from the passenger air bag module electrical connector.

14. Reconnect the passenger air bag module electrical connector electrical connector.
15. Install the glove compartment. For additional information, refer to [Section 501-12](#).

16.  **WARNING: The restraint system diagnostic tool is for restraint system service only. Remove from vehicle prior to road use. Failure to remove could result in injury and possible violation of vehicle safety standards.**

Remove the restraint system diagnostic tool from the driver air bag module electrical connector.

17. Install the driver air bag module from the vehicle. For additional information, refer to [Driver Air Bag Module](#) in this section.
18. Reconnect the battery ground cable. For additional information, refer to [Section 414-01](#).
19. Prove out the system.

Deactivation Procedure — Seats Not Removed



WARNING: If the supplemental restraint system (SRS) is being serviced, the system must be deactivated and restraint system diagnostic tools must be installed. Refer to [Air Bag and Safety Belt Pretensioner Supplemental Restraint System \(SRS\)](#) in this section.


The air bag restraint system diagnostic tools must be removed and the air bag modules reconnected when the system is reactivated to avoid non-deployment in a collision, resulting in possible personal injury.

NOTE: Diagnostics or repairs are not to be performed on a seat equipped with a seat side air bag with the seat in the vehicle. Prior to attempting to diagnose or repair a seat concern when equipped with a seat side air bag, the seat must be removed from the vehicle and the restraint system diagnostic tools must be installed in the seat side air bag electrical connectors. **The restraint system diagnostic tools must be removed prior to operating the vehicle over the road.**

NOTE: After diagnosing or repairing an SRS, the restraint system diagnostic tools must be removed before operating the vehicle over the road.

NOTE: After diagnosing or repairing a seat system, the restraint system diagnostic tools must be removed before operating the vehicle over the road.

NOTE: The SRS must be fully operational and free of faults before releasing the vehicle to the customer.


1.  **WARNING:** To avoid accidental deployment and possible personal injury, the backup power supply must be depleted before repairing or replacing any front or side air bag supplemental restraint system (SRS) components and before servicing, replacing adjusting or striking components near the front or side air bag sensors, such as doors, instrument panel, console, door latches, strikers, seats and hood latches.

The side air bag sensors are located at or near the base of the B-pillar.

To deplete the backup power supply energy, disconnect the battery ground cable and wait at least one minute. Be sure to disconnect auxiliary batteries and power supplies (if equipped).

Disconnect the battery ground cable (14301). For additional information, refer to [Section 414-01](#).

2. Wait at least one minute for the backup power supply in the restraints control module (RCM) to deplete its stored energy.

3.  **WARNING:** Carry a live air bag module with the air bag and trim cover pointed away from your body. This will reduce the risk of injury in the event of an accidental deployment.

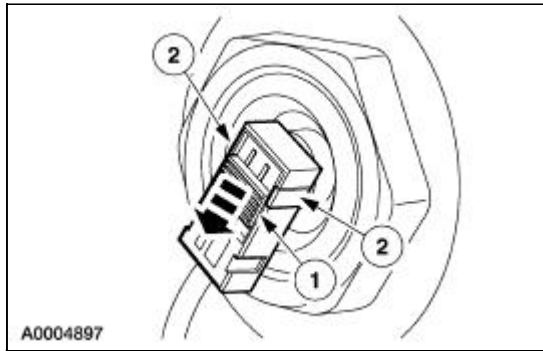



WARNING: Do not set a live air bag module down with the trim cover face down. This will reduce the risk of injury in the event of an accidental deployment.

Remove the driver air bag module from the vehicle. For additional information, refer to [Driver Air Bag Module](#) in this section.

4. Attach a restraint system diagnostic tool 418-F395 to the clockspring side of the driver air bag module electrical connector.

5. Remove the glove compartment. For additional information, refer to [Section 501-12](#).



6. Disconnect the passenger air bag electrical connector.
 1. Reaching over the cross-car beam, slide the passenger air bag module electrical connector lock downward.
 2. Squeeze the electrical connector locking tabs and pull the electrical connector from the passenger air bag module.
7. Attach a restraint system diagnostic tool 418-F395 to the harness side of the passenger air bag module electrical connector.
8. Reconnect the battery ground cable. For additional information, refer to [Section 414-01](#).
9. Move and tilt the front seats to their highest and most forward position.
10.  **WARNING: To avoid accidental deployment and possible personal injury, the backup power supply must be depleted before repairing or replacing any front or side air bag supplemental restraint system (SRS) components and before servicing, replacing adjusting or striking components near the front or side air bag sensors, such as doors, instrument panel, console, door latches, strikers, seats and hood latches.**

The side air bag sensors are located at or near the base of the B-pillar.

To deplete the backup power supply energy, disconnect the battery ground cable and wait at least one minute. Be sure to disconnect auxiliary batteries and power supplies (if equipped).

Disconnect the battery ground cable (14301). For additional information, refer to [Section 414-01](#).

11. Disconnect the passenger side air bag module electrical connector beneath the passenger seat.
12. Attach a restraint system diagnostic tool 418-133 to the passenger side air bag floor electrical connector.
13. Access the passenger safety belt retractor pretensioner in the passenger side B-pillar.
14. Disconnect the passenger side safety belt retractor pretensioner electrical connector.
15. Attach a restraint system diagnostic tool 418-F088 to the passenger safety belt retractor pretensioner electrical connector.
16. Disconnect the driver side air bag module electrical connector beneath the driver seat.
17. Attach a restraint system diagnostic tool 418-133 to the driver side air bag module electrical connector.

18. Access the driver safety belt retractor pretensioner in the driver side B-pillar.
19. Disconnect the driver safety belt retractor pretensioner electrical connector.
20. Attach a restraint system diagnostic tool 418-F088 to the driver safety belt retractor pretensioner electrical connector.
21. Reconnect the battery ground cable. For additional information, refer to [Section 414-01](#).

Reactivation Procedure — Seats Not Removed




WARNING: The air bag restraint system diagnostic tools must be removed and the air bag modules reconnected when the system is reactivated to avoid non-deployment in a collision, resulting in possible personal injury.




WARNING: To reduce the risk of serious personal injury, read and follow all warnings and notes at the beginning of the deactivation procedure.

1. Disconnect the battery ground cable. For additional information, refer to [Section 414-01](#).
2. Wait at least one minute for the backup power supply in the restraints control module (RCM) to deplete its stored energy.

3.  **WARNING:** The restraint system diagnostic tool is for restraint system service only. Remove from vehicle prior to road use. Failure to remove could result in injury and possible violation of vehicle safety standards.


Remove the restraint system diagnostic tool from the driver side air bag module electrical connector.

4. Connect the driver side air bag module electrical connector.

5.  **WARNING:** The restraint system diagnostic tool is for restraint system service only. Remove from vehicle prior to road use. Failure to remove could result in injury and possible violation of vehicle safety standards.


Remove the restraint system diagnostic tool from the driver seat belt retractor pretensioner electrical connector.

6. Connect the driver seat belt retractor pretensioner electrical connector.
7. Install the driver side B-pillar trim panels.

8.  **WARNING:** The restraint system diagnostic tool is for restraint system service only. Remove from vehicle prior to road use. Failure to remove could result in injury and possible violation of vehicle safety standards.


Remove the restraint system diagnostic tool from the passenger side air bag module electrical connector.

9. Connect the passenger side air bag module electrical connector.

10.  **WARNING: The restraint system diagnostic tool is for restraint system service only. Remove from vehicle prior to road use. Failure to remove could result in injury and possible violation of vehicle safety standards.**

Remove the restraint system diagnostic tool from the passenger seat belt buckle pretensioner electrical connector.


11. Connect the passenger seat belt retractor pretensioner electrical connector.
12. Reconnect the battery ground cable. For additional information, refer to [Section 414-01](#).
13. Move and tilt the front seats rearward.

14.  **WARNING: To avoid accidental deployment and possible personal injury, the backup power supply must be depleted before repairing or replacing any front or side air bag supplemental restraint system (SRS) components and before servicing, replacing adjusting or striking components near the front or side air bag sensors, such as doors, instrument panel, console, door latches, strikers, seats and hood latches.**

The side air bag sensors are located at or near the base of the B-pillar.


To deplete the backup power supply energy, disconnect the battery ground cable and wait at least one minute. Be sure to disconnect auxiliary batteries and power supplies (if equipped).

Disconnect the battery ground cable (14301). For additional information, refer to [Section 414-01](#).

15.  **WARNING: The restraint system diagnostic tool is for restraint system service only. Remove from vehicle prior to road use. Failure to remove could result in injury and possible violation of vehicle safety standards.**

Remove the restraint system diagnostic tool from the passenger air bag module electrical connector.

16. Reconnect the passenger air bag module electrical connector electrical connector.
17. Install the glove compartment. For additional information, refer to [Section 501-12](#).

18.  **WARNING: The restraint system diagnostic tool is for restraint system service only. Remove from vehicle prior to road use. Failure to remove could result in injury and possible violation of vehicle safety standards.**

Remove the restraint system diagnostic tool from the driver air bag module electrical connector.

19. Install the driver air bag module from the vehicle. For additional information, refer to [Driver Air Bag Module](#) in this section.
20. Reconnect the battery ground cable. For additional information, refer to [Section 414-01](#).
21. Prove out the system.

Prove Out Procedure

Turn the ignition switch from the OFF to the RUN position and visually monitor the air bag indicator with the air bag modules or restraint system diagnostic tools installed. The air bag indicator will light continuously for approximately six seconds and then turn off. If an air bag supplemental restraint system (SRS) fault is present, the air bag indicator will either:

- fail to light.
- remain lit continuously.
- flash.

The flashing might not occur until approximately 30 seconds after the ignition switch has been turned from the OFF to the RUN position. This is the time required for the restraints control module (RCM) to complete the testing of the SRS. If the air bag indicator is inoperative and an SRS fault exists, a chime will sound in a pattern of five sets of five beeps. If this occurs, the air bag indicator will need to be repaired before diagnosis can continue.

Glossary

Restraint System Diagnostic Tools

Restraint system diagnostic tools are used to simulate air bag module connections to the system.

Disconnect the Component

Disconnect the component means disconnect the component vehicle harness connector. It does not mean remove the component. Do not reconnect a disconnected component unless instructed to do so.

Deactivate the System

Deactivate the system means to carry out the deactivation procedure. Refer to Deactivation Procedure in this section.

Prove Out the System

Prove out the system means to turn the ignition switch from the OFF to the RUN position and visually monitor the air bag indicator with the air bag modules installed. Refer to Prove Out Procedure in this section.

Reactivate the System

Reactivate the system means to carry out the reactivation procedure. Refer to Reactivation Procedure in this section.

Reconnect the System

Reconnect the system means to reconnect all system components. Refer to Air Bag Reconnect Checklist in this section.

Install a New Component

Install a new component means to remove the existing component and install a new authorized part obtained from Ford Customer Service Division.

Verify the System

Verify the system means to prove out the system with restraint system diagnostic tools for the air bag

modules in place of the components.


Air Bag Reconnect Checklist

The checklist below should be completed following diagnosis or repair of any air bag system concern:

1. All restraint system diagnostic tools removed?
 2. All in-seat electrical connectors connected?
 3. All air bag modules connected?
 4. Restraints control module (RCM) connected?
 5. All safety belt pretensioners connectors connected?
 6. All sensors (side impact) connected?
 7. Battery connected?
-

Diagnostic Instructions — Air Bag and Safety Belt Pretensioner Supplemental Restraint System (SRS)

Special Tool(s)

	Worldwide Diagnostic System (WDS) 418-F224, New Generation STAR (NGS) Tester 418-F052, or equivalent scan tool
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The symptom chart can be used to help locate the air bag supplemental restraint system (SRS) concerns if no diagnostic trouble codes (DTCs) are retrieved and the listed symptoms are observed. Whether or not the listed symptoms are observed, always carry out the following:

1. Retrieve all DTCs stored in the restraints control module (RCM) memory. For additional information, refer to Retrieve/Clear Continuous DTCs in this section.
2. Run the On-Demand Self Test to determine what DTCs are currently being sensed by the RCM. For additional information, refer to On-Demand Self Test in this section.
3. If the stored DTCs are different than the current DTCs, always repair the current DTCs first.
4. If memory displays different continuous DTCs than the On-Demand Self Test, perform in the following order:
 - On-Demand Self Test.
 - Memory (Retrieve/Clear Continuous DTCs).

A DTC can indicate several concerns. The DTCs are to assist in system diagnosis and are not to be considered definitive. Always refer to the pinpoint test corresponding to the DTC to determine where the concern lies and to repair the concern correctly.

The SRS diagnostics can be divided into three sections:

- diagnostic test modes.
- PID/data monitor and record.
- active command modes.

Diagnostic Test Modes

Two menu options are available under the diagnostic test modes:

- Retrieve/Clear Continuous DTCs.

- On-Demand Self Test.

Retrieve/Clear Continuous DTCs

During vehicle operation the restraints control module (RCM) will detect and store both intermittent and hard fault DTCs in nonvolatile memory. The DTC strategy employed by the RCM incorporates a time-out scheme for determining when a concern exists in the system. This requires a concern to exist for up to one minute in the system before the RCM will detect it. For the RCM to determine that a concern no longer exists, the concern must be absent for up to one minute. The actual detection time-outs vary with each DTC. The DTCs can be retrieved with the scan tool. Any DTCs stored in the RCM will be displayed on the scan tool along with a brief description of the DTC. If no DTCs are present, the scan tool will display a SYSTEM PASSED message. The scan tool can also be used to clear DTCs from the RCM memory, as long as the concern no longer exists. Once 254 key cycles have been recorded since the concern was last detected, the DTC will automatically be removed from memory.

To retrieve or clear DTCs, connect the scan tool to the data link connector (DLC). Follow the instructions for the scan tool being used. All continuous DTCs will be displayed on the screen. Before proceeding with the clearing operation, make note of the DTCs displayed, because once cleared, they cannot be retrieved. Hard DTCs will be redisplayed after clearing DTCs since they cannot be cleared from the RCM.

On-Demand Self Test

The On-Demand Self Test option is used to verify that no electrical concerns exist with the air bag supplemental restraint system (SRS). Upon entering the self test, the restraint control module (RCM) will make an electrical check of each electrical component in the system. If a concern is detected, a DTC is displayed on the scan tool with a brief description of the DTC. Concerns detected during the self test are not stored in memory, unless the same concern was also detected during normal vehicle operation. The self test should always be run after any repair to verify that the repair was successful.

To run the On-Demand Self Test, connect the scan tool to the data link connector (DLC). Follow the instructions for the scan tool being used. The RCM will run the On-Demand Self Test and display on-demand DTCs (reflecting hard system concerns) on the screen.

PID/Data Monitor and Record

The PID/Data Monitor and Record option allows the scan tool operator to read the state of several parameter IDs (PIDs) to aid in diagnosing the system. PIDs are real time measurements of parameters such as voltages, resistances, etc., calculated by the restraints control module (RCM) and sent to the scan tool for display. Many of the PIDs supported by the RCM are calculated periodically and therefore are not true real time readings.

To retrieve PIDs, connect the scan tool to the data link connector (DLC). Follow the instructions for the scan tool being used. PIDs are updated continuously on the display.

Active Commands

This command allows the technician to verify operation of the air bag indicator and chime. When the air bag output command is executed, the indicator and the chime are activated simultaneously for approximately four seconds. Both devices are deactivated automatically.

Restraints Control Module (RCM) Diagnostic Trouble Code (DTC) Priority Table

DTC ^a	LFC ^b	LFC Priority	Description	Action To Take
—	—	1	RCM Disconnected, Inoperative, or Lost/Low Ignition Feed	Go To Pinpoint Test A.
B1342	24	2	RCM is Faulted	INSTALL a new RCM.
B1231	19	3	RCM Crash Data Memory Full	INSTALL a new RCM and impact sensors.
B1921	21	4	RCM Bracket Ground Resistance High	Go To Pinpoint Test B.
C1414	29	5	Incorrect Vehicle Identification Code	Go To Pinpoint Test C.
B1887	15	6	Driver Air Bag Circuit Shorted to Ground	Go To Pinpoint Test D.
B1888	16	7	Passenger Air Bag Circuit Shorted to Ground	Go To Pinpoint Test E.
B1916	15	6	Driver Air Bag Circuit Shorted to Battery or Ignition	Go To Pinpoint Test F.
B1925	16	7	Passenger Air Bag Circuit Shorted to Battery or Ignition	Go To Pinpoint Test G.
B1932	32	8	Driver Air Bag Circuit Resistance High	Go To Pinpoint Test H.
B1933	33	9	Passenger Air Bag Circuit Resistance High	Go To Pinpoint Test I.
B1934	34	10	Driver Air Bag Circuit Resistance Low	Go To Pinpoint Test J.
B1935	35	11	Passenger Air Bag Circuit Resistance Low	Go To Pinpoint Test K.
B2444	48	16	Driver Side Crash Sensor is Faulted	Go To Pinpoint Test L.
B2440	43	19	Passenger Side Crash Sensor Mounting Fault	Go To Pinpoint Test M.
B2441	42	18	Driver Side Crash Sensor Mounting Fault	Go To Pinpoint Test N.
B2445	49	17	Passenger Side Crash Sensor is Faulted	Go To Pinpoint Test O.
U2017	44	20	Driver Side Crash Sensor Communication Fault	Go To Pinpoint Test P.
U2018	45	21	Passenger Side Crash Sensor Communication Fault	Go To Pinpoint Test Q.
B1993	36	22	Driver Side Air Bag Circuit Shorted to Ground	Go To Pinpoint Test R.
B1997	37	23	Passenger Side Air Bag Circuit Shorted to Ground	Go To Pinpoint Test S.
B1992	36	22	Driver Side Air Bag Circuit Shorted to Battery or Ignition	Go To Pinpoint Test T.
B1996	37	23	Passenger Side Air Bag Circuit Shorted to Battery or Ignition	Go To Pinpoint Test U.
B1994	36	22	Driver Side Air Bag Circuit High Resistance	Go To Pinpoint Test V.
B1998	37	23	Passenger Side Air Bag Circuit Resistance High	Go To Pinpoint Test W.
B1995	36	22	Driver Side Air Bag Circuit Resistance Low	Go To Pinpoint Test X.
B1999	37	23	Passenger Side Air Bag Circuit Resistance Low	Go To Pinpoint Test Y.

B1877	46	24	Driver Pretensioner Circuit Resistance High	Go To Pinpoint Test Z .
B1885	46	24	Driver Pretensioner Circuit Resistance Low	Go To Pinpoint Test Z .
B1881	47	25	Passenger Pretensioner Circuit Resistance High	Go To Pinpoint Test AA .
B1886	47	25	Passenger Pretensioner Circuit Resistance Low	Go To Pinpoint Test AA .
B1878	17	26	Driver Pretensioner Circuit Shorted to Battery or Ignition	Go To Pinpoint Test AB .
B1879	17	26	Driver Pretensioner Circuit Shorted to Ground	Go To Pinpoint Test AC .
B1882	18	27	Passenger Pretensioner Circuit Shorted to Battery or Ignition	Go To Pinpoint Test AD .
B1883	18	27	Passenger Pretensioner Circuit Shorted to Ground	Go To Pinpoint Test AE .
B1892	—	—	Air Bag Tone Warning Indicator Circuit Shorted to Ground or Open	Go To Pinpoint Test AF .
B1891	—	—	Air Bag Tone Warning Indicator Circuit Shorted to Battery or Ignition	Go To Pinpoint Test AG .
B1869	Tone ^c	—	Air Bag Indicator Inoperative	Go To Pinpoint Test AH .
B1870	Tone ^c	—	Air Bag Indicator Shorted to Battery	Go To Pinpoint Test AI .
—	—	—	No Communication with the Restraints Control Module (RCM)	Go To Pinpoint Test AJ .
—	5Hz	—	RCM in Plant Mode	Go To Pinpoint Test AK .

^a DTC: Diagnostic trouble code, retrieved using scan tool.

^b LFC: Lamp fault code, flashed on air bag indicator.

^c Tone will sound only if additional DTCs are present.

Inspection and Verification

1. Verify the customer concern by checking the air bag indicator in the instrument cluster. For additional information, refer to Prove Out Procedure in this section.
2. Visually inspect for obvious signs of mechanical and electrical damage using the following chart.

Visual Inspection Chart

Mechanical	Electrical
<ul style="list-style-type: none"> ● Damaged restraints control module (RCM) bracket ● Loose component mounting 	<ul style="list-style-type: none"> ● Open fuse(s) ● Damaged wiring harness ● Loose or corroded connectors ● Circuitry open/shorted ● Damaged shorting bars

3. If the concern is not visually evident, use the scan tool to retrieve diagnostic trouble codes (DTCs) and carry out the on-demand self test.
4. If the on-demand self test is passed and no DTCs are retrieved, GO to [Symptom Chart .](#)

5. If DTCs are retrieved, refer to the Restraints Control Module (RCM) Diagnostic Trouble Code (DTC) Priority Table.

Symptom Chart


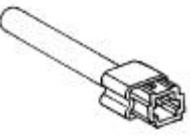



Symptom Chart

Condition	Possible Sources	Action
<ul style="list-style-type: none"> ● Air bag indicator is illuminated continuously 	<ul style="list-style-type: none"> ● Connector shorting bar. ● Circuitry. ● RCM disconnected. ● RCM. ● Instrument cluster. 	<ul style="list-style-type: none"> ● Go To Pinpoint Test A.
<ul style="list-style-type: none"> ● Air bag indicator flashing 	<ul style="list-style-type: none"> ● Air bag SRS system fault. 	<ul style="list-style-type: none"> ● REFER to DTC Priority Table.
<ul style="list-style-type: none"> ● Audible tone — DTCs retrieved 	<ul style="list-style-type: none"> ● Air bag SRS system fault. 	<ul style="list-style-type: none"> ● Go To Pinpoint Test AF. ● Go To Pinpoint Test AG.
<ul style="list-style-type: none"> ● No communication with the restraints control module (RCM) 	<ul style="list-style-type: none"> ● RCM. ● NGS Tester. ● Circuitry. ● Data link connector (DLC). 	<ul style="list-style-type: none"> ● Go To Pinpoint Test AJ.

Pinpoint Tests — Air Bag and Safety Belt Pretensioner Supplemental Restraint System (SRS)

Refer to Wiring Diagrams Section [501-20B](#) for schematic and connector information.

Special Tool(s)

 <p>ST2502-A</p>	<p>Diagnostic Tool, Restraint System (2 Req'd) 418-F395 (014-R1079)</p>
 <p>ST1590-A</p>	<p>Diagnostic Tool, Restraint System (3 Req'd) 418-F088 (105-R0012)</p>
 <p>ST2306-A</p>	<p>Diagnostic Tool, Restraint System (2 Req'd) 418-133 (40-009)</p>
 <p>ST1137-A</p>	<p>FLUKE 73III Automotive Meter 105-R0057 or equivalent</p>
 <p>ST2332-A</p>	<p>Worldwide Diagnostic System (WDS) 418-F224, New Generation STAR (NGS) Tester 418-F052, or equivalent scan tool</p>

Restraint System Diagnostic Tool Warning

 **WARNING:** Restraint system diagnostic tools are for service only. Tools must be removed prior to operating the vehicle over the road. Failure to remove diagnostic tools could result in injury and possible violation of vehicle safety standards.

Pinpoint Test A: Air Bag Warning Indicator Is Illuminated Continuously — RCM Disconnected, Inoperative or Lost/Low Ignition Feed

Normal Operation

NOTE: Be sure to cycle the ignition switch and look for a 6 second indicator prove-out without LFCs.



During normal operation the air bag indicator will illuminate continuously for 6 seconds after the ignition switch is placed in the RUN position. The air bag indicator will also illuminate after five cycles of a lamp fault code (LFC) if a fault exists. The restraints control module (RCM) will communicate diagnostic trouble codes (DTCs) to the scan tool through the data link connector (DLC). If the scan tool displays NO COMMUNICATION when retrieving continuous DTCs, use Pinpoint Test AL to troubleshoot the system.

Possible Causes

An air bag indicator that is illuminated continuously can be caused by:


- a damaged shorting bar or other electrical connector component.
- the ignition circuit damaged.
- the RCM disconnected from the vehicle harness.
- a loss of RCM ground circuit.
- the RCM is faulted.
- air bag indicator circuit shorted to ground.

PINPOINT TEST A: AIR BAG WARNING INDICATOR IS ILLUMINATED CONTINUOUSLY — RCM DISCONNECTED, INOPERATIVE OR LOST/LOW IGNITION FEED

CONDITIONS	DETAILS/RESULTS/ACTIONS
A1 CHECK FOR CONTINUOUS OR ON-DEMAND SELF TEST DTCs	
<p>1 </p> <p style="text-align: center;">Retrieve/Clear Continuous DTCs</p> <p>2 </p> <p style="text-align: center;">On-Demand Self Test</p>	<p>1 Retrieve and record any continuous DTCs for use later in this pinpoint test.</p> <p>● Were any continuous or on-demand self test DTCs retrieved?</p> <p>→ Yes If continuous DTCs were retrieved, GO to A3. If on-demand DTCs were retrieved, GO to the Restraints Control Module (RCM) Diagnostic Trouble Code (DTC) Priority Table in this section for pinpoint test direction.</p>

→ **No**
GO to [A2](#).

A2 CHECK THE RCM CONNECTION

 **WARNING:** If the supplemental restraint system (SRS) is being serviced, the system must be deactivated and restraint system diagnostic tools must be installed. Refer to [Air Bag and Safety Belt Pretensioner Supplemental Restraint System \(SRS\)](#) in this section.

The air bag restraint system diagnostic tools must be removed and the air bag modules reconnected when the system is reactivated to avoid non-deployment in a collision, resulting in possible personal injury.

NOTE: Diagnostics or repairs are not to be performed on a seat equipped with a seat side air bag with the seat in the vehicle. Prior to attempting to diagnose or repair a seat concern when equipped with a seat side air bag, the seat must be removed from the vehicle and the restraint system diagnostic tools must be installed in the seat side air bag electrical connectors. **The restraint system diagnostic tools must be removed prior to operating the vehicle over the road.**

NOTE: After diagnosing or repairing an SRS, the restraint system diagnostic tools must be removed before operating the vehicle over the road.

NOTE: After diagnosing or repairing a seat system, the restraint system diagnostic tools must be removed before operating the vehicle over the road.

NOTE: The SRS must be fully operational and free of faults before releasing the vehicle to the customer.

1



RCM C310a

1

Make sure RCM C310a is fully connected and the locking tab is engaged.

- Is RCM C310a fully connected and are the locking tabs engaged?

→ **Yes**
GO to [A3](#).

→ **No**
CONNECT C310a and ENGAGE the locking tabs. GO to [A7](#).

A3 CHECK THE RCM CONNECTOR

1

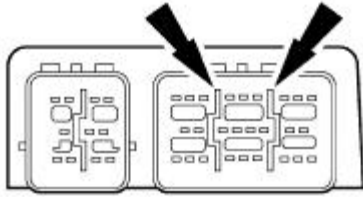


RCM C310a

2

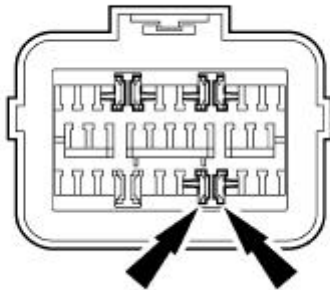
2

Inspect RCM C310a component side for worn, or damaged camming beam.



DR1540-A

3



DR1541-A

3 Inspect C310a harness side for worn, damaged or dislodged shorting bar at pins 20 and 21.

● Were any connector concerns found?

→ Yes
CORRECT connector concerns.GO to [A7](#).

→ No
GO to [A4](#).

A4 CHECK THE IGNITION CIRCUIT 20-JA10A (PK/OG) FOR AN OPEN



WARNING: If the supplemental restraint system (SRS) is being serviced, the system must be deactivated and restraint system diagnostic tools must be installed. Refer to [Air Bag and Safety Belt Pretensioner Supplemental Restraint System \(SRS\)](#) in this section.

The air bag restraint system diagnostic tools must be removed and the air bag modules reconnected when the system is reactivated to avoid non-deployment in a collision, resulting in possible personal injury.

NOTE: Diagnostics or repairs are not to be performed on a seat equipped with a seat side air bag with the seat in the vehicle. Prior to attempting to diagnose or repair a seat concern when equipped with a seat side air bag, the seat must be removed from the vehicle and the restraint system diagnostic tools must be installed in the seat side air bag electrical connectors. **The restraint system diagnostic tools must be removed prior to operating the vehicle over the road.**

NOTE: After diagnosing or repairing an SRS, the restraint system diagnostic tools must be removed before operating the vehicle over the road.

NOTE: After diagnosing or repairing a seat system, the restraint system diagnostic tools must be removed before operating the vehicle over the road.

NOTE: The SRS must be fully operational and free of faults before releasing the vehicle to the customer.

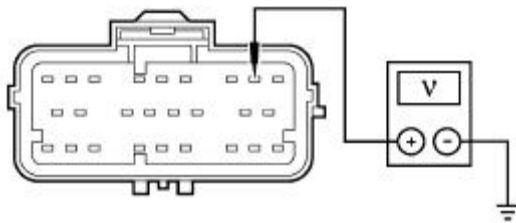
1



3



4



DR0994-A

2 Deactivate the system. Refer to [Air Bag and Safety Belt Pretensioner Supplemental Restraint System \(SRS\)](#) in the Diagnosis and Testing portion of this section.

4 Measure the voltage to ground at RCM C310a pin 2, circuit 20-JA10A (PK/OG), harness side.

• Is the voltage between 9 and 16 volts?

→ Yes
GO to [A5](#).

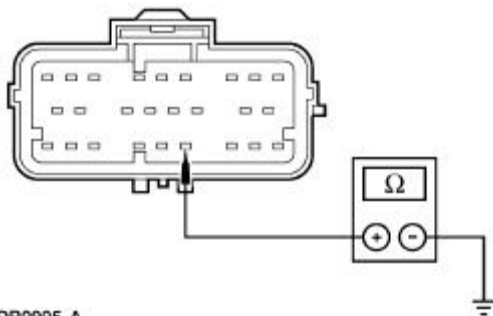
→ No
REPAIR the circuit. GO to [A7](#).

A5 CHECK THE GROUND CIRCUIT 31-JA10A (BK/RD) FOR AN OPEN

1



2



DR0995-A

2 Measure the resistance between RCM C310a pin 21, circuit 31-JA10A (BK/RD), harness side and a sheet metal ground near the RCM.

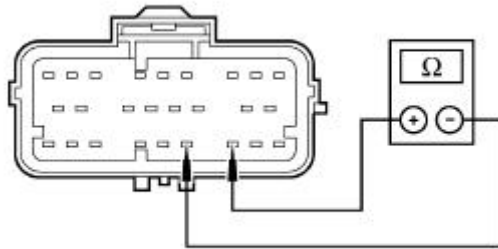
• Is the resistance less than 10 ohms?

→ **Yes**
GO to [A6](#).

→ **No**
REPAIR the circuit. GO to [A7](#).

A6 CHECK CIRCUIT 31S-JA14 (BK/GN) FOR A SHORT TO GROUND

1



DR1217-A

1 Measure the resistance between RCM C310a pin 20, circuit 31S-JA14 (BK/GN), harness side and RCM C310a pin 21, circuit 31-JA10 (BK/RD), harness side.

- **Is the resistance less than 5 ohms?**

→ **Yes**
REPAIR the circuit. GO to [A7](#).

→ **No**
INSTALL a new RCM. GO to [A7](#).

A7 CHECK FOR ADDITIONAL DTCs

1 Refer to the continuous DTCs recorded during Step A1.

- **Were any continuous DTCs retrieved during Step A1?**

→ **Yes**
Do not clear any DTCs until all DTCs have been resolved. GO to the Restraints Control Module (RCM) Diagnostic Trouble Code (DTC) Priority Table in this section for pinpoint test direction.

→ **No**
RECONNECT the system. REACTIVATE the system. PROVE OUT the system. REFER to [Air Bag and Safety Belt Pretensioner Supplemental Restraint System \(SRS\)](#). CLEAR all DTCs.

Pinpoint Test B: LFC 21/DTC B1921 — RCM Bracket Ground Resistance High

Normal Operation



WARNING: The tightening torque of the restraints control module (RCM) retaining bolts is

critical for proper air bag supplemental restraint system (SRS) operation. Refer to [Restraints Control Module \(RCM\)](#) in this section for correct torque values.



The restraints control module (RCM) monitors the resistance between the ground connections at its housing and the reference ground at pin 21. If the RCM detects a resistance greater than 100 ohms, it will store a diagnostic trouble code (DTC) B1921 in memory and flash a lamp fault code (LFC) 21 (or higher priority code if one exists) on the air bag indicator.

Possible Causes

High resistance between the RCM housing ground and pin ground can be caused by:

- incorrect seating of the RCM retaining bolts.
- incorrect tightening torque of the RCM retaining bolts.
- high resistance on RCM logic ground circuit 31-JA10A (BK/RD).

PINPOINT TEST B: LFC 21/DTC B1921 — RCM BRACKET GROUND RESISTANCE HIGH

CONDITIONS	DETAILS/RESULTS/ACTIONS
B1 CHECK FOR A HARD OR INTERMITTENT DTC	
<p>1 </p> <p>Retrieve/Clear Continuous DTCs</p> <p>2 </p> <p>On-Demand Self Test</p>	<p>1 Retrieve and record any continuous DTCs for use later in this pinpoint test.</p> <p>● Was DTC B1921 retrieved during the on-demand self test?</p> <p>→ Yes This is a hard fault. The fault condition is still present. This fault cannot be cleared until it is corrected and the DTC is no longer retrieved during the on-demand self test. GO to B2.</p> <p>→ No This is an intermittent fault. The fault condition is not present at this time. GO to B6.</p>
B2 INSPECT THE RCM MOUNTING, MOUNTING BRACKET AND MOUNTING SURFACE	
	<p>1 Remove the RCM. Refer to Restraints Control Module (RCM) in this section.</p> <p>2 Visually inspect the RCM, mounting</p>

bracket and mounting surface for damage, corrosion or dirt.

3 Inspect the RCM mounting and make sure that the retaining bolts are fully seated and tightened correctly. Refer to [Restraints Control Module \(RCM\)](#) in this section for correct tightening torque.

- **Was a significant amount of corrosion or dirt found, the RCM mounting bracket attached to the mounting surface incorrectly or were the four RCM retaining bolts not fully seated and tightened correctly?**

→ **Yes**
MAKE SURE the RCM, mounting bracket and mounting surface are free of damage, corrosion or dirt, and the four retaining bolts are fully seated and correctly tightened. REATTACH the RCM and mounting bracket to the mounting surface. GO to [B7](#).

→ **No**
GO to [B3](#).

B3 CHECK THE RCM HARNESS CONNECTION

1 Check the RCM harness connection.

- **Are the RCM harness connectors connected to the RCM correctly with the red locking clips engaged?**

→ **Yes**
GO to [B4](#).

→ **No**
ATTACH the RCM harness connectors correctly. GO to [B7](#).

B4 CHECK THE VEHICLE CHASSIS GROUND

1 Measure the resistance between a known good chassis ground and the mounting surface of the RCM.

- **Is the resistance greater than 100 ohms?**

→ **Yes**
REPAIR the chassis grounding system. GO to [B7](#).

→ **No**
GO to [B5](#).

B5 CHECK THE GROUND CIRCUIT 31-JA10A (BK/RD) FOR AN OPEN

1

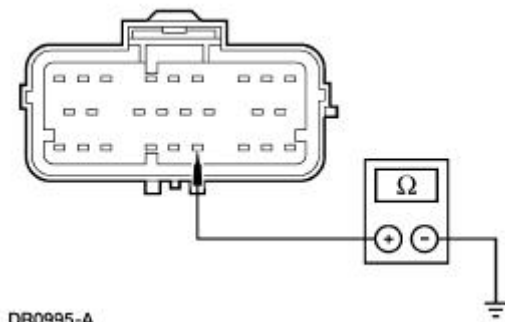


2



RCM C310a

3



3

Measure the resistance between RCM C310a pin 21, circuit 31-JA10A (BK/RD), harness side and a sheet metal ground near the RCM.

- Is the resistance greater than 100 ohms?

→ **Yes**
REPAIR the circuit. GO to [B7](#).

→ **No**
INSTALL a new RCM. GO to [B7](#).

B6 CHECK FOR AN INTERMITTENT FAULT



WARNING: If the supplemental restraint system (SRS) is being serviced, the system must be deactivated and restraint system diagnostic tools must be installed. Refer to [Air Bag and Safety Belt Pretensioner Supplemental Restraint System \(SRS\)](#) in this section.

The air bag restraint system diagnostic tools must be removed and the air bag modules reconnected when the system is reactivated to avoid non-deployment in a collision, resulting in possible personal injury.

NOTE: Diagnostics or repairs are not to be performed on a seat equipped with a seat side air bag with the seat in the vehicle. Prior to attempting to diagnose or repair a seat concern when equipped with a seat side air bag, the seat must be removed from the vehicle and the restraint system diagnostic tools must be installed in the seat side air bag electrical connectors. **The restraint system diagnostic tools must be removed prior to operating the vehicle over the road.**

NOTE: After diagnosing or repairing an SRS, the restraint system diagnostic tools must be removed before operating the vehicle over the road.

NOTE: After diagnosing or repairing a seat system, the restraint system diagnostic tools must be removed before operating the vehicle over the road.

NOTE: The SRS must be fully operational and free of faults before releasing the vehicle to the customer.

1



3



On-Demand Self Test

2 Deactivate the system. Refer to [Air Bag and Safety Belt Pretensioner Supplemental Restraint System \(SRS\)](#).

● **Was DTC B1921 retrieved during the on-demand self test?**

→ **Yes**
GO to [B2](#).

→ **No**
CHECK for causes of intermittent high resistance on circuit 31-JA10A (BK/RD). ATTEMPT to recreate the hard fault by flexing the wire harness and cycling the ignition key frequently. REPAIR any intermittent concerns found. GO to [B7](#).

B7 CHECK FOR ADDITIONAL DTCs

1 Refer to the continuous DTCs recorded during Step B1.

● **Were any continuous DTCs retrieved during Step B1?**

→ **Yes**
Do not clear any DTCs until all DTCs have been resolved. GO to the Restraints Control Module (RCM) Diagnostic Trouble Code (DTC) Priority Table in this section for pinpoint test direction.

→ **No**
RECONNECT the system. PROVE OUT the system. REFER to [Air Bag and Safety Belt Pretensioner Supplemental Restraint System \(SRS\)](#). CLEAR all DTCs.

Pinpoint Test C: LFC 29/DTC C1414 — Incorrect Vehicle Identification Code

Normal Operation




The restraints control module (RCM) monitors the electrical condition at C310a pins 10, 13 and 14 to determine if it is installed on the correct vehicle. If the RCM detects an unexpected condition on any of these pins, it will store a diagnostic trouble code (DTC) C1414 in memory and flash a lamp fault code (LFC) 29 (or higher priority code if one exists) on the air bag indicator.

Possible Causes

An incorrect vehicle ID code can be caused by:

- incorrect RCM.
- RCM incorrectly programmed.
- a wiring concern at RCM C310a pins 10, 13 and 14.

PINPOINT TEST C: LFC 29/DTC C1414 — INCORRECT VEHICLE IDENTIFICATION CODE

CONDITIONS	DETAILS/RESULTS/ACTIONS
C1 CHECK FOR A HARD OR INTERMITTENT DTC	
<p>1  Retrieve/Clear Continuous DTCs</p> <p>2  On-Demand Self Test</p>	<p>1 Retrieve and record any continuous DTCs for use later in this pinpoint test.</p> <ul style="list-style-type: none"> ● Was DTC C1414 retrieved during the on-demand self test? <p>→ Yes This is a hard fault. The fault condition is still present. This fault cannot be cleared until it is corrected and the DTC is no longer retrieved during the on-demand self test. GO to C2.</p> <p>→ No This is an intermittent fault. The fault condition is not present at this time. GO to C6.</p>
C2 CHECK THE VEHICLE IDENTIFICATION PIN NO. 1	
<p> WARNING: If the supplemental restraint system (SRS) is being serviced, the system must be deactivated and restraint system diagnostic tools must be installed. Refer to Air Bag and Safety Belt Pretensioner Supplemental Restraint System (SRS) in this section.</p> <p>The air bag restraint system diagnostic tools must be removed and the air bag modules reconnected when the system is reactivated to avoid non-deployment in a collision, resulting in possible personal injury.</p> <p>NOTE: Diagnostics or repairs are not to be performed on a seat equipped with a seat side air bag with the seat in the vehicle. Prior to attempting to diagnose or repair a seat concern when equipped with a seat side air bag, the seat must be removed from the vehicle and the restraint system diagnostic tools must be installed in the seat side air bag electrical connectors. The</p>	

restraint system diagnostic tools must be removed prior to operating the vehicle over the road.

NOTE: After diagnosing or repairing an SRS, the restraint system diagnostic tools must be removed before operating the vehicle over the road.

NOTE: After diagnosing or repairing a seat system, the restraint system diagnostic tools must be removed before operating the vehicle over the road.

NOTE: The SRS must be fully operational and free of faults before releasing the vehicle to the customer.

1



2



RCM C310a

3 Inspect C310a harness side. Make sure there is no wire attached to pin cavity 10.

• Does C310a cavity 10 contain a wire?

→ **Yes**
DETERMINE the cause of incorrect vehicle harness configuration. REPAIR as necessary. GO to [C5](#).

→ **No**
GO to [C3](#).

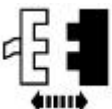
C3 CHECK THE VEHICLE IDENTIFICATION PIN NO. 2

NOTE: For this vehicle application, RCM C310a pin 13 should be ignition voltage.

1



2



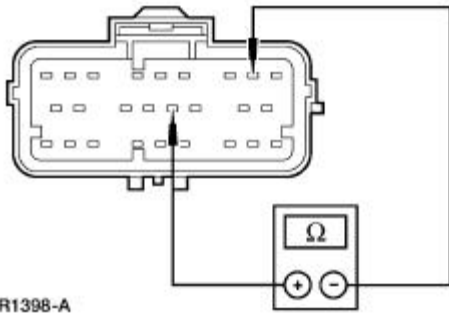
Battery Ground Cable

3



4

4 Measure the resistance between RCM C310a pin 13, circuit 20-JA10B (PK/OG) and pin 2, circuit 20-JA10A (PK/OG).



● Is the resistance less than 5 ohms?

→ **Yes**
GO to [C4](#).

→ **No**
REPAIR the circuit. GO to [C5](#).

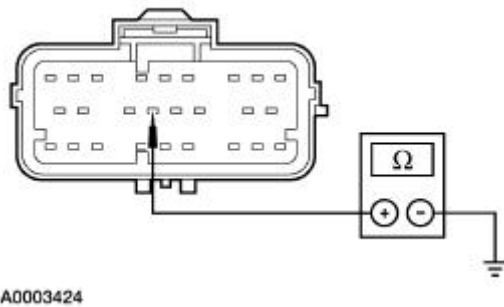
C4 CHECK THE VEHICLE IDENTIFICATION PIN NO. 3

NOTE: For this vehicle application, RCM C310a pin 14 should be grounded.

1



2



2 Measure the resistance to ground at RCM C310a pin 14, circuit 31-JA10B (BK/RD).

● Is the resistance less than 5 ohms?

→ **Yes**
GO to [C5](#).

→ **No**
REPAIR the circuit. GO to [C7](#).

C5 CHECK THE RCM PROGRAMMED VEHICLE ID

1



PID/Data Monitor and Record

2 Select PID VID No.1, VID No. 2 and VID No. 3.

- Was vehicle ID No. 1 open circuit, ID No. 2 ignition and No. 3 ground?

→ Yes
GO to [C6](#).

→ No
INSTALL a new RCM. GO to [C7](#).

C6 CHECK FOR AN INTERMITTENT FAULT



WARNING: If the supplemental restraint system (SRS) is being serviced, the system must be deactivated and restraint system diagnostic tools must be installed. Refer to [Air Bag and Safety Belt Pretensioner Supplemental Restraint System \(SRS\)](#) in this section.

The air bag restraint system diagnostic tools must be removed and the air bag modules reconnected when the system is reactivated to avoid non-deployment in a collision, resulting in possible personal injury.

NOTE: Diagnostics or repairs are not to be performed on a seat equipped with a seat side air bag with the seat in the vehicle. Prior to attempting to diagnose or repair a seat concern when equipped with a seat side air bag, the seat must be removed from the vehicle and the restraint system diagnostic tools must be installed in the seat side air bag electrical connectors. **The restraint system diagnostic tools must be removed prior to operating the vehicle over the road.**

NOTE: After diagnosing or repairing an SRS, the restraint system diagnostic tools must be removed before operating the vehicle over the road.

NOTE: After diagnosing or repairing a seat system, the restraint system diagnostic tools must be removed before operating the vehicle over the road.

NOTE: The SRS must be fully operational and free of faults before releasing the vehicle to the customer.

1



3



On-Demand Self Test

2 Deactivate the system. Refer to [Air Bag and Safety Belt Pretensioner Supplemental Restraint System \(SRS\)](#).

- Was DTC C1414 retrieved during the on-demand self test?

→ Yes
GO to [C2](#).

→ No

	CHECK for causes of intermittent open circuits. ATTEMPT to recreate the failure by flexing the wire harness and cycling the key frequently. REPAIR any intermittent concerns found. GO to C7 .
C7 CHECK FOR ADDITIONAL DTCs	
	<p>1 Refer to the continuous DTCs recorded during Step C1.</p> <ul style="list-style-type: none"> ● Were any continuous DTCs retrieved during Step C1? <p>→ Yes Do not clear any DTCs until all DTCs have been resolved. GO to the Restraints Control Module (RCM) Diagnostic Trouble Code (DTC) Priority Table in this section for pinpoint test direction.</p> <p>→ No RECONNECT the system. PROVE OUT the system. CLEAR all DTCs.</p>

Pinpoint Test D: LFC 15/DTC B1887 — Driver Air Bag Circuit Shorted to Ground

Normal Operation

The restraints control module (RCM) checks for driver air bag circuit shorts to ground by monitoring the voltage of circuits 30S-JA8 (RD/OG) and 31S-JA8 (BK/OG) at pins 3 and 4. If the RCM detects a short to ground on either of these pins, it will store a diagnostic trouble code (DTC) B1887 in memory and flash a lamp fault code (LFC) 15 (or higher priority code if one exists) on the air bag indicator.

Possible Causes

A driver air bag circuit short to ground can be caused by:

- a short to ground on circuit 30S-JA8 (RD/OG).
- a short to ground on circuit 31S-JA8 (BK/OG).
- a short to ground on the clockspring (14A664).
- a short to ground on the driver air bag module.

PINPOINT TEST D: LFC 15/DTC B1887 — DRIVER AIR BAG CIRCUIT SHORTED TO GROUND

CONDITIONS	DETAILS/RESULTS/ACTIONS
D1 CHECK FOR A HARD OR INTERMITTENT DTC	
1	1 Retrieve and record any continuous DTCs for use later in this pinpoint test.



Retrieve/Clear Continuous DTCs

2



On-Demand Self Test

- Was DTC B1887 retrieved during the on-demand self test?

→ Yes

This is a hard fault. The fault condition is still present. This fault cannot be cleared until it is corrected and the DTC is no longer retrieved during the on-demand self test. GO to [D2](#).

→ No

This is an intermittent fault. The fault condition is not present at this time. GO to [D2](#).

D2 CHECK THE DRIVER AIR BAG MODULE



WARNING: If the supplemental restraint system (SRS) is being serviced, the system must be deactivated and restraint system diagnostic tools must be installed. Refer to [Air Bag and Safety Belt Pretensioner Supplemental Restraint System \(SRS\)](#) in this section.

The air bag restraint system diagnostic tools must be removed and the air bag modules reconnected when the system is reactivated to avoid non-deployment in a collision, resulting in possible personal injury.

NOTE: Diagnostics or repairs are not to be performed on a seat equipped with a seat side air bag with the seat in the vehicle. Prior to attempting to diagnose or repair a seat concern when equipped with a seat side air bag, the seat must be removed from the vehicle and the restraint system diagnostic tools must be installed in the seat side air bag electrical connectors. **The restraint system diagnostic tools must be removed prior to operating the vehicle over the road.**

NOTE: After diagnosing or repairing an SRS, **the restraint system diagnostic tools must be removed before operating the vehicle over the road.**

NOTE: After diagnosing or repairing a seat system, **the restraint system diagnostic tools must be removed before operating the vehicle over the road.**

NOTE: The SRS must be fully operational and free of faults before releasing the vehicle to the customer.

1



2

Deactivate the system. Refer to [Air Bag and Safety Belt Pretensioner Supplemental Restraint System \(SRS\)](#) in the Diagnosis and Testing portion of this section.

3



On-Demand Self Test

● Was DTC B1887 retrieved?

→ Yes

GO to [D3](#).

→ No

INSTALL a new driver air bag module.

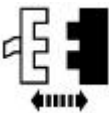
GO to [D6](#).

D3 CHECK THE DRIVER AIR BAG MODULE CIRCUIT

1

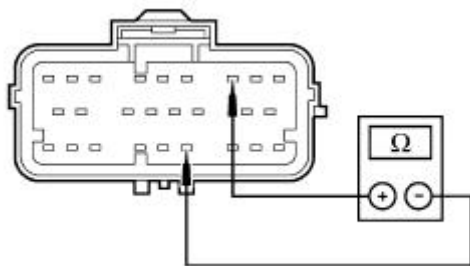


2



RCM C310a

3



DR0999-B

3

NOTE: Do not separate or remove the shorting bars from RCM C310a.

Measure the resistance between RCM C310a pin 3, circuit 30S-JA8 (RD/OG), harness side and RCM C310a pin 21, circuit 31-JA10A (BK/RD), harness side.

● Is the resistance less than 10,000 ohms?

→ Yes

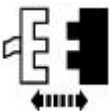
GO to [D4](#).

→ No

INSTALL a new RCM. GO to [D6](#).

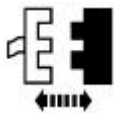
D4 CHECK THE DRIVER AIR BAG MODULE WIRING AND THE CLOCKSPrING

1



Driver Air Bag Module Restraint System Diagnostic Tool

2



Clockspring C218C

3 Inspect all crimps, terminals, wires and connectors in circuit 30S-JA8 (RD/OG) feeding the RCM pin 3, circuit 31S-JA8 (BK/OG) feeding pin 4, the clockspring assembly and the clockspring connector C218C. Check for pinched wires and damaged connector pin terminals.

● Was any damage found?

→ Yes
REPAIR as necessary. GO to [D6](#).

→ No
GO to [D5](#).

D5 CHECK FOR AN INTERMITTENT FAULT



WARNING: If the supplemental restraint system (SRS) is being serviced, the system must be deactivated and restraint system diagnostic tools must be installed. Refer to [Air Bag and Safety Belt Pretensioner Supplemental Restraint System \(SRS\)](#) in this section.

The air bag restraint system diagnostic tools must be removed and the air bag modules reconnected when the system is reactivated to avoid non-deployment in a collision, resulting in possible personal injury.

NOTE: Diagnostics or repairs are not to be performed on a seat equipped with a seat side air bag with the seat in the vehicle. Prior to attempting to diagnose or repair a seat concern when equipped with a seat side air bag, the seat must be removed from the vehicle and the restraint system diagnostic tools must be installed in the seat side air bag electrical connectors. **The restraint system diagnostic tools must be removed prior to operating the vehicle over the road.**

NOTE: After diagnosing or repairing an SRS, the restraint system diagnostic tools must be removed before operating the vehicle over the road.

NOTE: After diagnosing or repairing a seat system, the restraint system diagnostic tools must be removed before operating the vehicle over the road.

NOTE: The SRS must be fully operational and free of faults before releasing the vehicle to the customer.

1



3



On-Demand Self Test

2 Deactivate the system. Refer to [Air Bag and Safety Belt Pretensioner Supplemental Restraint System \(SRS\)](#).

	<ul style="list-style-type: none"> ● Was DTC B1887 retrieved during the on-demand self test? <p>→ Yes CHECK for causes of intermittent fault at or near the driver air bag module connector. REPAIR any intermittent concerns found.</p> <p>If an intermittent concern was found and repaired, GO to D6.</p> <p>If an intermittent concern was not found, GO to D3.</p> <p>→ No CHECK for causes of intermittent short to ground on circuits 30S-JA8 (RD/OG) and 31S-JA8 (BK/OG), and the clockspring assembly. ATTEMPT to recreate the hard fault by flexing the wire harness and cycling the key frequently. REPAIR any intermittent concern found. GO to D6.</p>
D6 CHECK FOR ADDITIONAL DTCs	
	<p>1 Refer to the continuous DTCs recorded during Step D1.</p> <ul style="list-style-type: none"> ● Were any continuous DTCs retrieved during Step D1? <p>→ Yes Do not clear any DTCs until all DTCs have been resolved. GO to the Restraints Control Module (RCM) Diagnostic Trouble Code (DTC) Priority Table in this section for pinpoint test direction.</p> <p>→ No RECONNECT the system. REACTIVATE the system. PROVE OUT the system. REFER to Air Bag and Safety Belt Pretensioner Supplemental Restraint System (SRS). CLEAR all DTCs.</p>

Pinpoint Test E: LFC 16/DTC B1888 — Passenger Air Bag Circuit Shorted to Ground

Normal Operation




The restraints control module (RCM) checks for passenger air bag circuit shorts to ground by monitoring the voltage of circuits 30S-JA11 (RD/WH) and 31S-JA11 (BK/WH) at pins 6 and 7. If the RCM detects a short to ground on either of these pins, it will store a diagnostic trouble code (DTC) B1888 in memory and flash a lamp fault code (LFC) 16 (or higher priority code if one exists) on the air bag indicator.

Possible Causes

A passenger air bag circuit short to ground can be caused by:

- a short to ground on circuit 30S-JA11 (RD/WH).
- a short to ground on circuit 31S-JA11 (BK/WH).
- a short to ground on the passenger air bag module.

PINPOINT TEST E: LFC 16/DTC B1888 — PASSENGER AIR BAG CIRCUIT SHORTED TO GROUND

CONDITIONS	DETAILS/RESULTS/ACTIONS
E1 CHECK FOR A HARD OR INTERMITTENT DTC	
<p>1  Retrieve/Clear Continuous DTCs</p> <p>2  On-Demand Self Test</p>	<p>1 Retrieve and record any continuous DTCs for use later in this pinpoint test.</p> <ul style="list-style-type: none"> ● Was DTC B1888 retrieved during the on-demand self test? <p>→ Yes This is a hard fault. The fault condition is still present. This fault cannot be cleared until it is corrected and the DTC is no longer retrieved during the on-demand self test. GO to E2.</p> <p>→ No This is an intermittent fault. The fault condition is not present at this time. GO to E5.</p>
E2 CHECK THE PASSENGER AIR BAG MODULE	
<p> WARNING: If the supplemental restraint system (SRS) is being serviced, the system must be deactivated and restraint system diagnostic tools must be installed. Refer to Air Bag and Safety Belt Pretensioner Supplemental Restraint System (SRS) in this section.</p> <p>The air bag restraint system diagnostic tools must be removed and the air bag modules reconnected when the system is reactivated to avoid non-deployment in a collision, resulting in possible personal injury.</p> <p>NOTE: Diagnostics or repairs are not to be performed on a seat equipped with a seat side air bag with the seat in the vehicle. Prior to attempting to diagnose or repair a seat concern when equipped with a seat side air bag, the seat must be removed from the vehicle and the restraint system diagnostic tools must be installed in the seat side air bag electrical connectors. The restraint system diagnostic tools must be removed prior to operating the vehicle over the road.</p>	

NOTE: After diagnosing or repairing an SRS, the restraint system diagnostic tools must be removed before operating the vehicle over the road.

NOTE: After diagnosing or repairing a seat system, the restraint system diagnostic tools must be removed before operating the vehicle over the road.

NOTE: The SRS must be fully operational and free of faults before releasing the vehicle to the customer.

1



3



On-Demand Self Test

2

Deactivate the system. Refer to [Air Bag and Safety Belt Pretensioner Supplemental Restraint System \(SRS\)](#) in the Diagnosis and Testing portion of this section.

● Was DTC B1888 retrieved?

→ **Yes**
GO to [E3](#).

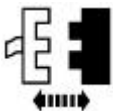
→ **No**
INSTALL a new passenger air bag module. GO to [E6](#).

E3 E3CHECK THE PASSENGER AIR BAG MODULE CIRCUIT

1

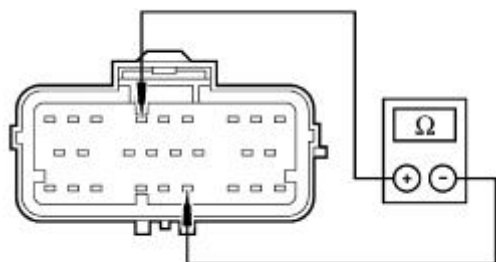


2



RCM C310a

3



DR1000-B

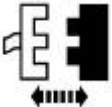
3

NOTE: Do not separate or remove the shorting bars from RCM C310a.


Measure the resistance between RCM C310a pin 6, circuit 30S-JA11 (RD/WH), harness side and RCM C310a pin 21, circuit 31-JA10A (BK/RD), harness side.

	<ul style="list-style-type: none"> ● Is the resistance less than 10,000 ohms? <p>→ Yes GO to E4.</p> <p>→ No INSTALL a new RCM. GO to E6.</p>
--	--

E4 CHECK THE PASSENGER AIR BAG MODULE WIRING

<p>1</p>  <p>Passenger Air Bag Module Restraint System Diagnostic Tool</p>	<p>2</p> <p>Inspect all crimps, terminals, wires and connectors in circuit 30S-JA11 (RD/WH) feeding the RCM pin 6, circuit 31S-JA11 (BK/WH) feeding pin 7. Check for pinched wires and damaged connector pin terminals.</p> <ul style="list-style-type: none"> ● Was any damage found? <p>→ Yes REPAIR as necessary. GO to E6.</p> <p>→ No GO to E6.</p>
---	---

E5 CHECK FOR AN INTERMITTENT FAULT

 **WARNING:** If the supplemental restraint system (SRS) is being serviced, the system must be deactivated and restraint system diagnostic tools must be installed. Refer to [Air Bag and Safety Belt Pretensioner Supplemental Restraint System \(SRS\)](#) in this section.


The air bag restraint system diagnostic tools must be removed and the air bag modules reconnected when the system is reactivated to avoid non-deployment in a collision, resulting in possible personal injury.

NOTE: Diagnostics or repairs are not to be performed on a seat equipped with a seat side air bag with the seat in the vehicle. Prior to attempting to diagnose or repair a seat concern when equipped with a seat side air bag, the seat must be removed from the vehicle and the restraint system diagnostic tools must be installed in the seat side air bag electrical connectors. **The restraint system diagnostic tools must be removed prior to operating the vehicle over the road.**

NOTE: After diagnosing or repairing an SRS, **the restraint system diagnostic tools must be removed before operating the vehicle over the road.**

NOTE: After diagnosing or repairing a seat system, **the restraint system diagnostic tools must be removed before operating the vehicle over the road.**

NOTE: The SRS must be fully operational and free of faults before releasing the vehicle to the customer.

<p>1</p> 	
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3



On-Demand Self Test

2 Deactivate the system. Refer to [Air Bag and Safety Belt Pretensioner Supplemental Restraint System \(SRS\)](#) in the Diagnosis and Testing portion of this section.

● **Was DTC B1888 retrieved during the on-demand self test?**

→ **Yes**

CHECK for causes of intermittent fault at or near the passenger air bag module connector. REPAIR any intermittent concerns found.

If an intermittent concern **was** found and repaired, GO to [E6](#).

If an intermittent concern **was not** found, GO to [E3](#).

→ **No**

CHECK for causes of intermittent short to ground on circuits 30S-JA11 (RD/WH) and 31S-JA11 (BK/WH). ATTEMPT to recreate the hard fault by flexing the wire harness and cycling the key frequently. REPAIR any intermittent concern found. GO to [E6](#).

E6 CHECK FOR ADDITIONAL DTCs

1 Refer to the continuous DTCs recorded during Step E1.

● **Were any continuous DTCs retrieved during Step E1?**

→ **Yes**

Do not clear any DTCs until all DTCs have been resolved. GO to the Restraints Control Module (RCM) Diagnostic Trouble Code (DTC) Priority Table in this section for pinpoint test direction.

→ **No**

RECONNECT the system. REACTIVATE the system. PROVE OUT the system. REFER to [Air Bag and Safety Belt Pretensioner Supplemental Restraint System \(SRS\)](#). CLEAR all DTCs.

Pinpoint Test F: LFC 15/DTC B1916 — Driver Air Bag Circuit Shorted to Battery or Ignition

Normal Operation



The restraints control module (RCM) checks for driver air bag circuit shorts to battery or ignition by monitoring the voltage of circuit 30S-JA8 (RD/OG) and 31S-JA8 (BK/OG) at pins 3 and 4. If the RCM detects a short to battery or ignition on either of these pins, it will store a diagnostic trouble code (DTC) B1916 in memory and flash a lamp fault code (LFC) 15 (or higher priority code if one exists) on the air bag indicator.

Possible Causes

A driver air bag circuit short to battery or ignition can be caused by:

- a short to battery or ignition on circuit 30S-JA8 (RD/OG).
- a short to battery or ignition on circuit 31S-JA8 (BK/OG).
- a short to battery or ignition on the clockspring.
- a short to battery or ignition on the driver air bag module.

PINPOINT TEST F: LFC 15/DTC B1916 — DRIVER AIR BAG CIRCUIT SHORTED TO BATTERY OR IGNITION

CONDITIONS	DETAILS/RESULTS/ACTIONS
F1 CHECK FOR A HARD OR INTERMITTENT DTC	
<p>1 </p> <p>Retrieve/Clear Continuous DTCs</p> <p>2 </p> <p>On-Demand Self Test</p>	<p>1 Retrieve and record any continuous DTCs for use later in this pinpoint test.</p> <p>● Was DTC B1916 retrieved during the on-demand self test?</p> <p>→ Yes This is a hard fault. The fault condition is still present. This fault cannot be cleared until it is corrected and the DTC is no longer retrieved during the on-demand self test. GO to F2.</p> <p>→ No This is an intermittent fault. The fault condition is not present at this time. GO to F5.</p>
F2 CHECK THE DRIVER AIR BAG MODULE	



WARNING: If the supplemental restraint system (SRS) is being serviced, the system must be deactivated and restraint system diagnostic tools must be installed. Refer to [Air Bag and Safety Belt Pretensioner Supplemental Restraint System \(SRS\)](#) in this section.

The air bag restraint system diagnostic tools must be removed and the air bag modules reconnected when the system is reactivated to avoid non-deployment in a collision, resulting in possible personal injury.

NOTE: Diagnostics or repairs are not to be performed on a seat equipped with a seat side air bag with the seat in the vehicle. Prior to attempting to diagnose or repair a seat concern when equipped with a seat side air bag, the seat must be removed from the vehicle and the restraint system diagnostic tools must be installed in the seat side air bag electrical connectors. **The restraint system diagnostic tools must be removed prior to operating the vehicle over the road.**

NOTE: After diagnosing or repairing an SRS, the restraint system diagnostic tools must be removed before operating the vehicle over the road.

NOTE: After diagnosing or repairing a seat system, the restraint system diagnostic tools must be removed before operating the vehicle over the road.

NOTE: The SRS must be fully operational and free of faults before releasing the vehicle to the customer.

1



3



On-Demand Self Test

2

Deactivate the system. Refer to [Air Bag and Safety Belt Pretensioner Supplemental Restraint System \(SRS\)](#) in the Diagnosis and Testing portion of this section.

● Was DTC B1916 retrieved?

→ **Yes**
GO to [F3](#).

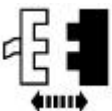
→ **No**
INSTALL a new driver air bag module.
GO to [F6](#).

F3 CHECK THE DRIVER AIR BAG MODULE CIRCUIT

1



2



Driver Air Bag Module Restraint System Diagnostic Tool

3

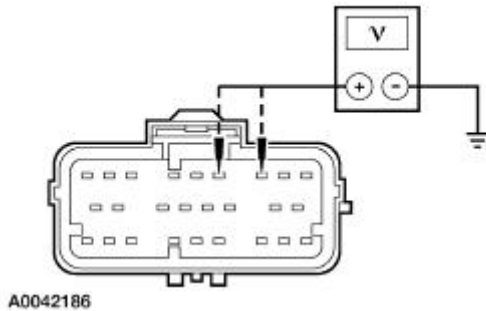


RCM C310a

4



5



5

NOTE: Do not separate or remove the shorting bars from RCM C310a.

Measure the voltage between RCM C310a pin 3, circuit 30S-JA8 (RD/OG), harness side and ground; and between RCM C310a pin 4, circuit 31S-JA8 (BK/OG) harness side and ground.

• **Are the voltages less than 0.2 volt?**

→ **Yes**
REPAIR the affected circuit. GO to [F4](#).

→ **No**
GO to [F4](#).

F4 CHECK THE DRIVER AIR BAG MODULE WIRING AND THE CLOCKSPrING

1



Clockspring C218C

2

Inspect all crimps, terminals, wires and connectors in circuit 30S-JA8 (RD/OG) feeding the RCM pin 3, circuit 31S-JA8 (BK/OG) feeding pin 4, the clockspring assembly and the clockspring connector C218C. Check for pinched wires and damaged connector pin terminals.

• **Was any damage found?**

→ **Yes**
REPAIR as necessary. GO to [F6](#).

→ **No**
INSTALL a new RCM. GO to [F6](#).

F5 CHECK FOR AN INTERMITTENT FAULT



WARNING: If the supplemental restraint system (SRS) is being serviced, the system

must be deactivated and restraint system diagnostic tools must be installed. Refer to [Air Bag and Safety Belt Pretensioner Supplemental Restraint System \(SRS\)](#) in this section.

The air bag restraint system diagnostic tools must be removed and the air bag modules reconnected when the system is reactivated to avoid non-deployment in a collision, resulting in possible personal injury.

NOTE: Diagnostics or repairs are not to be performed on a seat equipped with a seat side air bag with the seat in the vehicle. Prior to attempting to diagnose or repair a seat concern when equipped with a seat side air bag, the seat must be removed from the vehicle and the restraint system diagnostic tools must be installed in the seat side air bag electrical connectors. **The restraint system diagnostic tools must be removed prior to operating the vehicle over the road.**

NOTE: After diagnosing or repairing an SRS, **the restraint system diagnostic tools must be removed before operating the vehicle over the road.**

NOTE: After diagnosing or repairing a seat system, **the restraint system diagnostic tools must be removed before operating the vehicle over the road.**

NOTE: The SRS must be fully operational and free of faults before releasing the vehicle to the customer.

1



3



On-Demand Self Test

2

Deactivate the system. Refer to [Air Bag and Safety Belt Pretensioner Supplemental Restraint System \(SRS\)](#) in the Diagnosis and Testing portion of this section.

● Was DTC B1916 retrieved during the on-demand self test?

→ **Yes**

CHECK for causes of intermittent fault at or near the driver air bag module connector. REPAIR any intermittent concerns found.

If an intermittent concern **was** found and repaired, GO to [F6](#).

If an intermittent concern **was not** found, GO to [F3](#).

→ **No**

CHECK for causes of intermittent short to battery or ignition on circuits 30S-JA8 (RD/OG) and 31S-JA8 (BK/OG) and the clockspring. ATTEMPT to recreate the hard fault by flexing the wire harness and cycling the key frequently. REPAIR any intermittent concern found. GO to [F6](#).

F6 CHECK FOR ADDITIONAL DTCs	
	<p>1 Refer to the continuous DTCs recorded during Step F1.</p> <ul style="list-style-type: none"> ● Were any continuous DTCs retrieved during Step F1? <p>→ Yes Do not clear any DTCs until all DTCs have been resolved. GO to the Restraints Control Module (RCM) Diagnostic Trouble (DTC) Priority Table in this section for pinpoint test direction.</p> <p>→ No RECONNECT the system. REACTIVATE the system. PROVE OUT the system. REFER to Air Bag and Safety Belt Pretensioner Supplemental Restraint System (SRS). CLEAR all DTCs.</p>

Pinpoint Test G: LFC 16/DTC B1925 — Passenger Air Bag Circuit Shorted to Battery or Ignition

Normal Operation


The restraints control module (RCM) checks for passenger air bag circuit shorts to battery or ignition by monitoring the voltage of circuits 30S-JA11 (RD/WH) and 31S-JA11 (BK/WH) at pins 6 and 7. If the RCM detects a short to battery or ignition on either of these pins, it will store a diagnostic trouble code (DTC) B1925 in memory and flash a lamp fault code (LFC) 16 (or higher priority code if one exists) on the air bag indicator.

Possible Causes

A passenger air bag circuit short to battery or ignition can be caused by:

- a short to battery or ignition on circuit 30S-JA11 (RD/WH).
- a short to battery or ignition on circuit 31S-JA11 (BK/WH).
- a short to battery or ignition on the passenger air bag module.
- an RCM internal concern.

PINPOINT TEST G: LFC 16/DTC B1925 — PASSENGER AIR BAG CIRCUIT SHORTED TO BATTERY OR IGNITION

CONDITIONS	DETAILS/RESULTS/ACTIONS
G1 CHECK FOR A HARD OR INTERMITTENT DTC	
<p>1</p>  <p>Retrieve/Clear Continuous DTCs</p>	<p>1 Retrieve and record any continuous DTCs for use later in this pinpoint test.</p>

2



On-Demand Self Test

- Was DTC B1925 retrieved during the on-demand self test?

→ Yes

This is a hard fault. The fault condition is still present. This fault cannot be cleared until it is corrected and the DTC is no longer retrieved during the on-demand self test. GO to [G2](#).

→ No

This is an intermittent fault. The fault condition is not present at this time. GO to [G5](#).

G2 CHECK THE PASSENGER AIR BAG MODULE



WARNING: If the supplemental restraint system (SRS) is being serviced, the system must be deactivated and restraint system diagnostic tools must be installed. Refer to [Air Bag and Safety Belt Pretensioner Supplemental Restraint System \(SRS\)](#) in this section.

The air bag restraint system diagnostic tools must be removed and the air bag modules reconnected when the system is reactivated to avoid non-deployment in a collision, resulting in possible personal injury.

NOTE: Diagnostics or repairs are not to be performed on a seat equipped with a seat side air bag with the seat in the vehicle. Prior to attempting to diagnose or repair a seat concern when equipped with a seat side air bag, the seat must be removed from the vehicle and the restraint system diagnostic tools must be installed in the seat side air bag electrical connectors. **The restraint system diagnostic tools must be removed prior to operating the vehicle over the road.**

NOTE: After diagnosing or repairing an SRS, **the restraint system diagnostic tools must be removed before operating the vehicle over the road.**

NOTE: After diagnosing or repairing a seat system, **the restraint system diagnostic tools must be removed before operating the vehicle over the road.**

NOTE: The SRS must be fully operational and free of faults before releasing the vehicle to the customer.

1



3



2

Deactivate the system. Refer to [Air Bag and Safety Belt Pretensioner Supplemental Restraint System \(SRS\)](#) in the Diagnosis and Testing portion of this section.

On-Demand Self Test

- Was DTC B1925 retrieved?

→ Yes

GO to [G3](#).

→ No

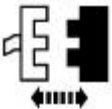
INSTALL a new passenger air bag module. GO to [G6](#).

G3 CHECK THE PASSENGER AIR BAG MODULE CIRCUIT

1



2



Passenger Air Bag Module Restraint System Diagnostic System

3

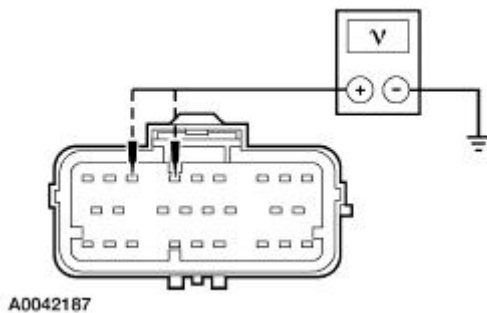


RCM C310a

4



5



5 **NOTE:** Do not separate or remove the shorting bars from RCM C310a.

Measure the voltage between RCM C310a pin 6, circuit 30S-JA11 (RD/WH), harness side and ground; and between RCM C310a pin 7, circuit 31S-JA11 (BK/WH), harness side and ground.

- Are the voltages less than 0.2 volts

→ Yes

REPAIR the affected circuit. GO to [G6](#).

→ No

GO to [G4](#).

G4 CHECK THE PASSENGER AIR BAG MODULE WIRING

1



Passenger Air Bag Module Restraint System Diagnostic Tool

2 Inspect all crimps, terminals, wires, and connectors in circuit 30S-JA11 (RD/WH) feeding the RCM pin 6, circuit 31S-JA11 (BK/WH) feeding pin 7. Check for pinched wires and damaged connector pin terminals.

● Was any damage found?

→ Yes
REPAIR as necessary. GO to [G6](#).

→ No
GO to [G6](#).

G5 CHECK FOR AN INTERMITTENT FAULT



WARNING: If the supplemental restraint system (SRS) is being serviced, the system must be deactivated and restraint system diagnostic tools must be installed. Refer to [Air Bag and Safety Belt Pretensioner Supplemental Restraint System \(SRS\)](#) in this section.

The air bag restraint system diagnostic tools must be removed and the air bag modules reconnected when the system is reactivated to avoid non-deployment in a collision, resulting in possible personal injury.

NOTE: Diagnostics or repairs are not to be performed on a seat equipped with a seat side air bag with the seat in the vehicle. Prior to attempting to diagnose or repair a seat concern when equipped with a seat side air bag, the seat must be removed from the vehicle and the restraint system diagnostic tools must be installed in the seat side air bag electrical connectors. **The restraint system diagnostic tools must be removed prior to operating the vehicle over the road.**

NOTE: After diagnosing or repairing an SRS, the restraint system diagnostic tools must be removed before operating the vehicle over the road.

NOTE: After diagnosing or repairing a seat system, the restraint system diagnostic tools must be removed before operating the vehicle over the road.

NOTE: The SRS must be fully operational and free of faults before releasing the vehicle to the customer.

1



3



On-Demand Self Test

2 Deactivate the system. Refer to [Air Bag and Safety Belt Pretensioner Supplemental Restraint System \(SRS\)](#) in the Diagnosis and Testing portion of this section.

	<ul style="list-style-type: none"> ● Was DTC B1925 retrieved during the on-demand self test? <p>→ Yes CHECK for causes of intermittent fault at or near the passenger air bag module connector. REPAIR any intermittent concerns found.</p> <p>If an intermittent concern was found and repaired, GO to G6.</p> <p>If an intermittent concern was not found, GO to G3.</p> <p>→ No CHECK for causes of intermittent short to battery or ignition on circuits 30S-JA11 (RD/WH) and 31S-JA11 (BK/WH). ATTEMPT to recreate the hard fault by flexing the wire harness and cycling the key frequently. REPAIR any intermittent concern found. GO to G6.</p>
G6 CHECK FOR ADDITIONAL DTCs	
	<p>1 Refer to the continuous DTCs recorded during Step G1.</p> <ul style="list-style-type: none"> ● Were any continuous DTCs retrieved during Step G1? <p>→ Yes Do not clear any DTCs until all DTCs have been resolved. GO to the Restraints Control Module (RCM) Diagnostic Trouble Code (DTC) Priority Table in this section for pinpoint test direction.</p> <p>→ No RECONNECT the system. REACTIVATE the system. PROVE OUT the system. REFER to Air Bag and Safety Belt Pretensioner Supplemental Restraint System (SRS). CLEAR all DTCs.</p>

Pinpoint Test H: LFC 32/DTC B1932 — Driver Air Bag Circuit Resistance High

Normal Operation




The restraints control module (RCM) monitors the resistance of the driver air bag ignitor by measuring the resistance between pins 3 and 4. If the RCM detects high resistance between these pins, it will store a diagnostic trouble code (DTC) B1932 in memory and flash a lamp fault code (LFC) 32 (or higher priority code if one exists) on the air bag indicator.

Possible Causes

Driver air bag high resistance can be caused by:

- a poor connection or corrosion in the driver air bag module circuits or the clockspring.
- high resistance in the clockspring.
- high resistance in the wiring harness.
- high resistance in the driver air bag module.
- RCM is faulted.

PINPOINT TEST H: LFC 32/DTC B1932 — DRIVER AIR BAG CIRCUIT RESISTANCE HIGH

CONDITIONS	DETAILS/RESULTS/ACTIONS
H1 CHECK FOR A HARD OR INTERMITTENT DTC	
<p>1</p>  <p>Retrieve/Clear Continuous DTCs</p> <p>2</p>  <p>On-Demand Self Test</p>	<p>1 Retrieve and record any continuous DTCs for use later in this pinpoint test.</p> <ul style="list-style-type: none"> ● Was DTC B1932 retrieved during the on-demand self test? <p>→ Yes This is a hard fault. The fault condition is still present. This fault cannot be cleared until it is corrected and the DTC is no longer retrieved during the on-demand self test. GO to H2.</p> <p>→ No This is an intermittent fault. The fault condition is not present at this time. GO to H5.</p>
H2 CHECK THE DRIVER AIR BAG MODULE	
<p> WARNING: If the supplemental restraint system (SRS) is being serviced, the system must be deactivated and restraint system diagnostic tools must be installed. Refer to Air Bag and Safety Belt Pretensioner Supplemental Restraint System (SRS) in this section.</p> <p>The air bag restraint system diagnostic tools must be removed and the air bag modules reconnected when the system is reactivated to avoid non-deployment in a collision, resulting in possible personal injury.</p> <p>NOTE: Diagnostics or repairs are not to be performed on a seat equipped with a seat side air bag with the seat in the vehicle. Prior to attempting to diagnose or repair a seat concern when equipped with a seat side air bag, the seat must be removed from the vehicle and the restraint</p>	

system diagnostic tools must be installed in the seat side air bag electrical connectors. **The restraint system diagnostic tools must be removed prior to operating the vehicle over the road.**

NOTE: After diagnosing or repairing an SRS, the restraint system diagnostic tools must be removed before operating the vehicle over the road.

NOTE: After diagnosing or repairing a seat system, the restraint system diagnostic tools must be removed before operating the vehicle over the road.

NOTE: The SRS must be fully operational and free of faults before releasing the vehicle to the customer.

1



3



On-Demand Self Test

2

Deactivate the system. Refer to [Air Bag and Safety Belt Pretensioner Supplemental Restraint System \(SRS\)](#) in the Diagnosis and Testing portion of this section.

● Was DTC B1932 retrieved?

→ Yes
GO to [H3](#).

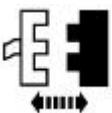
→ No
INSTALL a new driver air bag module.
GO to [H6](#).

H3 CHECK THE DRIVER AIR BAG MODULE CIRCUIT

1

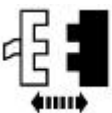


2



RCM C310a

3

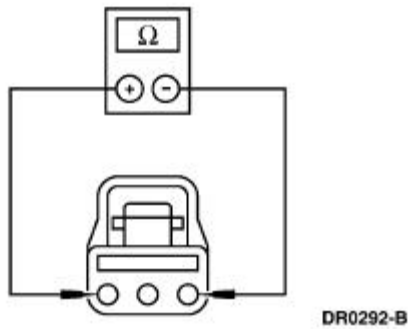


Driver Air Bag Module Restraint System Diagnostic Tool

4

4

NOTE: By disconnecting the RCM connector, circuit 30S-JA8 (RD/OG) and circuit 31S-JA8 (BK/OG) of the RCM connector are shorted together



with a shorting bar. Do not remove the shorting bar.

Measure the resistance between driver air bag C216, circuit 30S-JA8 (RD/OG), harness side and driver air bag C216, circuit 31S-JA8 (BK/OG), harness side.

- Is the resistance greater than 1.0 ohm?

→ **Yes**
GO to [H4](#).

→ **No**
INSTALL a new RCM. GO to [H6](#).

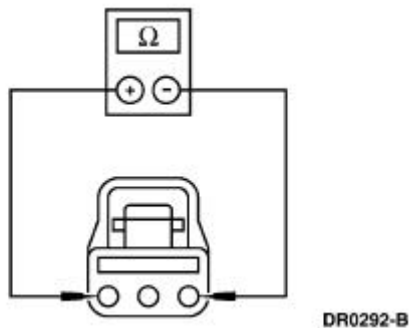
H4 CHECK THE CLOCKSPrING CIRCUIT

1



Clockspring C218C

2



2

NOTE: By disconnecting the clockspring connector, the connector pins are shorted together with a shorting bar. Do not remove the shorting bar.

Measure the resistance between clockspring C218C, circuit 30S-JA8 (RD/OG), harness side and clockspring C218C, circuit 31S-JA8 (BK/OG), harness side.

- Is the resistance greater than 1.0 ohm?

→ **Yes**
REPAIR the circuit(s) as necessary. GO to [H6](#).

→ **No**
INSTALL a new clockspring. GO to [H6](#).

H5 CHECK FOR AN INTERMITTENT FAULT



WARNING: If the supplemental restraint system (SRS) is being serviced, the system must be deactivated and restraint system diagnostic tools must be installed. Refer to [Air Bag and Safety Belt Pretensioner Supplemental Restraint System \(SRS\)](#) in this section.

The air bag restraint system diagnostic tools must be removed and the air bag modules reconnected when the system is reactivated to avoid non-deployment in a collision,

resulting in possible personal injury.

NOTE: Diagnostics or repairs are not to be performed on a seat equipped with a seat side air bag with the seat in the vehicle. Prior to attempting to diagnose or repair a seat concern when equipped with a seat side air bag, the seat must be removed from the vehicle and the restraint system diagnostic tools must be installed in the seat side air bag electrical connectors. **The restraint system diagnostic tools must be removed prior to operating the vehicle over the road.**

NOTE: After diagnosing or repairing an SRS, **the restraint system diagnostic tools must be removed before operating the vehicle over the road.**

NOTE: After diagnosing or repairing a seat system, **the restraint system diagnostic tools must be removed before operating the vehicle over the road.**

NOTE: The SRS must be fully operational and free of faults before releasing the vehicle to the customer.

1



3



On-Demand Self Test

2 Deactivate the system. Refer to [Air Bag and Safety Belt Pretensioner Supplemental Restraint System \(SRS\)](#) in the Diagnosis and Testing portion of this section.

● Was DTC B1932 retrieved during the on-demand self test?

→ Yes

CHECK for causes of intermittent fault at or near the driver air bag module connector. REPAIR any intermittent concerns found.

If an intermittent concern **was** found and repaired, GO to [H6](#).

If an intermittent concern **was not** found, GO to [H3](#).

→ No

CHECK for causes of intermittent short to battery or ignition on circuits 30S-JA8 (RD/OG) and 31S-JA8 (BK/OG) and the clockspring. ATTEMPT to recreate the hard fault by flexing the wire harness and cycling the key frequently. REPAIR any intermittent concern found. GO to [H6](#).

H6 CHECK FOR ADDITIONAL DTCs

1 Refer to the continuous DTCs recorded during Step H1.

	<ul style="list-style-type: none"> ● Were any continuous DTCs retrieved during Step H1? <p>→ Yes Do not clear any DTCs until all DTCs have been resolved. GO to the Restraints Control Module (RCM) Diagnostic Trouble Code (DTC) Priority Table in this section for pinpoint test direction.</p> <p>→ No RECONNECT the system. REACTIVATE the system. PROVE OUT the system. REFER to Air Bag and Safety Belt Pretensioner Supplemental Restraint System (SRS). CLEAR all DTCs.</p>
--	---

Pinpoint Test I: LFC 33/DTC B1933 — Passenger Air Bag Circuit Resistance High

Normal Operation



The restraints control module (RCM) monitors the resistance of the passenger air bag ignitor by measuring the resistance between pins 6 and 7. If the RCM detects high resistance between these pins, it will store a diagnostic trouble code (DTC) B1933 in memory and flash a lamp fault code (LFC) 33 (or higher priority code if one exists) on the air bag indicator.

Possible Causes

A passenger air bag high resistance can be caused by:

- a poor connection or corrosion in the passenger air bag module circuits.
- high resistance in the wiring harness.
- high resistance in the passenger air bag module.
- RCM is faulted.

PINPOINT TEST I: LFC 33/DTC B1933 — PASSENGER AIR BAG CIRCUIT RESISTANCE HIGH

CONDITIONS	DETAILS/RESULTS/ACTIONS
I1 CHECK FOR A HARD OR INTERMITTENT DTC	
<p>1</p>  <p>Retrieve/Record DTCs</p> <p>2</p>  <p>Clear DTCs</p>	<p>1 Retrieve and record any continuous DTCs for use later in this pinpoint test.</p>

On-Demand Self Test

- Was DTC B1933 retrieved during the on-demand self test?

→ **Yes**

This is a hard fault. The fault condition is still present. This fault cannot be cleared until it is corrected and the DTC is no longer retrieved during the on-demand self test. GO to [12](#).

→ **No**

This is an intermittent fault. The fault condition is not present at this time. GO to [14](#).

12 CHECK THE PASSENGER AIR BAG MODULE



WARNING: If the supplemental restraint system (SRS) is being serviced, the system must be deactivated and restraint system diagnostic tools must be installed. Refer to [Air Bag and Safety Belt Pretensioner Supplemental Restraint System \(SRS\)](#) in this section.

The air bag restraint system diagnostic tools must be removed and the air bag modules reconnected when the system is reactivated to avoid non-deployment in a collision, resulting in possible personal injury.

NOTE: Diagnostics or repairs are not to be performed on a seat equipped with a seat side air bag with the seat in the vehicle. Prior to attempting to diagnose or repair a seat concern when equipped with a seat side air bag, the seat must be removed from the vehicle and the restraint system diagnostic tools must be installed in the seat side air bag electrical connectors. **The restraint system diagnostic tools must be removed prior to operating the vehicle over the road.**

NOTE: After diagnosing or repairing an SRS, the restraint system diagnostic tools must be removed before operating the vehicle over the road.

NOTE: After diagnosing or repairing a seat system, the restraint system diagnostic tools must be removed before operating the vehicle over the road.

NOTE: The SRS must be fully operational and free of faults before releasing the vehicle to the customer.

1



3



On-Demand Self Test

2

Deactivate the system. Refer to [Air Bag and Safety Belt Pretensioner Supplemental Restraint System \(SRS\)](#) in the Diagnosis and Testing portion of this section.

- Was DTC B1933 retrieved?

→ **Yes**
GO to [13](#).

→ **No**
INSTALL a new passenger air bag module. GO to [15](#).

I3 CHECK THE PASSENGER AIR BAG MODULE CIRCUIT

1



2



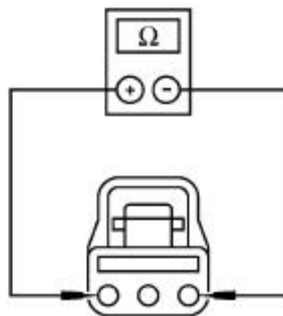
RCM C310a

3



Passenger Air Bag Module Restraint System Diagnostic Tool

4



DR0292-B

4 **NOTE:** By disconnecting the RCM connector, circuit 30S-JA11 (RD/WH) and circuit 31S-JA11 (BK/WH) of the RCM connector are shorted together with a shunting bar. Do not remove the shunting bar.

Measure the resistance between passenger air bag C256, circuit 30S-JA11 (RD/WH), harness side and passenger air bag C256, circuit 31S-JA11 (BK/WH) harness side.

- **Is the resistance greater than 1.0 ohm?**

→ **Yes**
REPAIR the circuit(s) as necessary. GO to [15](#).

→ **No**
INSTALL a new RCM. GO to [15](#).

I4 CHECK FOR AN INTERMITTENT FAULT



WARNING: If the supplemental restraint system (SRS) is being serviced, the system must be deactivated and restraint system diagnostic tools must be installed. Refer to [Air Bag and Safety Belt Pretensioner Supplemental Restraint System \(SRS\)](#) in this section.

The air bag restraint system diagnostic tools must be removed and the air bag modules reconnected when the system is reactivated to avoid non-deployment in a collision, resulting in possible personal injury.

NOTE: Diagnostics or repairs are not to be performed on a seat equipped with a seat side air bag with the seat in the vehicle. Prior to attempting to diagnose or repair a seat concern when

equipped with a seat side air bag, the seat must be removed from the vehicle and the restraint system diagnostic tools must be installed in the seat side air bag electrical connectors. **The restraint system diagnostic tools must be removed prior to operating the vehicle over the road.**

NOTE: After diagnosing or repairing an SRS, the restraint system diagnostic tools must be removed before operating the vehicle over the road.

NOTE: After diagnosing or repairing a seat system, the restraint system diagnostic tools must be removed before operating the vehicle over the road.

NOTE: The SRS must be fully operational and free of faults before releasing the vehicle to the customer.

1



3



On-Demand Self Test

2

Deactivate the system. Refer to [Air Bag and Safety Belt Pretensioner Supplemental Restraint System \(SRS\)](#) in the Diagnosis and Testing portion of this section.

● **Was DTC B1933 retrieved during the on-demand self test?**

→ **Yes**

CHECK for causes of intermittent fault at or near the passenger air bag module connector. REPAIR any intermittent concerns found.

If an intermittent concern **was** found and repaired, GO to [15](#).

If an intermittent concern **was not** found, GO to [13](#).

→ **No**

CHECK for causes of intermittent short to battery or ignition on circuits 30S-JA11 (RD/WH) and 31S-JA11 (BK/WH). ATTEMPT to recreate the hard fault by flexing the wire harness and cycling the key frequently. REPAIR any intermittent concern found. GO to [15](#).

15 CHECK FOR ADDITIONAL DTCs

1

Refer to the continuous DTCs recorded during Step 11.

● **Were any continuous DTCs retrieved during Step 11?**

	<p>→ Yes Do not clear any DTCs until all DTCs have been resolved. GO to the Restraints Control Module (RCM) Diagnostic Trouble Code (DTC) Priority Table in this section for pinpoint test direction.</p> <p>→ No RECONNECT the system. REACTIVATE the system. PROVE OUT the system. REFER to Air Bag and Safety Belt Pretensioner Supplemental Restraint System (SRS) . CLEAR all DTCs.</p>
--	--

Pinpoint Test J: LFC 34/DTC B1934 — Driver Air Bag Circuit Resistance Low

Normal Operation


The restraints control module (RCM) monitors the resistance of the driver air bag ignitor by measuring the resistance between pins 3 and 4. If the RCM detects low resistance between these pins, it will store a diagnostic trouble code (DTC) B1934 in memory and flash a lamp fault code (LFC) 34 (or higher priority code if one exists) on the air bag indicator.

Possible Causes

Driver air bag low resistance can be caused by:

- a short in the clockspring.
- a short in the wiring harness.
- a low resistance in the driver air bag module.
- worn or damaged electrical connector shorting bar.
- worn or damaged electrical connector camming beam.
- RCM is faulted.

PINPOINT TEST J: LFC 34/DTC B1934 — DRIVER AIR BAG CIRCUIT RESISTANCE LOW

CONDITIONS	DETAILS/RESULTS/ACTIONS
J1 J1 CHECK FOR A HARD OR INTERMITTENT DTC	
<p>1 </p> <p>Retrieve/Clear Continuous DTCs</p> <p>2</p>	<p>1 Retrieve and record any continuous DTCs for use later in this pinpoint test.</p>



On-Demand Self Test

- Was DTC B1934 retrieved during the on-demand self test?

→ **Yes**

This is a hard fault. The fault condition is still present. This fault cannot be cleared until it is corrected and the DTC is no longer retrieved during the on-demand self test. GO to [J2](#).

→ **No**

This is an intermittent fault. The fault condition is not present at this time. GO to [J5](#).

J2 CHECK THE DRIVER AIR BAG MODULE



WARNING: If the supplemental restraint system (SRS) is being serviced, the system must be deactivated and restraint system diagnostic tools must be installed. Refer to [Air Bag and Safety Belt Pretensioner Supplemental Restraint System \(SRS\)](#) in this section.

The air bag restraint system diagnostic tools must be removed and the air bag modules reconnected when the system is reactivated to avoid non-deployment in a collision, resulting in possible personal injury.

NOTE: Diagnostics or repairs are not to be performed on a seat equipped with a seat side air bag with the seat in the vehicle. Prior to attempting to diagnose or repair a seat concern when equipped with a seat side air bag, the seat must be removed from the vehicle and the restraint system diagnostic tools must be installed in the seat side air bag electrical connectors. **The restraint system diagnostic tools must be removed prior to operating the vehicle over the road.**

NOTE: After diagnosing or repairing an SRS, the restraint system diagnostic tools must be removed before operating the vehicle over the road.

NOTE: After diagnosing or repairing a seat system, the restraint system diagnostic tools must be removed before operating the vehicle over the road.

NOTE: The SRS must be fully operational and free of faults before releasing the vehicle to the customer.

1



3



On-Demand Self Test

2

Deactivate the system. Refer to [Air Bag and Safety Belt Pretensioner Supplemental Restraint System \(SRS\)](#) in the Diagnosis and Testing portion of this section.

● Was DTC B1934 retrieved?

→ **Yes**
GO to [J3](#).

→ **No**
INSTALL a new driver air bag module.
GO to [J6](#).

J3 CHECK THE DRIVER AIR BAG MODULE CIRCUIT

1

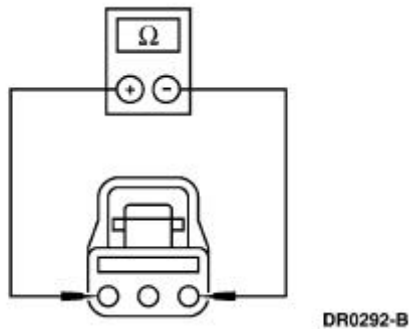


2



Driver Air Bag Module Restraint System Diagnostic Tool

3



3 Measure the resistance between driver air bag C216, circuit 30S-JA8 (RD/OG), harness side and driver air bag C216, circuit 31S-JA8 (BK/OG), harness side.

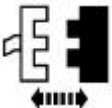
● Is the resistance greater than 10,000 ohms?

→ **Yes**
INSTALL a new RCM. GO to [J6](#).

→ **No**
GO to [J4](#).

J4 CHECK THE CLOCKSPRING

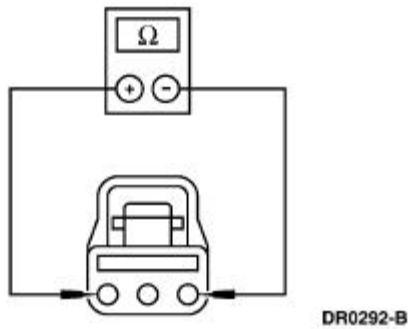
1



Clockspring C218C

2

2 Measure the resistance between clockspring C218C, circuit 30S-JA8 (RD/OG) and circuit 31S-JA8 (BK/OG), harness side.



- Is the resistance greater than 10,000 ohms?

- **Yes**
INSTALL a new clockspring. GO to [J6](#).
- **No**
REPAIR the circuit(s) as necessary. GO to [J6](#).

J5 CHECK FOR AN INTERMITTENT FAULT

⚠ WARNING: If the supplemental restraint system (SRS) is being serviced, the system must be deactivated and restraint system diagnostic tools must be installed. Refer to [Air Bag and Safety Belt Pretensioner Supplemental Restraint System \(SRS\)](#) in this section.

The air bag restraint system diagnostic tools must be removed and the air bag modules reconnected when the system is reactivated to avoid non-deployment in a collision, resulting in possible personal injury.

NOTE: Diagnostics or repairs are not to be performed on a seat equipped with a seat side air bag with the seat in the vehicle. Prior to attempting to diagnose or repair a seat concern when equipped with a seat side air bag, the seat must be removed from the vehicle and the restraint system diagnostic tools must be installed in the seat side air bag electrical connectors. **The restraint system diagnostic tools must be removed prior to operating the vehicle over the road.**

NOTE: After diagnosing or repairing an SRS, the restraint system diagnostic tools must be removed before operating the vehicle over the road.

NOTE: After diagnosing or repairing a seat system, the restraint system diagnostic tools must be removed before operating the vehicle over the road.

NOTE: The SRS must be fully operational and free of faults before releasing the vehicle to the customer.

1



3



- 2 Deactivate the system. Refer to [Air Bag and Safety Belt Pretensioner Supplemental Restraint System \(SRS\)](#) in the Diagnosis and Testing portion of this section.

<p>On-Demand Self Test</p>	<p>● Was DTC B1934 retrieved during the on-demand self test?</p> <p>→ Yes CHECK for causes of intermittent fault at or near the driver air bag module connector. REPAIR any intermittent concerns found.</p> <p>If an intermittent concern was found and repaired, GO to J6.</p> <p>If an intermittent concern was not found, GO to J3.</p> <p>→ No CHECK for causes of intermittent short to battery or ignition on circuits 30S-JA8 (RD/OG) and 31S-JA8 (BK/OG) and the clockspring. ATTEMPT to recreate the hard fault by flexing the wire harness and cycling the key frequently. REPAIR any intermittent concern found. GO to J6.</p>
<p>J6 CHECK FOR ADDITIONAL DTCs</p>	
	<p>1 Refer to the continuous DTCs recorded during Step J1.</p> <p>● Were any continuous DTCs retrieved during Step J1?</p> <p>→ Yes Do not clear any DTCs until all DTCs have been resolved. GO to the Restraints Control Module (RCM) Diagnostic Trouble Code (DTC) Priority Table in this section for pinpoint test direction.</p> <p>→ No RECONNECT the system. REACTIVATE the system. PROVE OUT the system. REFER to Air Bag and Safety Belt Pretensioner Supplemental Restraint System (SRS). CLEAR all DTCs.</p>

Pinpoint Test K: LFC 35/DTC B1935 — Passenger Air Bag Circuit Resistance Low

Normal Operation




The restraints control module (RCM) monitors the resistance of the passenger air bag ignitor by measuring the resistance between pins 6 and 7. If the RCM detects low resistance between these pins, it will store a diagnostic trouble code (DTC) B1935 in memory and flash a lamp fault code (LFC) 35 (or higher priority code if one exists) on the air bag indicator.

Possible Causes

Passenger air bag low resistance can be caused by:

- a short in the wiring harness.
- a low resistance in the passenger air bag module.
- an RCM internal concern.
- a worn or damaged electrical connector shorting bar.
- a worn or damaged electrical connector camming beam.

PINPOINT TEST K: LFC 35/DTC B1935 — PASSENGER AIR BAG CIRCUIT RESISTANCE LOW

CONDITIONS	DETAILS/RESULTS/ACTIONS
K1 CHECK FOR A HARD OR INTERMITTENT DTC	
<p>1</p>  <p>Retrieve/Clear Continuous DTCs</p> <p>2</p>  <p>On-Demand Self Test</p>	<p>1 Retrieve and record any continuous DTCs for use later in this pinpoint test.</p> <p>● Was DTC B1935 retrieved during the on-demand self test?</p> <p>→ Yes This is a hard fault. The fault condition is still present. This fault cannot be cleared until it is corrected and the DTC is no longer retrieved during the on-demand self test. GO to K2.</p> <p>→ No This is an intermittent fault. The fault condition is not present at this time. GO to K4.</p>
K2 CHECK THE PASSENGER AIR BAG MODULE	
<p> WARNING: If the supplemental restraint system (SRS) is being serviced, the system must be deactivated and restraint system diagnostic tools must be installed. Refer to Air Bag and Safety Belt Pretensioner Supplemental Restraint System (SRS) in this section.</p> <p>The air bag restraint system diagnostic tools must be removed and the air bag modules reconnected when the system is reactivated to avoid non-deployment in a collision, resulting in possible personal injury.</p> <p>NOTE: Diagnostics or repairs are not to be performed on a seat equipped with a seat side air bag with the seat in the vehicle. Prior to attempting to diagnose or repair a seat concern when equipped with a seat side air bag, the seat must be removed from the vehicle and the restraint</p>	

system diagnostic tools must be installed in the seat side air bag electrical connectors. **The restraint system diagnostic tools must be removed prior to operating the vehicle over the road.**

NOTE: After diagnosing or repairing an SRS, **the restraint system diagnostic tools must be removed before operating the vehicle over the road.**

NOTE: After diagnosing or repairing a seat system, **the restraint system diagnostic tools must be removed before operating the vehicle over the road.**

NOTE: The SRS must be fully operational and free of faults before releasing the vehicle to the customer.

1



3



On-Demand Self Test

2

Deactivate the system. Refer to [Air Bag and Safety Belt Pretensioner Supplemental Restraint System \(SRS\)](#) in the Diagnosis and Testing portion of this section.

● Was DTC B1935 retrieved?

→ **Yes**
GO to [K3](#).

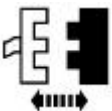
→ **No**
INSTALL a new passenger air bag module. GO to [K5](#).

K3 CHECK THE PASSENGER AIR BAG MODULE CIRCUIT

1



2

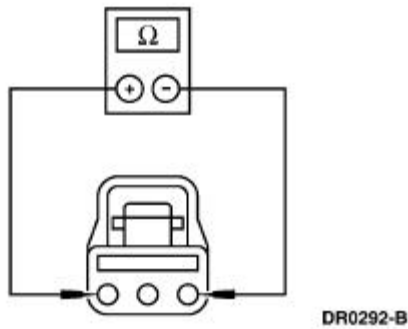


Passenger Air Bag Module Restraint System Diagnostic Tool

3

3

Measure the resistance between passenger air bag C256, circuit 30S-JA11 (RD/WH), harness side and passenger air bag C256, circuit 31S-JA11 (BK/WH), harness side.



- Is the resistance greater than 10,000 ohms?

→ **Yes**
INSTALL a new RCM. GO to [K5](#).

→ **No**
REPAIR the circuit(s) as necessary. GO to [K5](#).

K4 CHECK FOR AN INTERMITTENT FAULT

⚠ WARNING: If the supplemental restraint system (SRS) is being serviced, the system must be deactivated and restraint system diagnostic tools must be installed. Refer to [Air Bag and Safety Belt Pretensioner Supplemental Restraint System \(SRS\)](#) in this section.

The air bag restraint system diagnostic tools must be removed and the air bag modules reconnected when the system is reactivated to avoid non-deployment in a collision, resulting in possible personal injury.

NOTE: Diagnostics or repairs are not to be performed on a seat equipped with a seat side air bag with the seat in the vehicle. Prior to attempting to diagnose or repair a seat concern when equipped with a seat side air bag, the seat must be removed from the vehicle and the restraint system diagnostic tools must be installed in the seat side air bag electrical connectors. **The restraint system diagnostic tools must be removed prior to operating the vehicle over the road.**

NOTE: After diagnosing or repairing an SRS, the restraint system diagnostic tools must be removed before operating the vehicle over the road.

NOTE: After diagnosing or repairing a seat system, the restraint system diagnostic tools must be removed before operating the vehicle over the road.

NOTE: The SRS must be fully operational and free of faults before releasing the vehicle to the customer.

1



3



2 Deactivate the system. Refer to [Air Bag and Safety Belt Pretensioner Supplemental Restraint System \(SRS\)](#) in the Diagnosis and Testing portion of this section.

<p>On-Demand Self Test</p>	<ul style="list-style-type: none"> ● Was DTC B1935 retrieved during the on-demand self test? <p>→ Yes CHECK for causes of intermittent fault at or near the passenger air bag module connector. REPAIR any intermittent concerns found.</p> <p>If an intermittent concern was found and repaired, GO to K5.</p> <p>If an intermittent concern was not found, GO to K3.</p> <p>→ No CHECK for causes of intermittent short to battery or ignition on circuits 30S-JA11 (RD/WH) and 31S-JA11 (BK/WH). ATTEMPT to recreate the hard fault by flexing the wire harness and cycling the key frequently. REPAIR any intermittent concern found. GO to K5.</p>
<p>K5 CHECK FOR ADDITIONAL DTCs</p>	
	<p>1 Refer to the continuous DTCs recorded during Step K1.</p> <ul style="list-style-type: none"> ● Were any continuous DTCs retrieved during Step K1? <p>→ Yes Do not clear any DTCs until all DTCs have been resolved. GO to the Restraints Control Module (RCM) Diagnostic Trouble Code (DTC) Priority Table in this section for pinpoint test direction.</p> <p>→ No RECONNECT the system. REACTIVATE the system. PROVE OUT the system. REFER to Air Bag and Safety Belt Pretensioner Supplemental Restraint System (SRS). CLEAR all DTCs.</p>

Pinpoint Test L: LTC 48/DTC B2444 — Driver Seat Side Impact Sensor Is Faulted

Normal Operation

The driver seat side impact sensor monitors the severity of a crash event. If the crash is severe enough, the sensor will signal the restraints control module (RCM) to deploy the driver seat side air bag.

The RCM monitors the two-wire current loop to the driver seat side impact sensor for a signal that is out of the expected range. If the RCM detects an out-of-range signal from the driver seat side impact



sensor, indicating a fault, it will store diagnostic trouble code (DTC) B2444 and flash a lamp fault code (LFC) 48 (or a higher priority code if one exists) on the air bag indicator.

Possible Causes

A driver seat side impact sensor fault can be caused by:

- Faulted driver seat side impact sensor.

PINPOINT TEST L: LFC 48/DTC B2444 — DRIVER SEAT SIDE IMPACT SENSOR IS FAULTED

CONDITIONS	DETAILS/RESULTS/ACTIONS
L1 CHECK FOR A HARD OR INTERMITTENT DTC	
<p>1</p>  <p>Retrieve/Clear Continuous DTCs</p> <p>2</p>  <p>On-Demand Self Test</p>	<p>1 Retrieve and record any continuous DTCs for use later in this pinpoint test.</p> <p>● Was DTC B2444 retrieved during the on-demand self test?</p> <p>→ Yes This is a hard fault. The fault condition is still present. This fault cannot be cleared until it is corrected and the DTC is no longer retrieved during the on-demand self test. INSTALL a new driver seat side impact sensor. GO to L2.</p> <p>→ No This is an intermittent fault. The fault condition is not present at this time. INSTALL a new driver seat side impact sensor. GO to L2.</p>
L2 CHECK FOR ADDITIONAL DTCs	
	<p>1 Refer to the continuous DTCs recorded during Step L1.</p> <p>● Were any continuous DTCs retrieved during Step L1?</p> <p>→ Yes Do not clear any DTCs until all DTCs have been resolved. GO to the Restraints Control Module (RCM) Diagnostic Trouble Code (DTC) Priority Table in this section for pinpoint test direction.</p> <p>→ No CLEAR all DTCs.</p>

Pinpoint Test M: LFC 43/DTC B2440 — Passenger Seat Side Impact Sensor Mounting Fault

Normal Operation

The passenger seat side impact sensor monitors the severity of a crash event. If the crash is severe enough, the sensor will signal the restraints control module (RCM) to deploy the passenger seat side air bag.



The RCM monitors the two-wire current loop to the passenger seat side impact sensor for a signal that is out of the expected range. If the RCM detects an out-of-range signal from the passenger seat side impact sensor, indicating a sensor mounting fault, it will store diagnostic trouble code (DTC) B2440 and flash a lamp fault code (LFC) 43 (or a higher priority code if one exists) on the air bag indicator.

Possible Causes

A passenger seat side impact sensor mounting fault can be caused by:

- a passenger seat side impact sensor internal fault.
- a passenger seat side impact sensor mounting fault.
- RCM is faulted.

PINPOINT TEST M: LFC 43/DTC B2440 — PASSENGER SEAT SIDE IMPACT SENSOR MOUNTING FAULT

CONDITIONS	DETAILS/RESULTS/ACTIONS
M1 CHECK FOR A HARD OR INTERMITTENT DTC	
<p>1 </p> <p>Retrieve/Clear Continuous DTCs</p> <p>2 </p> <p>On-Demand Self Test</p>	<p>1 Retrieve and record any continuous DTCs for use later in this pinpoint test.</p> <p>● Was DTC B2440 retrieved during the on-demand self test?</p> <p>→ Yes This is a hard fault. The fault condition is still present. This fault cannot be cleared until it is corrected and the DTC is no longer retrieved during the on-demand self test. GO to M2.</p> <p>→ No This is an intermittent fault. The fault condition is not present at this time. GO to M5.</p>
M2 CHECK THE MOUNTING OF THE PASSENGER SEAT SIDE IMPACT SENSOR	



WARNING: If the supplemental restraint system (SRS) is being serviced, the system must be deactivated and restraint system diagnostic tools must be installed. Refer to [Air Bag and Safety Belt Pretensioner Supplemental Restraint System \(SRS\)](#) in this section.

The air bag restraint system diagnostic tools must be removed and the air bag modules reconnected when the system is reactivated to avoid non-deployment in a collision, resulting in possible personal injury.

NOTE: Diagnostics or repairs are not to be performed on a seat equipped with a seat side air bag with the seat in the vehicle. Prior to attempting to diagnose or repair a seat concern when equipped with a seat side air bag, the seat must be removed from the vehicle and the restraint system diagnostic tools must be installed in the seat side air bag electrical connectors. **The restraint system diagnostic tools must be removed prior to operating the vehicle over the road.**

NOTE: After diagnosing or repairing an SRS, the restraint system diagnostic tools must be removed before operating the vehicle over the road.

NOTE: After diagnosing or repairing a seat system, the restraint system diagnostic tools must be removed before operating the vehicle over the road.

NOTE: The SRS must be fully operational and free of faults before releasing the vehicle to the customer.

- 1 Deactivate the system. Refer to [Air Bag and Safety Belt Pretensioner Supplemental Restraint System \(SRS\)](#) in the Diagnosis and Testing portion of this section.
 - 2 Remove the passenger seat side impact sensor. Refer to [Side Impact Sensor](#) in the Removal and Installation portion of this section.
 - 3 Visually inspect the passenger seat side impact sensor, mounting bracket and mounting surface for damage, corrosion or dirt.
 - 4 Inspect the passenger seat side impact sensor mounting and make sure that the retaining bolts are fully seated and tightened correctly. Refer to [Side Impact Sensor](#) in the Removal and Installation portion of this section for correct tightening torque.
- **Was a significant amount of corrosion or dirt found, the passenger seat side impact sensor mounting bracket attached to the mounting surface in correctly, or the two passenger seat side impact sensor retaining bolts not fully seated and tightened correctly?**
- **Yes**
MAKE SURE the passenger seat side impact sensor, mounting bracket and mounting surface are free of damage, corrosion or dirt and the two retaining bolts are fully seated and correctly tightened. REATTACH the passenger seat side impact sensor and mounting bracket to the mounting surface. GO to [M6](#).
- **No**
GO to [M3](#).

M3 CHECK THE PASSENGER SEAT SIDE IMPACT SENSOR HARNESS CONNECTION

- 1 Check the passenger seat side impact sensor harness connection.
- **Is the passenger seat side impact sensor harness connector connected to the passenger seat side impact sensor correctly?**
- **Yes**
GO to [M4](#).

→ **No**
ATTACH the passenger seat side impact sensor harness connector correctly. GO to [M6](#).

M4 CHECK THE VEHICLE CHASSIS GROUND

1 Measure the resistance between a known good chassis ground and the mounting surface of the passenger seat side impact sensor.

- **Is the resistance greater than 100 ohms?**

→ **Yes**
REPAIR the chassis grounding system. GO to [M6](#).

→ **No**
INSTALL a new RCM. GO to [M6](#).

M5 CHECK FOR AN INTERMITTENT FAULT



WARNING: If the supplemental restraint system (SRS) is being serviced, the system must be deactivated and restraint system diagnostic tools must be installed. Refer to [Air Bag and Safety Belt Pretensioner Supplemental Restraint System \(SRS\)](#) in this section.

The air bag restraint system diagnostic tools must be removed and the air bag modules reconnected when the system is reactivated to avoid non-deployment in a collision, resulting in possible personal injury.

NOTE: Diagnostics or repairs are not to be performed on a seat equipped with a seat side air bag with the seat in the vehicle. Prior to attempting to diagnose or repair a seat concern when equipped with a seat side air bag, the seat must be removed from the vehicle and the restraint system diagnostic tools must be installed in the seat side air bag electrical connectors. **The restraint system diagnostic tools must be removed prior to operating the vehicle over the road.**

NOTE: After diagnosing or repairing an SRS, **the restraint system diagnostic tools must be removed before operating the vehicle over the road.**

NOTE: After diagnosing or repairing a seat system, **the restraint system diagnostic tools must be removed before operating the vehicle over the road.**

NOTE: The SRS must be fully operational and free of faults before releasing the vehicle to the customer.

1 Deactivate the system. Refer to [Air Bag and Safety Belt Pretensioner Supplemental Restraint System \(SRS\)](#) in the Diagnosis and Testing portion of this section.

2



On-Demand Self-test

3 Refer to the continuous DTCs recorded during Step M1.

- **Was DTC B2440 retrieved during the on-demand self test?**

→ **Yes**
GO to [M2](#).

→ **No**

	CHECK for causes of an intermittent mounting fault. ATTEMPT to recreate the hard fault by flexing the wire harness and cycling the ignition key frequently. REPAIR any intermittent concerns found. GO to M6 .
M6 CHECK FOR ADDITIONAL DTCs	
	<p>1 Refer to the continuous DTCs recorded during Step M1.</p> <ul style="list-style-type: none"> ● Were any continuous DTCs retrieved during Step M1? <p>→ Yes Do not clear any DTCs until all DTCs have been resolved. GO to the Restraints Control Module (RCM) Diagnostic Trouble Code (DTC) Priority Table in this section for pinpoint test direction.</p> <p>→ No RECONNECT the system. PROVE OUT the system. CLEAR all DTCs.</p>

Pinpoint Test N: LFC 42/DTC B2441 — Driver Seat Side Impact Sensor Mounting Fault

Normal Operation

The driver seat side impact sensor monitors the severity of a crash event. If the crash is severe enough, the sensor will signal the restraints control module (RCM) to deploy the driver seat side air bag.


The RCM monitors the two-wire current loop to the driver seat side impact sensor for a signal that is out of the expected range. If the RCM detects an out-of-range signal from the driver seat side impact sensor, indicating a sensor mounting fault, it will store diagnostic trouble code (DTC) B2441 and flash a lamp fault code (LFC) 42 (or a higher priority code if one exists) on the air bag indicator.

Possible Causes

A driver seat side impact sensor mounting fault can be caused by:

- a driver seat side impact sensor internal fault.
- a driver seat side impact sensor mounting fault.
- RCM is faulted.

PINPOINT TEST N: LFC 42/DTC B2441 — DRIVER SEAT SIDE IMPACT SENSOR MOUNTING FAULT

CONDITIONS	DETAILS/RESULTS/ACTIONS
N1 CHECK FOR A HARD OR INTERMITTENT DTC	
<p>1</p>  <p>Retrieve/Clear Continuous DTCs</p> <p>2</p>	<p>1 Retrieve and record any continuous DTCs for use later in this pinpoint test.</p>



On-Demand Self Test

- Was DTC B2441 retrieved during the on-demand self test?

→ Yes

This is a hard fault. The fault condition is still present. This fault cannot be cleared until it is corrected and the DTC is no longer retrieved during the on-demand self test. GO to [N2](#).

→ No

This is an intermittent fault. The fault condition is not present at this time. GO to [N5](#).

N2 CHECK THE MOUNTING OF THE DRIVER SIDE CRASH SENSOR



WARNING: If the supplemental restraint system (SRS) is being serviced, the system must be deactivated and restraint system diagnostic tools must be installed. Refer to [Air Bag and Safety Belt Pretensioner Supplemental Restraint System \(SRS\)](#) in this section.

The air bag restraint system diagnostic tools must be removed and the air bag modules reconnected when the system is reactivated to avoid non-deployment in a collision, resulting in possible personal injury.

NOTE: Diagnostics or repairs are not to be performed on a seat equipped with a seat side air bag with the seat in the vehicle. Prior to attempting to diagnose or repair a seat concern when equipped with a seat side air bag, the seat must be removed from the vehicle and the restraint system diagnostic tools must be installed in the seat side air bag electrical connectors. **The restraint system diagnostic tools must be removed prior to operating the vehicle over the road.**

NOTE: After diagnosing or repairing an SRS, **the restraint system diagnostic tools must be removed before operating the vehicle over the road.**

NOTE: After diagnosing or repairing a seat system, **the restraint system diagnostic tools must be removed before operating the vehicle over the road.**

NOTE: The SRS must be fully operational and free of faults before releasing the vehicle to the customer.

- 1 Deactivate the system. Refer to [Air Bag and Safety Belt Pretensioner Supplemental Restraint System \(SRS\)](#) in the Diagnosis and Testing portion of this section.
- 2 Remove the driver seat side impact sensor. Refer to [Side Impact Sensor](#) in the Removal and Installation portion of this section.
- 3 Visually inspect the driver seat side impact sensor, mounting bracket and mounting surface for damage, corrosion or dirt.
- 4 Inspect the driver seat side impact sensor mounting and make sure that the retaining bolts are fully seated and tightened correctly. Refer to [Side Impact Sensor](#) in this section for correct tightening torque.

- Was a significant amount of corrosion or dirt found, the driver seat side impact sensor mounting bracket attached to the mounting surface incorrectly, or the two driver seat side impact sensor retaining bolts not fully seated and tightened correctly?

→ Yes

MAKE SURE the driver seat side impact sensor, mounting bracket and mounting surface are free of damage, corrosion or dirt and the two retaining bolts are fully seated and correctly tightened. REATTACH the driver seat side impact sensor and mounting bracket to the mounting surface. GO to [N6](#).

→ **No**
GO to [N3](#).

N3 CHECK THE DRIVER SEAT SIDE CRASH SENSOR HARNESS CONNECTION

1 Check the driver seat side impact sensor harness connection.

- **Is the driver seat side impact sensor harness connector connected to the driver seat side impact sensor correctly?**

→ **Yes**
GO to [N4](#).

→ **No**
ATTACH the driver seat side impact sensor harness connector correctly.
GO to [N6](#).

N4 CHECK THE VEHICLE CHASSIS GROUND

1 Measure the resistance between a known good chassis ground and the mounting surface of the driver seat side impact sensor.

- **Is the resistance greater than 100 ohms?**

→ **Yes**
REPAIR the chassis grounding system. GO to [N6](#).

→ **No**
INSTALL a new RCM. GO to [N6](#).

N5 CHECK FOR AN INTERMITTENT FAULT



WARNING: If the supplemental restraint system (SRS) is being serviced, the system must be deactivated and restraint system diagnostic tools must be installed. Refer to [Air Bag and Safety Belt Pretensioner Supplemental Restraint System \(SRS\)](#) in this section.

The air bag restraint system diagnostic tools must be removed and the air bag modules reconnected when the system is reactivated to avoid non-deployment in a collision, resulting in possible personal injury.


NOTE: Diagnostics or repairs are not to be performed on a seat equipped with a seat side air bag with the seat in the vehicle. Prior to attempting to diagnose or repair a seat concern when equipped with a seat side air bag, the seat must be removed from the vehicle and the restraint system diagnostic tools must be installed in the seat side air bag electrical connectors. **The restraint system diagnostic tools must be removed prior to operating the vehicle over the road.**

NOTE: After diagnosing or repairing an SRS, **the restraint system diagnostic tools must be removed before operating the vehicle over the road.**

NOTE: After diagnosing or repairing a seat system, **the restraint system diagnostic tools must be removed before operating the vehicle over the road.**

NOTE: The SRS must be fully operational and free of faults before releasing the vehicle to the customer.

1 Deactivate the system. Refer to [Air Bag and Safety Belt Pretensioner Supplemental Restraint System \(SRS\)](#) in the Diagnosis and Testing

<p>2</p>  <p>On-Demand Self Test</p>	<p>portion of this section.</p> <ul style="list-style-type: none"> ● Was DTC B2441 retrieved during the on-demand self test? <p>→ Yes GO to N2.</p> <p>→ No CHECK for causes of an intermittent mounting fault. ATTEMPT to recreate the hard fault by flexing the wire harness and cycling the ignition key frequently. REPAIR any intermittent concerns found. GO to N6.</p>
<p>N6 CHECK FOR ADDITIONAL DTCs</p>	
	<p>1 Refer to the continuous DTCs recorded during Step N1.</p> <ul style="list-style-type: none"> ● Were any continuous DTCs retrieved during Step N1? <p>→ Yes Do not clear any DTCs until all DTCs have been resolved. GO to the Restraints Control Module (RCM) Diagnostic Trouble Code (DTC) Priority Table in this section for pinpoint test direction.</p> <p>→ No RECONNECT the system. PROVE OUT the system. CLEAR all DTCs.</p>

Pinpoint Test O: LFC 49/DTC B2445 — Passenger Seat Side Impact Sensor Is Faulted

Normal Operation

The passenger seat side impact sensor monitors the severity of a crash event. If the crash is severe enough, the sensor will signal the restraints control module (RCM) to deploy the passenger seat side air bag.



The RCM monitors the two-wire current loop to the passenger seat side impact sensor for a signal that is out of the expected range. If the RCM detects an out-of-range signal from the passenger seat side impact sensor, indicating a fault, it will store diagnostic trouble code (DTC) B2445 and flash a lamp fault code (LFC) 49 (or a higher priority code if one exists) on the air bag indicator.

Possible Causes

A passenger seat side impact sensor fault can be caused by:

- damaged passenger seat side impact sensor.

PINPOINT TEST O: LFC 49/DTC B2445 — PASSENGER SEAT SIDE IMPACT SENSOR IS FAULTED

CONDITIONS	DETAILS/RESULTS/ACTIONS
O1 CHECK FOR A HARD OR INTERMITTENT DTC	
<p>1</p>  <p>Retrieve/Clear Continuous DTCs</p> <p>2</p>  <p>On-Demand Self Test</p>	<p>1 Retrieve and record any continuous DTCs for use later in this pinpoint test.</p> <p>● Was DTC B2445 retrieved during the on-demand self test?</p> <p>→ Yes This is a hard fault. The fault condition is still present. This fault cannot be cleared until it is corrected and the DTC is no longer retrieved during the on-demand self test. INSTALL a new passenger seat side impact sensor. GO to O2.</p> <p>→ No This is an intermittent fault. The fault condition is not present at this time. INSTALL a new passenger seat side impact sensor. GO to O2.</p>
O2 CHECK FOR ADDITIONAL DTCs	
	<p>1 Refer to the continuous DTCs recorded during Step O1.</p> <p>● Were any continuous DTCs retrieved during Step O1?</p> <p>→ Yes Do not clear any DTCs until all DTCs have been resolved. GO to the Restraints Control Module (RCM) Diagnostic Trouble Code (DTC) Priority Table in this section for pinpoint test direction.</p> <p>→ No CLEAR all DTCs.</p>

Pinpoint Test P: LFC 44/DTC U2017 — Driver Side Impact Sensor Communication Fault

Normal Operation

The driver seat side impact sensor monitors the severity of a crash event. If the crash is severe enough, the sensor will signal the restraints control module (RCM) to deploy the driver seat side air bag.




The RCM monitors the two-wire current loop to the driver seat side impact sensor for a signal that is out of the expected range. If the RCM detects an out-of-range signal from the driver seat side impact sensor, indicating a sensor communication fault, it will store diagnostic trouble code (DTC) U2017 and flash a lamp fault code (LFC) 44 (or a higher priority code if one exists) on the air bag indicator.

Possible Causes

A driver seat side impact sensor communication fault can be caused by:

- damaged wiring on circuit 7-JA39 (YE).
- damaged wiring on circuit 9-JA39 (BN).
- damaged driver seat side impact sensor.

PINPOINT TEST P: LFC 44/DTC U2017 — DRIVER SEAT SIDE IMPACT SENSOR COMMUNICATION FAULT

CONDITIONS	DETAILS/RESULTS/ACTIONS
<p>P1 CHECK FOR CONTINUOUS OR ON-DEMAND SELF TEST DTCs</p>	
<p>1  Retrieve/Clear Continuous DTCs</p> <p>2  On-Demand Self Test</p>	<p>1 Retrieve and record any continuous DTCs for use later in this pinpoint test.</p> <ul style="list-style-type: none"> ● Was DTC U2017 retrieved during the on-demand self test? <p>→ Yes This is a hard fault. The fault condition is still present. This fault cannot be cleared until it is corrected and the DTC is no longer retrieved during the on-demand self test. GO to P2.</p> <p>→ No This is an intermittent fault. The fault condition is not present at this time. GO to P9.</p>
<p>P2 CHECK THE DRIVER SIDE CRASH SENSOR HARNESS CONNECTOR</p>	
<p> WARNING: If the supplemental restraint system (SRS) is being serviced, the system must be deactivated and restraint system diagnostic tools must be installed. Refer to Air Bag and Safety Belt Pretensioner Supplemental Restraint System (SRS) in this section.</p> <p>The air bag restraint system diagnostic tools must be removed and the air bag modules reconnected when the system is reactivated to avoid non-deployment in a collision, resulting in possible personal injury.</p> <p>NOTE: Diagnostics or repairs are not to be performed on a seat equipped with a seat side air bag with the seat in the vehicle. Prior to attempting to diagnose or repair a seat concern when equipped with a seat side air bag, the seat must be removed from the vehicle and the restraint system diagnostic tools must be installed in the seat side air bag electrical connectors. The restraint system diagnostic tools must be removed prior to operating the vehicle over the road.</p>	

NOTE: After diagnosing or repairing an SRS, the restraint system diagnostic tools must be removed before operating the vehicle over the road.

NOTE: After diagnosing or repairing a seat system, the restraint system diagnostic tools must be removed before operating the vehicle over the road.

NOTE: The SRS must be fully operational and free of faults before releasing the vehicle to the customer.

1 Deactivate the system. Refer to [Air Bag and Safety Belt Pretensioner Supplemental Restraint System \(SRS\)](#) in the Diagnosis and Testing portion of this section.

2 Check the driver seat side impact sensor electrical connector for a correct connection.

- Is the driver seat side impact sensor connected correctly?

→ **Yes**
GO to [P3](#).

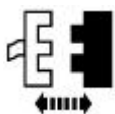
→ **No**
CONNECT the driver seat side impact sensor connector correctly. GO to [P10](#).

P3 CHECK THE CIRCUIT 7-JA39 (YE) FOR AN OPEN

1

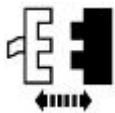


2



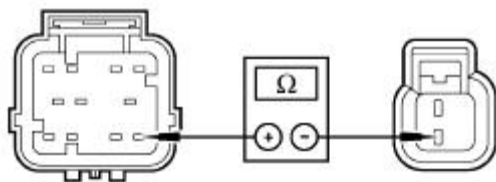
RCM C310

3



Driver Side Crash Sensor C305

4



DR1002-A

4 Measure the resistance between RCM C310b pin 8, circuit 7-JA39 (YE), harness side and driver seat side impact sensor C305, circuit 7-JA39 (YE), harness side.

- Is the resistance greater than

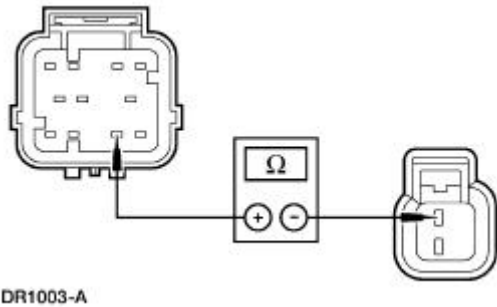
10,000 ohms?

→ **Yes**
REPAIR the circuit. GO to [P10](#).

→ **No**
GO to [P4](#).

P4 CHECK CIRCUIT 9-JA39 (BN) FOR AN OPEN

1



1

Measure the resistance between RCM C310b pin 9, circuit 9-JA39 (BN), harness side and driver seat side impact sensor C305, circuit 9-JA39 (BN), harness side.

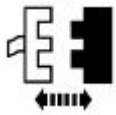
● **Is the resistance greater than 10,000 ohms?**

→ **Yes**
REPAIR the circuit. GO to [P10](#).

→ **No**
GO to [P5](#).

P5 CHECK CIRCUIT 7-JA39 (YE) FOR A SHORT TO GROUND

1

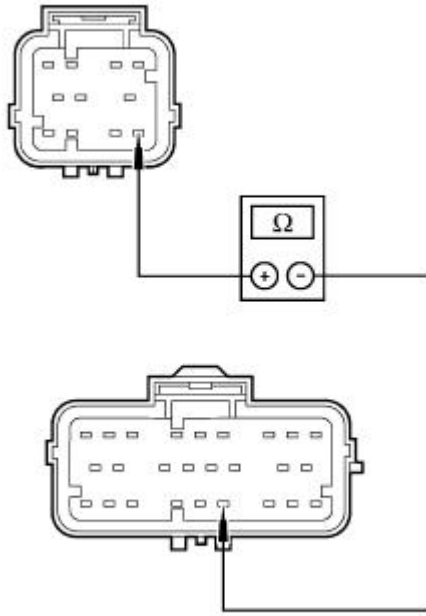


RCM C310a

2

2

Measure the resistance between RCM C310b pin 8, circuit 7-JA39 (YE), harness side and RCM C310a pin 21, circuit 31-JA10A (BK/RD), harness side.



DR1010-A

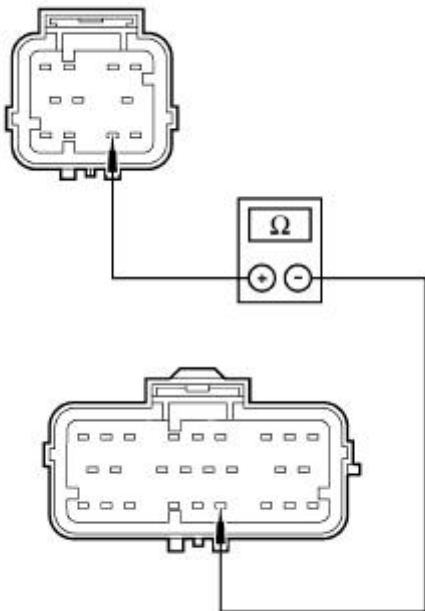
- Is the resistance less than 10,000 ohms?

→ **Yes**
REPAIR the circuit. GO to [P10](#).

→ **No**
GO to [P6](#).

P6 CHECK CIRCUIT 9-JA39 (BN) FOR A SHORT TO GROUND

1



DR1020-A

1

Measure the resistance between RCM C310b pin 9, circuit 9-JA39 (BN), harness side and RCM C310a pin 21, circuit 31-JA10A (BK/RD), harness side.

- Is the resistance less than 10,000 ohms?

→ **Yes**
REPAIR the circuit. GO to [P10](#).

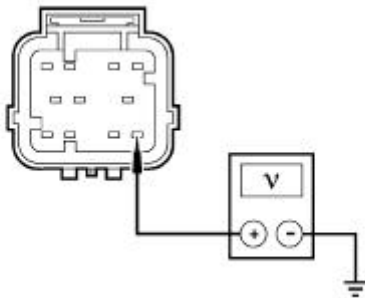
→ **No**
GO to [P7](#).

P7 CHECK CIRCUIT 7-JA39 (YE) FOR A SHORT TO BATTERY OR IGNITION

1



2



A0042307

2 Measure the voltage between RCM C310b pin 8, circuit 7-JA39 (YE), harness side and ground.

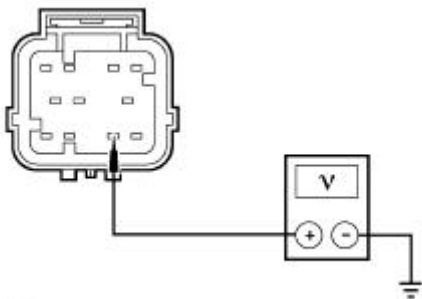
- Is the voltage less than 0.2 volt?

→ **Yes**
GO to [P8](#).

→ **No**
REPAIR the circuit. GO to [P10](#).

P8 CHECK CIRCUIT 9-JA39 (BN) FOR A SHORT TO BATTERY OR IGNITION

1



A0030433


1 Measure the voltage between RCM C310b pin 9, circuit 9-JA39 (BN), harness side and ground.

- Is the voltage less than 0.2 volt?

→ **Yes**
INSTALL a new driver seat side impact sensor. GO to [P10](#).

→ **No**
REPAIR the circuit. GO to [P10](#).

P9 CHECK FOR AN INTERMITTENT FAULT

 **WARNING:** If the supplemental restraint system (SRS) is being serviced, the system must be deactivated and restraint system diagnostic tools must be installed. Refer to [Air Bag and Safety Belt Pretensioner Supplemental Restraint System \(SRS\)](#) in this section.

The air bag restraint system diagnostic tools must be removed and the air bag modules reconnected when the system is reactivated to avoid non-deployment in a collision, resulting in possible personal injury.

NOTE: Diagnostics or repairs are not to be performed on a seat equipped with a seat side air bag with the seat in the vehicle. Prior to attempting to diagnose or repair a seat concern when equipped with a seat side air bag, the seat must be removed from the vehicle and the restraint system diagnostic tools must be installed in the seat side air bag electrical connectors. **The restraint system diagnostic tools must be removed prior to operating the vehicle over the road.**

NOTE: After diagnosing or repairing an SRS, the restraint system diagnostic tools must be removed before operating the vehicle over the road.

NOTE: After diagnosing or repairing a seat system, the restraint system diagnostic tools must be removed before operating the vehicle over the road.

NOTE: The SRS must be fully operational and free of faults before releasing the vehicle to the customer.

2



On-Demand Self Test

1 Deactivate the system. Refer to [Air Bag and Safety Belt Pretensioner Supplemental Restraint System \(SRS\)](#) in the Diagnosis and Testing portion of this section.

- Was DTC U2017 retrieved during the on-demand self test?

→ **Yes**
GO to [P2](#).

→ **No**
CHECK for causes of a communication fault. ATTEMPT to recreate the hard fault by flexing the wire harness and cycling the ignition key frequently. REPAIR any intermittent concerns found. GO to [P10](#).

P10 CHECK FOR ADDITIONAL DTCs

1 Refer to the continuous DTCs recorded during Step P1.

- Were any continuous DTCs retrieved during Step P1?

	<p>→ Yes Do not clear any DTCs until all DTCs have been resolved. GO to the Restraints Control Module (RCM) Diagnostic Trouble Code (DTC) Priority Table in this section for pinpoint test direction.</p> <p>→ No RECONNECT the system. REACTIVATE the system. PROVE OUT the system. REFER to Air Bag and Safety Belt Pretensioner Supplemental Restraint System (SRS) . CLEAR all DTCs.</p>
--	--

Pinpoint Test Q: LFC 45/DTC U2018 — Passenger Seat Side Impact Sensor Communication Fault

Normal Operation

The passenger seat side impact sensor monitors the severity of a crash event. If the crash is severe enough, the sensor will signal the restraints control module (RCM) to deploy the passenger seat side air bag.


The RCM monitors the two-wire current loop to the passenger seat side impact sensor for a signal that is out of the expected range. If the RCM detects an out-of-range signal from the passenger seat side impact sensor, indicating a sensor communication fault, it will store diagnostic trouble code (DTC) U2018 and flash a lamp fault code (LFC) 45 (or a higher priority code if one exists) on the air bag indicator.

Possible Causes

A passenger seat side impact sensor communication fault can be caused by:

- damaged wiring on circuit 7-JA40 (YE/VT).
- damaged wiring on circuit 9-JA40 (BN/WH).
- damaged passenger seat side impact sensor.

PINPOINT TEST Q: LFC LFC 45/DTC U2018 — PASSENGER SIDE IMPACT SENSOR COMMUNICATION FAULT

CONDITIONS	DETAILS/RESULTS/ACTIONS
Q1 CHECK FOR CONTINUOUS OR ON-DEMAND SELF TEST DTCs	
<p>1 </p> <p>Retrieve/Clear Continuous DTCs</p> <p>2</p>	<p>1 Retrieve and record any continuous DTCs for use later in this pinpoint test.</p>



On-Demand Self Test

- **Was DTC U2018 retrieved during the on-demand self test?**

→ **Yes**

This is a hard fault. The fault condition is still present. This fault cannot be cleared until it is corrected and the DTC is no longer retrieved during the on-demand self test. GO to [Q2](#).

→ **No**

This is an intermittent fault. The fault condition is not present at this time. GO to [Q9](#).

Q2 CHECK THE PASSENGER SIDE IMPACT SENSOR HARNESS CONNECTOR



WARNING: If the supplemental restraint system (SRS) is being serviced, the system must be deactivated and restraint system diagnostic tools must be installed. Refer to [Air Bag and Safety Belt Pretensioner Supplemental Restraint System \(SRS\)](#) in this section.

The air bag restraint system diagnostic tools must be removed and the air bag modules reconnected when the system is reactivated to avoid non-deployment in a collision, resulting in possible personal injury.

NOTE: Diagnostics or repairs are not to be performed on a seat equipped with a seat side air bag with the seat in the vehicle. Prior to attempting to diagnose or repair a seat concern when equipped with a seat side air bag, the seat must be removed from the vehicle and the restraint system diagnostic tools must be installed in the seat side air bag electrical connectors. **The restraint system diagnostic tools must be removed prior to operating the vehicle over the road.**

NOTE: After diagnosing or repairing an SRS, **the restraint system diagnostic tools must be removed before operating the vehicle over the road.**

NOTE: After diagnosing or repairing a seat system, **the restraint system diagnostic tools must be removed before operating the vehicle over the road.**

NOTE: The SRS must be fully operational and free of faults before releasing the vehicle to the customer.

1 Deactivate the system. Refer to [Air Bag and Safety Belt Pretensioner Supplemental Restraint System \(SRS\)](#) in the Diagnosis and Testing portion of this section.

2 Check the passenger seat side impact sensor electrical connector for a correct connection.

- **Is the passenger seat side impact sensor connected correctly?**

→ **Yes**

GO to [Q3](#).

→ **No**
CONNECT the passenger seat side impact sensor connector correctly. GO to [Q6](#).

Q3 CHECK CIRCUIT 7-JA40 (YE/VT) FOR AN OPEN

1



2



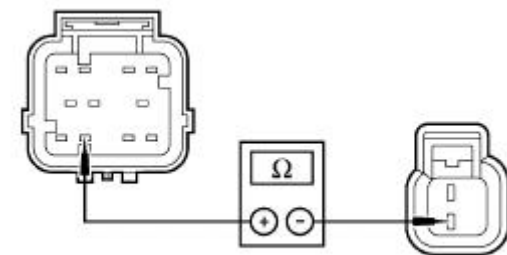
RCM C310

3



Passenger Side Crash Sensor C304

4



DR1004-A

4 Measure the resistance between RCM C310b pin 10, circuit 7-JA40 (YE/VT), harness side and passenger seat side impact sensor C304, circuit 7-JA40 (YE/VT), harness side.

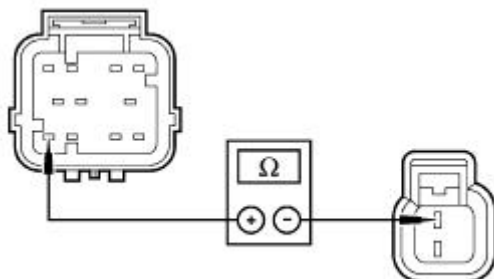
- Is the resistance greater than 10,000 ohms?

→ **Yes**
REPAIR the circuit. GO to [Q10](#).

→ **No**
GO to [Q4](#).

Q4 CHECK CIRCUIT 9-JA40 (BN/WH) FOR AN OPEN

1



DR1005-A

1 Measure the resistance between RCM C310b pin 11, circuit 9-JA40 (BN/WH), harness side and passenger seat side impact sensor C304, circuit 9-JA40 (BN/WH), harness side.

- Is the resistance greater than 10,000 ohms?

→ **Yes**
REPAIR the circuit. GO to [Q10](#).

→ **No**
GO to [Q5](#).

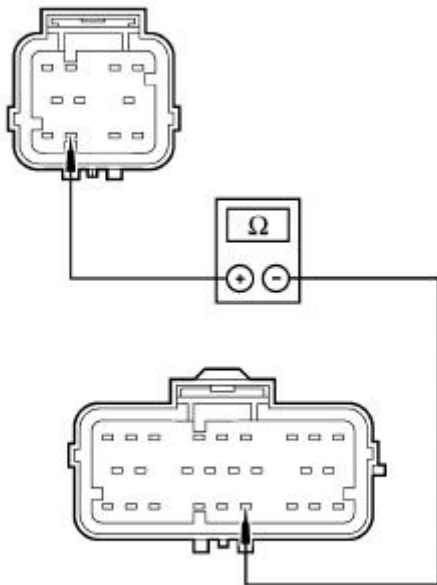
Q5 CHECK CIRCUIT 7-JA40 (YE/VT) FOR A SHORT TO GROUND

1



RCM C310a

2



DR1023-A

2 Measure the resistance between RCM C310b pin 10, circuit 7-JA40 (YE/VT), harness side and RCM C310a pin 21, circuit 31-JA10A (BK/RD), harness side.

- Is the resistance less than 10,000 ohms?

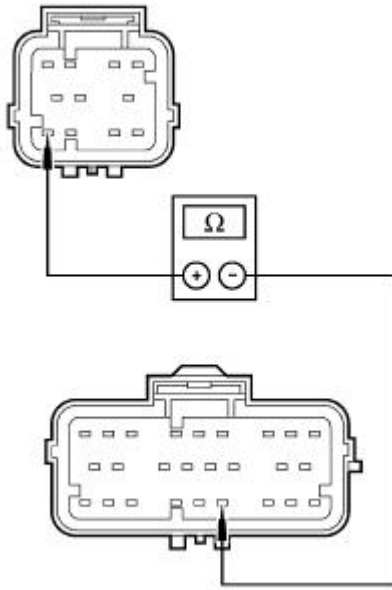
→ **Yes**
REPAIR the circuit. GO to [Q10](#).

→ **No**
GO to [Q6](#).

Q6 CHECK CIRCUIT 9-JA40 (BN/WH) FOR A SHORT TO GROUND

1

1 Measure the resistance between RCM C310b pin 11, circuit 9-JA40 (BN/WH), harness side and RCM C310a pin 21, circuit 31-JA10A (BK/RD), harness side.



DR1057-A

- Is the resistance less than 10,000 ohms?

→ **Yes**
REPAIR the circuit. GO to [Q10](#).

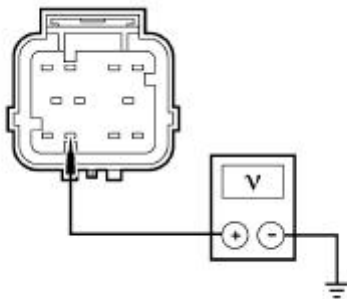
→ **No**
GO to [Q7](#).

Q7 CHECK CIRCUIT 7-JA40 (YE/VT) FOR A SHORT TO BATTERY OR IGNITION

1



2



A0042310

- 2 Measure the voltage between RCM C310b pin 10, circuit 7-JA40 (YE/VT), harness side and ground.

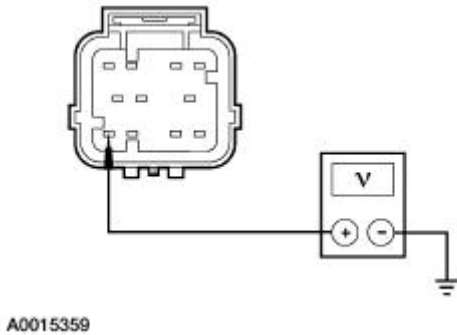
- Is the voltage less than 0.2 volt?

→ **Yes**
GO to [Q8](#).

→ **No**
REPAIR the circuit. GO to [Q10](#).

Q8 CHECK CIRCUIT 9-JA40 (BN/WH) FOR A SHORT TO BATTERY OR IGNITION

1



1 Measure the voltage between the RCM C310b pin 11, circuit 9-JA40 (BN/WH), harness side and ground.

● **Is the voltage less than 0.2 volt?**

→ **Yes**
INSTALL a new passenger seat side impact sensor. GO to [Q10](#).

→ **No**
REPAIR the circuit. GO to [Q10](#).

Q9 CHECK FOR AN INTERMITTENT FAULT

⚠ WARNING: If the supplemental restraint system (SRS) is being serviced, the system must be deactivated and restraint system diagnostic tools must be installed. Refer to [Air Bag and Safety Belt Pretensioner Supplemental Restraint System \(SRS\)](#) in this section.

The air bag restraint system diagnostic tools must be removed and the air bag modules reconnected when the system is reactivated to avoid non-deployment in a collision, resulting in possible personal injury.

NOTE: Diagnostics or repairs are not to be performed on a seat equipped with a seat side air bag with the seat in the vehicle. Prior to attempting to diagnose or repair a seat concern when equipped with a seat side air bag, the seat must be removed from the vehicle and the restraint system diagnostic tools must be installed in the seat side air bag electrical connectors. **The restraint system diagnostic tools must be removed prior to operating the vehicle over the road.**

NOTE: After diagnosing or repairing an SRS, the restraint system diagnostic tools must be removed before operating the vehicle over the road.

NOTE: After diagnosing or repairing a seat system, the restraint system diagnostic tools must be removed before operating the vehicle over the road.

NOTE: The SRS must be fully operational and free of faults before releasing the vehicle to the customer.

2



1 Deactivate the system. Refer to [Air Bag and Safety Belt Pretensioner Supplemental Restraint System \(SRS\)](#) in the Diagnosis and Testing portion of this section.

	<ul style="list-style-type: none"> ● Was DTC U2018 retrieved during the on-demand self test? <p>→ Yes GO to Q2.</p> <p>→ No CHECK for causes of a communication fault. ATTEMPT to recreate the hard fault by flexing the wire harness and cycling the ignition key frequently. REPAIR any intermittent concerns found. GO to Q10.</p>
Q10 CHECK FOR ADDITIONAL DTCs	
	<p>1 Refer to the continuous DTCs recorded during Step Q1.</p> <ul style="list-style-type: none"> ● Were any continuous DTCs retrieved during Step Q1? <p>→ Yes Do not clear any DTCs until all DTCs have been resolved. GO to the Restraints Control Module (RCM) Diagnostic Trouble Code (DTC) Priority Table in this section for pinpoint test direction.</p> <p>→ No RECONNECT the system. REACTIVATE the system. PROVE OUT the system. REFER to Air Bag and Safety Belt Pretensioner Supplemental Restraint System (SRS). CLEAR all DTCs.</p>

Pinpoint Test R: LFC 36/DTC B1993 — Driver Seat Side Air Bag Circuit Shorted to Ground

Normal Operation




The restraints control module (RCM) monitors the resistance to ground at RCM C310b pins 2 and 3. If the resistance is less than 10,000 ohms at either pin, the RCM will interpret that as a ground short, store diagnostic trouble code (DTC) B1993 and flash lamp fault code (LFC) 36.

Possible Causes

A driver seat side air bag circuit short to ground can be caused by:

- grounded wiring on circuit 30S-JA37 (RD/GN).
- damaged wiring on circuit 31S-JA37 (BK/GN).
- ground short in the driver seat side air bag module.
- RCM is faulted.

PINPOINT TEST R: LFC 36/DTC B1993 — DRIVER SIDE AIR BAG CIRCUIT SHORTED TO GROUND

CONDITIONS	DETAILS/RESULTS/ACTIONS
R1 CHECK FOR A HARD OR INTERMITTENT DTC	
<p>1  Retrieve/Clear Continuous DTCs</p> <p>2  On-Demand Self Test</p>	<p>1 Retrieve and record any continuous DTCs for use later in this pinpoint test.</p> <p>● Was DTC B1993 retrieved during the on-demand self test?</p> <p>→ Yes This is a hard fault. The fault condition is still present. This fault cannot be cleared until it is corrected and the DTC is no longer retrieved during the on-demand self test. GO to R2.</p> <p>→ No This is an intermittent fault. The fault condition is not present at this time. GO to R5.</p>
R2 CHECK THE DRIVER SIDE AIR BAG MODULE	
<p> WARNING: If the supplemental restraint system (SRS) is being serviced, the system must be deactivated and restraint system diagnostic tools must be installed. Refer to Air Bag and Safety Belt Pretensioner Supplemental Restraint System (SRS) in this section.</p> <p>The air bag restraint system diagnostic tools must be removed and the air bag modules reconnected when the system is reactivated to avoid non-deployment in a collision, resulting in possible personal injury.</p> <p>NOTE: Diagnostics or repairs are not to be performed on a seat equipped with a seat side air bag with the seat in the vehicle. Prior to attempting to diagnose or repair a seat concern when equipped with a seat side air bag, the seat must be removed from the vehicle and the restraint system diagnostic tools must be installed in the seat side air bag electrical connectors. The restraint system diagnostic tools must be removed prior to operating the vehicle over the road.</p> <p>NOTE: After diagnosing or repairing an SRS, the restraint system diagnostic tools must be removed before operating the vehicle over the road.</p> <p>NOTE: After diagnosing or repairing a seat system, the restraint system diagnostic tools must be removed before operating the vehicle over the road.</p> <p>NOTE: The SRS must be fully operational and free of faults before releasing the vehicle to the customer.</p>	
<p>1</p>	



3



On-Demand Self Test

- 2 Deactivate the system. Refer to [Air Bag and Safety Belt Pretensioner Supplemental Restraint System \(SRS\)](#) in the Diagnosis and Testing portion of this section.

● Was DTC B1993 retrieved?

- Yes
GO to [R3](#).
- No
INSTALL a new driver seat side air bag module. GO to [R6](#).

R3 CHECK THE DRIVER SIDE AIR BAG MODULE CIRCUITS

1



2



RCM C310b

3

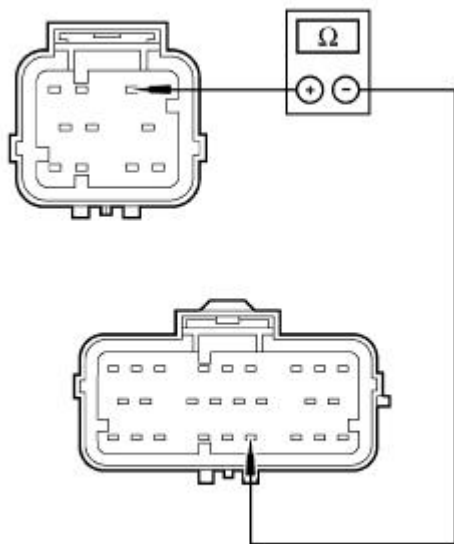


RCM C310a

4

- 4 **NOTE:** Do not separate or remove shorting bars from RCM C310b.

Measure the resistance between RCM C310b pin 2, circuit 30S-JA37 (RD/GN), harness side and RCM C310a pin 21, circuit 31-JA10A (BK/RD), harness side.



DR1011-A

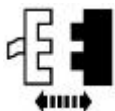
- Is the resistance less than 10,000 ohms?

→ **Yes**
REPAIR the circuit(s) as necessary. GO to [R6](#).

→ **No**
GO to [R4](#).

R4 CHECK THE WIRING TO DRIVER SIDE AIR BAG MODULE

1



Driver Side Air Bag Module Restraint System Diagnostic Tool

2

Inspect all crimps, terminals, wires and connectors in circuit 30S-JA37 (RD/GN) between the driver seat side air bag module connector C367 and RCM C310b pin 2 and circuit 31S-JA37 (BK/GN) between the driver seat side air bag module connector C367 and RCM C310b pin 3. Check for pinched wires and damaged connector pin terminals.

- Was any damage found?

→ **Yes**
REPAIR as necessary. GO to [R6](#).

→ **No**
INSTALL a new RCM. GO to [R6](#).

R5 CHECK FOR AN INTERMITTENT FAULT



WARNING: If the supplemental restraint system (SRS) is being serviced, the system must be deactivated and restraint system diagnostic tools must be installed. Refer to [Air Bag and Safety Belt Pretensioner Supplemental Restraint System \(SRS\)](#) in this section.

The air bag restraint system diagnostic tools must be removed and the air bag modules reconnected when the system is reactivated to avoid non-deployment in a collision, resulting in possible personal injury.

NOTE: Diagnostics or repairs are not to be performed on a seat equipped with a seat side air bag with the seat in the vehicle. Prior to attempting to diagnose or repair a seat concern when equipped with a seat side air bag, the seat must be removed from the vehicle and the restraint system diagnostic tools must be installed in the seat side air bag electrical connectors. **The restraint system diagnostic tools must be removed prior to operating the vehicle over the road.**

NOTE: After diagnosing or repairing an SRS, the restraint system diagnostic tools must be removed before operating the vehicle over the road.

NOTE: After diagnosing or repairing a seat system, the restraint system diagnostic tools must be removed before operating the vehicle over the road.

NOTE: The SRS must be fully operational and free of faults before releasing the vehicle to the customer.

1



3



On-Demand Self Test

2

Deactivate the system. Refer to [Air Bag and Safety Belt Pretensioner Supplemental Restraint System \(SRS\)](#) in the Diagnosis and Testing portion of this section.

● **Was DTC B1993 retrieved during the on-demand self test?**

→ **Yes**

CHECK for causes of intermittent fault at or near the driver air bag module connector. REPAIR any intermittent concerns found.

If an intermittent concern **was** found and repaired, GO to [R6](#).

If an intermittent concern **was not** found, GO to [R3](#).

→ **No**

CHECK for causes of intermittent short to battery or ignition on circuits 30S-JA8 (RD/OG) and 31S-JA8 (BK/OG) and the clockspring. ATTEMPT to recreate the

	hard fault by flexing the wire harness and cycling the key frequently. REPAIR any intermittent concern found. GO to R6 .
R6 CHECK FOR ADDITIONAL DTCs	
	<p>1 Refer to the continuous DTCs recorded during Step R1.</p> <ul style="list-style-type: none"> ● Were any continuous DTCs retrieved during Step R1? <p>→ Yes Do not clear any DTCs until all DTCs have been resolved. GO to the Restraints Control Module (RCM) Diagnostic Trouble Code (DTC) Priority Table in this section for pinpoint test direction.</p> <p>→ No RECONNECT the system. REACTIVATE the system. PROVE OUT the system. REFER to Air Bag and Safety Belt Pretensioner Supplemental Restraint System (SRS). CLEAR all DTCs.</p>

Pinpoint Test S: LFC 37/DTC B1997 — Passenger Seat Side Air Bag Circuit Shorted to Ground

Normal Operation


The restraints control module (RCM) monitors the resistance to ground at RCM C310b pins 5 and 6. If the resistance is less than 10,000 ohms at either pin, the RCM will interpret that as a ground short, store diagnostic trouble code (DTC) B1997 and flash lamp fault code (LFC) 37.

Possible Causes

A passenger seat side air bag circuit short to ground can be caused by:

- grounded wiring on circuit 30S-JA38 (RD/BK).
- damaged wiring on circuit 31S-JA38 (BK/RD).
- ground short in the passenger seat side air bag module.
- RCM is faulted.

PINPOINT TEST S: LFC 37/DTC B1997 — PASSENGER SEAT SIDE AIR BAG CIRCUIT SHORTED TO GROUND

CONDITIONS	DETAILS/RESULTS/ACTIONS
S1 CHECK FOR A HARD OR INTERMITTENT DTC	
<p>1</p> 	<p>1 Retrieve and record any continuous DTCs for use later in this pinpoint test.</p>

Retrieve/Clear Continuous DTCs

2



On-Demand Self Test

● Was DTC B1997 retrieved during the on-demand self test?

→ Yes

This is a hard fault. The fault condition is still present. This fault cannot be cleared until it is corrected and the DTC is no longer retrieved during the on-demand self test. GO to [S2](#).

→ No

This is an intermittent fault. The fault condition is not present at this time. GO to [S5](#).

S2 CHECK THE PASSENGER SEAT SIDE AIR BAG MODULE



WARNING: If the supplemental restraint system (SRS) is being serviced, the system must be deactivated and restraint system diagnostic tools must be installed. Refer to [Air Bag and Safety Belt Pretensioner Supplemental Restraint System \(SRS\)](#) in this section.

The air bag restraint system diagnostic tools must be removed and the air bag modules reconnected when the system is reactivated to avoid non-deployment in a collision, resulting in possible personal injury.

NOTE: Diagnostics or repairs are not to be performed on a seat equipped with a seat side air bag with the seat in the vehicle. Prior to attempting to diagnose or repair a seat concern when equipped with a seat side air bag, the seat must be removed from the vehicle and the restraint system diagnostic tools must be installed in the seat side air bag electrical connectors. **The restraint system diagnostic tools must be removed prior to operating the vehicle over the road.**

NOTE: After diagnosing or repairing an SRS, the restraint system diagnostic tools must be removed before operating the vehicle over the road.

NOTE: After diagnosing or repairing a seat system, the restraint system diagnostic tools must be removed before operating the vehicle over the road.

NOTE: The SRS must be fully operational and free of faults before releasing the vehicle to the customer.

1



3

2 Deactivate the system. Refer to [Air Bag and Safety Belt Pretensioner Supplemental Restraint System \(SRS\)](#) in the Diagnosis and Testing portion of this section.



On-Demand Self Test

● Was DTC B1997 retrieved?

→ Yes

GO to [S3](#).

→ No

INSTALL a new passenger seat side air bag module. GO to [S6](#).

S3 CHECK THE PASSENGER SEAT SIDE AIR BAG MODULE CIRCUITS

1



2



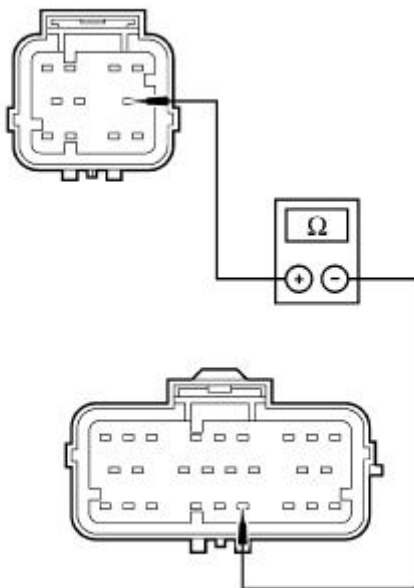
RCM C310b

3



RCM C310a

4



4

Measure the resistance between RCM C310b pin 5, circuit 30S-JA38 (RD/BK), harness side and RCM C310a pin 21, circuit 31-JA10A (BK/RD), harness side.

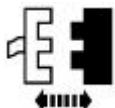
● Is the resistance less than 10,000 ohms?

→ **Yes**
REPAIR the circuit(s) as necessary. GO to [S6](#).

→ **No**
GO to [S4](#).

S4 CHECK THE WIRING TO THE PASSENGER SEAT SIDE AIR BAG MODULE

1



Passenger Seat Side Air Bag Module Restraint System Diagnostic Tool

2 Inspect all crimps, terminals, wires and connectors in circuit 30S-JA38 (RD/BK) between the passenger seat side air bag module connector C314 and RCM C310b pin 5 and circuit 31S-JA38 (BK/RD) between the passenger seat side air bag module connector C314 and RCM C310b pin 6. Check for pinched wires and damaged connector pin terminals.

● Was any damage found?

→ **Yes**
REPAIR as necessary. GO to [S6](#).

→ **No**
INSTALL a new RCM. GO to [S6](#).

S5 CHECK FOR AN INTERMITTENT FAULT



WARNING: If the supplemental restraint system (SRS) is being serviced, the system must be deactivated and restraint system diagnostic tools must be installed. Refer to [Air Bag and Safety Belt Pretensioner Supplemental Restraint System \(SRS\)](#) in this section.

The air bag restraint system diagnostic tools must be removed and the air bag modules reconnected when the system is reactivated to avoid non-deployment in a collision, resulting in possible personal injury.

NOTE: Diagnostics or repairs are not to be performed on a seat equipped with a seat side air bag with the seat in the vehicle. Prior to attempting to diagnose or repair a seat concern when equipped with a seat side air bag, the seat must be removed from the vehicle and the restraint system diagnostic tools must be installed in the seat side air bag electrical connectors. **The restraint system diagnostic tools must be removed prior to operating the vehicle over the road.**

NOTE: After diagnosing or repairing an SRS, **the restraint system diagnostic tools must be removed before operating the vehicle over the road.**

NOTE: After diagnosing or repairing a seat system, **the restraint system diagnostic tools must be removed before operating the vehicle over the road.**

NOTE: The SRS must be fully operational and free of faults before releasing the vehicle to the customer.

1



3



On-Demand Self Test

2 Deactivate the system. Refer to [Air Bag and Safety Belt Pretensioner Supplemental Restraint System \(SRS\)](#) in the Diagnosis and Testing portion of this section.

● **Was DTC B1997 retrieved during the on-demand self test?**

→ **Yes**

CHECK for causes of intermittent fault at or near the passenger seat air bag module connector. REPAIR any intermittent concerns found.

If an intermittent concern **was** found and repaired, GO to [S6](#).

If an intermittent concern **was not** found, GO to [S3](#).

→ **No**

CHECK for causes of intermittent short to ground on circuits 30S-JA38 (RD/BK) and 31S-JA38 (BK/RD). ATTEMPT to recreate the hard fault by flexing the wire harness and cycling the key frequently. REPAIR any intermittent concern found. GO to [S6](#).

S6 CHECK FOR ADDITIONAL DTCs

1 Refer to the continuous DTCs recorded during Step S1.

● **Were any continuous DTCs retrieved during Step S1?**

→ **Yes**

Do not clear any DTCs until all DTCs have been resolved. GO to the Restraints Control Module (RCM) Diagnostic Trouble Code (DTC) Priority Table in this section for pinpoint test direction.

→ **No**

RECONNECT the system. REACTIVATE the system. PROVE OUT the system.

REFER to [Air Bag and Safety Belt Pretensioner Supplemental Restraint System \(SRS\)](#). CLEAR all DTCs.

Pinpoint Test T: LFC 36/DTC B1992 — Driver Seat Side Air Bag Circuit Shorted to Battery or Ignition

Normal Operation



The restraints control module (RCM) monitors the driver seat side air bag circuits at RCM C310b pins 2 and 3 for a short to battery or ignition. If battery or ignition voltage is detected, the RCM will store diagnostic trouble code (DTC) B1992 and flash lamp fault code (LFC) 36.

Possible Causes

A driver seat side air bag circuit short to battery or ignition can be caused by:

- battery or ignition voltage on circuit 30S-JA38 (RD/BK).
- battery or ignition voltage on circuit 31S-JA38 (BK/RD).
- battery or ignition voltage short in the driver seat side air bag module.
- RCM is faulted.

PINPOINT TEST T: LFC 36/DTC B1992 — DRIVER SEAT SIDE AIR BAG CIRCUIT SHORTED TO BATTERY OR IGNITION

CONDITIONS	DETAILS/RESULTS/ACTIONS
T1 CHECK FOR A HARD OR INTERMITTENT DTC	
<p>1  Retrieve/Clear Continuous DTCs</p> <p>2  On-Demand Self Test</p>	<p>1 Retrieve and record any continuous DTCs for use later in this pinpoint test.</p> <p>● Was DTC B1992 retrieved during the on-demand self test?</p> <p>→ Yes This is a hard fault. The fault condition is still present. This fault cannot be cleared until it is corrected and the DTC is no longer retrieved during the on-demand self test. GO to T2.</p> <p>→ No This is an intermittent fault. The fault</p>

condition is not present at this time. GO to [T5](#).

T2 CHECK THE DRIVER SEAT SIDE AIR BAG MODULE



WARNING: If the supplemental restraint system (SRS) is being serviced, the system must be deactivated and restraint system diagnostic tools must be installed. Refer to [Air Bag and Safety Belt Pretensioner Supplemental Restraint System \(SRS\)](#) in this section.

The air bag restraint system diagnostic tools must be removed and the air bag modules reconnected when the system is reactivated to avoid non-deployment in a collision, resulting in possible personal injury.

NOTE: Diagnostics or repairs are not to be performed on a seat equipped with a seat side air bag with the seat in the vehicle. Prior to attempting to diagnose or repair a seat concern when equipped with a seat side air bag, the seat must be removed from the vehicle and the restraint system diagnostic tools must be installed in the seat side air bag electrical connectors. **The restraint system diagnostic tools must be removed prior to operating the vehicle over the road.**

NOTE: After diagnosing or repairing an SRS, **the restraint system diagnostic tools must be removed before operating the vehicle over the road.**

NOTE: After diagnosing or repairing a seat system, **the restraint system diagnostic tools must be removed before operating the vehicle over the road.**

NOTE: The SRS must be fully operational and free of faults before releasing the vehicle to the customer.

1



3



On-Demand Self Test

2

Deactivate the system. Refer to [Air Bag and Safety Belt Pretensioner Supplemental Restraint System \(SRS\)](#) in the Diagnosis and Testing portion of this section.

● Was DTC B1992 retrieved?

→ **Yes**
GO to [T3](#).

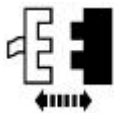
→ **No**
INSTALL a new driver seat side air bag module. GO to [T6](#).

T3 CHECK THE DRIVER SEAT SIDE AIR BAG MODULE CIRCUITS

1



2



Driver Seat Side Air Bag Module Restraint System Diagnostic Tool

3

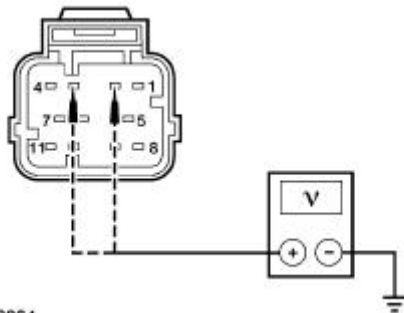


RCM C310b

4



5



5 **NOTE:** Do not separate or remove shorting bars from RCM C310b.

Measure the voltage between RCM C310b pin 2, circuit 30S-JA37 (RD/GN), harness side and ground; and between RCM C310b pin 3, circuit 31S-JA37 (BK/GN) harness side and ground.

● **Are the voltages less than 0.2 volt?**

→ **Yes**
GO to [T4](#).

→ **No**
REPAIR the circuit(s) as necessary. GO to [T6](#).

T4 CHECK THE WIRING TO THE DRIVER SEAT SIDE AIR BAG MODULE

1 Inspect all crimps, terminals, wires and connectors in circuit 30S-JA37 (RD/GN) between the driver seat side air bag module connector C367 and RCM C310b pin 2 and circuit 31S-JA37 (BK/GN) between the driver seat side air bag module connector C367 and RCM C310b pin 3. Check for pinched wires and damaged connector pin terminals.

● **Was any damage found?**

→ **Yes**
REPAIR as necessary. GO to [T6](#).

→ **No**
INSTALL a new RCM. GO to [T6](#).

T5 CHECK FOR AN INTERMITTENT FAULT



WARNING: If the supplemental restraint system (SRS) is being serviced, the system must be deactivated and restraint system diagnostic tools must be installed. Refer to [Air Bag and Safety Belt Pretensioner Supplemental Restraint System \(SRS\)](#) in this section.

The air bag restraint system diagnostic tools must be removed and the air bag modules reconnected when the system is reactivated to avoid non-deployment in a collision, resulting in possible personal injury.

NOTE: Diagnostics or repairs are not to be performed on a seat equipped with a seat side air bag with the seat in the vehicle. Prior to attempting to diagnose or repair a seat concern when equipped with a seat side air bag, the seat must be removed from the vehicle and the restraint system diagnostic tools must be installed in the seat side air bag electrical connectors. **The restraint system diagnostic tools must be removed prior to operating the vehicle over the road.**

NOTE: After diagnosing or repairing an SRS, the restraint system diagnostic tools must be removed before operating the vehicle over the road.

NOTE: After diagnosing or repairing a seat system, the restraint system diagnostic tools must be removed before operating the vehicle over the road.

NOTE: The SRS must be fully operational and free of faults before releasing the vehicle to the customer.

1



3



On-Demand Self Test

2

Deactivate the system. Refer to [Air Bag and Safety Belt Pretensioner Supplemental Restraint System \(SRS\)](#) in the Diagnosis and Testing portion of this section.

- Was DTC B1992 retrieved during the on-demand self test?

→ **Yes**

CHECK for causes of intermittent fault at or near the driver seat air bag module connector. REPAIR any intermittent concerns found.

If an intermittent concern **was** found and repaired, GO to [T6](#).

If an intermittent concern **was not** found, GO to [T3](#).

→ **No**

CHECK for causes of intermittent short to battery or ignition on circuits 30S-JA37 (RD/GN) and 31S-JA37 (BK/GN). ATTEMPT to recreate the hard fault by

	flexing the wire harness and cycling the key frequently. REPAIR any intermittent concern found. GO to T6 .
T6 CHECK FOR ADDITIONAL DTCs	
	<p>1 Refer to the continuous DTCs recorded during Step V1.</p> <ul style="list-style-type: none"> ● Were any continuous DTCs retrieved during Step V1? <p>→ Yes Do not clear any DTCs until all DTCs have been resolved. GO to the Restraints Control Module (RCM) Diagnostic Trouble Code (DTC) Priority Table in this section for pinpoint test direction.</p> <p>→ No RECONNECT the system. REACTIVATE the system. PROVE OUT the system. REFER to Air Bag and Safety Belt Pretensioner Supplemental Restraint System (SRS). CLEAR all DTCs.</p>

Pinpoint Test U: LFC 37/DTC B1996 — Passenger Seat Side Air Bag Circuit Shorted to Battery or Ignition

Normal Operation

The restraints control module (RCM) monitors the passenger seat side air bag circuits at RCM C310b pins 5 and 6 for a short to battery or ignition. If battery or ignition voltage is detected, the RCM will store diagnostic trouble code (DTC) B1996 and flash lamp fault code (LFC) 37.

Possible Causes:

A passenger seat side air bag circuit short to battery or ignition can be caused by:

- battery or ignition voltage on circuit 30S-JA38 (RD/BK).
- battery or ignition voltage on circuit 31S-JA38 (BK/RD).
- battery or ignition voltage short in the passenger seat side air bag module.
- RCM is faulted.

PINPOINT TEST U: LFC 37/DTC B1996 — PASSENGER SEAT SIDE AIR BAG CIRCUIT SHORTED TO BATTERY OR IGNITION

CONDITIONS	DETAILS/RESULTS/ACTIONS
U1 CHECK FOR A HARD OR INTERMITTENT DTC	
1	1 Retrieve and record any continuous DTCs for use later in this pinpoint test.



Retrieve/Clear Continuous DTCs

2



On-Demand Self Test

- Was DTC B1996 retrieved during the on-demand self test?

→ Yes

This is a hard fault. The fault condition is still present. This fault cannot be cleared until it is corrected and the DTC is no longer retrieved during the on-demand self test. GO to [U2](#).

→ No

This is an intermittent fault. The fault condition is not present at this time. GO to [U5](#).

U2 CHECK THE PASSENGER SIDE AIR BAG MODULE



WARNING: If the supplemental restraint system (SRS) is being serviced, the system must be deactivated and restraint system diagnostic tools must be installed. Refer to [Air Bag and Safety Belt Pretensioner Supplemental Restraint System \(SRS\)](#) in this section.

The air bag restraint system diagnostic tools must be removed and the air bag modules reconnected when the system is reactivated to avoid non-deployment in a collision, resulting in possible personal injury.

NOTE: Diagnostics or repairs are not to be performed on a seat equipped with a seat side air bag with the seat in the vehicle. Prior to attempting to diagnose or repair a seat concern when equipped with a seat side air bag, the seat must be removed from the vehicle and the restraint system diagnostic tools must be installed in the seat side air bag electrical connectors. **The restraint system diagnostic tools must be removed prior to operating the vehicle over the road.**

NOTE: After diagnosing or repairing an SRS, **the restraint system diagnostic tools must be removed before operating the vehicle over the road.**

NOTE: After diagnosing or repairing a seat system, **the restraint system diagnostic tools must be removed before operating the vehicle over the road.**

NOTE: The SRS must be fully operational and free of faults before releasing the vehicle to the customer.

1



- 2 Deactivate the system. Refer to [Air Bag and Safety Belt Pretensioner Supplemental Restraint System \(SRS\)](#) in the Diagnosis and Testing portion of this section.

3



On-Demand Self Test

● Was DTC B1996 retrieved?

→ Yes
GO to [U3](#).

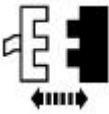
→ No
INSTALL a new passenger seat side air bag module. GO to [U6](#).

U3 CHECK THE PASSENGER SEAT SIDE AIR BAG MODULE CIRCUITS

1

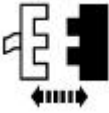


2



Passenger Seat Side Air Bag Module Restraint System Diagnostic Tool

3

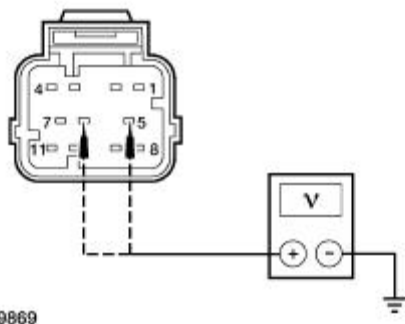


RCM C310b

4



5



A0029869

5 Measure the voltage between RCM C310b pin 5, circuit 30S-JA38 (RD/BK), harness side and ground; between RCM C310b pin 6, circuit 31S-JA38 (BK/RD), harness side and ground.

● Are the voltages less than 0.2 volt?

→ Yes
GO to [U4](#).

→ **No**
REPAIR the circuit(s) as necessary. GO to [U6](#).

U4 CHECK THE WIRING TO THE PASSENGER SEAT SIDE AIR BAG MODULE


1 Inspect all crimps, terminals, wires and connectors in circuit 30S-JA38 (RD/BK) between the passenger air bag module connector C337 and RCM C310b pin 5 and circuit 31S-JA38 (BK/RD) between the passenger air bag module connector C337 and RCM C310b pin 6. Check for pinched wires and damaged connector pin terminals.

● **Was any damage found?**

→ **Yes**
REPAIR as necessary. GO to [U6](#).

→ **No**
INSTALL a new RCM. GO to [U6](#).

U5 CHECK FOR AN INTERMITTENT FAULT

 **WARNING:** If the supplemental restraint system (SRS) is being serviced, the system must be deactivated and restraint system diagnostic tools must be installed. Refer to [Air Bag and Safety Belt Pretensioner Supplemental Restraint System \(SRS\)](#) in this section.

The air bag restraint system diagnostic tools must be removed and the air bag modules reconnected when the system is reactivated to avoid non-deployment in a collision, resulting in possible personal injury.

NOTE: Diagnostics or repairs are not to be performed on a seat equipped with a seat side air bag with the seat in the vehicle. Prior to attempting to diagnose or repair a seat concern when equipped with a seat side air bag, the seat must be removed from the vehicle and the restraint system diagnostic tools must be installed in the seat side air bag electrical connectors. **The restraint system diagnostic tools must be removed prior to operating the vehicle over the road.**

NOTE: After diagnosing or repairing an SRS, **the restraint system diagnostic tools must be removed before operating the vehicle over the road.**

NOTE: After diagnosing or repairing a seat system, **the restraint system diagnostic tools must be removed before operating the vehicle over the road.**

NOTE: The SRS must be fully operational and free of faults before releasing the vehicle to the customer.

1



3

2 Deactivate the system. Refer to [Air Bag and Safety Belt Pretensioner Supplemental Restraint System \(SRS\)](#) in the Diagnosis and Testing portion of this section.



On-Demand Self Test

- **Was DTC B1996 retrieved during the on-demand self test?**

→ **Yes**

CHECK for causes of intermittent fault at or near the passenger seat air bag module connector. REPAIR any intermittent concerns found.

If an intermittent concern **was** found and repaired, GO to [U6](#).

If an intermittent concern **was not** found, GO to [U3](#).

→ **No**

CHECK for causes of intermittent short to battery or ignition on circuits 30S-JA38 (RD/BK) and 31S-JA38 (BK/RD). ATTEMPT to recreate the hard fault by flexing the wire harness and cycling the key frequently. REPAIR any intermittent concern found. GO to [U6](#).

U6 CHECK FOR ADDITIONAL DTCs

1 Refer to the continuous DTCs recorded during Step U1.

- **Were any continuous DTCs retrieved during Step U1?**

→ **Yes**

Do not clear any DTCs until all DTCs have been resolved. GO to the Restraints Control Module (RCM) Diagnostic Trouble Code (DTC) Priority Table in this section for pinpoint test direction.

→ **No**

RECONNECT the system. REACTIVATE the system. PROVE OUT the system. REFER to [Air Bag and Safety Belt Pretensioner Supplemental Restraint System \(SRS\)](#). CLEAR all DTCs.

Pinpoint Test V: LFC 36/DTC B1994 — Driver Seat Side Air Bag Circuit Resistance High

Normal Operation




The restraints control module (RCM) monitors the resistance of the driver seat side air bag circuit loop and the air bag module igniter at RCM C301b pins 2 and 3. If the resistance is greater than 3.6 ohms, the RCM will store diagnostic trouble code (DTC) B1994 and flash lamp fault code (LFC) 36.

Possible Causes

A high resistance on the driver seat side air bag circuit can be caused by:

- damaged wiring on circuit 30S-JA37 (RD/GN).
- damaged wiring on circuit 31S-JA37 (BK/GN).
- damaged driver seat side air bag module.
- RCM is faulted.

PINPOINT TEST V: LFC 36/DTC B1994 — DRIVER SEAT SIDE AIR BAG CIRCUIT RESISTANCE HIGH

CONDITIONS	DETAILS/RESULTS/ACTIONS
V1 CHECK FOR A HARD OR INTERMITTENT DTC	
<p>1  Retrieve/Clear Continuous DTCs</p> <p>2  On-Demand Self Test</p>	<p>1 Retrieve and record any continuous DTCs for use later in this pinpoint test.</p> <p>● Was DTC B1994 retrieved during the on-demand self test?</p> <p>→ Yes This is a hard fault. The fault condition is still present. This fault cannot be cleared until it is corrected and the DTC is no longer retrieved during the on-demand self test. GO to V2.</p> <p>→ No This is an intermittent fault. The fault condition is not present at this time. GO to V5.</p>
V2 CHECK THE DRIVER SEAT SIDE AIR BAG MODULE	
<p>1 </p>	<p>2 Deactivate the system. Refer to Air Bag and Safety Belt Pretensioner Supplemental Restraint System (SRS) in the Diagnosis and Testing portion of this section.</p>

3



On-Demand Self Test

● Was DTC B1994 retrieved?

→ Yes

GO to [V3](#).

→ No

INSTALL a new driver seat side air bag module. GO to [V6](#).

V3 CHECK THE DRIVER SEAT SIDE AIR BAG MODULE CIRCUITS

1



2



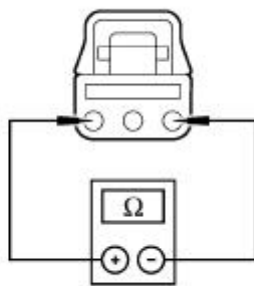
RCM C310b

3



Driver Side Air Bag Module Restraint System Diagnostic Tool

4



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4

NOTE: By disconnecting RCM C310b, circuit 30S-JA37 (RD/GN) and circuit 31S-JA37 (BK/GN) of the RCM connector are shorted together with a shorting bar. Do not remove the shorting bar.

Measure the resistance between driver seat side air bag C367, circuit 30S-JA37 (RD/GN), harness side and driver seat side air bag C367, circuit 31S-JA37 (BK/GN), harness side.

● Is the resistance greater than 1.0 ohm?

→ Yes

REPAIR the circuit(s) as necessary. GO to [V6](#).

→ No

GO to [V4](#).

V4 CHECK THE WIRING TO THE DRIVER SEAT SIDE AIR BAG MODULE


1 Inspect all crimps, terminals, wires and connectors in circuit 30S-JA37 (RD/GN) between the driver seat side air bag module connector C367 and RCM C310b pin 2 and circuit 31S-JA37 (BK/GN) between the driver seat side air bag module connector C367 and RCM C310b pin 3. Check for pinched wires and damaged connector pin terminals.

● Was any damage found?

→ Yes
REPAIR as necessary. GO to [V6](#).

→ No
INSTALL a new RCM. GO to [V6](#).

V5 CHECK FOR AN INTERMITTENT FAULT

 **WARNING:** If the supplemental restraint system (SRS) is being serviced, the system must be deactivated and restraint system diagnostic tools must be installed. Refer to [Air Bag and Safety Belt Pretensioner Supplemental Restraint System \(SRS\)](#) in this section.

The air bag restraint system diagnostic tools must be removed and the air bag modules reconnected when the system is reactivated to avoid non-deployment in a collision, resulting in possible personal injury.

NOTE: Diagnostics or repairs are not to be performed on a seat equipped with a seat side air bag with the seat in the vehicle. Prior to attempting to diagnose or repair a seat concern when equipped with a seat side air bag, the seat must be removed from the vehicle and the restraint system diagnostic tools must be installed in the seat side air bag electrical connectors. **The restraint system diagnostic tools must be removed prior to operating the vehicle over the road.**

NOTE: After diagnosing or repairing an SRS, **the restraint system diagnostic tools must be removed before operating the vehicle over the road.**

NOTE: After diagnosing or repairing a seat system, **the restraint system diagnostic tools must be removed before operating the vehicle over the road.**

NOTE: The SRS must be fully operational and free of faults before releasing the vehicle to the customer.

1



3



On-Demand Self Test

2 Deactivate the system. Refer to [Air Bag and Safety Belt Pretensioner Supplemental Restraint System \(SRS\)](#) in the Diagnosis and Testing portion of this section.

● Was DTC B1994 retrieved during the on-demand self test?

	<p>→ Yes CHECK for causes of intermittent fault at or near the driver seat air bag module connector. REPAIR any intermittent concerns found.</p> <p>If an intermittent concern was found and repaired, GO to V6.</p> <p>If an intermittent concern was not found, GO to V3.</p> <p>→ No CHECK for causes of intermittent high resistance on circuits 30S-JA37 (RD/GN) and 31S-JA37 (BK/GN). ATTEMPT to recreate the hard fault by flexing the wire harness and cycling the key frequently. REPAIR any intermittent concern found. GO to V6.</p>
<p>V6 CHECK FOR ADDITIONAL DTCs</p>	
	<p>1 Refer to the continuous DTCs recorded during Step V1.</p> <p>● Were any continuous DTCs retrieved during Step V1?</p> <p>→ Yes Do not clear any DTCs until all DTCs have been resolved. GO to the Restraints Control Module (RCM) Diagnostic Trouble Code (DTC) Priority Table in this section for pinpoint test direction.</p> <p>→ No RECONNECT the system. REACTIVATE the system. PROVE OUT the system. REFER to Air Bag and Safety Belt Pretensioner Supplemental Restraint System (SRS). CLEAR all DTCs.</p>

Pinpoint Test W LFC 37/DTC B1998 — Passenger Seat Side Air Bag Circuit Resistance High

Normal Operation

The restraints control module (RCM) monitors the resistance of the passenger seat side air bag circuit loop and the air bag module igniter at RCM C301b pins 5 and 6. If the resistance is greater than 3.6 ohms, the RCM will store diagnostic trouble code (DTC) B1998 and flash lamp fault code (LFC) 37.




Possible Causes

A high resistance on the passenger seat side air bag circuit can be caused by:

- damaged wiring on circuit 30S-JA38 (RD/BK).
- damaged wiring on circuit 31S-JA38 (BK/RD).
- damaged passenger seat side air bag module.

- RCM is faulted.

PINPOINT TEST W: LFC 37/DTC B1998 — PASSENGER SIDE AIR BAG CIRCUIT RESISTANCE HIGH

CONDITIONS	DETAILS/RESULTS/ACTIONS
W1 CHECK FOR A HARD OR INTERMITTENT DTC	
<p>1  Retrieve/Clear Continuous DTCs</p> <p>2  On-Demand Self Test</p>	<p>1 Retrieve and record any continuous DTCs for use later in this pinpoint test.</p> <p>● Was DTC B1998 retrieved during the on-demand self test?</p> <p>→ Yes This is a hard fault. The fault condition is still present. This fault cannot be cleared until it is corrected and the DTC is no longer retrieved during the on-demand self test. GO to W2.</p> <p>→ No This is an intermittent fault. The fault condition is not present at this time. GO to W6.</p>
W2 CHECK THE PASSENGER SIDE AIR BAG MODULE	
<p> WARNING: If the supplemental restraint system (SRS) is being serviced, the system must be deactivated and restraint system diagnostic tools must be installed. Refer to Air Bag and Safety Belt Pretensioner Supplemental Restraint System (SRS) in this section.</p> <p>The air bag restraint system diagnostic tools must be removed and the air bag modules reconnected when the system is reactivated to avoid non-deployment in a collision, resulting in possible personal injury.</p> <p>NOTE: Diagnostics or repairs are not to be performed on a seat equipped with a seat side air bag with the seat in the vehicle. Prior to attempting to diagnose or repair a seat concern when equipped with a seat side air bag, the seat must be removed from the vehicle and the restraint system diagnostic tools must be installed in the seat side air bag electrical connectors. The restraint system diagnostic tools must be removed prior to operating the vehicle over the road.</p> <p>NOTE: After diagnosing or repairing an SRS, the restraint system diagnostic tools must be removed before operating the vehicle over the road.</p> <p>NOTE: After diagnosing or repairing a seat system, the restraint system diagnostic tools must be removed before operating the vehicle over the road.</p>	

NOTE: The SRS must be fully operational and free of faults before releasing the vehicle to the customer.

1



3



On-Demand Self Test

2 Deactivate the system. Refer to [Air Bag and Safety Belt Pretensioner Supplemental Restraint System \(SRS\)](#) in the Diagnosis and Testing portion of this section.

• Was DTC B1998 retrieved?

→ Yes
GO to [W3](#).

→ No
INSTALL a new passenger seat side air bag module. GO to [W5](#).

W3 CHECK THE PASSENGER SIDE AIR BAG MODULE CIRCUIT

1

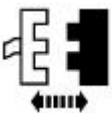


2



RCM C310b

3

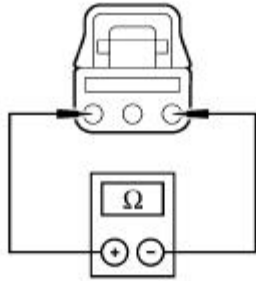


Passenger Seat Side Air Bag Module Restraint System Diagnostic Tool

4

4 **NOTE:** By disconnecting RCM C310b, circuit 30S-JA38 (RD/BK) and circuit 31S-JA38 (BK/RD) of the RCM connector are shorted together with a shorting bar. Do not remove the shorting bar.

Measure the resistance between passenger seat side air bag C337, circuit 30S-JA38 (RD/BK), harness side and passenger seat side air bag



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C337, circuit 31S-JA38 (BK/RD), harness side.

- Is the resistance greater than 1.0 ohm?

→ **Yes**
REPAIR the circuit(s) as necessary. GO to [W6](#).

→ **No**
GO to [W4](#).

W4 CHECK THE WIRING TO THE PASSENGER SIDE AIR BAG MODULE

- 1 Inspect all crimps, terminals, wires and connectors in circuits 30S-JA38 (RD/BK) and 31S-JA38 (BK/RD) between passenger seat side air bag module connector C337 and RCM C310b pins 5 and 6. Check for pinched wires and damaged connector pin terminals.

- Was any damage found?

→ **Yes**
REPAIR as necessary. GO to [W6](#).

→ **No**
INSTALL a new RCM. GO to [W6](#).

W5 CHECK FOR AN INTERMITTENT FAULT

⚠ WARNING: If the supplemental restraint system (SRS) is being serviced, the system must be deactivated and restraint system diagnostic tools must be installed. Refer to [Air Bag and Safety Belt Pretensioner Supplemental Restraint System \(SRS\)](#) in this section.

The air bag restraint system diagnostic tools must be removed and the air bag modules reconnected when the system is reactivated to avoid non-deployment in a collision, resulting in possible personal injury.

NOTE: Diagnostics or repairs are not to be performed on a seat equipped with a seat side air bag with the seat in the vehicle. Prior to attempting to diagnose or repair a seat concern when equipped with a seat side air bag, the seat must be removed from the vehicle and the restraint system diagnostic tools must be installed in the seat side air bag electrical connectors. **The restraint system diagnostic tools must be removed prior to operating the vehicle over the road.**

NOTE: After diagnosing or repairing an SRS, the restraint system diagnostic tools must be removed before operating the vehicle over the road.

NOTE: After diagnosing or repairing a seat system, the restraint system diagnostic tools

must be removed before operating the vehicle over the road.

NOTE: The SRS must be fully operational and free of faults before releasing the vehicle to the customer.

1



3



On-Demand Self Test

2

Deactivate the system. Refer to [Air Bag and Safety Belt Pretensioner Supplemental Restraint System \(SRS\)](#) in the Diagnosis and Testing portion of this section.

- **Was DTC B1998 retrieved during the on-demand self test?**

→ **Yes**

CHECK for causes of intermittent fault at or near the passenger seat air bag module connector. REPAIR any intermittent concerns found.

If an intermittent concern **was** found and repaired, GO to [W6](#).

If an intermittent concern **was not** found, GO to [W3](#).

→ **No**

CHECK for causes of intermittent high resistance on circuit 30S-JA38 (RD/BK) and circuit 31S-JA38 (BK/RD).

ATTEMPT to recreate the hard fault by flexing the wire harness and cycling the ignition key frequently. REPAIR any intermittent concerns found. GO to [W6](#).

W6 CHECK FOR ADDITIONAL DTCs

1

Refer to the continuous DTCs recorded during Step W1.

- **Were any continuous DTCs retrieved during Step W1?**

→ **Yes**

Do not clear any DTCs until all DTCs have been resolved. GO to the Restraints Control Module (RCM) Diagnostic Trouble Code (DTC) Priority Table in this section for pinpoint test direction.

→ **No**
 RECONNECT the system.
 REACTIVATE the system. PROVE OUT
 the system. REFER to [Air Bag and
 Safety Belt Pretensioner Supplemental
 Restraint System \(SRS\)](#). CLEAR all
 DTCs.

Pinpoint Test X: LFC 36/DTC B1995 — Driver Seat Side Air Bag Circuit Resistance Low

Normal Operation



The restraints control module (RCM) monitors the resistance of the driver seat side air bag circuit loop and the air bag module igniter at RCM C310b pin 2 and 3. If the resistance is less than 0.7 ohms, the RCM will store diagnostic trouble code (DTC) B1995 and flash lamp fault code (LFC) 36.

Possible Causes

A low resistance on the driver seat side air bag circuit can be caused by:

- damaged wiring on circuit 30S-JA37 (RD/GN).
- damaged wiring on circuit 31S-JA37 (BK/GN).
- damaged driver seat side air bag module.
- RCM is faulted.
- damaged electrical connector shorting bar.
- damaged electrical connector camming beam.


PINPOINT TEST X: LFC 36/DTC B1995 — DRIVER SEAT SIDE AIR BAG CIRCUIT RESISTANCE LOW

CONDITIONS	DETAILS/RESULTS/ACTIONS
X1 CHECK FOR A HARD OR INTERMITTENT DTC	
<p>1  Retrieve/Clear Continuous DTCs</p> <p>2  On-Demand Self-Test</p>	<p>1 Retrieve and record any continuous DTCs for use later in this pinpoint test.</p> <p>● Was DTC B1995 retrieved during the on-demand self test?</p> <p>→ Yes This is a hard fault. The fault condition is</p>

still present. This fault cannot be cleared until it is corrected and the DTC is no longer retrieved during the on-demand self test. GO to [X2](#).

→ **No**
This is an intermittent fault. The fault condition is not present at this time. GO to [X4](#).

X2 CHECK THE DRIVER SIDE AIR BAG MODULE

 **WARNING:** If the supplemental restraint system (SRS) is being serviced, the system must be deactivated and restraint system diagnostic tools must be installed. Refer to [Air Bag and Safety Belt Pretensioner Supplemental Restraint System \(SRS\)](#) in this section.

The air bag restraint system diagnostic tools must be removed and the air bag modules reconnected when the system is reactivated to avoid non-deployment in a collision, resulting in possible personal injury.

NOTE: Diagnostics or repairs are not to be performed on a seat equipped with a seat side air bag with the seat in the vehicle. Prior to attempting to diagnose or repair a seat concern when equipped with a seat side air bag, the seat must be removed from the vehicle and the restraint system diagnostic tools must be installed in the seat side air bag electrical connectors. **The restraint system diagnostic tools must be removed prior to operating the vehicle over the road.**

NOTE: After diagnosing or repairing an SRS, the restraint system diagnostic tools must be removed before operating the vehicle over the road.

NOTE: After diagnosing or repairing a seat system, the restraint system diagnostic tools must be removed before operating the vehicle over the road.

NOTE: The SRS must be fully operational and free of faults before releasing the vehicle to the customer.

1



3



On-Demand Self Test

2 Deactivate the system. Refer to [Air Bag and Safety Belt Pretensioner Supplemental Restraint System \(SRS\)](#) in the Diagnosis and Testing portion of this section.

● Was DTC B1995 retrieved?

→ **Yes**
GO to [X3](#).

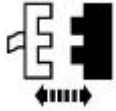
→ **No**
INSTALL a new driver seat side air bag module. GO to [X5](#).

X3 CHECK THE DRIVER SIDE AIR BAG MODULE CIRCUIT TO THE SEAT HARNESS

1

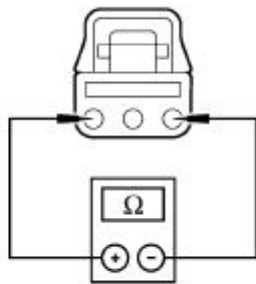


2



Driver Seat Side Air Bag Module Restraint System Diagnostic Tool

3



DR1050-A

3

Measure the resistance between driver seat side air bag C367, circuit 30S-JA37 (RD/GN), harness side and driver seat side air bag C367, circuit 31S-JA37 (BK/GN), harness side.

- Is the resistance greater than 10,000 ohms?

→ **Yes**
INSTALL a new RCM. GO to [X5](#).

→ **No**
REPAIR the circuit(s) as necessary. GO to [X5](#).

X4 CHECK FOR AN INTERMITTENT FAULT



WARNING: If the supplemental restraint system (SRS) is being serviced, the system must be deactivated and restraint system diagnostic tools must be installed. Refer to [Air Bag and Safety Belt Pretensioner Supplemental Restraint System \(SRS\)](#) in this section.

The air bag restraint system diagnostic tools must be removed and the air bag modules reconnected when the system is reactivated to avoid non-deployment in a collision, resulting in possible personal injury.

NOTE: Diagnostics or repairs are not to be performed on a seat equipped with a seat side air bag with the seat in the vehicle. Prior to attempting to diagnose or repair a seat concern when equipped with a seat side air bag, the seat must be removed from the vehicle and the restraint system diagnostic tools must be installed in the seat side air bag electrical connectors. **The restraint system diagnostic tools must be removed prior to operating the vehicle over the road.**

NOTE: After diagnosing or repairing an SRS, the restraint system diagnostic tools must be removed before operating the vehicle over the road.

NOTE: After diagnosing or repairing a seat system, the restraint system diagnostic tools must be removed before operating the vehicle over the road.

NOTE: The SRS must be fully operational and free of faults before releasing the vehicle to the customer.

1



3



On-Demand Self Test

- 2 Deactivate the system. Refer to [Air Bag and Safety Belt Pretensioner Supplemental Restraint System \(SRS\)](#) in the Diagnosis and Testing portion of this section.

● **Was DTC B1995 retrieved during the on-demand self test?**

→ **Yes**

CHECK for causes of intermittent fault at or near the driver seat air bag module connector. REPAIR any intermittent concerns found.

If an intermittent concern **was** found and repaired, GO to [X5](#).

If an intermittent concern **was not** found, GO to [X3](#).

→ **No**

CHECK for causes of intermittent high resistance on circuits 30S-JA37 (RD/GN) and 31S-JA37 (BK/GN). ATTEMPT to recreate the hard fault by flexing the wire harness and cycling the key frequently. REPAIR any intermittent concern found. GO to [X5](#).

X5 CHECK FOR ADDITIONAL DTCs

- 1 Refer to the continuous DTCs recorded during Step X1.

● **Was the continuous DTC retrieved during Step X1?**

→ **Yes**

Do not clear any DTCs until all DTCs have been resolved. GO to the Restraints Control Module (RCM) Diagnostic Trouble Code (DTC) Priority Table in this section for pinpoint test direction.

→ **No**

RECONNECT the system. REACTIVATE the system. PROVE OUT the system. REFER to [Air Bag and](#)

Pinpoint Test Y: LFC 37/DTC B1999 — Passenger Seat Side Air Bag Circuit Resistance Low

Normal Operation



The restraints control module (RCM) monitors the resistance of the passenger seat side air bag circuit loop and the air bag module igniter at RCM C310b pins 5 and 6. If the resistance is less than 0.7 ohms, the RCM will store diagnostic trouble code (DTC) B1999 and flash lamp fault code (LFC) 37.

Possible Causes

A low resistance on the passenger seat side air bag circuit can be caused by:

- damaged wiring on circuit 30S-JA38 (RD/BK).
- damaged wiring on circuit 31S-JA38 (BK/RD).
- damaged passenger seat side air bag module.
- RCM is faulted.
- damaged electrical connector shorting bar.
- damaged electrical connector camming beam.

PINPOINT TEST Y: LFC 37/DTC B1999 — PASSENGER SIDE AIR BAG CIRCUIT RESISTANCE LOW

CONDITIONS	DETAILS/RESULTS/ACTIONS
Y1 CHECK FOR A HARD OR INTERMITTENT DTC	
<p>1  Retrieve/Clear Continuous DTCs</p> <p>2  On-Demand Self Test</p>	<p>1 Retrieve and record any continuous DTCs for use later in this pinpoint test.</p> <p>● Was DTC B1999 retrieved during the on-demand self test?</p> <p>→ Yes This is a hard fault. The fault condition is still present. This fault cannot be cleared until it is corrected and the DTC is no longer retrieved during the on-demand self test. GO to Y2.</p>

→ **No**
This is an intermittent fault. The fault condition is not present at this time. GO to [Y4](#).

Y2 CHECK THE PASSENGER SIDE AIR BAG MODULE

⚠ WARNING: If the supplemental restraint system (SRS) is being serviced, the system must be deactivated and restraint system diagnostic tools must be installed. Refer to [Air Bag and Safety Belt Pretensioner Supplemental Restraint System \(SRS\)](#) in this section.

The air bag restraint system diagnostic tools must be removed and the air bag modules reconnected when the system is reactivated to avoid non-deployment in a collision, resulting in possible personal injury.

NOTE: Diagnostics or repairs are not to be performed on a seat equipped with a seat side air bag with the seat in the vehicle. Prior to attempting to diagnose or repair a seat concern when equipped with a seat side air bag, the seat must be removed from the vehicle and the restraint system diagnostic tools must be installed in the seat side air bag electrical connectors. **The restraint system diagnostic tools must be removed prior to operating the vehicle over the road.**

NOTE: After diagnosing or repairing an SRS, the restraint system diagnostic tools must be removed before operating the vehicle over the road.

NOTE: After diagnosing or repairing a seat system, the restraint system diagnostic tools must be removed before operating the vehicle over the road.

NOTE: The SRS must be fully operational and free of faults before releasing the vehicle to the customer.

1



3



On-Demand Self Test

2 Deactivate the system. Refer to [Air Bag and Safety Belt Pretensioner Supplemental Restraint System \(SRS\)](#) in the Diagnosis and Testing portion of this section.

● **Was DTC B1999 Retrieved?**

→ **Yes**
GO to [Y3](#).

→ **No**
INSTALL a new passenger seat side air bag module. GO to [Y5](#).

Y3 CHECK THE PASSENGER SIDE AIR BAG MODULE CIRCUIT

1

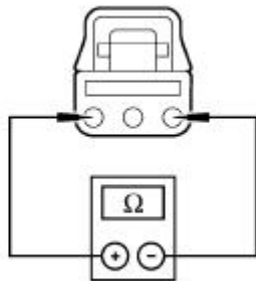


2



Passenger Side Air Bag Module Restraint System Diagnostic Tool

3



DR1050-A

3

Measure the resistance between passenger seat side air bag C337, circuit 30S-JA38 (RD/BK), harness side and circuit 31S-JA38 (BK/RD), harness side.

- Is the resistance greater than 10,000 ohms?

→ **Yes**
INSTALL a new RCM. GO to [Y5](#).

→ **No**
REPAIR the circuit(s) as necessary. GO to [Y5](#).

Y4 CHECK FOR AN INTERMITTENT FAULT



WARNING: If the supplemental restraint system (SRS) is being serviced, the system must be deactivated and restraint system diagnostic tools must be installed. Refer to [Air Bag and Safety Belt Pretensioner Supplemental Restraint System \(SRS\)](#) in this section.

The air bag restraint system diagnostic tools must be removed and the air bag modules reconnected when the system is reactivated to avoid non-deployment in a collision, resulting in possible personal injury.

NOTE: Diagnostics or repairs are not to be performed on a seat equipped with a seat side air bag with the seat in the vehicle. Prior to attempting to diagnose or repair a seat concern when equipped with a seat side air bag, the seat must be removed from the vehicle and the restraint system diagnostic tools must be installed in the seat side air bag electrical connectors. **The restraint system diagnostic tools must be removed prior to operating the vehicle over the road.**

NOTE: After diagnosing or repairing an SRS, the restraint system diagnostic tools must be removed before operating the vehicle over the road.

NOTE: After diagnosing or repairing a seat system, the restraint system diagnostic tools must be removed before operating the vehicle over the road.

NOTE: The SRS must be fully operational and free of faults before releasing the vehicle to the customer.

1



2

Deactivate the system. Refer to [Air Bag and Safety Belt Pretensioner](#)

3



On-Demand Self Test

[Supplemental Restraint System \(SRS\)](#) in the Diagnosis and Testing portion of this section.

- **Was DTC B1999 retrieved during the on-demand self test?**

→ **Yes**

CHECK for causes of intermittent fault at or near the passenger seat air bag module connector. REPAIR any intermittent concerns found.

If an intermittent concern **was** found and repaired, GO to [Y5](#).

If an intermittent concern **was not** found, GO to [Y3](#).

→ **No**

CHECK for causes of intermittent high resistance on circuits 30S-JA38 (RD/BK) and 31S-JA38 (BK/RD). ATTEMPT to recreate the hard fault by flexing the wire harness and cycling the key frequently. REPAIR any intermittent concern found. GO to [Y5](#).

Y5 CHECK FOR ADDITIONAL DTCs

1 Refer to the continuous DTCs recorded during Step Y1.

- **Were any continuous DTCs retrieved during Step Y1?**

→ **Yes**

Do not clear any DTCs until all DTCs have been resolved. GO to the Restraints Control Module (RCM) Diagnostic Trouble Code (DTC) Priority Table in this section for pinpoint test direction.

→ **No**

RECONNECT the system. REACTIVATE the system. PROVE OUT the system. REFER to [Air Bag and Safety Belt Pretensioner Supplemental Restraint System \(SRS\)](#). CLEAR all DTCs.

Normal Operation



The restraints control module (RCM) monitors the resistance of the circuit to the driver safety belt retractor pretensioner. When the RCM detects a resistance that is out of the expected range (high or low) it will set lamp fault code (LFC) 46 and diagnostic test code (DTC) B1885 or B1877.

Possible Causes

An out of range resistance on the driver safety belt retractor pretensioner circuit can be caused by:

- out of range resistance on circuit 30S-JA33 (RD/BU).
- out of range resistance on circuit 31S-JA33 (BK/BU).
- out of range resistance on the driver safety belt retractor pretensioner.
- RCM is faulted.

PINPOINT TEST Z: LFC 46/DTC B1885/B1877 — DRIVER SAFETY BELT RETRACTOR PRETENSIONER CIRCUIT RESISTANCE HIGH OR LOW

CONDITIONS	DETAILS/RESULTS/ACTIONS
Z1 CHECK FOR A HARD OR INTERMITTENT DTC	
<p>1  Retrieve/Clear Continuous DTCs</p> <p>2  On-Demand Self Test</p>	<p>1 Retrieve and record any continuous DTCs for use later in this pinpoint test.</p> <p>● Was DTC B1877 or B1885 retrieved during the on-demand self test?</p> <p>→ Yes This is a hard fault. The fault condition is still present. This fault cannot be cleared until it is corrected and the DTC is no longer retrieved during the on-demand self test. GO to Z2.</p> <p>→ No This is an intermittent fault. The fault condition is not present at this time. GO to Z4.</p>
Z2 CHECK THE DRIVER SAFETY BELT RETRACTOR PRETENSIONER CIRCUIT	
1	



PID/Data Monitor and Record

2 Select PID D_PRTNR.

● Is the resistance greater than 3.2 or less than 1.7 ohms?

→ Yes
GO to Z3.

→ No
INSTALL a new RCM. GO to Z5.

Z3 CHECK THE DRIVER SAFETY BELT RETRACTOR PRETENSIONER



WARNING: If the supplemental restraint system (SRS) is being serviced, the system must be deactivated and restraint system diagnostic tools must be installed. Refer to [Air Bag and Safety Belt Pretensioner Supplemental Restraint System \(SRS\)](#) in this section.

The air bag restraint system diagnostic tools must be removed and the air bag modules reconnected when the system is reactivated to avoid non-deployment in a collision, resulting in possible personal injury.

NOTE: Diagnostics or repairs are not to be performed on a seat equipped with a seat side air bag with the seat in the vehicle. Prior to attempting to diagnose or repair a seat concern when equipped with a seat side air bag, the seat must be removed from the vehicle and the restraint system diagnostic tools must be installed in the seat side air bag electrical connectors. **The restraint system diagnostic tools must be removed prior to operating the vehicle over the road.**

NOTE: After diagnosing or repairing an SRS, the restraint system diagnostic tools must be removed before operating the vehicle over the road.

NOTE: After diagnosing or repairing a seat system, the restraint system diagnostic tools must be removed before operating the vehicle over the road.

NOTE: The SRS must be fully operational and free of faults before releasing the vehicle to the customer.

1



2 Deactivate the system. Refer to [Air Bag and Safety Belt Pretensioner Supplemental Restraint System \(SRS\)](#) in the Diagnosis and Testing portion of this section.

3



PID/Data Monitor and Record

3 Select PID D_PRTNR.


● Is the resistance greater than 3.2 or less than 1.7 ohms?

→ Yes
REPAIR the resistance concern on circuit 30S-JA33 (RD/BU) or 31S-JA33

(BK/BU). GO to [Z5](#).

→ **No**
INSTALL a new driver safety belt retractor pretensioner. GO to [Z5](#).

Z4 CHECK FOR AN INTERMITTENT FAULT

 **WARNING:** If the supplemental restraint system (SRS) is being serviced, the system must be deactivated and restraint system diagnostic tools must be installed. Refer to [Air Bag and Safety Belt Pretensioner Supplemental Restraint System \(SRS\)](#) in this section.

The air bag restraint system diagnostic tools must be removed and the air bag modules reconnected when the system is reactivated to avoid non-deployment in a collision, resulting in possible personal injury.

NOTE: Diagnostics or repairs are not to be performed on a seat equipped with a seat side air bag with the seat in the vehicle. Prior to attempting to diagnose or repair a seat concern when equipped with a seat side air bag, the seat must be removed from the vehicle and the restraint system diagnostic tools must be installed in the seat side air bag electrical connectors. **The restraint system diagnostic tools must be removed prior to operating the vehicle over the road.**

NOTE: After diagnosing or repairing an SRS, the restraint system diagnostic tools must be removed before operating the vehicle over the road.

NOTE: After diagnosing or repairing a seat system, the restraint system diagnostic tools must be removed before operating the vehicle over the road.

NOTE: The SRS must be fully operational and free of faults before releasing the vehicle to the customer.

1



2 Deactivate the system. Refer to [Air Bag and Safety Belt Pretensioner Supplemental Restraint System \(SRS\)](#) in the Diagnosis and Testing portion of this section.

3



On-Demand Self Test

- Was DTC B1877 or B1885 retrieved during the on-demand self test?

→ **Yes**
CHECK for causes of intermittent fault at or near the driver safety belt retractor pretensioner connector. REPAIR any intermittent concerns found.

If an intermittent concern **was** found and repaired, GO to [Z5](#).

If an intermittent concern **was not** found, GO to [Z2](#).

→ **No**
CHECK for causes of intermittent high resistance on circuits 30S-JA33 (RD/BU) and circuit 31S-JA33 (BK/BU). ATTEMPT to recreate the hard fault by flexing the wire harness and cycling the ignition key frequently. REPAIR any intermittent concerns found. GO to [Z5](#).

Z5 CHECK FOR ADDITIONAL DTCs

	<p>1 Refer to the continuous DTCs recorded during Step Z1.</p> <ul style="list-style-type: none"> ● Were any continuous DTCs retrieved during Step Z1? <p>→ Yes Do not clear any DTCs until all DTCs have been resolved. GO to the Restraints Control Module (RCM) Diagnostic Trouble Code (DTC) Priority Table in this section for pinpoint test direction.</p> <p>→ No RECONNECT the system. REACTIVATE the system. PROVE OUT the system. REFER to Air Bag and Safety Belt Pretensioner Supplemental Restraint System (SRS). CLEAR all DTCs.</p>
--	--

Pinpoint Test AA: LFC 47/DTC B1881/B1886 — Passenger Safety Belt Retractor Pretensioner Circuit Resistance High or Low

Normal Operation


The restraints control module (RCM) monitors the resistance of the circuit to the passenger safety belt retractor pretensioner. When the RCM detects a resistance that is out of the expected range (high or low) it will set lamp fault code (LFC) 47 and diagnostic test code (DTC) B1881 or B1886.

Possible Causes

An out of range resistance on the passenger safety belt retractor pretensioner circuit can be caused by:

- out of range resistance on circuit 30S-JA34 (RD/BK).
- out of range resistance on circuit 31S-JA34 (BK/RD).
- out of range resistance on the passenger safety belt retractor pretensioner.
- RCM is faulted.

PINPOINT TEST AA: LFC 47/DTC B1881/B1886 — PASSENGER SAFETY BELT RETRACTOR PRETENSIONER CIRCUIT RESISTANCE HIGH OR LOW

CONDITIONS	DETAILS/RESULTS/ACTIONS
AA1 CHECK FOR A HARD OR INTERMITTENT DTC	
<p>1</p>  <p>Retrieve/Clear Continuous DTCs</p> <p>2</p>	<p>1 Retrieve and record any continuous DTCs for use later in this pinpoint test.</p>



On-Demand Self Test

- Was DTC B1881 or B1886 retrieved during the on-demand self test?

→ **Yes**

This is a hard fault. This fault condition is still present. This fault cannot be cleared until it is corrected and the DTC is no longer retrieved during the on-demand self test. GO to [AA2](#).

→ **No**

This is an intermittent fault. The fault condition is not present at this time. GO to [AA4](#).

AA2 CHECK THE PASSENGER PRETENSIONER CIRCUIT

1



PID/Data Monitor and Record

2 Select PID P_PRTNR.

- Is the resistance greater than 3.2 or less than 1.7 ohms?

→ **Yes**

GO to [AA3](#).

→ **No**

INSTALL a new RCM. GO to [AA5](#).

AA3 CHECK THE PASSENGER PRETENSIONER



WARNING: If the supplemental restraint system (SRS) is being serviced, the system must be deactivated and restraint system diagnostic tools must be installed. Refer to [Air Bag and Safety Belt Pretensioner Supplemental Restraint System \(SRS\)](#) in this section.

The air bag restraint system diagnostic tools must be removed and the air bag modules reconnected when the system is reactivated to avoid non-deployment in a collision, resulting in possible personal injury.

NOTE: Diagnostics or repairs are not to be performed on a seat equipped with a seat side air bag with the seat in the vehicle. Prior to attempting to diagnose or repair a seat concern when equipped with a seat side air bag, the seat must be removed from the vehicle and the restraint system diagnostic tools must be installed in the seat side air bag electrical connectors. **The restraint system diagnostic tools must be removed prior to operating the vehicle over the road.**

NOTE: After diagnosing or repairing an SRS, the restraint system diagnostic tools must be removed before operating the vehicle over the road.

NOTE: After diagnosing or repairing a seat system, the restraint system diagnostic tools must be removed before operating the vehicle over the road.

NOTE: The SRS must be fully operational and free of faults before releasing the vehicle to the customer.

1



3



PID/Data Monitor and Record

2 Deactivate the system. Refer to [Air Bag and Safety Belt Pretensioner Supplemental Restraint System \(SRS\)](#) in the Diagnosis and Testing portion of this section.

3 Select PID P_PRTNR

- Is the resistance greater than 3.2 or less than 1.7 ohms?

→ Yes

REPAIR the resistance concern on circuit 30S-JA34 (RD/BK) or 31S-JA34 (BK/RD). GO to [AA5](#).

→ No

INSTALL a new passenger pretensioner. GO to [AA5](#).

AA4 CHECK FOR AN INTERMITTENT FAULT



WARNING: If the supplemental restraint system (SRS) is being serviced, the system must be deactivated and restraint system diagnostic tools must be installed. Refer to [Air Bag and Safety Belt Pretensioner Supplemental Restraint System \(SRS\)](#) in this section.

The air bag restraint system diagnostic tools must be removed and the air bag modules reconnected when the system is reactivated to avoid non-deployment in a collision, resulting in possible personal injury.

NOTE: Diagnostics or repairs are not to be performed on a seat equipped with a seat side air bag with the seat in the vehicle. Prior to attempting to diagnose or repair a seat concern when equipped with a seat side air bag, the seat must be removed from the vehicle and the restraint system diagnostic tools must be installed in the seat side air bag electrical connectors. **The restraint system diagnostic tools must be removed prior to operating the vehicle over the road.**

NOTE: After diagnosing or repairing an SRS, the restraint system diagnostic tools must be removed before operating the vehicle over the road.

NOTE: After diagnosing or repairing a seat system, the restraint system diagnostic tools must be removed before operating the vehicle over the road.

NOTE: The SRS must be fully operational and free of faults before releasing the vehicle to the customer.

1



3



2 Deactivate the system. Refer to [Air Bag and Safety Belt Pretensioner Supplemental Restraint System \(SRS\)](#) in the Diagnosis and Testing portion of this section.

On-Demand Self Test	<ul style="list-style-type: none"> ● Was DTC B1881 or B1886 retrieved during the on-demand self test? <p>→ Yes CHECK for causes of intermittent fault at or near the passenger safety belt retractor pretensioner electrical connector. REPAIR any intermittent concerns found.</p> <p>If an intermittent concern was found and repaired, GO to AA5.</p> <p>If an intermittent concern was not found, GO to AA2.</p> <p>→ No CHECK for causes of intermittent high resistance on circuits 30S-JA34 (RD/BK) and circuit 31S-JA34 (BK/RD). ATTEMPT to recreate the hard fault by flexing the wire harness and cycling the ignition key frequently. REPAIR any intermittent concerns found. GO to AA5.</p>
AA5 CHECK FOR ADDITIONAL DTCs	
	<p>1 Refer to the continuous DTCs recorded during Step AA1.</p> <ul style="list-style-type: none"> ● Were any continuous DTCs retrieved during Step AA1? <p>→ Yes Do not clear any DTCs until all DTCs have been resolved. GO to the Restraints Control Module (RCM) Diagnostic Trouble Code (DTC) Priority Table in this section for pinpoint test direction.</p> <p>→ No RECONNECT the system. REACTIVATE the system. PROVE OUT the system. REFER to Air Bag and Safety Belt Pretensioner Supplemental Restraint System (SRS). CLEAR all DTCs.</p>

Pinpoint Test AB: LFC 17/DTC B1878 — Driver Safety Belt Retractor Pretensioner Circuit Shorted to Battery or Ignition

Normal Operation




The restraints control module (RCM) monitors the circuit to the driver safety belt retractor pretensioner. When the RCM detects a circuit short to battery or ignition it will set lamp fault code (LFC) 17 and diagnostic test code (DTC) B1878.

Possible Causes

A short to battery or ignition on the driver safety belt retractor pretensioner circuit can be caused by:

- a short to battery or ignition on circuit 30S-JA33 (RD/BU).
- a short to battery or ignition on circuit 31S-JA33 (BK/BU).
- a short to battery or ignition on the driver safety belt retractor pretensioner.
- RCM is faulted.

PINPOINT TEST AB: LFC 17/DTC B1878 — DRIVER SAFETY BELT RETRACTOR PRETENSIONER CIRCUIT SHORTED TO BATTERY OR IGNITION

CONDITIONS	DETAILS/RESULTS/ACTIONS
AB1 CHECK FOR A HARD OR INTERMITTENT DTC	
<p>1  Retrieve/Clear Continuous DTCs</p> <p>2  On-Demand Self Test</p>	<p>1 Retrieve and record any continuous DTCs for use later in this pinpoint test.</p> <p>● Was DTC B1878 retrieved during the on-demand self test?</p> <p>→ Yes This is a hard fault. The fault condition is still present. This fault cannot be cleared until it is corrected and the DTC is no longer retrieved during the on-demand self test. GO to AB2.</p> <p>→ No This is an intermittent fault. The fault condition is not present at this time. GO to AB4.</p>
AB2 CHECK THE DRIVER PRETENSIONER	
<p> WARNING: If the supplemental restraint system (SRS) is being serviced, the system must be deactivated and restraint system diagnostic tools must be installed. Refer to Air Bag and Safety Belt Pretensioner Supplemental Restraint System (SRS) in this section.</p> <p>The air bag restraint system diagnostic tools must be removed and the air bag modules reconnected when the system is reactivated to avoid non-deployment in a collision, resulting in possible personal injury.</p> <p>NOTE: Diagnostics or repairs are not to be performed on a seat equipped with a seat side air bag with the seat in the vehicle. Prior to attempting to diagnose or repair a seat concern when equipped with a seat side air bag, the seat must be removed from the vehicle and the restraint system diagnostic tools must be installed in the seat side air bag electrical connectors. The restraint system diagnostic tools must be removed prior to operating the vehicle over the road.</p> <p>NOTE: After diagnosing or repairing an SRS, the restraint system diagnostic tools must be removed before operating the vehicle over the road.</p> <p>NOTE: After diagnosing or repairing a seat system, the restraint system diagnostic tools must be removed before operating the vehicle over the road.</p> <p>NOTE: The SRS must be fully operational and free of faults before releasing the vehicle to the customer.</p>	
1	



3



On-Demand Self Test

2 Deactivate the system. Refer to [Air Bag and Safety Belt Pretensioner Supplemental Restraint System \(SRS\)](#) in the Diagnosis and Testing portion of this section.

● Was DTC B1878 retrieved?

→ Yes
GO to [AB3](#).

→ No
INSTALL a new driver belt pretensioner.
GO to [AB5](#).

AB3 CHECK THE DRIVER PRETENSIONER CIRCUITS

1

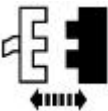


2



Driver Safety Belt Pretensioner Restraint System Diagnostic Tool

3



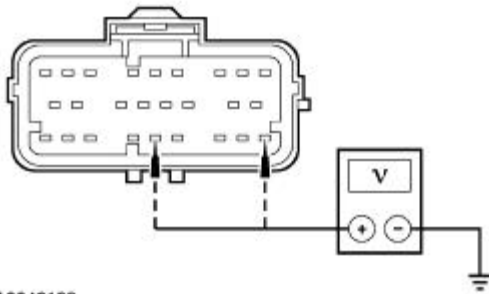
RCM C310a

4



5

5 Measure the voltage between the RCM C310a pin 18, circuits 30S-JA33 (RD/BU), harness side and ground; and between the RCM C310a pin 22, circuit 31S-JA33 (BK/BU), harness side and ground.



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- Are the voltages less than 0.2 volt?

- **Yes**
INSTALL a new RCM. GO to [AB5](#).
- **No**
REPAIR the affected circuit. GO to [AB5](#).

AB4 CHECK FOR AN INTERMITTENT FAULT



WARNING: If the supplemental restraint system (SRS) is being serviced, the system must be deactivated and restraint system diagnostic tools must be installed. Refer to [Air Bag and Safety Belt Pretensioner Supplemental Restraint System \(SRS\)](#) in this section.

The air bag restraint system diagnostic tools must be removed and the air bag modules reconnected when the system is reactivated to avoid non-deployment in a collision, resulting in possible personal injury.

NOTE: Diagnostics or repairs are not to be performed on a seat equipped with a seat side air bag with the seat in the vehicle. Prior to attempting to diagnose or repair a seat concern when equipped with a seat side air bag, the seat must be removed from the vehicle and the restraint system diagnostic tools must be installed in the seat side air bag electrical connectors. **The restraint system diagnostic tools must be removed prior to operating the vehicle over the road.**

NOTE: After diagnosing or repairing an SRS, the restraint system diagnostic tools must be removed before operating the vehicle over the road.

NOTE: After diagnosing or repairing a seat system, the restraint system diagnostic tools must be removed before operating the vehicle over the road.

NOTE: The SRS must be fully operational and free of faults before releasing the vehicle to the customer.

1



3



On-Demand Self Test

2

Deactivate the system. Refer to [Air Bag and Safety Belt Pretensioner Supplemental Restraint System \(SRS\)](#) in the Diagnosis and Testing portion of this section.

	<ul style="list-style-type: none"> ● Was DTC B1878 retrieved during the on-demand self test? <p>→ Yes CHECK for causes of intermittent fault at or near the driver safety belt retractor pretensioner electrical connector. REPAIR any intermittent concerns found.</p> <p>If an intermittent concern was found and repaired, GO to AB5.</p> <p>If an intermittent concern was not found, GO to AB3.</p> <p>→ No CHECK for causes of intermittent high resistance on circuits 30S-JA33 (RD/BK) and circuit 31S-JA33 (BK/RD). ATTEMPT to recreate the hard fault by flexing the wire harness and cycling the ignition key frequently. REPAIR any intermittent concerns found. GO to AB5.</p>
AB5 CHECK FOR ADDITIONAL DTCs	
	<p>1 Refer to the continuous DTCs recorded during Step AB1.</p> <ul style="list-style-type: none"> ● Were any continuous DTCs retrieved during Step AB1? <p>→ Yes Do not clear any DTCs until all DTCs have been resolved. GO to the Restraints Control Module (RCM) Diagnostic Trouble Code (DTC) Priority Table in this section for pinpoint test direction.</p> <p>→ No RECONNECT the system. REACTIVATE the system. PROVE OUT the system. REFER to Air Bag and Safety Belt Pretensioner Supplemental Restraint System (SRS). CLEAR all DTCs.</p>

Pinpoint Test AC: LFC 17/DTC B1879 — Driver Safety Belt Retractor Pretensioner Circuit Shorted to Ground

Normal Operation




The restraints control module (RCM) monitors the circuit to the driver safety belt retractor pretensioner. When the RCM detects a circuit short to ground it will set lamp fault code (LFC) 17 and diagnostic test code (DTC) B1879.

Possible Causes

A short to ground on the driver safety belt retractor pretensioner circuit can be caused by:

- a short to ground on circuit 30S-JA33 (RD/BU).
- a short to ground on circuit 31S-JA33 (BK/BU).
- a short to ground on the driver safety belt retractor pretensioner.
- RCM is faulted.

PINPOINT TEST AC: LFC 17/DTC B1879 — DRIVER PRETENSIONER CIRCUIT SHORTED TO GROUND

CONDITIONS	DETAILS/RESULTS/ACTIONS
AC1 CHECK FOR A HARD OR INTERMITTENT DTC	
<p>1 </p> <p>Retrieve/Clear Continuous DTCs</p> <p>2 </p> <p>On-Demand Self Test</p>	<p>1 Retrieve and record any continuous DTCs for use later in this pinpoint test.</p> <p>● Was DTC B1879 retrieved during the on-demand self test?</p> <p>→ Yes This is a hard fault. The fault condition is still present. This fault cannot be cleared until it is corrected and the DTC is no longer retrieved during the on-demand self test. GO to AC2.</p> <p>→ No This is an intermittent fault. The fault condition is not present at this time. GO to AC4.</p>
AC2 CHECK THE DRIVER PRETENSIONER	
<p> WARNING: If the supplemental restraint system (SRS) is being serviced, the system must be deactivated and restraint system diagnostic tools must be installed. Refer to Air Bag and Safety Belt Pretensioner Supplemental Restraint System (SRS) in this section.</p> <p>The air bag restraint system diagnostic tools must be removed and the air bag modules reconnected when the system is reactivated to avoid non-deployment in a collision, resulting in possible personal injury.</p> <p>NOTE: Diagnostics or repairs are not to be performed on a seat equipped with a seat side air bag with the seat in the vehicle. Prior to attempting to diagnose or repair a seat concern when equipped with a seat side air bag, the seat must be removed from the vehicle and the restraint system diagnostic tools must be installed in the seat side air bag electrical connectors. The restraint system diagnostic tools must be removed prior to operating the vehicle over the</p>	

road.

NOTE: After diagnosing or repairing an SRS, the restraint system diagnostic tools must be removed before operating the vehicle over the road.

NOTE: After diagnosing or repairing a seat system, the restraint system diagnostic tools must be removed before operating the vehicle over the road.

NOTE: The SRS must be fully operational and free of faults before releasing the vehicle to the customer.

1



3



On-Demand Self Test

2

Deactivate the system. Refer to [Air Bag and Safety Belt Pretensioner Supplemental Restraint System \(SRS\)](#) in the Diagnosis and Testing portion of this section.

● Was DTC B1879 retrieved?

→ **Yes**
GO to [AC3](#).

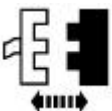
→ **No**
INSTALL a new driver belt pretensioner.
GO to [AC5](#).

AC3 CHECK THE DRIVER PRETENSIONER CIRCUITS

1

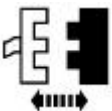


2



Driver Safety Belt Pretensioner Restraint System Diagnostic Tool

3

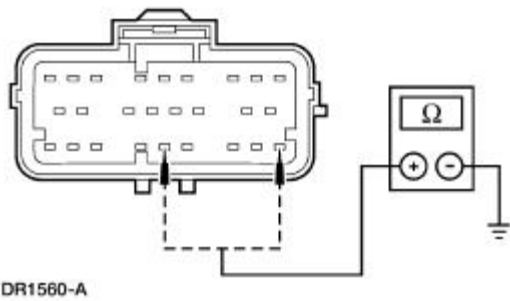


RCM C310a

4

4

Measure the resistance to ground at RCM C310a pin 18, circuit 30S-JA33 (RD/BU) and pin 22, circuit 31S-JA33 (BK/BU).



- Is the resistance less than 10,000 ohms at either pin?

→ **Yes**
REPAIR the short to ground. GO to [AC5](#).

→ **No**
INSTALL a new RCM. GO to [AC5](#).

AC4 CHECK FOR AN INTERMITTENT FAULT



WARNING: If the supplemental restraint system (SRS) is being serviced, the system must be deactivated and restraint system diagnostic tools must be installed. Refer to [Air Bag and Safety Belt Pretensioner Supplemental Restraint System \(SRS\)](#) in this section.

The air bag restraint system diagnostic tools must be removed and the air bag modules reconnected when the system is reactivated to avoid non-deployment in a collision, resulting in possible personal injury.

NOTE: Diagnostics or repairs are not to be performed on a seat equipped with a seat side air bag with the seat in the vehicle. Prior to attempting to diagnose or repair a seat concern when equipped with a seat side air bag, the seat must be removed from the vehicle and the restraint system diagnostic tools must be installed in the seat side air bag electrical connectors. **The restraint system diagnostic tools must be removed prior to operating the vehicle over the road.**

NOTE: After diagnosing or repairing an SRS, **the restraint system diagnostic tools must be removed before operating the vehicle over the road.**

NOTE: After diagnosing or repairing a seat system, **the restraint system diagnostic tools must be removed before operating the vehicle over the road.**

NOTE: The SRS must be fully operational and free of faults before releasing the vehicle to the customer.

1



3



2

Deactivate the system. Refer to [Air Bag and Safety Belt Pretensioner Supplemental Restraint System \(SRS\)](#) in the Diagnosis and Testing portion of this section.

<p>On-Demand Self Test</p>	<ul style="list-style-type: none"> ● Was DTC B1879 retrieved during the on-demand self test? <p>→ Yes CHECK for causes of intermittent fault at or near the driver safety belt retractor pretensioner electrical connector. REPAIR any intermittent concerns found.</p> <p>If an intermittent concern was found and repaired, GO to AC5.</p> <p>If an intermittent concern was not found, GO to AC3.</p> <p>→ No CHECK for causes of intermittent short to ground on circuit 30S-JA33 (RD/BU) and circuit 31S-JA33 (BK/BU). ATTEMPT to recreate the hard fault by flexing the wire harness and cycling the ignition key frequently. REPAIR any intermittent concerns found. GO to AC5.</p>
<p>AC5 CHECK FOR ADDITIONAL DTCs</p>	
	<p>1 Refer to the continuous DTCs recorded during Step AC1.</p> <ul style="list-style-type: none"> ● Were any continuous DTCs retrieved during Step AC1? <p>→ Yes Do not clear any DTCs until all DTCs have been resolved. GO to the Restraints Control Module (RCM) Diagnostic Trouble Code (DTC) Priority Table in this section for pinpoint test direction.</p> <p>→ No RECONNECT the system. REACTIVATE the system. PROVE OUT the system. REFER to Air Bag and Safety Belt Pretensioner Supplemental Restraint System (SRS). CLEAR all DTCs.</p>

Pinpoint Test AD: LFC 18/DTC B1882 — Passenger Safety Belt Retractor Pretensioner Circuit Shorted to Battery or Ignition

Normal Operation




The restraints control module (RCM) monitors the circuit to the passenger safety belt retractor pretensioner. When the RCM detects a circuit short to battery or ignition it will set lamp fault code (LFC) 18 and diagnostic test code (DTC) 1882.

Possible Causes

A short to battery or ignition on the passenger safety belt retractor pretensioner circuit can be caused by:

- a short to battery or ignition on circuit 30S-JA34 (RD/BK).
- a short to battery or ignition on circuit 31S-JA34 (BK/RD).
- a short to battery or ignition on the passenger safety belt retractor pretensioner.
- RCM is faulted.

PINPOINT TEST AD: LFC 18/DTC B1882 — PASSENGER SAFETY BELT RETRACTOR PRETENSIONER CIRCUIT SHORTED TO BATTERY OR IGNITION



CONDITIONS	DETAILS/RESULTS/ACTIONS
AD1 CHECK FOR A HARD OR INTERMITTENT DTC	
<p>1  Retrieve/Clear Continuous DTCs</p> <p>2  On-Demand Self Test</p>	<p>1 Retrieve and record any continuous DTCs for use later in this pinpoint test.</p> <p>● Was DTC B1882 retrieved during the on-demand self test?</p> <p>→ Yes This is a hard fault. The fault condition is still present. This fault cannot be cleared until it is corrected and the DTC is no longer retrieved during the on-demand self test. GO to AD2.</p> <p>→ No This is an intermittent fault. The fault condition is not present at this time. GO to AD4.</p>
AD2 CHECK THE PASSENGER PRETENSIONER	
<p> WARNING: If the supplemental restraint system (SRS) is being serviced, the system must be deactivated and restraint system diagnostic tools must be installed. Refer to Air Bag and Safety Belt Pretensioner Supplemental Restraint System (SRS) in this section.</p> <p>The air bag restraint system diagnostic tools must be removed and the air bag modules reconnected when the system is reactivated to avoid non-deployment in a collision, resulting in possible personal injury.</p>	

NOTE: Diagnostics or repairs are not to be performed on a seat equipped with a seat side air bag with the seat in the vehicle. Prior to attempting to diagnose or repair a seat concern when equipped with a seat side air bag, the seat must be removed from the vehicle and the restraint system diagnostic tools must be installed in the seat side air bag electrical connectors. **The restraint system diagnostic tools must be removed prior to operating the vehicle over the road.**


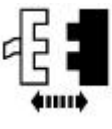
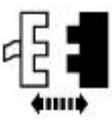
NOTE: After diagnosing or repairing an SRS, **the restraint system diagnostic tools must be removed before operating the vehicle over the road.**

NOTE: After diagnosing or repairing a seat system, **the restraint system diagnostic tools must be removed before operating the vehicle over the road.**

NOTE: The SRS must be fully operational and free of faults before releasing the vehicle to the customer.

<p>1</p>  <p>3</p>  <p>On-Demand Self Test</p>	<p>2</p> <p>Deactivate the system. Refer to Air Bag and Safety Belt Pretensioner Supplemental Restraint System (SRS) in the Diagnosis and Testing portion of this section.</p> <p>● Was DTC B1882 retrieved?</p> <p>→ Yes GO to AD3.</p> <p>→ No INSTALL a new passenger belt pretensioner. GO to AD5.</p>
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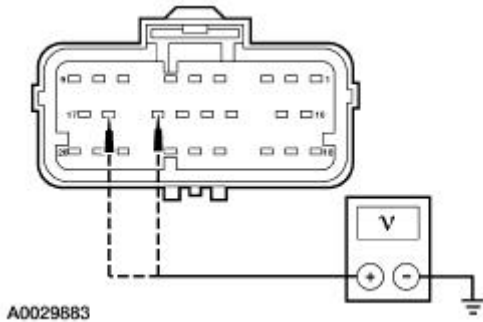
AD3 CHECK THE PASSENGER PRETENSIONER CIRCUITS

<p>1</p>  <p>2</p>  <p>Passenger Safety Belt Pretensioner Restraint System Diagnostic Tool</p> <p>3</p>  <p>RCM C310a</p>	
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4



5



- 5 Measure the voltage between the RCM C310a pin 15, circuit 30S-JA34 (RD/BK), harness side and ground; and between the RCM C310a pin 16, and 31S-JA34 (BK/RD), harness side and ground.

- Is the voltage less than 0.2 volt?

→ **Yes**
INSTALL a new RCM. GO to [AD5](#).

→ **No**
REPAIR the short to battery. GO to [AD5](#).

AD4 CHECK FOR AN INTERMITTENT FAULT

- 1 Refer to the continuous DTCs recorded during Step AD1.

- Was the continuous DTC retrieved during Step AD1 an intermittent fault?

→ **Yes**
CHECK for causes of intermittent fault at or near the passenger safety belt retractor pretensioner electrical connector. REPAIR any intermittent concerns found.

If an intermittent concern **was** found and repaired, GO to [AD5](#).

If an intermittent concern **was not** found, GO to [AD3](#).

→ **No**
CHECK for causes of intermittent short to battery or ignition on circuit 30S-JA34 (RD/BK) and circuit 31S-JA34 (BK/RD). ATTEMPT to recreate the hard fault by flexing the wire harness and cycling the ignition key frequently. REPAIR any intermittent concerns found. GO to [AD5](#).

AD5 CHECK FOR ADDITIONAL DTCs

	<p>1 Refer to the continuous DTCs recorded during Step AD1.</p> <ul style="list-style-type: none"> ● Were any continuous DTCs retrieved during Step AD1? <p>→ Yes Do not clear any DTCs until all DTCs have been resolved. GO to the Restraints Control Module (RCM) Diagnostic Trouble Code (DTC) Priority Table in this section for pinpoint test direction.</p> <p>→ No RECONNECT the system. REACTIVATE the system. PROVE OUT the system. REFER to Air Bag and Safety Belt Pretensioner Supplemental Restraint System (SRS). CLEAR all DTCs.</p>
--	--

Pinpoint Test AE: LFC 18/DTC B1883 — Passenger Safety Belt Retractor Pretensioner Circuit Shorted to Ground

Normal Operation


The restraints control module (RCM) monitors the circuit to the passenger safety belt retractor pretensioner. When the RCM detects a circuit short to ground it will set lamp fault code (LFC) 18 and diagnostic test code (DTC) B1883.

Possible Causes

A short to ground on the passenger safety belt retractor pretensioner circuit can be caused by:

- a short to ground on circuit 30S-JA34 (RD/BK).
- a short to ground on circuit 31S-JA34 (BK/RD).
- a short to ground on the passenger safety belt retractor pretensioner.
- RCM is faulted.

PINPOINT TEST AE: LFC 18/DTC B1883 — PASSENGER SAFETY BELT RETRACTOR PRETENSIONER CIRCUIT SHORTED TO GROUND

CONDITIONS	DETAILS/RESULTS/ACTIONS
AE1 CHECK FOR A HARD OR INTERMITTENT DTC	
<p>1</p>  <p>Retrieve/Clear Continuous DTCs</p>	<p>1 Retrieve and record any continuous DTCs for use later in this pinpoint test.</p>

2



On-Demand Self Test

- Was DTC B1883 retrieved during the on-demand self test?

→ Yes

This is a hard fault. The fault condition is still present. This fault cannot be cleared until it is corrected and the DTC is no longer retrieved during the on-demand self test. GO to [AE2](#).

→ No

This is an intermittent fault. The fault condition is not present at this time. GO to [AE4](#).

AE2 CHECK THE PASSENGER PRETENSIONER



WARNING: If the supplemental restraint system (SRS) is being serviced, the system must be deactivated and restraint system diagnostic tools must be installed. Refer to [Air Bag and Safety Belt Pretensioner Supplemental Restraint System \(SRS\)](#) in this section.

The air bag restraint system diagnostic tools must be removed and the air bag modules reconnected when the system is reactivated to avoid non-deployment in a collision, resulting in possible personal injury.

NOTE: Diagnostics or repairs are not to be performed on a seat equipped with a seat side air bag with the seat in the vehicle. Prior to attempting to diagnose or repair a seat concern when equipped with a seat side air bag, the seat must be removed from the vehicle and the restraint system diagnostic tools must be installed in the seat side air bag electrical connectors. **The restraint system diagnostic tools must be removed prior to operating the vehicle over the road.**

NOTE: After diagnosing or repairing an SRS, **the restraint system diagnostic tools must be removed before operating the vehicle over the road.**

NOTE: After diagnosing or repairing a seat system, **the restraint system diagnostic tools must be removed before operating the vehicle over the road.**

NOTE: The SRS must be fully operational and free of faults before releasing the vehicle to the customer.

1



3



2

Deactivate the system. Refer to [Air Bag and Safety Belt Pretensioner Supplemental Restraint System \(SRS\)](#) in the Diagnosis and Testing portion of this section.

On-Demand Self Test

● Was DTC B1883 retrieved?

→ **Yes**
GO to [AE3](#).

→ **No**
INSTALL a new passenger belt pretensioner. GO to [AE5](#).

AE3 CHECK THE PASSENGER PRETENSIONER CIRCUITS

1

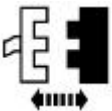


2



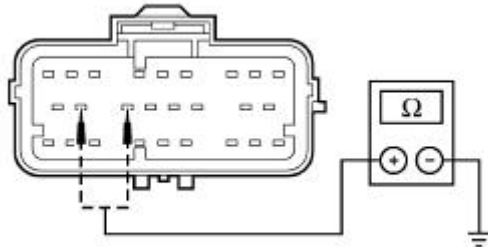
Passenger Safety Belt Pretensioner Restraint System Diagnostic Tool

3



RCM C310a

4



DR1562-A

4 Measure the resistance to ground at RCM C310a pin 15, circuit 30S-JA34 (RD/BK) and pin 16, circuit 31S-JA34 (BK/RD).

● Is the resistance less than 10,000 ohms at either pin?

→ **Yes**
REPAIR the short to ground. GO to [AE5](#).

→ **No**
INSTALL a new RCM. GO to [AE5](#).

AE4 CHECK FOR AN INTERMITTENT FAULT



WARNING: If the supplemental restraint system (SRS) is being serviced, the system must be deactivated and restraint system diagnostic tools must be installed. Refer to [Air Bag and Safety Belt Pretensioner Supplemental Restraint System \(SRS\)](#) in this section.

The air bag restraint system diagnostic tools must be removed and the air bag modules reconnected when the system is reactivated to avoid non-deployment in a collision, resulting in possible personal injury.

NOTE: Diagnostics or repairs are not to be performed on a seat equipped with a seat side air bag with the seat in the vehicle. Prior to attempting to diagnose or repair a seat concern when equipped with a seat side air bag, the seat must be removed from the vehicle and the restraint system diagnostic tools must be installed in the seat side air bag electrical connectors. **The restraint system diagnostic tools must be removed prior to operating the vehicle over the road.**

NOTE: After diagnosing or repairing an SRS, **the restraint system diagnostic tools must be removed before operating the vehicle over the road.**

NOTE: After diagnosing or repairing a seat system, **the restraint system diagnostic tools must be removed before operating the vehicle over the road.**

NOTE: The SRS must be fully operational and free of faults before releasing the vehicle to the customer.

1 Refer to the continuous DTCs recorded during Step AE1.

- **Was DTC B1883 retrieved during the on-demand self test?**

→ **Yes**

CHECK for causes of intermittent fault at or near the passenger safety belt retractor pretensioner connector. REPAIR any intermittent concerns found.

If an intermittent concern **was** found and repaired, GO to [AE5](#).

If an intermittent concern **was not** found, GO to [AE3](#).

→ **No**

CHECK for causes of intermittent short to ground on circuit 30S-JA34 (RD/BK) and circuit 31S-JA34 (BK/RD).

ATTEMPT to recreate the hard fault by flexing the wire harness and cycling the ignition key frequently. REPAIR any intermittent concerns found. GO to [AE5](#).

AE5 CHECK FOR ADDITIONAL DTCs

1 Refer to the continuous DTCs recorded during Step AE1.

- **Were any continuous DTCs retrieved during Step AE1?**

→ **Yes**

Do not clear any DTCs until all DTCs have been resolved. GO to the Restraints Control Module (RCM) Diagnostic Trouble Code (DTC) Priority Table in this section for pinpoint test direction.

→ **No**
 RECONNECT the system.
 REACTIVATE the system. PROVE OUT the system. REFER to [Air Bag and Safety Belt Pretensioner Supplemental Restraint System \(SRS\)](#). CLEAR all DTCs.

Pinpoint Test AF: B1892 — Air Bag Tone Warning Indicator Circuit Shorted to Ground or Open

Normal Operation



The restraints control module (RCM) monitors its connection to the instrument cluster at C310a at pin 26. This connection is used to signal a chime if the air bag indicator is inoperative and another SRS fault exists. If the RCM detects a short to ground or open on the connection to the instrument cluster, it will store a diagnostic trouble code (DTC) B1892 in memory.

Possible Causes

An air bag tone warning indicator circuit short to ground or open can be caused by:


- a short to ground or open on circuit 8-JA13 (WH/BK).
- a damaged or inoperative instrument cluster.
- RCM is faulted.

PINPOINT TEST AF: DTC B1892 — AIR BAG TONE WARNING INDICATOR CIRCUIT SHORTED TO GROUND OR OPEN

CONDITIONS	DETAILS/RESULTS/ACTIONS
AF1 CHECK FOR A HARD OR INTERMITTENT DTC	
<p>1  Retrieve/Clear Continuous DTCs</p> <p>2  On-Demand Self Test</p>	<p>1 Retrieve and record any continuous DTCs for use later in this pinpoint test.</p> <p>● Was DTC B1892 retrieved during the on-demand self test?</p> <p>→ Yes This is a hard fault. The fault condition is still present. This fault cannot be cleared until it is corrected and the DTC is no longer retrieved during the on-demand self test. GO to AF2.</p>

→ **No**
This is an intermittent fault. The fault condition is not present at this time. GO to [AF5](#).

AF2 CHECK THE AIR BAG TONE WARNING INDICATOR CIRCUIT

 **WARNING:** If the supplemental restraint system (SRS) is being serviced, the system must be deactivated and restraint system diagnostic tools must be installed. Refer to [Air Bag and Safety Belt Pretensioner Supplemental Restraint System \(SRS\)](#) in this section.

The air bag restraint system diagnostic tools must be removed and the air bag modules reconnected when the system is reactivated to avoid non-deployment in a collision, resulting in possible personal injury.

NOTE: Diagnostics or repairs are not to be performed on a seat equipped with a seat side air bag with the seat in the vehicle. Prior to attempting to diagnose or repair a seat concern when equipped with a seat side air bag, the seat must be removed from the vehicle and the restraint system diagnostic tools must be installed in the seat side air bag electrical connectors. **The restraint system diagnostic tools must be removed prior to operating the vehicle over the road.**

NOTE: After diagnosing or repairing an SRS, the restraint system diagnostic tools must be removed before operating the vehicle over the road.

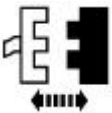
NOTE: After diagnosing or repairing a seat system, the restraint system diagnostic tools must be removed before operating the vehicle over the road.

NOTE: The SRS must be fully operational and free of faults before releasing the vehicle to the customer.

1



3



RCM C310a

4



Instrument Cluster C220B

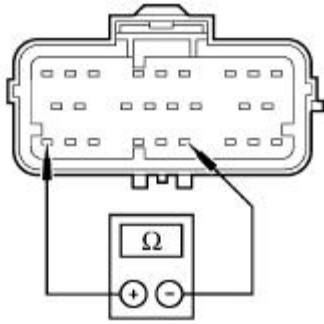
5

2

Deactivate the system. Refer to [Air Bag and Safety Belt Pretensioner Supplemental Restraint System \(SRS\)](#) in the Diagnosis and Testing portion of this section.

5

Measure the resistance between RCM C310a pin 26, circuit 8-JA13 (WH/BK), harness side and RCM C310a pin 21, circuit 31-JA10A (BK/RD), harness side.



DR1013-A

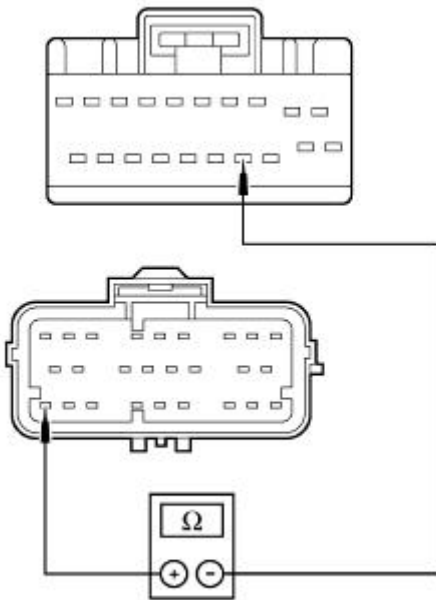
- Is the resistance less than 10,000 ohms?

→ **Yes**
REPAIR the circuit. GO to [AF6](#).

→ **No**
GO to [AF3](#).

AF3 CHECK THE AIR BAG TONE WARNING INDICATOR MODULE CIRCUIT

1



A0003425

1

Measure the resistance between RCM C310a pin 26, circuit 8-JA13 (WH/BK), harness side and instrument cluster C220B pin 14, circuit 8-JA13 (WH/BK), harness side.

- Is the resistance greater than 100 ohms?

→ **Yes**
REPAIR the circuit. GO to [AF6](#).

→ **No**
GO to [AF4](#).

AF4 CHECK THE AIR BAG TONE WARNING INDICATOR

1

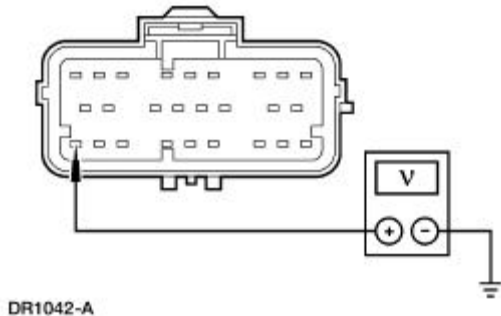


Instrument Cluster C220B

2



3



3

Measure the voltage between RCM C310a pin 26, circuit 8-JA13 (WH/BK), harness side and ground.

● Is the voltage less than 1.0 volt?

→ **Yes**
REPAIR the instrument cluster. GO to [AF6](#).

→ **No**
INSTALL a new RCM. GO to [AF6](#).

AF5 CHECK FOR AN INTERMITTENT FAULT



WARNING: If the supplemental restraint system (SRS) is being serviced, the system must be deactivated and restraint system diagnostic tools must be installed. Refer to [Air Bag and Safety Belt Pretensioner Supplemental Restraint System \(SRS\)](#) in this section.

The air bag restraint system diagnostic tools must be removed and the air bag modules reconnected when the system is reactivated to avoid non-deployment in a collision, resulting in possible personal injury.

NOTE: Diagnostics or repairs are not to be performed on a seat equipped with a seat side air bag with the seat in the vehicle. Prior to attempting to diagnose or repair a seat concern when equipped with a seat side air bag, the seat must be removed from the vehicle and the restraint system diagnostic tools must be installed in the seat side air bag electrical connectors. **The restraint system diagnostic tools must be removed prior to operating the vehicle over the road.**

NOTE: After diagnosing or repairing an SRS, the restraint system diagnostic tools must be removed before operating the vehicle over the road.

NOTE: After diagnosing or repairing a seat system, the restraint system diagnostic tools must be removed before operating the vehicle over the road.

NOTE: The SRS must be fully operational and free of faults before releasing the vehicle to the customer.

1



3



On-Demand Self Test

2 Deactivate the system. Refer to [Air Bag and Safety Belt Pretensioner Supplemental Restraint System \(SRS\)](#) in the Diagnosis and Testing portion of this section.

● **Was DTC B1892 retrieved during the on-demand self test?**

→ **Yes**
GO to [AF2](#).

→ **No**
CHECK for causes of intermittent short to ground or open on circuit 8-JA13 (WH/BK). ATTEMPT to recreate the hard fault by flexing the wire harness and cycling the ignition key frequently. REPAIR any intermittent concerns found. GO to [AF6](#).

AF6 CHECK FOR ADDITIONAL DTCs

1 Refer to the continuous DTCs recorded during Step AF1.

● **Were any continuous DTCs retrieved during Step AF1?**

→ **Yes**
Do not clear any DTCs until all DTCs have been resolved. GO to the Restraints Control Module (RCM) Diagnostic Trouble Code (DTC) Priority Table in this section for pinpoint test direction.

→ **No**
RECONNECT the system. REACTIVATE the system. PROVE OUT the system. REFER to [Air Bag and Safety Belt Pretensioner Supplemental Restraint System \(SRS\)](#). CLEAR all DTCs.

Pinpoint Test AG DTC B1891 — Air Bag Tone Warning Indicator Circuit Shorted to Battery or Ignition

Normal Operation




The restraints control module (RCM) monitors its connection to the instrument cluster at pin 26. This connection is used to signal a chime if the air bag indicator is inoperative and another SRS fault exists. If the RCM detects a short to battery or ignition on the connection to the instrument cluster, it will store a diagnostic trouble code (DTC) B1891 in memory.

Possible Causes

An air bag tone warning indicator circuit short to battery or ignition can be caused by:

- a short to battery or ignition on circuit 8-JA13 (WH/BK).
- a damaged or inoperative instrument cluster.
- RCM is faulted.

PINPOINT TEST AG: DTC B1891 — AIR BAG TONE WARNING INDICATOR CIRCUIT SHORTED TO BATTERY OR IGNITION

CONDITIONS	DETAILS/RESULTS/ACTIONS
AG1 CHECK FOR A HARD OR INTERMITTENT DTC	
<p>1  Retrieve/Clear Continuous DTCs</p> <p>2  On-Demand Self Test</p>	<p>1 Retrieve and record any continuous DTCs for use later in this pinpoint test.</p> <p>● Was DTC B1891 retrieved during the on-demand self test?</p> <p>→ Yes This is a hard fault. The fault condition is still present. This fault cannot be cleared until it is corrected and the DTC is no longer retrieved during the on-demand self test. GO to AG2.</p> <p>→ No This is an intermittent fault. The fault condition is not present at this time. GO to AG4.</p>
AG2 CHECK THE AIR BAG TONE WARNING INDICATOR CIRCUIT	
<p> WARNING: If the supplemental restraint system (SRS) is being serviced, the system must be deactivated and restraint system diagnostic tools must be installed. Refer to Air Bag and Safety Belt Pretensioner Supplemental Restraint System (SRS) in this section.</p> <p>The air bag restraint system diagnostic tools must be removed and the air bag modules reconnected when the system is reactivated to avoid non-deployment in a collision,</p>	

resulting in possible personal injury.

NOTE: Diagnostics or repairs are not to be performed on a seat equipped with a seat side air bag with the seat in the vehicle. Prior to attempting to diagnose or repair a seat concern when equipped with a seat side air bag, the seat must be removed from the vehicle and the restraint system diagnostic tools must be installed in the seat side air bag electrical connectors. **The restraint system diagnostic tools must be removed prior to operating the vehicle over the road.**

NOTE: After diagnosing or repairing an SRS, **the restraint system diagnostic tools must be removed before operating the vehicle over the road.**

NOTE: After diagnosing or repairing a seat system, **the restraint system diagnostic tools must be removed before operating the vehicle over the road.**

NOTE: The SRS must be fully operational and free of faults before releasing the vehicle to the customer.

1



3



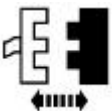
Battery Ground Cable

4



RCM C310a

5



Instrument Cluster C220B

6



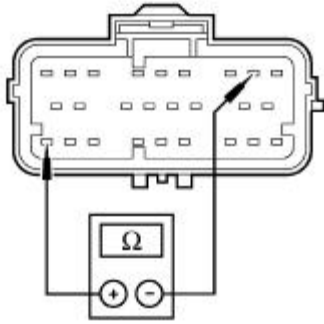
7

2

Deactivate the system. Refer to [Air Bag and Safety Belt Pretensioner Supplemental Restraint System \(SRS\)](#) in the Diagnosis and Testing portion of this section.

7

Measure the resistance between RCM C310a pin 26, circuit 8-JA13 (WH/BK), harness side and RCM C310a pin 2, circuit 20-JA10A, harness side.



DR1015-A

- Is the resistance less than 10,000 ohms?

→ **Yes**
REPAIR the circuit. GO to [AG5](#).

→ **No**
GO to [AG3](#).

AG3 CHECK THE AIR BAG TONE WARNING INDICATOR

1



2



Battery Ground Cable

3

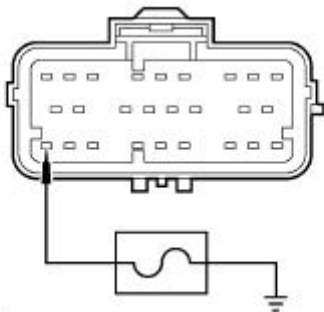


Instrument Cluster C220B

4



5




DR1043-A

5 Jumper RCM C310a pin 26, circuit 8-JA13 (WH/BK), harness side to ground.

- Does the instrument cluster

	<p style="text-align: center;">generate a tone?</p> <p>→ Yes INSTALL a new RCM. GO to AG5.</p> <p>→ No REPAIR the instrument cluster. GO to AG5.</p>
--	---

AG4 CHECK FOR AN INTERMITTENT FAULT

 **WARNING:** If the supplemental restraint system (SRS) is being serviced, the system must be deactivated and restraint system diagnostic tools must be installed. Refer to [Air Bag and Safety Belt Pretensioner Supplemental Restraint System \(SRS\)](#) in this section.


The air bag restraint system diagnostic tools must be removed and the air bag modules reconnected when the system is reactivated to avoid non-deployment in a collision, resulting in possible personal injury.

NOTE: Diagnostics or repairs are not to be performed on a seat equipped with a seat side air bag with the seat in the vehicle. Prior to attempting to diagnose or repair a seat concern when equipped with a seat side air bag, the seat must be removed from the vehicle and the restraint system diagnostic tools must be installed in the seat side air bag electrical connectors. **The restraint system diagnostic tools must be removed prior to operating the vehicle over the road.**

NOTE: After diagnosing or repairing an SRS, the restraint system diagnostic tools must be removed before operating the vehicle over the road.

NOTE: After diagnosing or repairing a seat system, the restraint system diagnostic tools must be removed before operating the vehicle over the road.

NOTE: The SRS must be fully operational and free of faults before releasing the vehicle to the customer.

<p>1</p> 	<p>2 Deactivate the system. Refer to Air Bag and Safety Belt Pretensioner Supplemental Restraint System (SRS) in the Diagnosis and Testing portion of this section.</p> <ul style="list-style-type: none"> ● Was DTC B1891 retrieved during the on-demand self test? <p>→ Yes GO to AG2.</p> <p>→ No CHECK for causes of intermittent short to ground or open on circuit 8-JA13 (WH/BK). ATTEMPT to recreate the hard fault by flexing the wire harness and cycling the ignition key frequently. REPAIR any intermittent concerns found. GO to AG5.</p>
---	--

AG5 CHECK FOR ADDITIONAL DTCs

	<p>1 Refer to the continuous DTCs recorded</p>
--	---

	<p>during Step AG1.</p> <ul style="list-style-type: none"> ● Were any continuous DTCs retrieved during Step AG1? <p>→ Yes Do not clear any DTCs until all DTCs have been resolved. GO to the Restraints Control Module (RCM) Diagnostic Trouble Code (DTC) Priority Table in this section for pinpoint test direction.</p> <p>→ No RECONNECT the system. REACTIVATE the system. PROVE OUT the system. REFER to Air Bag and Safety Belt Pretensioner Supplemental Restraint System (SRS). CLEAR all DTCs.</p>
--	--

Pinpoint Test AH: DTC B1869 — Air Bag Indicator Inoperative

Normal Operation

The air bag indicator is designed to illuminate for 6 (+/-2) seconds when the ignition switch is turned to the RUN position. This initial 6 seconds of illumination is considered normal operation and is called prove out of the air bag indicator. The air bag indicator is then used to warn the driver that there is a fault in the air bag supplemental restraint system (SRS).

The restraints control module (RCM) monitors the air bag indicator for open and short to ground conditions. If the RCM detects an open or short to ground condition on the air bag indicator circuit, it will store a diagnostic trouble code (DTC) B1869 in memory.

If the RCM detects an air bag indicator failure in addition to another SRS failure, the RCM will send a signal to the air bag tone warning indicator to produce five sets of five tone bursts.

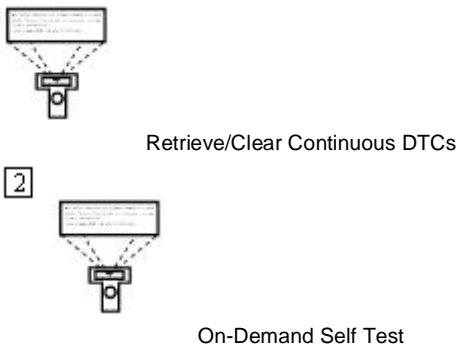
Possible Causes

An air bag indicator inoperative condition can be caused by:

- damaged wiring on circuit 31S-JA14.
- a damaged or burned out air bag indicator.
- an instrument cluster malfunction.
- RCM is faulted.

PINPOINT TEST AH: DTC B1869 — AIR BAG INDICATOR INOPERATIVE

CONDITIONS	DETAILS/RESULTS/ACTIONS
AH1 CHECK FOR A HARD OR INTERMITTENT DTC	
1	1 Retrieve and record any continuous



DTCs for use later in this pinpoint test.

- Was DTC B1869 retrieved during the on-demand self test?

→ Yes

This is a hard fault. The fault condition is still present. This fault cannot be cleared until it is corrected and the DTC is no longer retrieved during the on-demand self test. GO to [AH2](#).

→ No

This is an intermittent fault. The fault condition is not present at this time. GO to [AH5](#).

AH2 CHECK THE RCM



WARNING: If the supplemental restraint system (SRS) is being serviced, the system must be deactivated and restraint system diagnostic tools must be installed. Refer to [Air Bag and Safety Belt Pretensioner Supplemental Restraint System \(SRS\)](#) in this section.

The air bag restraint system diagnostic tools must be removed and the air bag modules reconnected when the system is reactivated to avoid non-deployment in a collision, resulting in possible personal injury.

NOTE: Diagnostics or repairs are not to be performed on a seat equipped with a seat side air bag with the seat in the vehicle. Prior to attempting to diagnose or repair a seat concern when equipped with a seat side air bag, the seat must be removed from the vehicle and the restraint system diagnostic tools must be installed in the seat side air bag electrical connectors. **The restraint system diagnostic tools must be removed prior to operating the vehicle over the road.**

NOTE: After diagnosing or repairing an SRS, **the restraint system diagnostic tools must be removed before operating the vehicle over the road.**

NOTE: After diagnosing or repairing a seat system, **the restraint system diagnostic tools must be removed before operating the vehicle over the road.**

NOTE: The SRS must be fully operational and free of faults before releasing the vehicle to the customer.

1



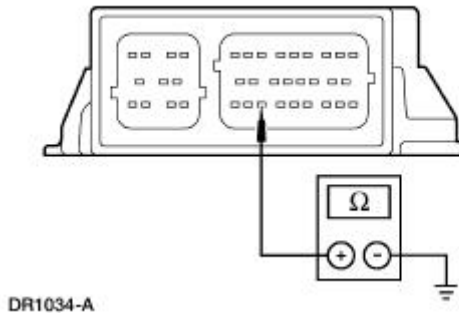
- 2 Deactivate the system. Refer to [Air Bag and Safety Belt Pretensioner Supplemental Restraint System \(SRS\)](#) in the Diagnosis and Testing portion of this section.

3



RCM C310a

4



DR1034-A

4

Measure the resistance between the RCM C310a, pin 20, component side, and a known good chassis ground.

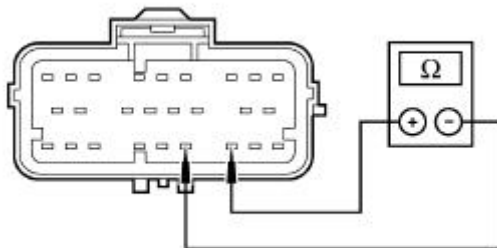
● Is the resistance less than 100 ohms?

→ **Yes**
INSTALL a new RCM. GO to [AH6](#).

→ **No**
GO to [AH3](#).

AH3 CHECK CIRCUIT 31S-JA14 FOR A SHORT TO GROUND

1



DR1217-A

1

Measure the resistance between RCM C310a pin 20, circuit 31S-JA14, harness side and RCM C310a pin 21, circuit 31-JA10 (BK/RD), harness side.

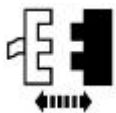
● Is the resistance less than 100 ohms?

→ **Yes**
REPAIR the circuit. GO to [AH6](#).

→ **No**
GO to [AH4](#).

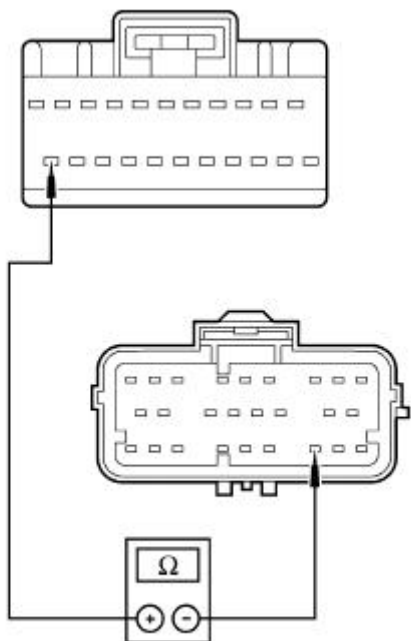
AH4 CHECK CIRCUIT 31S-JA14 (BK/GN) FOR AN OPEN

1



Instrument Cluster C220A

2



A0003426

2

Measure the resistance between RCM C310a pin 20, circuit 31S-JA14, harness side and instrument cluster C220A pin 22, circuit 31S-JA14, harness side.

- Is the resistance greater than 10 ohms?

→ **Yes**
REPAIR the circuit. GO to [AH6](#).

→ **No**
REPAIR the instrument cluster. REFER to [Section 413-01](#). GO to [AH6](#).

AH5 CHECK FOR AN INTERMITTENT FAULT



WARNING: If the supplemental restraint system (SRS) is being serviced, the system must be deactivated and restraint system diagnostic tools must be installed. Refer to [Air Bag and Safety Belt Pretensioner Supplemental Restraint System \(SRS\)](#) in this section.

The air bag restraint system diagnostic tools must be removed and the air bag modules reconnected when the system is reactivated to avoid non-deployment in a collision, resulting in possible personal injury.

NOTE: Diagnostics or repairs are not to be performed on a seat equipped with a seat side air bag with the seat in the vehicle. Prior to attempting to diagnose or repair a seat concern when equipped with a seat side air bag, the seat must be removed from the vehicle and the restraint system diagnostic tools must be installed in the seat side air bag electrical connectors. **The restraint system diagnostic tools must be removed prior to operating the vehicle over the road.**

NOTE: After diagnosing or repairing an SRS, the restraint system diagnostic tools must be removed before operating the vehicle over the road.

NOTE: After diagnosing or repairing a seat system, the restraint system diagnostic tools must be removed before operating the vehicle over the road.

NOTE: The SRS must be fully operational and free of faults before releasing the vehicle to the customer.

1



3



On-Demand Self-Test

2 Deactivate the system. Refer to [Air Bag and Safety Belt Pretensioner Supplemental Restraint System \(SRS\)](#) in the Diagnosis and Testing portion of this section.

● Was DTC B1869 retrieved during the on-demand self test?

→ Yes
GO to [AH2](#) .

→ No
CHECK for causes of intermittent short to ground or open on circuit 31S-JA14. ATTEMPT to recreate the hard fault by flexing the wire harness and cycling the ignition key frequently. REPAIR any intermittent concerns found. GO to [AH6](#) .

AH6 CHECK FOR ADDITIONAL DTCs

1 Refer to the continuous DTCs recorded during Step AH1.

● Were any continuous DTCs retrieved during Step AH1?

→ Yes
Do not clear any DTCs until all DTCs have been resolved. GO to the Restraints Control Module (RCM) Diagnostic Trouble Code (DTC) Priority Table in this section for pinpoint test direction.

→ No
RECONNECT the system. REACTIVATE the system. PROVE OUT the system. REFER to [Air Bag and Safety Belt Pretensioner Supplemental Restraint System \(SRS\)](#) . CLEAR all DTCs.

Pinpoint Test AI: DTC B1870 — Air Bag Indicator Shorted to Battery

Normal Operation

The air bag indicator is designed to illuminate for 6 seconds when the ignition switch is turned to the

RUN position. This is considered normal operation and is called SRS prove out . The air bag indicator is used to warn the driver that there is a fault in the (SRS).

The restraints control module (RCM) monitors the air bag indicator for short to battery conditions. If the RCM detects a short to battery condition on the air bag indicator circuit, it will store a diagnostic trouble code (DTC) B1870 in memory.




If the RCM detects an air bag indicator failure in addition to another SRS failure, the RCM will send a signal to the air bag tone warning indicator to produce five sets of five tone bursts.

Possible Causes

An air bag indicator short to battery condition can be caused by:

- damaged wiring on circuit 31S-JA14.
- an instrument cluster concern.
- RCM is faulted.

PINPOINT TEST AI: DTC B1870 — AIR BAG INDICATOR SHORTED TO BATTERY

CONDITIONS	DETAILS/RESULTS/ACTIONS
AI1 CHECK FOR A HARD OR INTERMITTENT DTC	
<div style="display: flex; flex-direction: column; align-items: center;"> <div style="margin-bottom: 20px;"> 1  <p>Retrieve/Clear Continuous DTCs</p> </div> <div> 2  <p>On-Demand Self Test</p> </div> </div>	<div style="margin-bottom: 20px;"> 1 Retrieve and record any continuous DTCs for use later in this pinpoint test. </div> <ul style="list-style-type: none"> ● Was DTC B1870 retrieved during the on-demand self test? <div style="margin-top: 10px;"> <p>→ Yes This is a hard fault. The fault condition is still present. This fault cannot be cleared until it is corrected and the DTC is no longer retrieved during the on-demand self test. GO to AI2.</p> <p>→ No This is an intermittent fault. The fault condition is not present at this time. GO to AI3.</p> </div>
AI2 CHECK THE AIR BAG INDICATOR CIRCUIT	
 <p>WARNING: If the supplemental restraint system (SRS) is being serviced, the system must be deactivated and restraint system diagnostic tools must be installed. Refer to Air Bag and Safety Belt Pretensioner Supplemental Restraint System (SRS) in this section.</p>	

The air bag restraint system diagnostic tools must be removed and the air bag modules reconnected when the system is reactivated to avoid non-deployment in a collision, resulting in possible personal injury.

NOTE: Diagnostics or repairs are not to be performed on a seat equipped with a seat side air bag with the seat in the vehicle. Prior to attempting to diagnose or repair a seat concern when equipped with a seat side air bag, the seat must be removed from the vehicle and the restraint system diagnostic tools must be installed in the seat side air bag electrical connectors. **The restraint system diagnostic tools must be removed prior to operating the vehicle over the road.**

NOTE: After diagnosing or repairing an SRS, the restraint system diagnostic tools must be removed before operating the vehicle over the road.

NOTE: After diagnosing or repairing a seat system, the restraint system diagnostic tools must be removed before operating the vehicle over the road.

NOTE: The SRS must be fully operational and free of faults before releasing the vehicle to the customer.

1



2

Deactivate the system. Refer to [Air Bag and Safety Belt Pretensioner Supplemental Restraint System \(SRS\)](#) in the Diagnosis and Testing portion of this section.

3



RCM C310a

4



● Is the air bag indicator illuminated?

→ Yes

INSTALL a new RCM. GO to [AI4](#).

→ No

CHECK the air bag indicator. REFER to [Section 413-01](#). If the air bag indicator is OK, REPAIR the circuit. GO to [AI4](#).

AI3 CHECK FOR AN INTERMITTENT FAULT



WARNING: If the supplemental restraint system (SRS) is being serviced, the system must be deactivated and restraint system diagnostic tools must be installed. Refer to [Air Bag and Safety Belt Pretensioner Supplemental Restraint System \(SRS\)](#) in this section.

The air bag restraint system diagnostic tools must be removed and the air bag modules reconnected when the system is reactivated to avoid non-deployment in a collision, resulting in possible personal injury.


NOTE: Diagnostics or repairs are not to be performed on a seat equipped with a seat side air bag with the seat in the vehicle. Prior to attempting to diagnose or repair a seat concern when equipped with a seat side air bag, the seat must be removed from the vehicle and the restraint system diagnostic tools must be installed in the seat side air bag electrical connectors. **The**

restraint system diagnostic tools must be removed prior to operating the vehicle over the road.

NOTE: After diagnosing or repairing an SRS, the restraint system diagnostic tools must be removed before operating the vehicle over the road.

NOTE: After diagnosing or repairing a seat system, the restraint system diagnostic tools must be removed before operating the vehicle over the road.

NOTE: The SRS must be fully operational and free of faults before releasing the vehicle to the customer.

<p>1</p> 	<p>2</p> <p>Deactivate the system. Refer to Air Bag and Safety Belt Pretensioner Supplemental Restraint System (SRS) in the Diagnosis and Testing portion of this section.</p> <ul style="list-style-type: none">● Was DTC B1870 retrieved during the on-demand self test? <p>→ Yes GO to A12.</p> <p>→ No CHECK for causes of intermittent short to battery on circuit 31S-JA14. ATTEMPT to recreate the hard fault by flexing the wire harness and cycling the ignition key frequently. REPAIR any intermittent concerns found. GO to A14.</p>
<p>A14 CHECK FOR ADDITIONAL DTCs</p>	
	<p>1</p> <p>Refer to the continuous DTCs recorded during Step A11.</p> <ul style="list-style-type: none">● Were any continuous DTCs retrieved during Step A11? <p>→ Yes Do not clear any DTCs until all DTCs have been resolved. GO to the Restraints Control Module (RCM) Diagnostic Trouble Code (DTC) Priority Table in this section for pinpoint test direction.</p> <p>→ No RECONNECT the system. REACTIVATE the system. PROVE OUT the system. REFER to Air Bag and Safety Belt Pretensioner Supplemental Restraint System (SRS). CLEAR all DTCs.</p>

Pinpoint Test AJ: No Communication with the Restraints Control Module (RCM)

Normal Operation


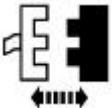
The RCM communicates with the scan tool using ISO 9141 communication mode through the data link connector (DLC).

Possible Causes

A no communication condition can be caused by:

- damage to circuit 4-EE1 (GY).
- DLC connection open.
- scan tool inoperative.
- RCM is faulted.

PINPOINT TEST AJ: NO COMMUNICATION WITH THE RESTRAINTS CONTROL MODULE (RCM)

CONDITIONS	DETAILS/RESULTS/ACTIONS
AJ1 CHECK THE RCM CONNECTOR C310a AND CONNECTOR PIN 5 FOR DAMAGE	
<p>NOTE: If the supplemental restraint system (SRS) is being serviced, the system must be deactivated and restraint system diagnostic tools must be installed. Refer to Air Bag and Safety Belt Pretensioner Supplemental Restraint System (SRS) Air Bag and Safety Belt Pretensioner Supplemental Restraint System (SRS) in this section.</p> <p>NOTE: Restraint system diagnostic tools MUST be installed under the seats in the side airbag and safety belt retractor pretensioner electrical connectors.</p> <p>NOTE: Diagnostics or repairs are not to be performed on a side airbag system or safety belt retractor pretensioner with the seat in the vehicle. Prior to attempting to diagnose/repair the side airbag system or safety belt retractor pretensioner the seat must be removed from the vehicle and the restraint system diagnostic tools must be installed in the side airbag and the safety belt retractor pretensioner electrical connectors. The restraint system diagnostic tools must be removed prior to operating the vehicle over the road.</p> <p>NOTE: Diagnostics may be performed on seat systems other than the side airbag or the safety belt retractor pretensioner such as (lumbar, climate controlled, heated, power seat track) with the seat installed in the vehicle as long as the SRS system is deactivated and the restraint system diagnostic tools are installed under the seats in the side airbag and safety belt retractor pretensioner electrical connectors.</p> <p>NOTE: After diagnosing/repairing a seat system, the restraint system diagnostic tools must be removed before operating the vehicle over the road.</p>	
<p>1</p>  <p>3</p>  <p>RCM C310a</p>	<p>2 Deactivate the system. Refer to Air Bag and Safety Belt Pretensioner Supplemental Restraint System (SRS) in the Diagnosis and Testing portion of this section.</p> <p>4 Inspect RCM C310a and RCM C310a pin 5 for damage.</p> <ul style="list-style-type: none"> ● Are RCM C310a and RCM C310a pin 5 OK?

→ **Yes**
GO to [AJ2](#).

→ **No**
REPAIR RCM C310a or RCM C310a pin 5 as necessary. RECONNECT the system. REACTIVATE the system. PROVE OUT the system. REFER to [Air Bag and Safety Belt Pretensioner Supplemental Restraint System \(SRS\)](#).

AJ2 CHECK THE DLC CONNECTOR C251 AND CONNECTOR PIN 7 FOR DAMAGE

1 Inspect DLC C251 and DLC C251 pin 7 for damage.

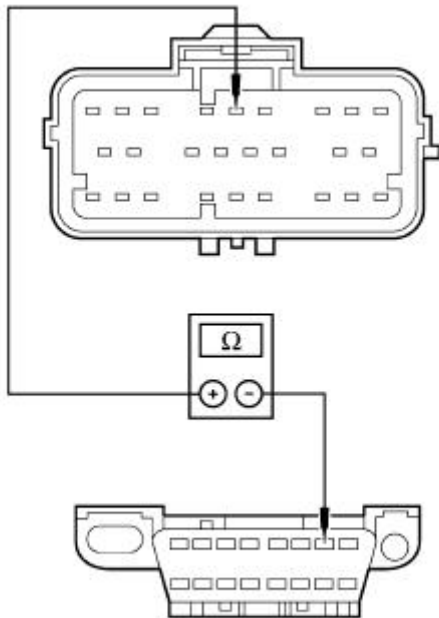
- **Are DLC C251 and DLC C251 pin 7 OK?**

→ **Yes**
GO to [AJ3](#).

→ **No**
REPAIR DLC C251 or DLC C251 pin 7 as necessary. RECONNECT the system. REACTIVATE the system. PROVE OUT the system. REFER to [Air Bag and Safety Belt Pretensioner Supplemental Restraint System \(SRS\)](#).

AJ3 CHECK CIRCUIT 4-EE1 (GY) FOR AN OPEN

1



DR1019-A

1 Measure the resistance between RCM C310a pin 5, circuit 4-EE1 (GY), harness side and DLC C251 pin 7, circuit 4-EE1 (GY), harness side.

- **Is the resistance less than 5 ohms?**

	<p>→ Yes INSTALL a new RCM. RECONNECT the system. REACTIVATE the system. PROVE OUT the system. REFER to Air Bag and Safety Belt Pretensioner Supplemental Restraint System (SRS).</p> <p>→ No REPAIR the circuit. RECONNECT the system. REACTIVATE the system. PROVE OUT the system. REFER to Air Bag and Safety Belt Pretensioner Supplemental Restraint System (SRS).</p>
--	---

Pinpoint Test AK: LFC 5 Hz — RCM in Plant Mode

Normal Operation

A new restraints control module (RCM) is programmed to flash a special code. The code is 5 Hz and is used during vehicle assembly. The code indicates that both (driver and passenger) side air bags are not installed correctly. The code will normally occur when both (and only both) of the following conditions are met:

- a new RCM is installed.
- both side air bags are not correctly installed.

Possible Causes

A 5 Hz LFC can be caused by:

- both front seats not installed.
- both side air bags not correctly installed.
- RCM is faulted.

PINPOINT TEST AK: PINPOINT TEST AG: LFC 5 HZ — RCM IN PLANT MODE

CONDITIONS	DETAILS/RESULTS/ACTIONS
AK1 CHECK THE LAMP FAULT CODE (LFC)	<p>1 Observe the flashing air bag indicator.</p> <p>● Is the air bag indicator flashing rapidly with no pauses?</p> <p>→ Yes GO to AK2.</p> <p>→ No REFER to the Restraints Control Module (RCM) Diagnostic Trouble</p>

Code (DTC) Priority Table for the indicated LFC.

AK2 CHECK FRONT SEAT INSTALLATION

- 1 Check that both front seats are installed.
- Are both front seats correctly installed?
- **Yes**
GO to [AK3](#).
- **No**
INSTALL the front seats. PROVE OUT the system. REFER to [Air Bag and Safety Belt Pretensioner Supplemental Restraint System \(SRS\)](#).

AK3 CHECK SIDE AIR BAG INSTALLATION

- 1 Check that both side air bags are correctly installed and connected.
- Are both side air bags correctly installed and connected?
- **Yes**
GO to [AK4](#).
- **No**
Correctly INSTALL and CONNECT both side air bags. PROVE OUT the system. REFER to [Air Bag and Safety Belt Pretensioner Supplemental Restraint System \(SRS\)](#).

AK4 CHECK BOTH SIDE AIR BAG LOOP RESISTANCES



WARNING: If the supplemental restraint system (SRS) is being serviced, the system must be deactivated and restraint system diagnostic tools must be installed. Refer to [Air Bag and Safety Belt Pretensioner Supplemental Restraint System \(SRS\)](#) in this section.

The air bag restraint system diagnostic tools must be removed and the air bag modules reconnected when the system is reactivated to avoid non-deployment in a collision, resulting in possible personal injury.

NOTE: Diagnostics or repairs are not to be performed on a seat equipped with a seat side air bag with the seat in the vehicle. Prior to attempting to diagnose or repair a seat concern when equipped with a seat side air bag, the seat must be removed from the vehicle and the restraint system diagnostic tools must be installed in the seat side air bag electrical connectors. **The restraint system diagnostic tools must be removed prior to operating the vehicle over the road.**

NOTE: After diagnosing or repairing an SRS, **the restraint system diagnostic tools must be removed before operating the vehicle over the road.**

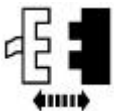
NOTE: After diagnosing or repairing a seat system, **the restraint system diagnostic tools must be removed before operating the vehicle over the road.**

NOTE: The SRS must be fully operational and free of faults before releasing the vehicle to the customer.

1

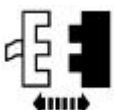


3



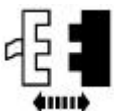
Battery Ground Cable

4



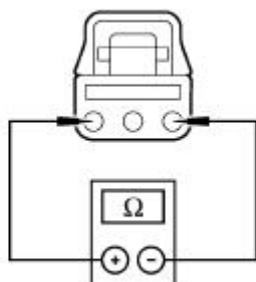
Driver and Passenger Side Air Bag Module Restraint System Diagnostic Tools

5



RCM C310b

6



DR1050-A

2

Deactivate the system. Refer to [Air Bag and Safety Belt Pretensioner Supplemental Restraint System \(SRS\)](#) in the Diagnosis and Testing portion of this section.

6

NOTE: By disconnecting RCM C310b each driver and passenger seat side air bag loop circuit will be shorted through a shorting bar. Do not remove the shorting bar.

Measure the resistances through C367 circuits 30S-JA37 (RD/GN) and 31S-JA37 (BK/GN) and through C337 circuits 30S-JA38 (RD/BK) and 31S-JA38 (BK/RD).

● **Is the resistance more than 1.0 ohm for both measurements?**

→ **Yes**


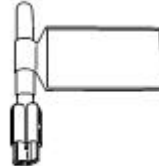
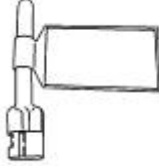
REPAIR the circuits. RECONNECT the system. REACTIVATE the system. PROVE OUT the system. REFER to [Air Bag and Safety Belt Pretensioner Supplemental Restraint System \(SRS\)](#).

→ **No**


INSTALL a new RCM. RECONNECT the system. REACTIVATE the system. PROVE OUT the system. REFER to [Air Bag and Safety Belt Pretensioner Supplemental Restraint System \(SRS\)](#).


Supplemental Restraint System (SRS) Deactivation and Reactivation

Special Tool(s)


 ST2502-A	Diagnostic Tool, Restraint System (1 Req'd) 418-F395 (014-R1079)
 ST2506-A	Diagnostic Tool, Restraint System (3 Req'd) 418-F088 (105-R0012)
 ST2507-A	Diagnostic Tool, Restraint System (2 Req'd) 418-133 (40-009)

Deactivation


 **WARNING:** Always wear safety glasses when repairing an air bag supplemental restraint system (SRS) vehicle and when handling an air bag module. This will reduce the risk of injury in the event of an accidental deployment.

 **WARNING:** Carry a live air bag module with the air bag and trim cover pointed away from your body. This will reduce the risk of injury in the event of an accidental deployment.

 **WARNING:** Do not set a live air bag module down with the trim cover face down. This will reduce the risk of injury in the event of an accidental deployment.

 **WARNING:** After deployment, the air bag surface can contain deposits of sodium hydroxide, a product of the gas generant combustion that is irritating to the skin. Wash your hands with soap and water afterwards.

 **WARNING:** Never probe the connectors on the air bag module. Doing so can result in air bag deployment, which can result in personal injury.

 **WARNING:** The safety belt buckle pretensioner and safety belt retractor pretensioner are pyrotechnic devices. Never probe a pretensioner electrical connector. Doing so could result in pretensioner or air bag deployment and could result in personal injury.



WARNING: Vehicle sensor orientation is critical for proper system operation. If a vehicle equipped with an air bag supplemental restraint system (SRS) is involved in a collision, inspect the sensor mounting bracket and wiring pigtail for deformation. Replace and properly position the sensor or any other damaged supplemental restraint system (SRS) components whether or not the air bag is deployed.



WARNING: The restraint system diagnostic tool is for restraint system service only. Remove from vehicle prior to road use. Failure to remove could result in injury and possible violation of vehicle safety standards.

NOTE: If a seat equipped with a seat mounted side air bag and/or a safety belt pretensioner (if equipped) system is being serviced, **the air bag system must be deactivated.**

NOTE: Restraint system diagnostic tools **MUST** be installed under the seats in the seat side air bag (if equipped) and safety belt pretensioner (if equipped) to floor connectors.

NOTE: Diagnostics or repairs are not to be performed on a seat equipped with a seat side air bag with the seat in the vehicle. Prior to attempting to diagnose or repair a seat concern when equipped with a seat side air bag, the seat must be removed from the vehicle and the restraint system diagnostic tools must be installed in the seat side air bag electrical connectors. **The restraint system diagnostic tools must be removed prior to operating the vehicle over the road.**

NOTE: After diagnosing or repairing an SRS, **the restraint system diagnostic tools must be removed before operating the vehicle over the road.**

NOTE: After diagnosing or repairing a seat system, **the restraint system diagnostic tools must be removed before operating the vehicle over the road.**

NOTE: The SRS must be fully operational and free of faults before releasing the vehicle to the customer.



- WARNING:** To avoid accidental deployment and possible personal injury, the backup power supply must be depleted before repairing or replacing any front or side air bag supplemental restraint system (SRS) components and before servicing, replacing, adjusting or striking components near the front or side air bag sensors, such as doors, instrument panel, console, door latches, strikers, seats and hood latches.

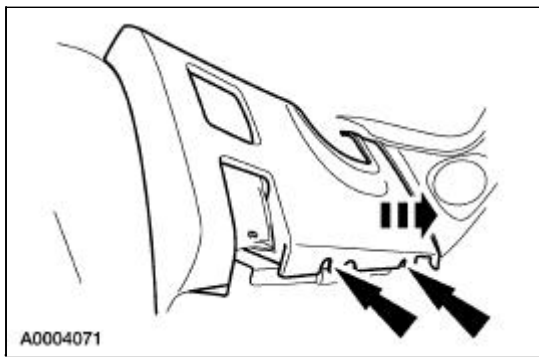
Please refer to the appropriate vehicle shop manual to determine location of the front air bag sensors.

The side air bag sensors are located at or near the base of the B-pillar.

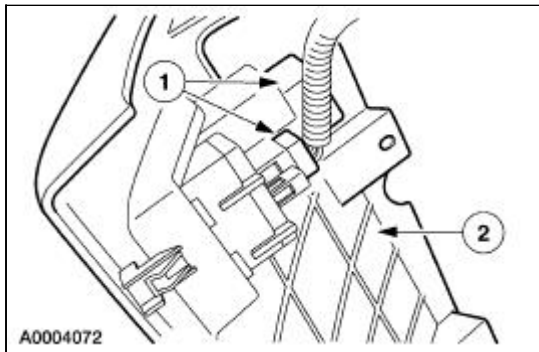
To deplete the backup power supply energy, disconnect the battery ground cable and wait at least one minute. Be sure to disconnect auxiliary batteries and power supplies (if equipped).

Disconnect the battery ground cable and wait at least one minute. For additional information, refer to [Section 414-01](#).

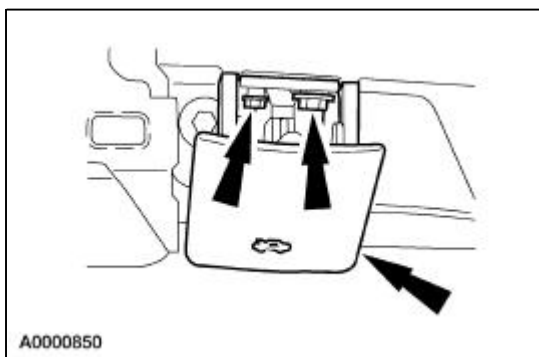
- Remove the two screws and pull out on the lower steering column opening finish panel enough to access the electrical connectors.



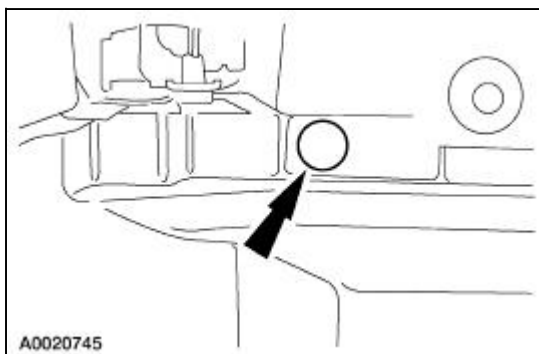
3. Remove the lower steering column opening finish panel.
 1. Disconnect the electrical connectors.
 2. Remove the lower steering column opening finish panel.



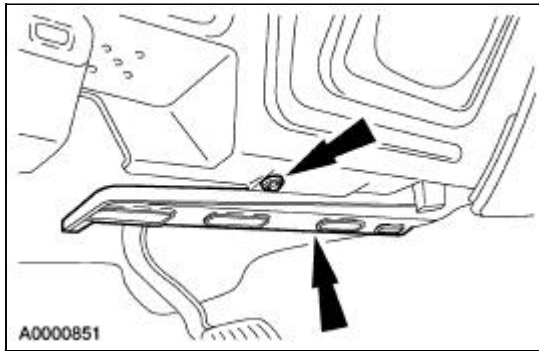
4. Remove the screws. Separate the hood latch release cable and handle assembly from the steering column opening reinforcement.



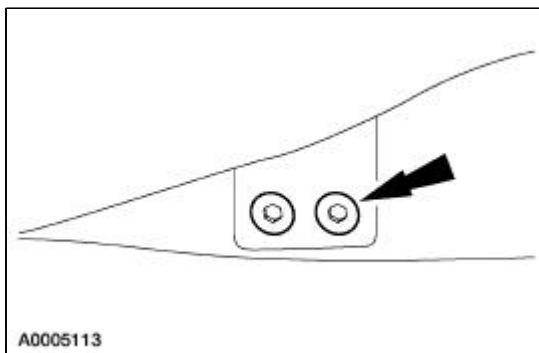
5. Remove the two pin-type retainers and the RH instrument panel insulator.
 - Disconnect the courtesy lamp.



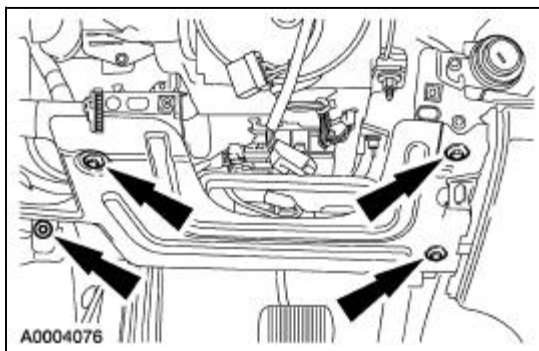
6. Remove the screw and the heater duct.



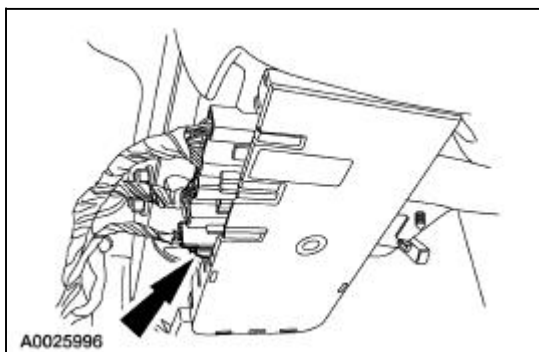
7. Loosen the two driver-side instrument panel tunnel brace bolts.
 - Position the carpet aside to gain access to the bolts.



8. Remove the screws and the steering column opening reinforcement.

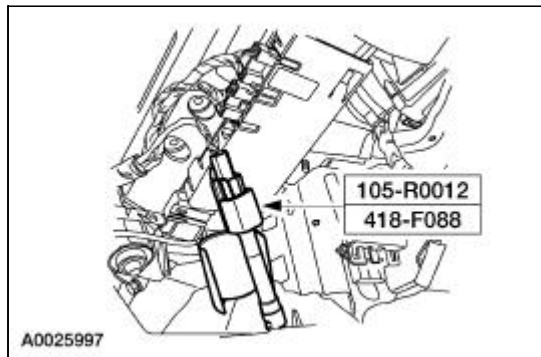


9. Disconnect the clockspring electrical connector at the base of the steering column.

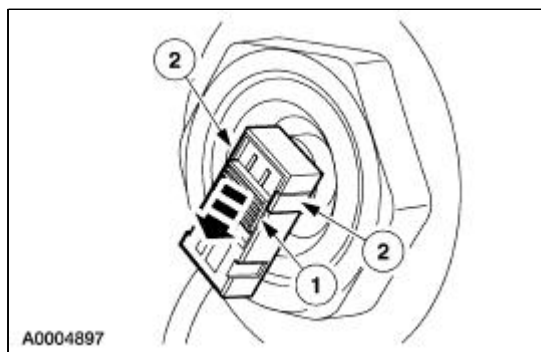


10. Attach the restraint system diagnostic tool to the vehicle harness side of the clockspring

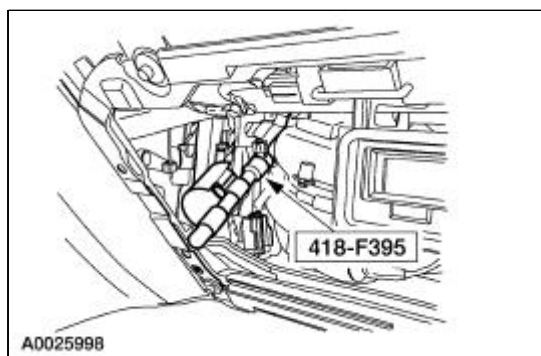
electrical connector.




11. Remove the glove compartment. For additional information, refer to [Section 501-12](#).
12. Disconnect the passenger air bag module electrical connector.
 1. Reaching into the glove box opening toward the center of the instrument panel, under the cross-car beam, slide and disengage the passenger air bag module electrical connector locking clip.
 2. Push in on the two release tabs and disconnect the passenger air bag module electrical connector.



13. Attach the restraint system diagnostic tool to the vehicle harness side of the passenger air bag electrical connector.



14. Connect the battery ground cable. For additional information, refer to [Section 414-01](#).
15. Move and tilt the front seats to their highest and most forward position.
16.  **WARNING:** To avoid accidental deployment and possible personal injury, the backup power supply must be depleted before repairing or replacing any front or side air bag supplemental restraint system (SRS) components and before servicing, replacing, adjusting or striking components near the front or side air bag sensors, such as doors,

instrument panel, console, door latches, strikers, seats and hood latches.

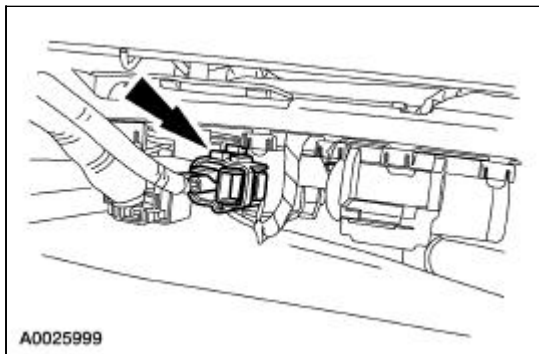
Please refer to the appropriate vehicle shop manual to determine location of the front air bag sensors.

The side air bag sensors are located at or near the base of the B-pillar.

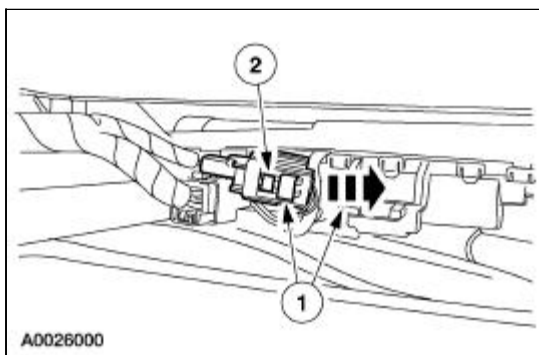
To deplete the backup power supply energy, disconnect the battery ground cable and wait at least one minute. Be sure to disconnect auxiliary batteries and power supplies (if equipped).

Disconnect the battery ground cable and wait at least one minute. For additional information, refer to [Section 414-01](#).

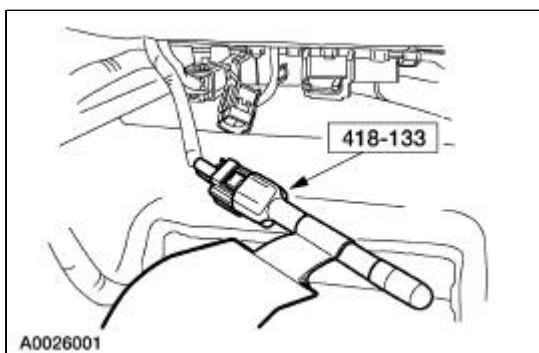
17. From under the passenger seat, release the tab on the connector bracket and remove the passenger seat side air bag electrical connector.



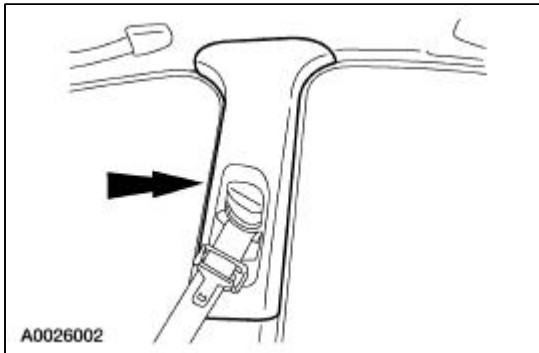
18. Disconnect the passenger seat side air bag electrical connector.
 1. Slide and disengage the passenger seat side air bag electrical connector locking clip.
 2. Push in to release the tab and disconnect the passenger seat side air bag electrical connector.



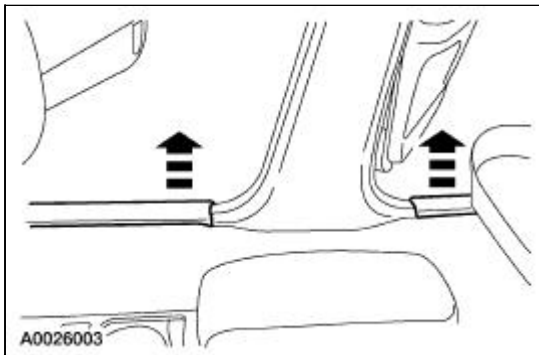
19. Attach the restraint system diagnostic tool to the passenger seat side air bag floor electrical connector.



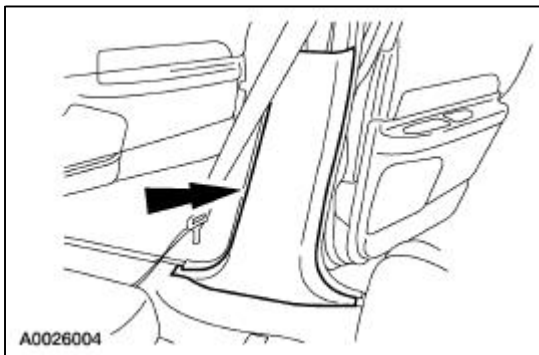
20. Remove the passenger side B-pillar weatherstripping.
21. Position the safety belt D-ring to its highest point.
22. Remove the passenger side B-pillar upper trim panel.



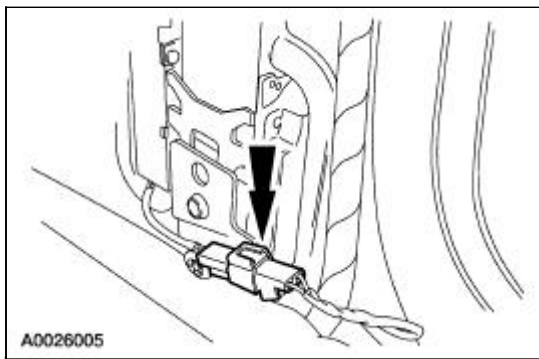
23. Remove the passenger side front and rear door scuff plates.



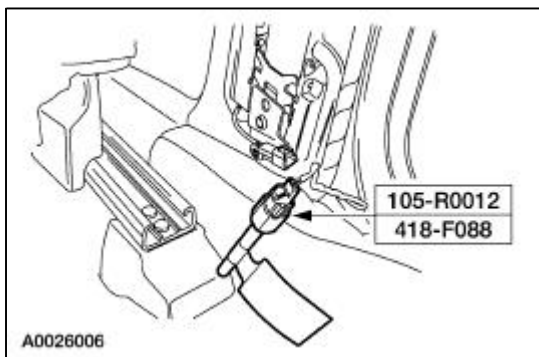
24. Remove the passenger side B-pillar lower trim panel.



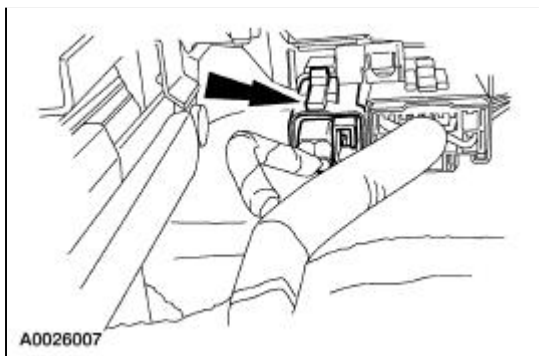
25. Disconnect the passenger side safety belt retractor pretensioner floor electrical connector.



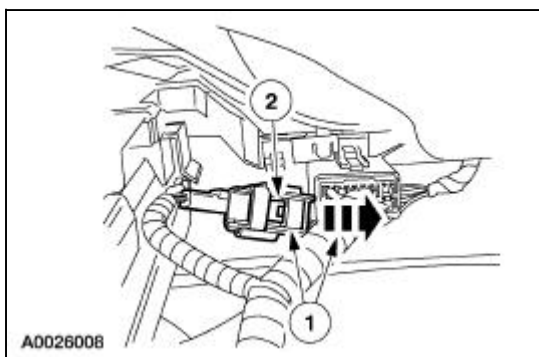
26. Attach the restraint system diagnostic tool to the passenger side safety belt retractor pretensioner floor electrical connector.



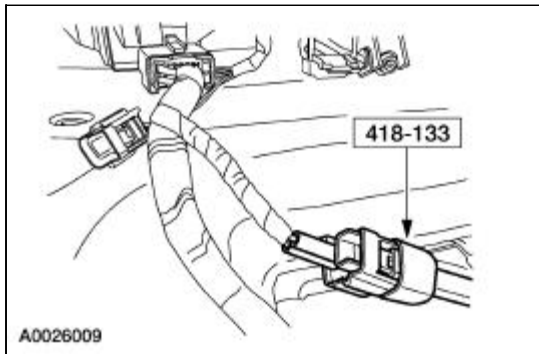
27. From under the driver seat, release the tab on the connector bracket and remove the driver seat side air bag electrical connector.



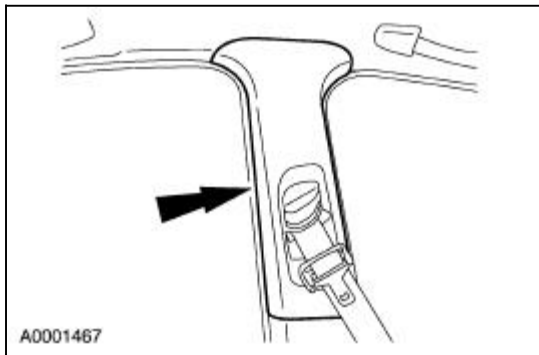
28. Disconnect the driver seat side air bag electrical connector.
1. Slide and disengage the driver seat side air bag electrical connector locking clip.
 2. Push down to release the tab and disconnect the driver seat side air bag electrical connector.



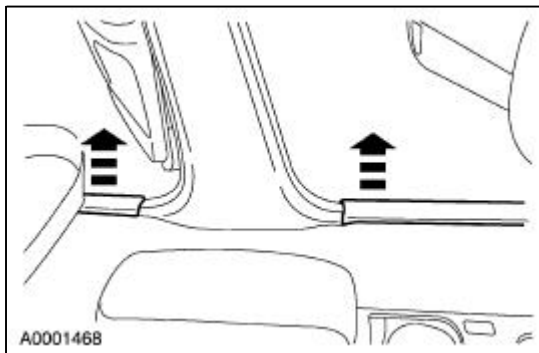
29. Attach the restraint system diagnostic tool to the driver seat side air bag floor electrical connector.



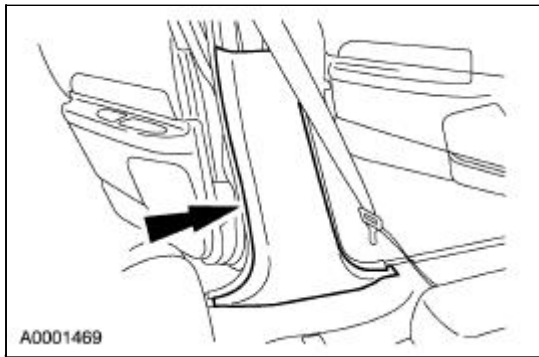
30. Remove the driver side B-pillar weatherstripping.
31. Position the safety belt D-ring to its highest point.
32. Remove the driver side B-pillar upper trim panel.



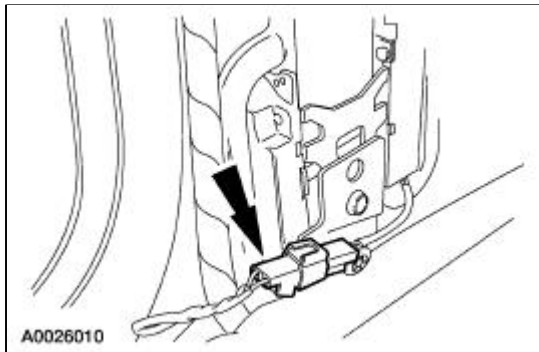
33. Remove the driver side front and rear door scuff plates.



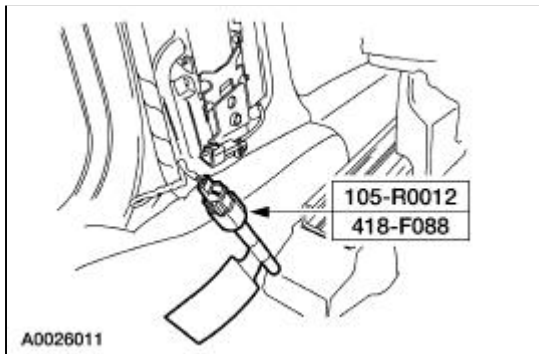
34. Remove the driver side B-pillar lower trim panel.



35. Disconnect the driver side safety belt retractor pretensioner electrical connector.



36. Attach the restraint system diagnostic tool to the driver side safety belt retractor pretensioner floor electrical connector.



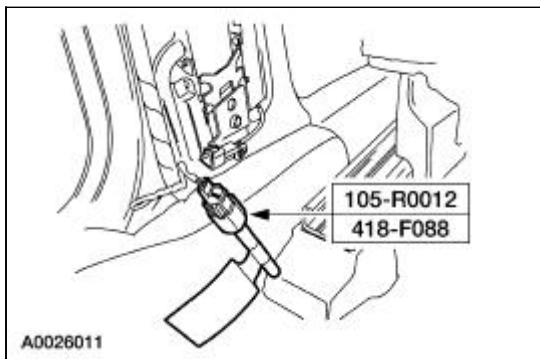
37. Connect the battery ground cable. For additional information, refer to [Section 414-01](#).
38. With the restraint system diagnostic tools installed at all deployable devices, prove out the supplemental restraint system (SRS). For additional information, refer to [Air Bag and Safety Belt Pretensioner Supplemental Restraint System \(SRS\)](#) in this section.
39. Disconnect the battery ground cable and wait at least one minute. For additional information, refer to [Section 414-01](#).

Reactivation

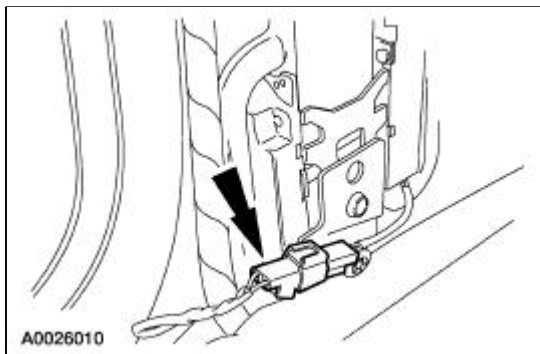


WARNING: To reduce the risk of serious personal injury, read and follow all warnings, cautions, and notes at the beginning of the deactivation procedure.

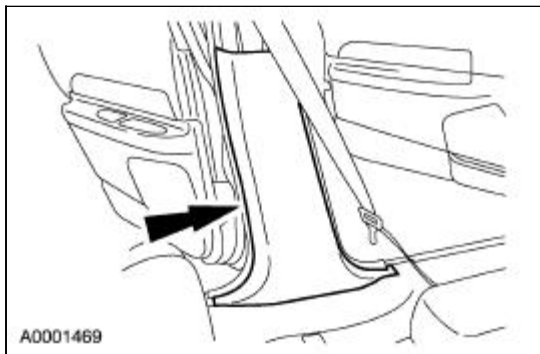
1. Remove the restraint system diagnostic tool from the driver side safety belt retractor pretensioner floor electrical connector.



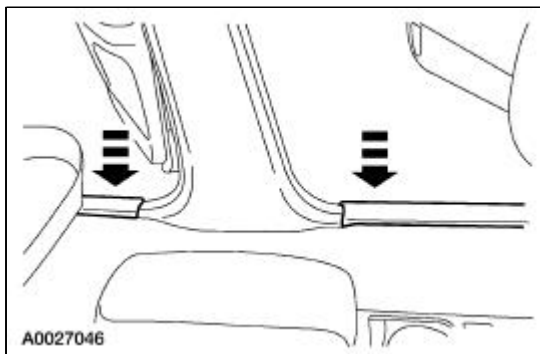
2. Connect the driver side safety belt retractor pretensioner electrical connector.



3. Install the driver side B-pillar lower trim panel.

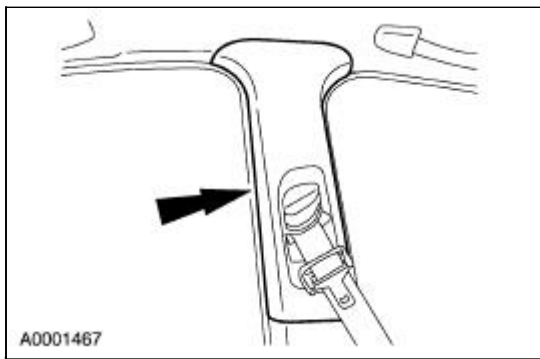


4. Install the driver side front and rear door scuff plates.

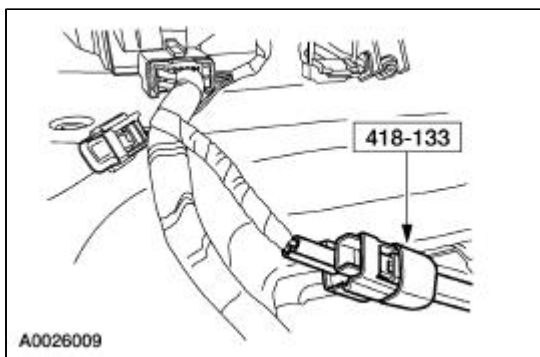


5. **NOTE:** Position the safety belt D-ring to its highest point.

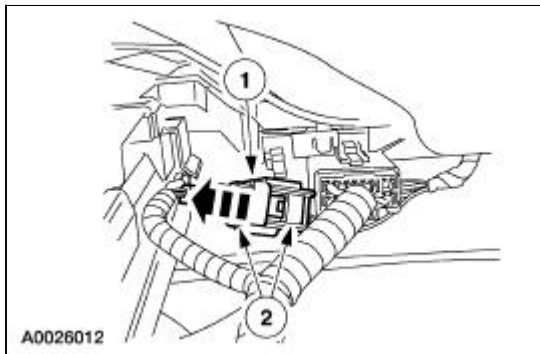
Install the driver side B-pillar upper trim panel.



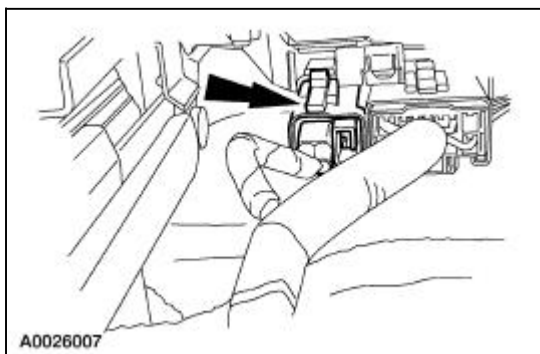
6. Install the driver side B-pillar weatherstripping.
7. Remove the restraint system diagnostic tool from the driver seat side air bag floor electrical connector.



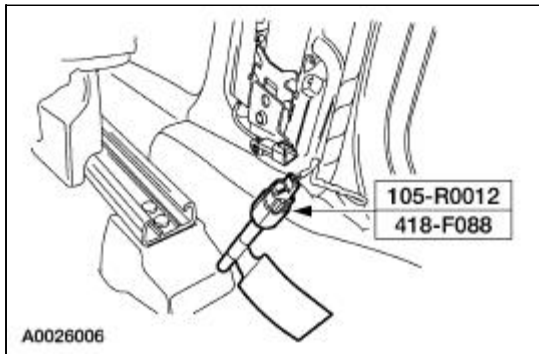
8. Connect the driver seat side air bag electrical connector.
 1. Connect the driver seat side air bag electrical connector.
 2. Slide and engage the driver seat side air bag electrical connector locking clip.



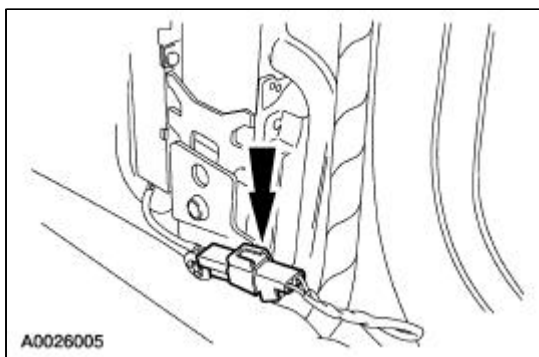
9. Install the driver seat side air bag electrical connector onto the connector bracket under the driver seat.



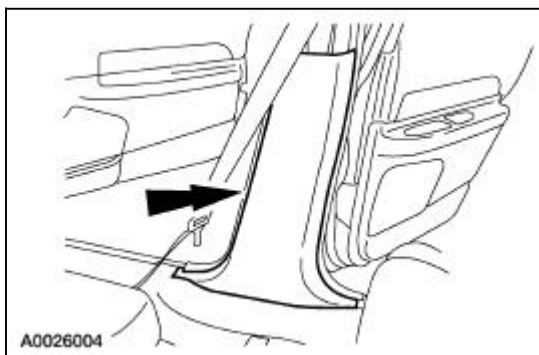
10. Remove the restraint system diagnostic tool from the passenger side safety belt retractor pretensioner electrical connector.



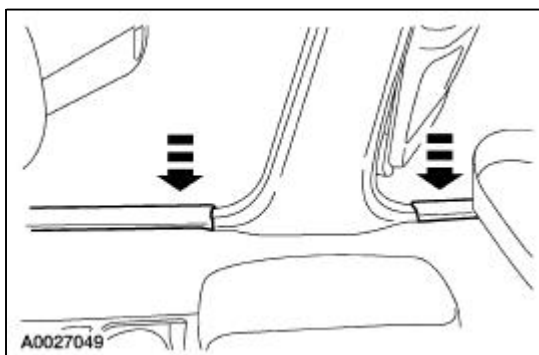
11. Connect the passenger side safety belt retractor pretensioner electrical connector.



12. Install the passenger side B-pillar lower trim panel.

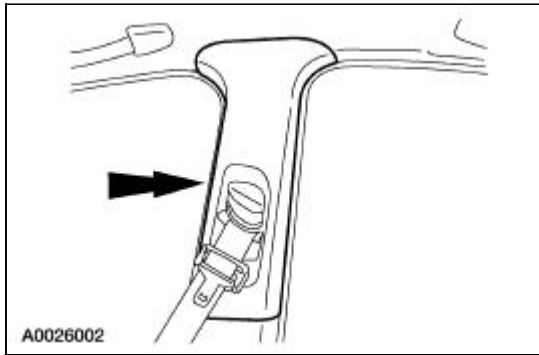


13. Install the passenger side front and rear door scuff plates.



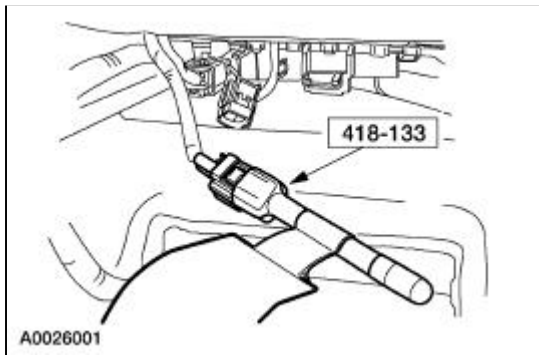
14. **NOTE:** Position the safety belt D-ring to its highest point.

Install the passenger side B-pillar upper trim panel.



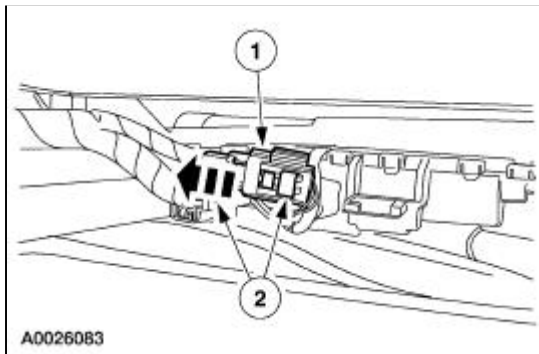
15. Install the passenger side B-pillar weatherstripping.

16. Remove the restraint system diagnostic tool from the passenger seat side air bag floor electrical connector.

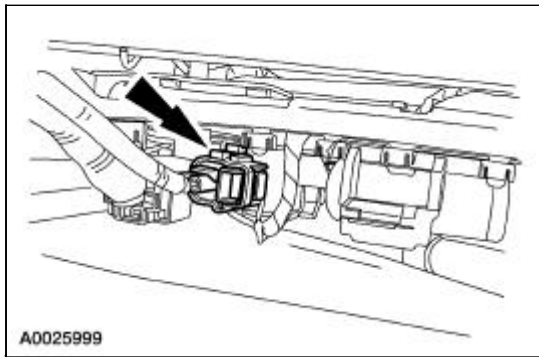



17. Connect the passenger seat side air bag electrical connector.

1. Connect the passenger seat side air bag electrical connector.
2. Slide and engage the passenger seat side air bag electrical connector locking clip.



18. Install the passenger seat side air bag electrical connector onto the connector bracket under the passenger seat.



19. Connect the battery ground cable. For additional information, refer to [Section 414-01](#).
20. Position the front seats rearward.
21.  **WARNING:** To avoid accidental deployment and possible personal injury, the backup power supply must be depleted before repairing or replacing any front or side air bag supplemental restraint system (SRS) components and before servicing, replacing, adjusting or striking components near the front or side air bag sensors, such as doors, instrument panel, console, door latches, strikers, seats and hood latches.

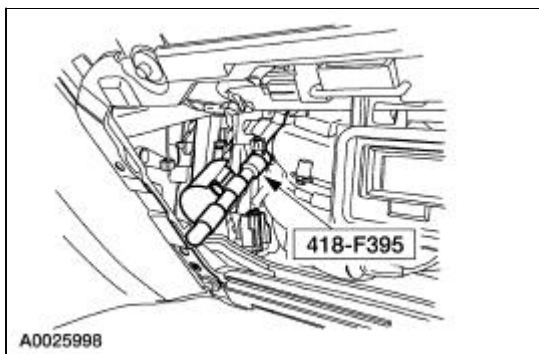
Please refer to the appropriate vehicle shop manual to determine location of the front air bag sensors.

The side air bag sensors are located at or near the base of the B-pillar.

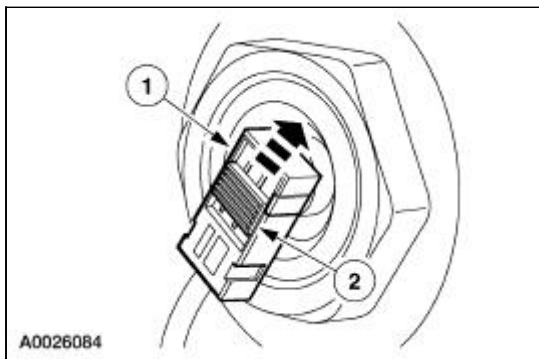
To deplete the backup power supply energy, disconnect the battery ground cable and wait at least one minute. Be sure to disconnect auxiliary batteries and power supplies (if equipped).

Disconnect the battery ground cable and wait at least one minute. For additional information, refer to [Section 414-01](#).

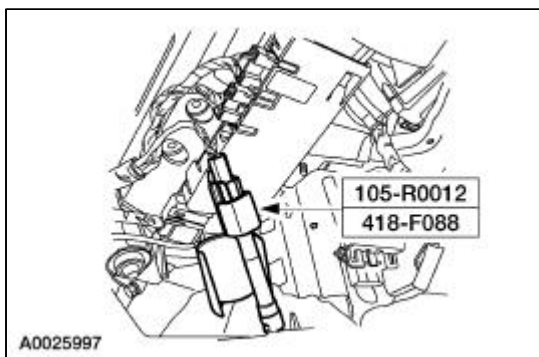
22. Remove the restraint system diagnostic tool from the vehicle harness side of the passenger air bag electrical connector.



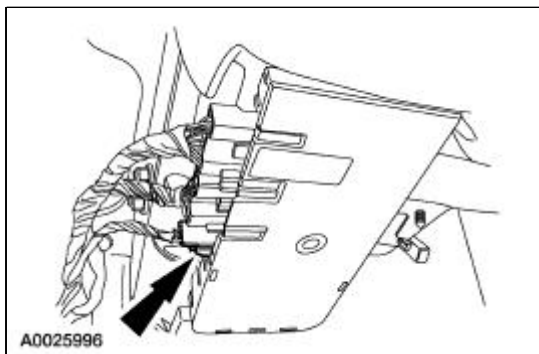
23. Connect the passenger air bag module electrical connector.
 1. Reach into the glove box opening toward the center of the instrument panel, under the cross-car beam and connect the passenger air bag module electrical connector.
 2. Slide and engage the passenger air bag module electrical connector locking clip.



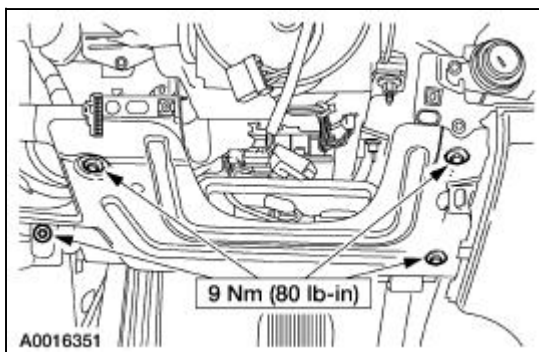
24. Install the glove compartment. For additional information, refer to [Section 501-12](#).
25. Remove the restraint system diagnostic tool from the vehicle harness side of the clockspring electrical connector.



26. Connect the clockspring electrical connector at the base of the steering column.



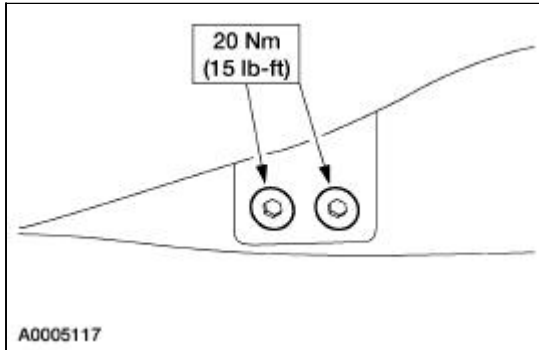
27. Position the steering column opening reinforcement and install the screws.



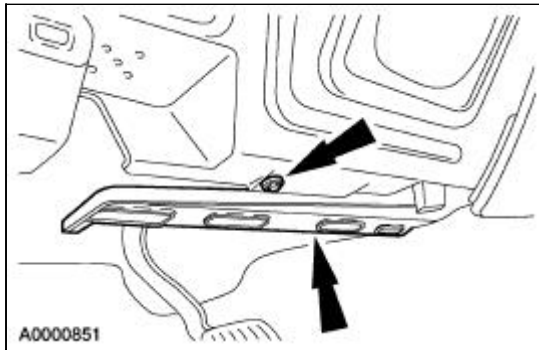
28.  **CAUTION:** Be sure the steering column opening reinforcement is in place before tightening the driver-side instrument panel tunnel brace bolts.

Tighten the two driver-side instrument panel tunnel brace bolts.

- Reposition the carpet.

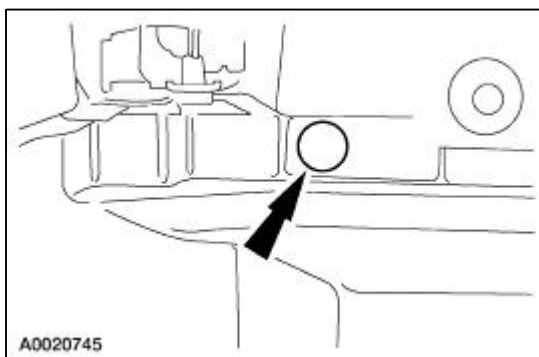


29. Position the heater duct and install the screw.

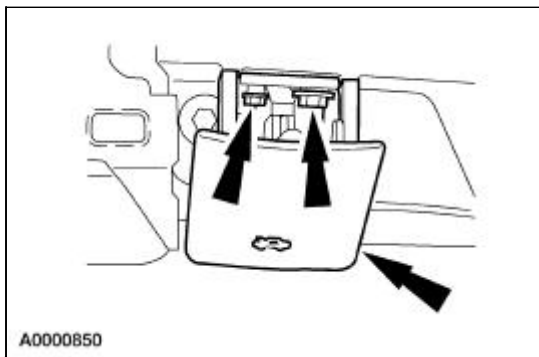


30. Install the RH instrument panel insulator and the two pin-type retainers.

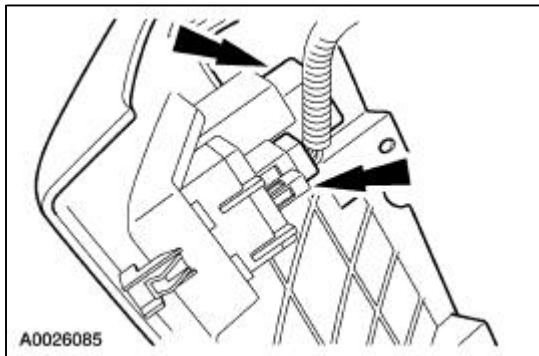
- Connect the courtesy lamp.



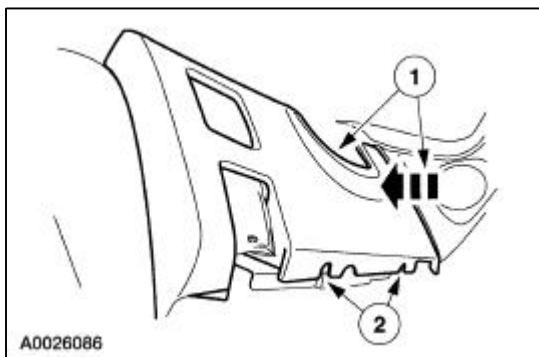
31. Position the hood latch release cable and handle assembly to the steering column opening reinforcement and install the screws.




32. Connect the electrical connectors to the switches in the lower steering column opening finish panel.



33. Install the lower steering column opening finish panel to the instrument panel.
 1. Position the lower steering column opening finish panel to the instrument panel and push in, seating the retaining clips.
 2. Install the screws.



34. Connect the battery ground cable. For additional information, refer to [Section 414-01](#).

35.  **WARNING: The restraint system diagnostic tool is for restraint system service only. Remove from vehicle prior to road use. Failure to remove could result in injury and possible violation of vehicle safety standards.**

With all the restraint system diagnostic tools removed, prove out the supplemental restraint system (SRS). For additional information, refer to [Air Bag and Safety Belt Pretensioner Supplemental Restraint System \(SRS\)](#) in this section.

36. Check the active restraint system for correct operation. For additional information, refer to [Section 501-20A](#).

Inspection and Repair After a Supplemental Restraint System (SRS) Deployment



WARNING: If the supplemental restraint system (SRS) is being serviced, the system must be deactivated and restraint system diagnostic tools must be installed. For additional information, refer to [Air Bag and Safety Belt Pretensioner Supplemental Restraint System \(SRS\)](#) in this section.

The air bag restraint system diagnostic tools must be removed and the air bag modules reconnected when the system is reactivated to avoid non-deployment in a collision, resulting in possible personal injury.

NOTE: Diagnostics or repairs are not to be carried out on a seat equipped with a seat side air bag with the seat in the vehicle. Prior to attempting to diagnose or repair a seat concern when equipped with a seat side air bag, the seat must be removed from the vehicle and the restraint system diagnostic tools must be installed in the seat side air bag electrical connectors. **The restraint system diagnostic tools must be removed prior to operating the vehicle over the road.**

NOTE: After diagnosing or repairing an SRS, **the restraint system diagnostic tools must be removed before operating the vehicle over the road.**


NOTE: After diagnosing or repairing a seat system, **the restraint system diagnostic tools must be removed before operating the vehicle over the road.**

NOTE: The SRS must be fully operational and free of faults before releasing the vehicle to the customer.

1. When any deployable device (driver air bag, passenger air bag, seat side air bag, safety belt pretensioner, etc.) or combination of devices are deployed and/or the RCM has the DTC B1231 (Crash Data Memory Full) in memory, the repair of the vehicle's supplemental restraint system (SRS) is to include the removal of all deployed devices and the installation of new deployable devices, the removal and installation of new impact sensors, and the removal and installation of a new RCM.
2. When any damage to the impact sensor mounting points or mounting hardware has occurred, repair or install new mounting points and mounting hardware as needed.
3. When the driver air bag module has deployed a new clockspring must be installed.
4. Inspect the entire vehicle for damage, including the following components:
 - steering column.
 - instrument panel knee bolsters and mounting points.
 - instrument panel braces and brackets.
 - instrument panel and mounting points.
 - seats and seat mounting points.
 - safety belts, safety belt buckles, and safety belt retractors. For additional information, refer to [Section 501-20A](#).
 - supplemental restraint system (SRS) wiring, wiring harnesses, and connectors.
5. After carrying out the review and inspection of the entire vehicle for damage, repair or install


new components as needed.

Air Bag Disposal —Deployed


1.  **WARNING:** Always wear safety glasses when repairing an air bag supplemental restraint system (SRS) vehicle and when handling an air bag module. This will reduce the risk of injury in the event of an accidental deployment.

Dispose of the deployed air bag modules and safety belt pretensioners in the same manner as any other part to be scrapped.

Air Bag Disposal —Undeployed Inoperative

 **WARNING:** Always wear safety glasses when repairing an air bag supplemental restraint system (SRS) vehicle and when handling an air bag module. This will reduce the risk of injury in the event of an accidental deployment.

 **WARNING:** Never probe the connectors on the air bag module. Doing so can result in air bag deployment, which can result in personal injury.

 **WARNING:** Carry a live air bag module with the air bag and trim cover or deployment door pointed away from your body. This will reduce the risk of injury in the event of an accidental deployment.

NOTE: All inoperative air bag modules and safety belt pretensioners have been placed on the Mandatory Return List. All discolored or damaged air bag modules must be treated the same as any inoperative live air bag being returned.

1. Remove the inoperative component from the vehicle. For additional information, refer to the appropriate air bag procedure in this section.

AIR BAG MODULE VERIFICATION


VEHICLE SERIAL NO.

This 17 digit number can be found (1) on your vehicle registration (2) on the dash panel at left side close to lower edge of windshield.

ATTENTION INSTALLER

Please complete and mail this postcard with your New Air Bag Module Serial Number (see sample below) and the Vehicle Identification Number (VIN) of the vehicle in which you are installing this module.

LOOK FOR YOUR REPLACEMENT AIR BAG MODULE SERIAL NUMBER (SN) AT THE LOCATION SHOWN IN THIS SAMPLE AND ENTER IT IN THE SPACE PROVIDED BELOW



SAMPLE

REPLACEMENT AIR BAG MODULE SERIAL NO.

A0005406

2. **NOTE:** When installing a new air bag module, a prepaid return postcard is provided with the replacement air bag module. The serial number for the new part and the vehicle identification number (VIN) must be recorded and sent to Ford Motor Company.

If installing a new air bag module, record the necessary information and return the inoperative air bag module to Ford Motor Company.

Air Bag Disposal —Driver, Undeployed, Scrapped Vehicle

Remote Deployment

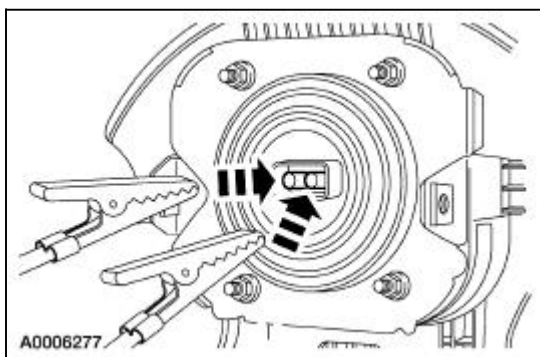
⚠ WARNING: Always wear safety glasses when repairing an air bag supplemental restraint system (SRS) vehicle and when handling an air bag module or safety belt retractor/pretensioner assembly. This will reduce the risk of injury in the event of an accidental deployment.

⚠ WARNING: Carry a live air bag module with the air bag and trim cover or deployment door pointed away from your body. This will reduce the risk of injury in the event of an accidental deployment.

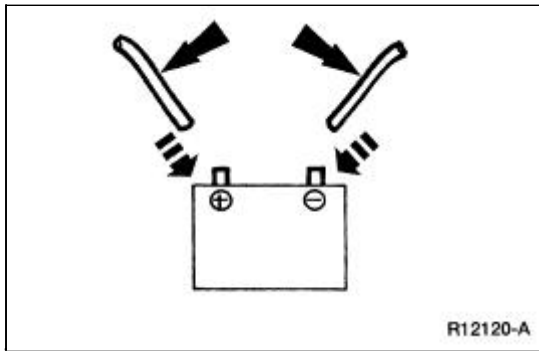
⚠ WARNING: Remote deployment is to be performed outdoors with all personnel at least 6.1 meters (20 feet) away to ensure personal safety. Due to the loud report which occurs when the air bag is deployed, hearing protection is required.

⚠ WARNING: Do not place the driver or passenger air bag module with the trim cover or deployment door facing down, as the forces of the deploying air bag can cause it to ricochet and cause personal injury.

1. Remove the driver air bag from the vehicle. For additional information, refer to [Driver Air Bag Module](#) in this section.
2. Obtain two wires (20 gauge minimum) at least 6.1 meters (20 feet) long and attach one end of each wire to the connector pins on the air bag module.




3. Place the air bag module on a flat surface in an open outdoor area with the trim cover facing upward.
4. Remain at least 6.1 meters (20 feet) away from the air bag module.
5. Deploy the air bag module by touching the other ends of the two wires to the terminals of a 12-volt battery.





6. To allow for cooling, wait at least ten minutes before approaching the deployed air bag.
 7. Dispose of the deployed air bag module in the same manner as any other part to be scrapped.
-


Air Bag Disposal —Passenger, Undeployed, Scrapped Vehicle

Remote Deployment

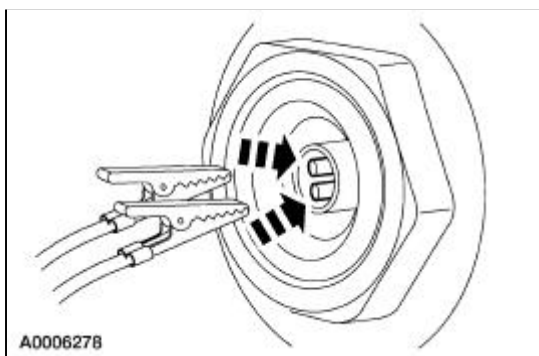
 **WARNING:** Always wear safety glasses when repairing an air bag supplemental restraint system (SRS) vehicle and when handling an air bag module or safety belt retractor/pretensioner assembly. This will reduce the risk of injury in the event of an accidental deployment.

 **WARNING:** Carry a live air bag module with the air bag and trim cover or deployment door pointed away from your body. This will reduce the risk of injury in the event of an accidental deployment.

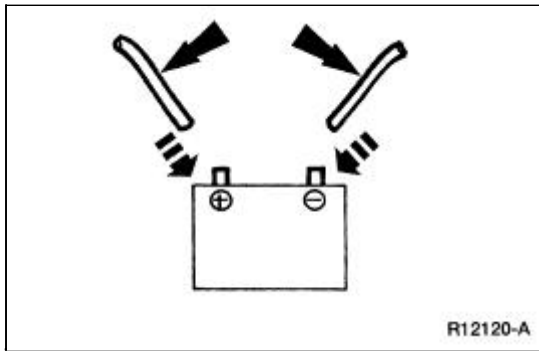
 **WARNING:** Remote deployment is to be performed outdoors with all personnel at least 6.1 meters (20 feet) away to ensure personal safety. Due to the loud report which occurs when the air bag is deployed, hearing protection is required.

 **WARNING:** Do not place the driver or passenger air bag module with the trim cover or deployment door facing down, as the forces of the deploying air bag can cause it to ricochet and cause personal injury.

1. Remove the passenger air bag from the vehicle. For additional information, refer to [Passenger Air Bag Module](#) in this section.
2. Obtain two wires (20 gauge minimum) at least 6.1 meters (20 feet) long and attach one end of each wire to the connector pins on the air bag module.



3. Place the air bag module on a flat surface in an open outdoor area with the deflector can facing downward.
4. Remain at least 6.1 meters (20 feet) away from the air bag module.
5. Deploy the air bag module by touching the other ends of the two wires to the terminals of a 12-volt battery.



6. To allow for cooling, wait at least ten minutes before approaching the deployed air bag.
 7. Dispose of the deployed air bag module in the same manner as any other part to be scrapped.
-

Air Bag Disposal —Side, Undeployed, Scrapped Vehicle

Remote Deployment

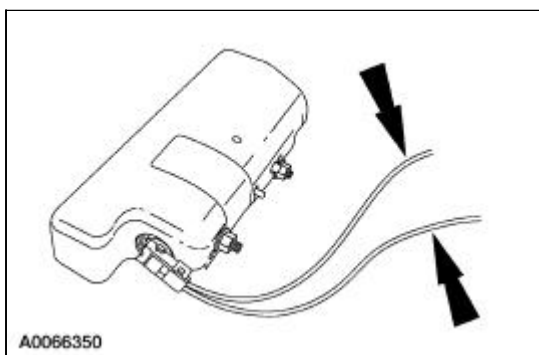
⚠ WARNING: Always wear safety glasses when repairing an air bag supplemental restraint system (SRS) vehicle and when handling an air bag module or safety belt retractor/pretensioner assembly. This will reduce the risk of injury in the event of an accidental deployment.

⚠ WARNING: Carry a live air bag module with the air bag and trim cover or deployment door pointed away from your body. This will reduce the risk of injury in the event of an accidental deployment.

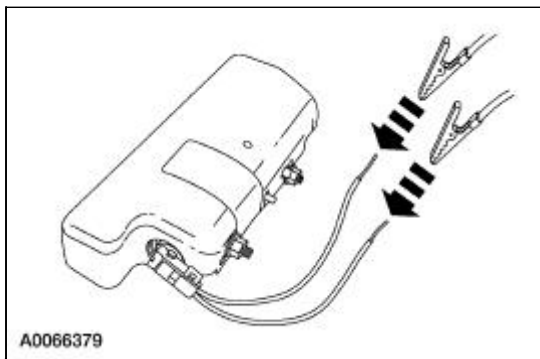
⚠ WARNING: Remote deployment is to be carried out outdoors with all personnel at least 6.1 meters (20 feet) away to ensure personal safety. Due to the loud report which occurs when the air bag is deployed, hearing protection is required.

⚠ WARNING: Do not place the side air bag module with the tear seam facing down or the attaching studs facing upward, as the forces of the deploying air bag can cause it to ricochet and cause personal injury.

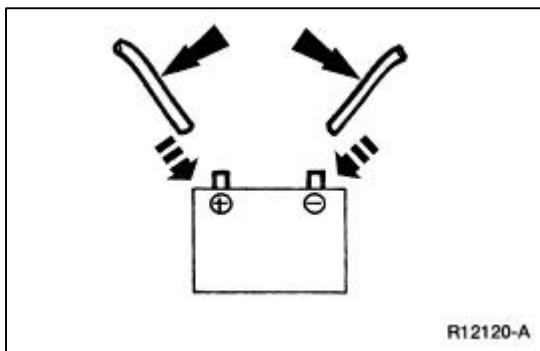
1. Remove the side air bag from the vehicle. For additional information, refer to [Side Air Bag Module](#) in this section.
2. Cut and strip the wires and connect the connector to the air bag module.



3. Obtain two wires (20 gauge minimum) at least 6.1 meters (20 feet) long and attach one end of each wire to the connector pins on the air bag module.




4. Place the air bag module on a flat surface in an open outdoor area with the tear seam facing upward and the attaching studs facing downward.
5. Remain at least 6.1 meters (20 feet) away from the air bag module.
6. Deploy the side air bag module by touching the other ends of the two wires to the terminals of a 12-volt battery.



7. To allow for cooling, wait at least ten minutes before approaching the deployed air bag.
 8. Dispose of the deployed side air bag module in the same manner as any other part to be scrapped.
-

Safety Belt Pretensioner Disposal —Deployed

1.  **WARNING:** The safety belt pretensioner is a pyrotechnic device. Always wear safety glasses when repairing an air bag equipped vehicle and when handling a safety belt buckle pretensioner or safety belt retractor pretensioner. Never probe a pretensioner electrical connector. Doing so could result in pretensioner or air bag deployment and could result in personal injury.

Dispose of the deployed safety belt pretensioner in the same manner as any other part to be scrapped.

Safety Belt Pretensioner Disposal —Undeployed, Inoperative



WARNING: The safety belt pretensioner is a pyrotechnic device. Always wear safety glasses when repairing an air bag equipped vehicle and when handling a safety belt buckle pretensioner or safety belt retractor pretensioner. Never probe a pretensioner electrical connector. Doing so could result in pretensioner or air bag deployment and could result in personal injury.



WARNING: Carry a live safety belt retractor pretensioner or safety belt buckle pretensioner so as to keep fingers and clothing away from moveable parts. This will reduce the risk of injury in the event of an accidental deployment.

NOTE: All inoperative safety belt buckle pretensioners and safety belt retractor pretensioners have been placed on the Mandatory Return List. All damaged safety belt buckle pretensioners and safety belt retractor pretensioners must be treated the same as any inoperative live safety belt buckle pretensioner or safety belt retractor pretensioner being returned.

1. Remove the inoperative safety belt buckle pretensioner or safety belt retractor pretensioner from the vehicle. For additional information, refer to [Section 501-20A](#).
 2. Package and return the inoperative safety belt buckle pretensioner or safety belt retractor pretensioner to Ford Motor Company.
-

Safety Belt Pretensioner Disposal —Undeployed, Scrapped Vehicle

Remote Deployment

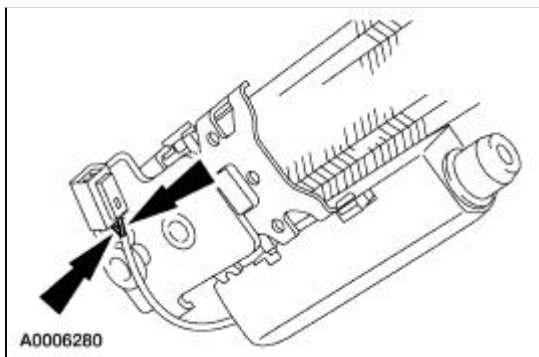
⚠ WARNING: The safety belt pretensioner is a pyrotechnic device. Always wear safety glasses when repairing an air bag equipped vehicle and when handling a safety belt buckle pretensioner or safety belt retractor pretensioner. Never probe a pretensioner electrical connector. Doing so could result in pretensioner or air bag deployment and could result in personal injury.

⚠ WARNING: Carry a live safety belt retractor/pretensioner assembly so as to keep fingers and clothing away from moveable parts. This will reduce the risk of injury in the event of an accidental deployment.

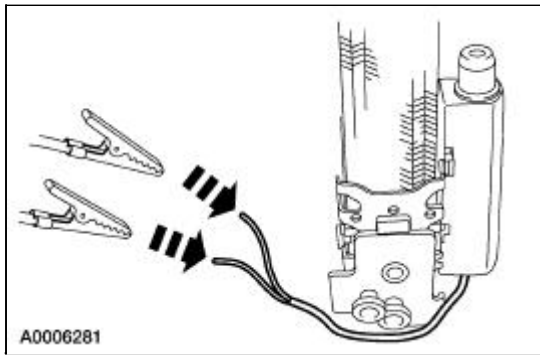
⚠ WARNING: Remote deployment is to be carried out outdoors with all personnel at least 6.1 meters (20 feet) away to ensure personal safety. Due to the loud report which occurs when the safety belt pretensioner is deployed, hearing protection is required.

⚠ WARNING: Do not position the safety belt retractor/pretensioner assembly so that moveable parts contact the support surface, as the forces of the deploying pretensioner can cause it to ricochet and cause personal injury.

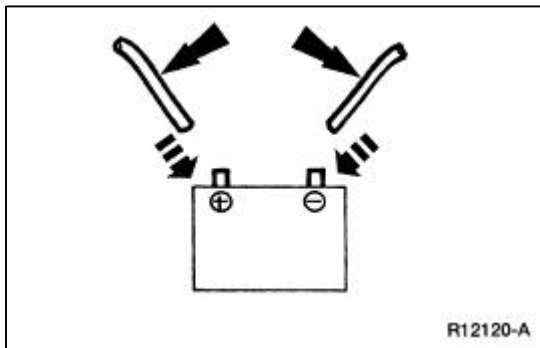
1. Remove the safety belt retractor/pretensioner assembly from the vehicle. For additional information, refer to [Section 501-20A](#).
2. Cut off the electrical connector and strip 25 mm (1 inch) of insulation off the wires.



3. Obtain two wires (20 gauge minimum) at least 6.1 meters (20 feet) long and attach one end of each wire to the safety belt pretensioner wires.



4. Position the safety belt retractor/pretensioner assembly on a flat surface in an open outdoor area so that moveable parts do not contact the support surface.
5. Remain at least 6.1 meters (20 feet) away from the safety belt retractor/pretensioner assembly.
6. Deploy the safety belt pretensioner by touching the other ends of the two wires to the terminals of a 12-volt battery.



7. To allow for cooling, wait at least ten minutes before approaching the deployed safety belt pretensioner retractor/pretensioner assembly.
 8. Dispose of the deployed safety belt retractor/pretensioner assembly in the same manner as any other part to be scrapped.
-

Wiring Repair

1. Inspect the supplemental restraint system (SRS) wiring and the wiring harness for any damage that may have occurred as a result of the accident. Inspect and repair or install new, as required, any damaged:
 - wires.
 - insulation.
 - terminal.
 - connectors.
 - splices.

 2. Splice damaged wires using the specified butt-splice connector or equivalent.
 - For splices required in adjacent wiring, stagger the splices 51 mm (2 inches) apart from each other.
 - Use waterproof butt-splice type connectors.
 - Use the correct size heat shrink nylon tube to prevent water, salt, condensation, and heat from affecting the wiring repair. Make sure the tube extends 25 mm (1 inch) each side of the repair.
 - Use a splice connector that is lined with a sealer that melts when heated with a heat gun and flows from the tubing, sealing and splice.
 - Use the correct gauge connector for the wire being repaired.
 - Use connectors that are transparent to allow inspection of the finished splice.
-

Weld Nut Repair — "J" Nut, Restraints Control Module (RCM) and Side Impact Sensor



WARNING: To avoid accidental deployment and possible personal injury, the backup power supply must be depleted before repairing or replacing any front or side air bag supplemental restraint system (SRS) components and before servicing, replacing, adjusting or striking components near the front or side air bag sensors, such as doors, instrument panel, console, door latches, strikers, seats and hood latches.

Please refer to the appropriate vehicle shop manual to determine location of the front air bag sensors.

The side impact sensors are located at or near the base of the B-pillar.

To deplete the backup power supply energy, disconnect the battery ground cable and wait at least one minute. Be sure to disconnect auxiliary batteries and power supplies (if equipped).

NOTE: There are two procedures to repair a vehicle having missing restraints control module or side impact sensor attaching weld nut(s). Read both this procedure and [Weld Nut Repair—Missing Weld Nut, Restraints Control Module \(RCM\) and Side Impact Sensor](#) before proceeding with the repair.

NOTE: If two or more weld nuts are missing, do not install the "J" nuts as outlined in this procedure. Weld nuts must be installed as outlined in [Weld Nut Repair—Missing Weld Nut, Restraints Control Module \(RCM\) and Side Impact Sensor](#).

NOTE: The following procedure applies to vehicles that have a rectangular hole in the sheet metal that is in close proximity to the missing weld nut.

1. Obtain a "J" nut (part number N623332-S301) or any of the following optional "J" nuts (part numbers: N623342-S101, N800854-S100, N800925-S100).
2. Obtain a 6 mm (0.24 in) grounding screw (part number N806327-S190) or equivalent.
3. Install the "J" nut through the rectangular hole in the sheet metal.
4. **NOTE:** Be sure the threaded portion of the "J" nut is aligned with the clearance hole in the sheet metal.

Install the crash sensor.

5. Tighten the attaching screws to specification. For additional information, refer to Torque Specifications in this section.
-

Weld Nut Repair —Missing Weld Nut, Restraints Control Module (RCM) and Side Impact Sensor

⚠ WARNING: To avoid accidental deployment and possible personal injury, the backup power supply must be depleted before repairing or replacing any front or side air bag supplemental restraint system (SRS) components and before servicing, replacing, adjusting or striking components near the front or side air bag sensors, such as doors, instrument panel, console, door latches, strikers, seats and hood latches.

Please refer to the appropriate vehicle shop manual to determine location of the front air bag sensors.

The side impact sensors are located at or near the base of the B-pillar.

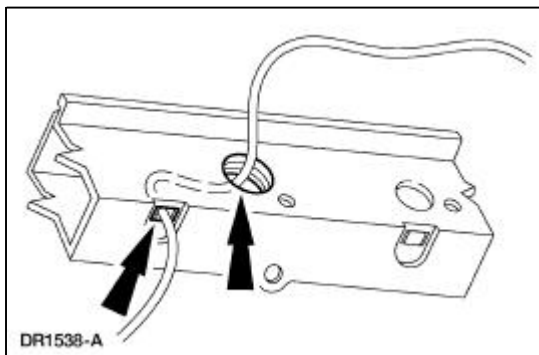
To deplete the backup power supply energy, disconnect the battery ground cable and wait at least one minute. Be sure to disconnect auxiliary batteries and power supplies (if equipped).

NOTE: There are two procedures to repair a vehicle having missing restraints control module or side impact sensor attaching weld nut(s). Read both this procedure and [Weld Nut Repair—"J" Nut, Restraints Control Module \(RCM\) and Side Impact Sensor](#) before proceeding with the repair.

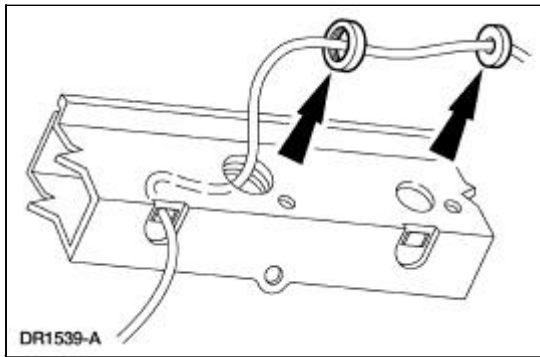
NOTE: Use only this procedure if two or more weld nuts are missing, do not install the "J" nuts as outlined in Weld Nut Repair — "J" Nut, Restraints Control Module (RCM) and Side Crash Sensor.

NOTE: Radiator support repair shown, others are similar.

1. Obtain a 6 mm (0.24 in) weld nut (part number N806285-S190).
2. Obtain a 6 mm (0.24 in) grounding screw (part number N806327-S190).
3. Route a sufficient length of copper welding wire through the weld nut clearance hole and back out an adjacent access hole.



4. Feed the copper welding wire through the weld nut, then through a standard flatwasher.



5. Secure the flatwasher so that it cannot be pulled off the end of the copper welding wire.
 6. Pull the copper welding wire back through the clearance hole, allowing the weld nut and flatwasher to follow the copper welding wire through.
 7. Position the weld nut to the weld nut clearance hole, firmly pulling on the copper welding wire allowing the secured flatwasher to hold the weld nut in position.
 8. Holding the weld nut securely in place and using a MIG welder, weld in four places around the edge of the weld nut.
 9. Metal finish as required.
 10. Verify the nut is securely in place.
 11. Install the crash sensor.
 12. Tighten the attaching screws to specification. For additional information, refer to Torque Specifications in this section.
-

Weld Nut Repair —Stripped Weld Nut, Restraints Control Module (RCM) and Side Impact Sensor



WARNING: To avoid accidental deployment and possible personal injury, the backup power supply must be depleted before repairing or replacing any front or side air bag supplemental restraint system (SRS) components and before servicing, replacing, adjusting or striking components near the front or side air bag sensors, such as doors, instrument panel, console, door latches, strikers, seats and hood latches.

Please refer to the appropriate vehicle shop manual to determine location of the front air bag sensors.


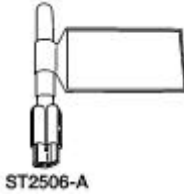
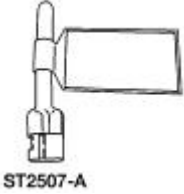
The side impact sensors are located at or near the base of the B-pillar.

To deplete the backup power supply energy, disconnect the battery ground cable and wait at least one minute. Be sure to disconnect auxiliary batteries and power supplies (if equipped).


1. Obtain an 8 mm (0.32 in) grounding screw (part number N802455-S190).
 2. Drill out the internal threads of the stripped-out weld nut to 7.37 mm (0.29 in) using a letter "L" size drill bit.
 3. Position the crash sensor to the vehicle.
 4. Install the 8 mm (0.32 in) grounding screw into the drilled-out weld nut.
 5. Install the remaining attaching screws.
 6. Tighten the attaching screws to specification. For additional information, refer to Torque Specifications in this section.
-

Side Impact Sensor

Special Tool(s)

 ST2502-A	Diagnostic Tool, Restraint System (1 Req'd) 418-F395 (014-R1079)
 ST2506-A	Diagnostic Tool, Restraint System (3 Req'd) 418-F088 (105-R0012)
 ST2507-A	Diagnostic Tool, Restraint System (2 Req'd) 418-133 (40-009)


Removal

 **WARNING:** Vehicle sensor orientation is critical for proper system operation. If a vehicle equipped with an air bag supplemental restraint system (SRS) is involved in a collision, inspect the sensor mounting bracket and wiring pigtail for deformation. Replace and properly position the sensor or any other damaged supplemental restraint system (SRS) components whether or not the air bag is deployed.

NOTE: Repair is made by installing a new part only. If the new part does not correct the condition, install the original part and perform the diagnostic procedure again.

NOTE: The left side is shown, the right side is similar.

1. Prepare the vehicle for side impact sensor removal.

1.  **WARNING:** To avoid accidental deployment and possible personal injury, the backup power supply must be depleted before repairing or replacing any front or side air bag supplemental restraint system (SRS) components and before servicing, replacing, adjusting or striking components near the front or side air bag sensors, such as doors, instrument panel, console, door latches, strikers, seats and hood latches.


Please refer to the appropriate vehicle shop manual to determine location of the front air bag sensors.

The side air bag sensors are located at or near the base of the B-pillar.

To deplete the backup power supply energy, disconnect the battery ground cable and wait at least one minute. Be sure to disconnect auxiliary batteries and power

supplies (if equipped).

Disconnect the battery ground cable (14301) and wait at least one minute. For additional information, refer to [Section 414-01](#).

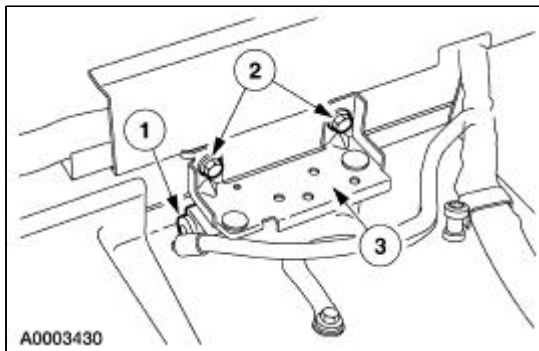
2.  **WARNING: To reduce the risk of serious personal injury, read and follow all warnings, cautions, notes, and instructions in the supplemental restraint system (SRS) deactivation/reactivation procedure.**

Deactivate the supplemental restraint system (SRS). For additional information, refer to [Supplemental Restraint System \(SRS\) Deactivation and Reactivation](#) in the General Procedures portion of this section.


3.  **WARNING: To reduce the risk of serious personal injury, read and follow all warnings, cautions, notes, and instructions in the seat removal and installation procedure.**


Remove the seat on the side with the affected side impact sensor. For additional information, refer to [Section 501-10](#).

2. Position the carpet away from the B-pillar.
3. Remove the side impact sensor.
 1. Disconnect the side impact sensor electrical connector.
 2. Remove the bolts.
 3. Remove the side impact sensor with bracket.



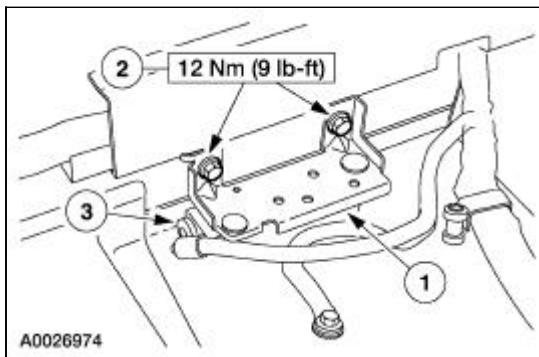
Installation

 **WARNING: To reduce the risk of serious personal injury, read and follow all warnings, cautions and notes at the beginning of the removal procedure.**

1.  **WARNING: The tightening torque of the air bag side impact sensor retaining bolts is critical for proper system operation.**

Install the side impact sensor.


1. Position the side impact sensor with bracket.
2. Install the bolts.
3. Connect the side impact sensor.




2. Connect the battery ground cable. For additional information, refer to [Section 414-01](#).
3. With the restraint system diagnostic tools installed at all deployable devices, prove out the supplemental restraint system (SRS). For additional information, refer to [Air Bag and Safety Belt Pretensioner Supplemental Restraint System \(SRS\)](#), in the Diagnosis and Testing portion of this section.
4. Disconnect the battery ground cable and wait at least one minute. For additional information, refer to [Section 414-01](#).
5. Reposition the carpet back at the B-pillar.
6. Restore the vehicle to operating condition.

1.  **WARNING: To reduce the risk of serious personal injury, read and follow all warnings, cautions, notes, and instructions in the seat removal and installation procedure.**

Install the seat on the side with the affected side impact sensor. For additional information, refer to [Section 501-10](#).

2.  **WARNING: To reduce the risk of serious personal injury, read and follow all warnings, cautions, notes, and instructions in the supplemental restraint system (SRS) deactivation/reactivation procedure.**

Reactivate the supplemental restraint system (SRS). For additional information, refer to [Supplemental Restraint System \(SRS\) Deactivation and Reactivation](#) in the General Procedures portion of this section.



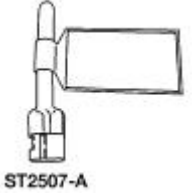
3.  **WARNING: The restraint system diagnostic tool is for restraint system service only. Remove from the vehicle prior to road use. Failure to remove could result in injury and possible violation of vehicle safety standards.**

With all the restraint system diagnostic tools removed, prove out the supplemental restraint system (SRS). For additional information, refer to [Air Bag and Safety Belt Pretensioner Supplemental Restraint System \(SRS\)](#) in the Diagnosis and Testing portion of this section.


4. Check the active restraint system for correct operation. For additional information, refer to [Section 501-20A](#).
-


Restraints Control Module (RCM)

Special Tool(s)

 ST2502-A	Diagnostic Tool, Restraint System (1 Req'd) 418-F395 (014-R1079)
 ST2506-A	Diagnostic Tool, Restraint System (3 Req'd) 418-F088 (105-R0012)
 ST2507-A	Diagnostic Tool, Restraint System (2 Req'd) 418-133 (40-009)

Removal

 **WARNING:** The restraints control module (RCM) orientation is critical for proper air bag supplemental restraint system (SRS) operation. If a vehicle equipped with an SRS system has been involved in a collision in which the center tunnel area has been damaged, inspect the mounting and bracket for deformation. If damaged, the RCM must be replaced whether or not the air bags have deployed. In addition, make sure the area of the RCM mounting is restored to its original condition.

 **WARNING:** Vehicle sensor orientation is critical for proper system operation. If a vehicle equipped with an air bag supplemental restraint system (SRS) is involved in a collision, inspect the sensor mounting bracket and wiring pigtail for deformation. Replace and properly position the sensor or any other damaged supplemental restraint system (SRS) components whether or not the air bag is deployed.

 **CAUTION:** Electronic modules are sensitive to static electrical charges. If exposed to these charges, damage can result.

NOTE: Repair is made by installing a new part only. If the new part does not correct the condition, install the original part and perform the diagnostic procedure again.

All vehicles

1. Prepare the vehicle for restraints control module (RCM) removal.

1.  **WARNING:** To avoid accidental deployment and possible personal injury, the


backup power supply must be depleted before repairing or replacing any front or side air bag supplemental restraint system (SRS) components and before servicing, replacing, adjusting or striking components near the front or side air bag sensors, such as doors, instrument panel, console, door latches, strikers, seats and hood latches.

Please refer to the appropriate vehicle shop manual to determine location of the front air bag sensors.

The side air bag sensors are located at or near the base of the B-pillar.

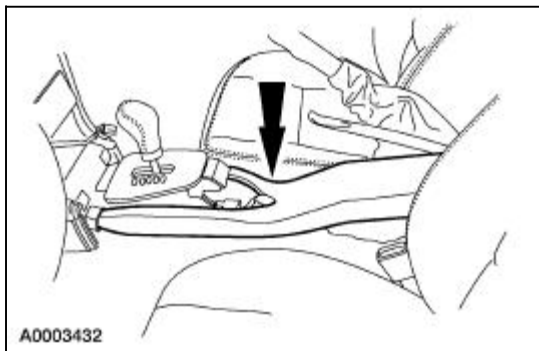
To deplete the backup power supply energy, disconnect the battery ground cable and wait at least one minute. Be sure to disconnect auxiliary batteries and power supplies (if equipped).

Disconnect the battery ground cable (14301) and wait at least one minute. For additional information, refer to [Section 414-01](#).

2.  **WARNING:** To reduce the risk of serious personal injury, read and follow all warnings, cautions, notes, and instructions in the supplemental restraint system (SRS) deactivation/reactivation procedure.

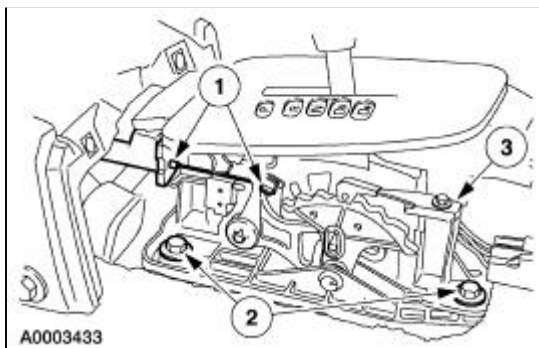
Deactivate the supplemental restraint system (SRS). For additional information, refer to [Supplemental Restraint System \(SRS\) Deactivation and Reactivation](#) in this section.

2. Remove the center console. For more information, refer to [Section 501-12](#).
3. Remove the rear vent duct.



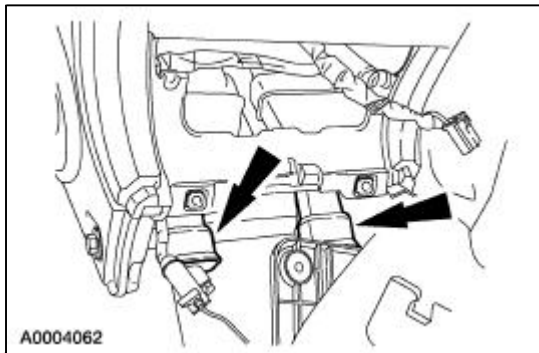
Vehicles with automatic transmission

4. Position the shifter out of the way.
 1. Disconnect and separate the shifter interlock cable and casing from the shifter.
 2. Remove the shifter retaining bolts (two shown).
 3. Position the shifter out of the way.



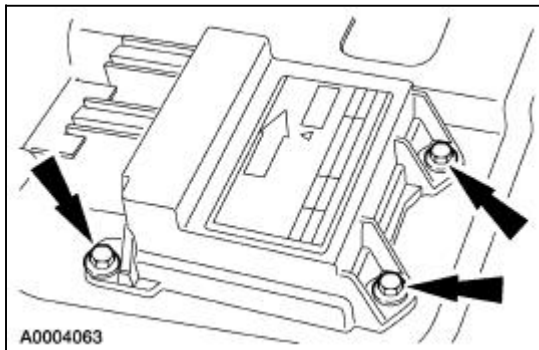
All vehicles

5. Remove the extension duct.

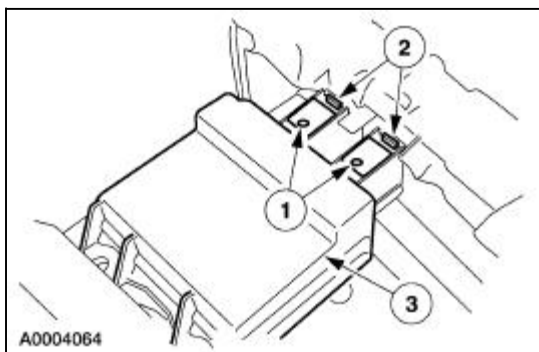


6. **NOTE:** The instrument panel has been removed for clarity.


Remove the bolts.



7. Remove the RCM.
 1. Slide and disengage the RCM electrical connector locking clips.
 2. Depressing the locking tab, disconnect the RCM electrical connectors.
 3. Remove the RCM.



Installation

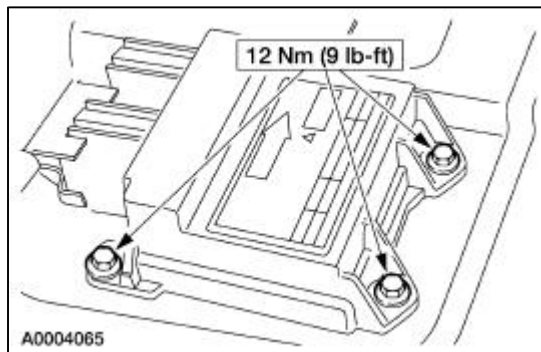
 **WARNING:** To reduce the risk of serious personal injury, read and follow all warnings, cautions and notes at the beginning of the removal procedure.

All vehicles

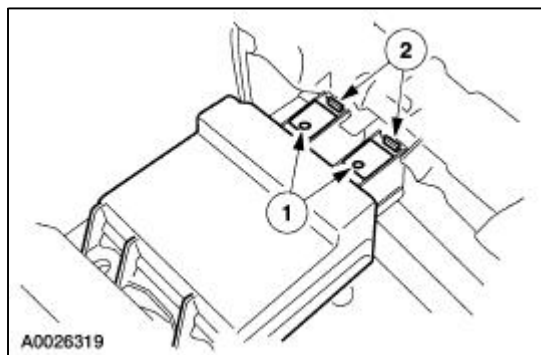
1.  **WARNING:** The tightening torque of the air bag restraints control module (RCM)

retaining bolts is critical for correct system operation.

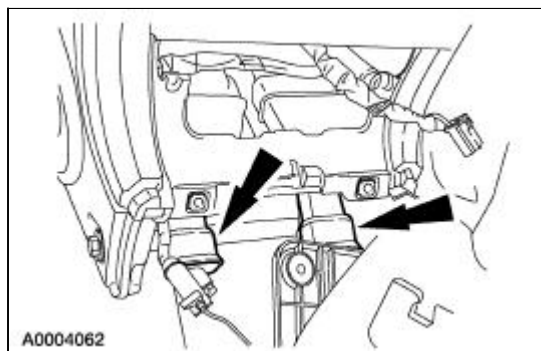
Position the RCM. Install the bolts.



2. Connect the RCM electrical connector.
 1. Connect the RCM electrical connectors.
 2. Slide and engage the RCM electrical connector locking clips.



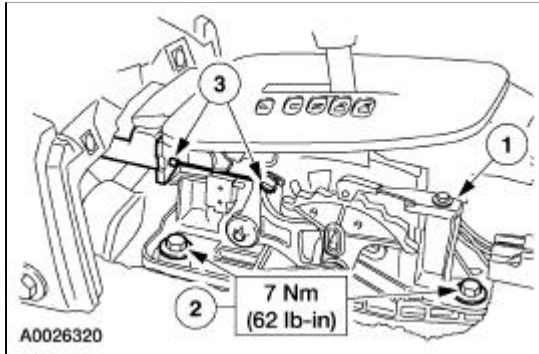
3. Connect the battery ground cable. For additional information, refer to [Section 414-01](#).
4. With the restraint system diagnostic tools installed at all deployable devices, prove out the supplemental restraint system (SRS). For additional information, refer to [Air Bag and Safety Belt Pretensioner Supplemental Restraint System \(SRS\)](#), in the Diagnosis and Testing portion of this section.
5. Disconnect the battery ground cable and wait at least one minute. For additional information, refer to [Section 414-01](#).
6. Install the extension duct.



Vehicles with automatic transmission

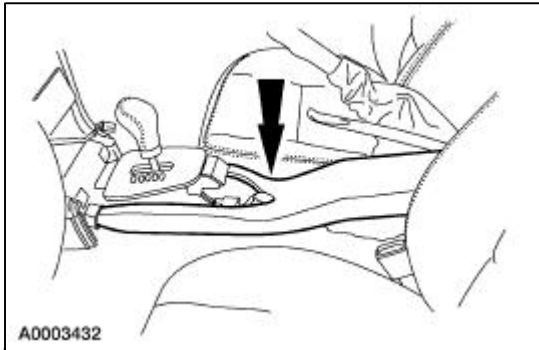
7. Install the shifter.


1. Position the shifter.
2. Install the shifter bolts (two shown).
3. Connect the shifter interlock cable and casing to the shifter.




All vehicles

8. Install the rear vent duct.



9. Install the center console. For additional information, refer to [Section 501-12](#).
10. Restore the vehicle to operating condition.
 1.  **WARNING:** To reduce the risk of serious personal injury, read and follow all warnings, cautions, notes, and instructions in the supplemental restraint system (SRS) deactivation/reactivation procedure.


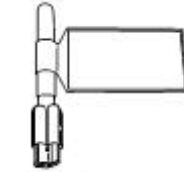
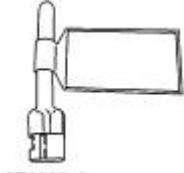
Reactivate the supplemental restraint system (SRS). For additional information, refer to [Supplemental Restraint System \(SRS\) Deactivation and Reactivation](#) in this section.

2.  **WARNING:** The restraint system diagnostic tool is for restraint system service only. Remove from the vehicle prior to road use. Failure to remove could result in injury and possible violation of vehicle safety standards.


With all the restraint system diagnostic tools removed, prove out the supplemental restraint system (SRS). For additional information, refer to [Air Bag and Safety Belt Pretensioner Supplemental Restraint System \(SRS\)](#) in this section.


Driver Air Bag Module

Special Tool(s)


 ST2502-A	Diagnostic Tool, Restraint System (2 Req'd) 418-F395 (014-R1079)
 ST2506-A	Diagnostic Tool, Restraint System (3 Req'd) 418-F088 (105-R0012)
 ST2507-A	Diagnostic Tool, Restraint System (2 Req'd) 418-133 (40-009)

Removal

 **WARNING:** Always wear safety glasses when repairing an air bag supplemental restraint system (SRS) vehicle and when handling an air bag module. This will reduce the risk of injury in the event of an accidental deployment.

 **WARNING:** Carry a live air bag module with the air bag and trim cover pointed away from your body. This will reduce the risk of injury in the event of an accidental deployment.

 **WARNING:** Do not set a live air bag module down with the trim cover face down. This will reduce the risk of injury in the event of an accidental deployment.

 **WARNING:** After deployment, the air bag surface can contain deposits of sodium hydroxide, a product of the gas generant combustion that is irritating to the skin. Wash your hands with soap and water afterwards.


 **WARNING:** Never probe the connectors on the air bag module. Doing so can result in air bag deployment, which can result in personal injury.

 **WARNING:** Air bag modules with discolored or damaged trim covers must be replaced, not repainted.

NOTE: A repair is made by installing a new part only. If the new part does not correct the condition,

install the original part and perform the diagnostic procedure again.

1. Prepare the vehicle for driver air bag module removal.


1.  **WARNING:** To avoid accidental deployment and possible personal injury, the backup power supply must be depleted before repairing or replacing any front or side air bag supplemental restraint system (SRS) components and before servicing, replacing, adjusting or striking components near the front or side air bag sensors, such as doors, instrument panel, console, door latches, strikers, seats and hood latches.

Please refer to the appropriate vehicle shop manual to determine location of the front air bag sensors.

The side air bag sensors are located at or near the base of the B-pillar.

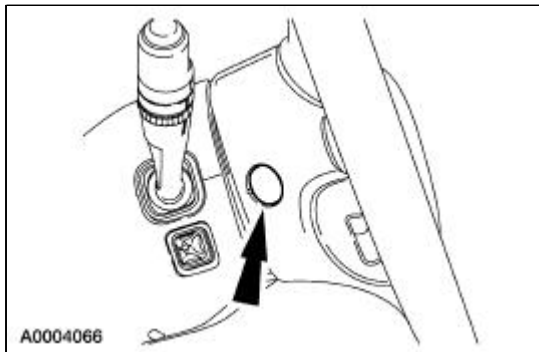
To deplete the backup power supply energy, disconnect the battery ground cable and wait at least one minute. Be sure to disconnect auxiliary batteries and power supplies (if equipped).

Disconnect the battery ground cable (14301) and wait at least one minute. For additional information, refer to [Section 414-01](#).

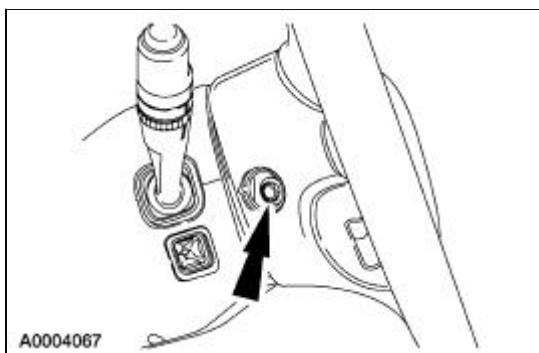
2.  **WARNING:** To reduce the risk of serious personal injury, read and follow all warnings, cautions, notes, and instructions in the supplemental restraint system (SRS) deactivation/reactivation procedure.

Deactivate the supplemental restraint system (SRS). For additional information, refer to [Supplemental Restraint System \(SRS\) Deactivation and Reactivation](#) in this section.

2. Remove the two steering wheel plugs.

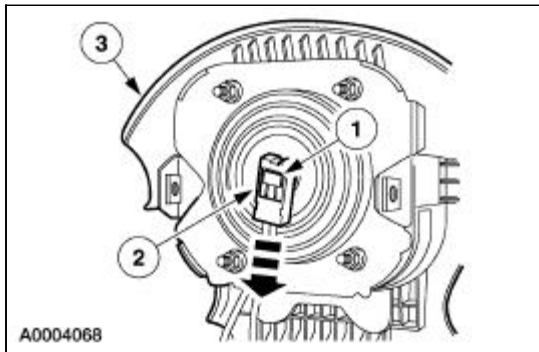


3. Remove the two driver air bag module retaining bolts.

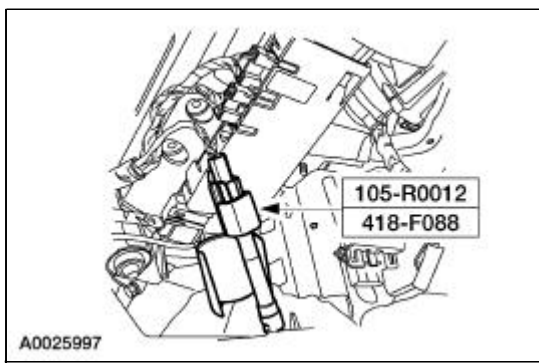


4. Disconnect and remove the driver air bag module.
 1. Slide and disengage the driver air bag electrical connector locking clip.

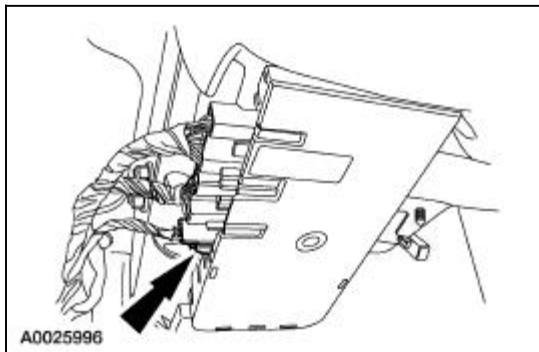
2. Depress the locking tabs and disconnect the driver air bag module electrical connector.
3. Remove the driver air bag module.



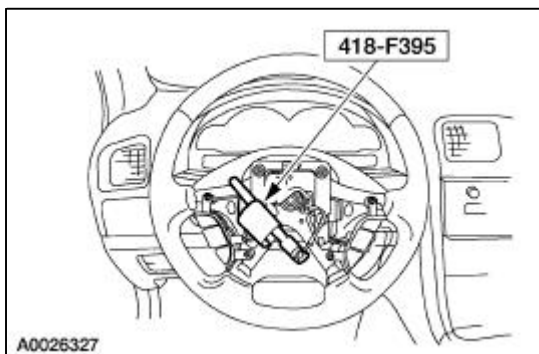
5. Remove the restraint system diagnostic tool from the vehicle harness side of the clockspring electrical connector at the base of the steering column.



6. Connect the clockspring electrical connector at the base of the steering column.




7. Attach the restraint system diagnostic tool to the clockspring electrical connector at the top of the steering column.

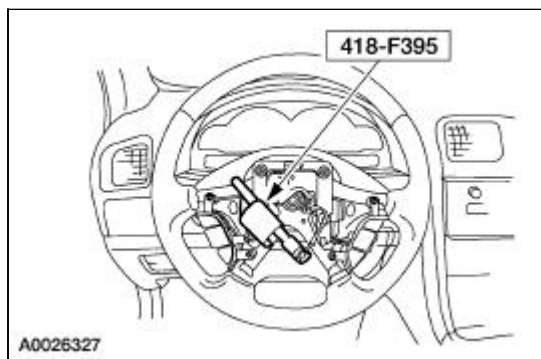


8. Connect the battery ground cable. For additional information, refer to [Section 414-01](#).
9. With the restraint system diagnostic tools installed at all deployable devices, prove out the supplemental restraint system (SRS). For additional information, refer to [Air Bag and Safety Belt Pretensioner Supplemental Restraint System \(SRS\)](#) in this section.
10. Disconnect the battery ground cable and wait at least one minute. For additional information, refer to [Section 414-01](#).

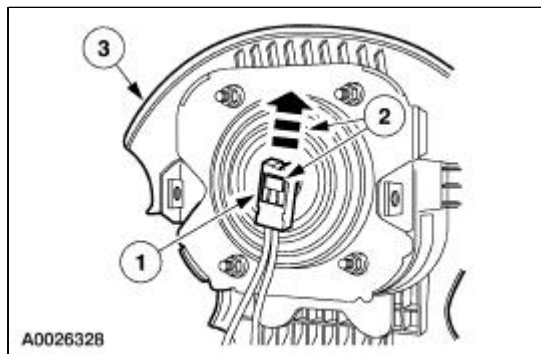
Installation

 **WARNING:** To reduce the risk of serious personal injury, read and follow all warnings, cautions and notes at the beginning of the removal procedure.

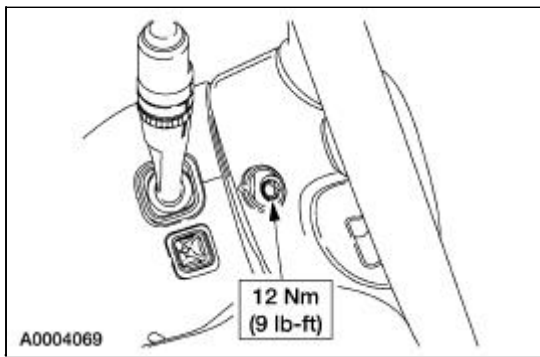
1. Remove the restraint system diagnostic tool from the clockspring electrical connector at the top of the steering column.



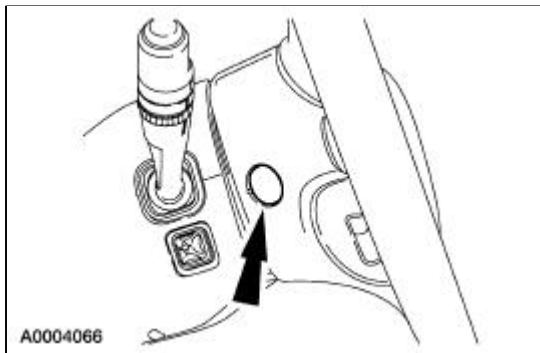
2. Connect and position the driver air bag module to the steering wheel.
 1. Connect the driver air bag module electrical connector.
 2. Slide and engage the driver air bag module electrical connector locking clip.
 3. Position the driver air bag module to the steering wheel.




3. Install the two driver air bag module bolts.



4. Install the two steering wheel back cover plugs.




5. Connect the battery ground cable. For additional information, refer to [Section 414-01](#).
6. With the restraint system diagnostic tools still installed at the remaining deployable devices, prove out the supplemental restraint system (SRS). For additional information, refer to [Air Bag and Safety Belt Pretensioner Supplemental Restraint System \(SRS\)](#) in this section.
7.  **WARNING:** To avoid accidental deployment and possible personal injury, the backup power supply must be depleted before repairing or replacing any front or side air bag supplemental restraint system (SRS) components and before servicing, replacing, adjusting or striking components near the front or side air bag sensors, such as doors, instrument panel, console, door latches, strikers, seats and hood latches.

Please refer to the appropriate vehicle shop manual to determine location of the front air bag sensors.


The side air bag sensors are located at or near the base of the B-pillar.

To deplete the backup power supply energy, disconnect the battery ground cable and wait at least one minute. Be sure to disconnect auxiliary batteries and power supplies (if equipped).

Disconnect the battery ground cable and wait at least one minute. For additional information, refer to [Section 414-01](#).

8. Restore the vehicle to operating condition.
 1.  **WARNING:** To reduce the risk of serious personal injury, read and follow all warnings, cautions, notes, and instructions in the supplemental restraint system (SRS) deactivation/reactivation procedure.

Reactivate the supplemental restraint system (SRS). For additional information, refer to [Supplemental Restraint System \(SRS\) Deactivation and Reactivation](#) in this section.


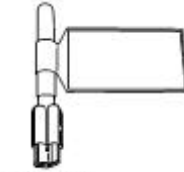
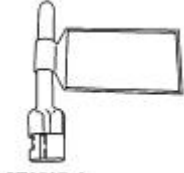
2.  **WARNING:** The restraint system diagnostic tool is for restraint system

service only. Remove from the vehicle prior to road use. Failure to remove could result in injury and possible violation of vehicle safety standards.


With all the restraint system diagnostic tools removed, prove out the supplemental restraint system (SRS). For additional information, refer to [Air Bag and Safety Belt Pretensioner Supplemental Restraint System \(SRS\)](#) in this section.


Passenger Air Bag Module


Special Tool(s)


 ST2502-A	Diagnostic Tool, Restraint System (3 Req'd) 418-F395 (014-R1079)
 ST2506-A	Diagnostic Tool, Restraint System (1 Req'd) 418-F088 (105-R0012)
 ST2507-A	Diagnostic Tool, Restraint System (2 Req'd) 418-133 (40-009)

Removal


 **WARNING:** Always wear safety glasses when repairing an air bag supplemental restraint system (SRS) vehicle and when handling an air bag module. This will reduce the risk of injury in the event of an accidental deployment.

 **WARNING:** Carry a live air bag module with the air bag and trim cover pointed away from your body. This will reduce the risk of injury in the event of an accidental deployment.

 **WARNING:** Do not set a live air bag module with the trim cover in the face down position. This will reduce the risk of injury in the event of an accidental deployment.

 **WARNING:** After deployment, the air bag surface can contain deposits of sodium hydroxide, a product of the gas generant combustion that is irritating to the skin. Wash your hands with soap and water afterwards.


 **WARNING:** Never probe the connectors on the air bag module. Doing so can result in air bag deployment, which can result in personal injury.

 **WARNING:** If the air bag module is discolored or damaged it must be replaced, not repaired.

NOTE: A repair is made by installing a new part only. If the new part does not correct the condition,

install the original part and perform the diagnostic procedure again.

1. Prepare the vehicle for passenger air bag module removal.


1.  **WARNING:** To avoid accidental deployment and possible personal injury, the backup power supply must be depleted before repairing or replacing any front or side air bag supplemental restraint system (SRS) components and before servicing, replacing, adjusting or striking components near the front or side air bag sensors, such as doors, instrument panel, console, door latches, strikers, seats and hood latches.

Please refer to the appropriate vehicle shop manual to determine location of the front air bag sensors.

The side impact sensors are located at or near the base of the B-pillar.

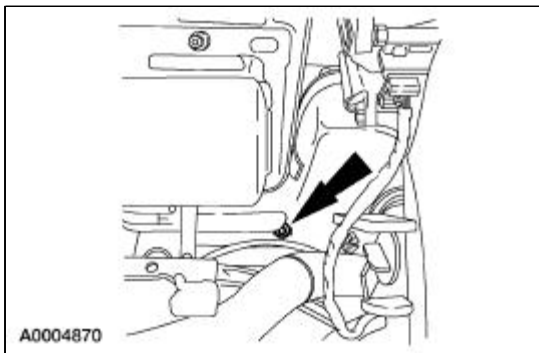
To deplete the backup power supply energy, disconnect the battery ground cable and wait at least one minute. Be sure to disconnect auxiliary batteries and power supplies (if equipped).

Disconnect the battery ground cable (14301) and wait at least one minute. For additional information, refer to [Section 414-01](#).

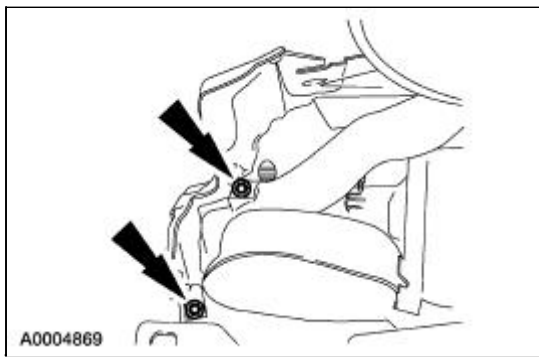
2.  **WARNING:** To reduce the risk of serious personal injury, read and follow all warnings, cautions, notes, and instructions in the supplemental restraint system (SRS) deactivation/reactivation procedure.

Deactivate the supplemental restraint system (SRS). For additional information, refer to [Supplemental Restraint System \(SRS\) Deactivation and Reactivation](#) in the General Procedures portion of this section.

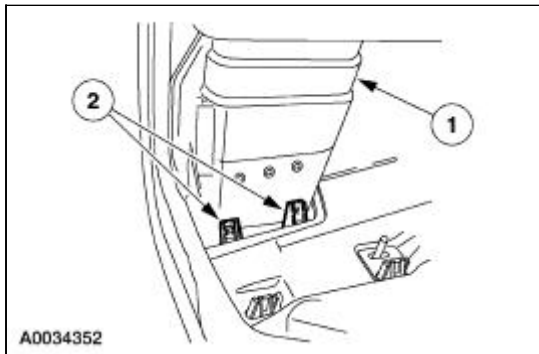
2. Remove the instrument panel. For additional information, refer to [Section 501-12](#).
3. Position the instrument panel face down on the bench.
 - Cover the work area with something clean and nonabrasive to protect the instrument panel.
4. Remove the screw for the passenger side A/C duct near the center of the instrument panel.



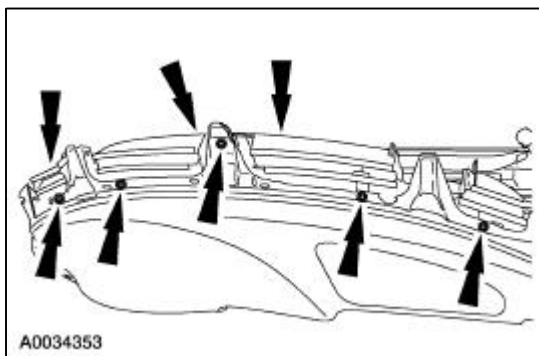
5. Remove the screws from the passenger side A/C and demister duct.



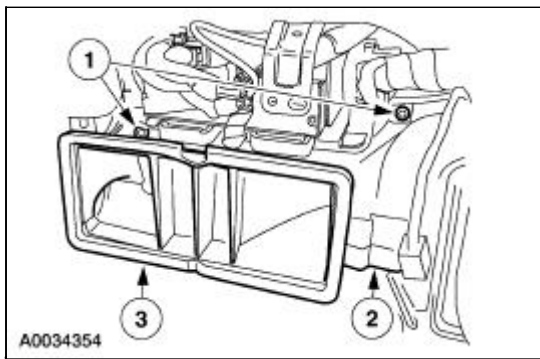
6. Remove the passenger side air conditioning register.
 1. Separate the A/C duct from the register.
 2. Push in on the retaining clips and remove the passenger side air conditioning register.



7. Remove the eight screws. Separate the driver side demister duct and remove the defrost nozzle.



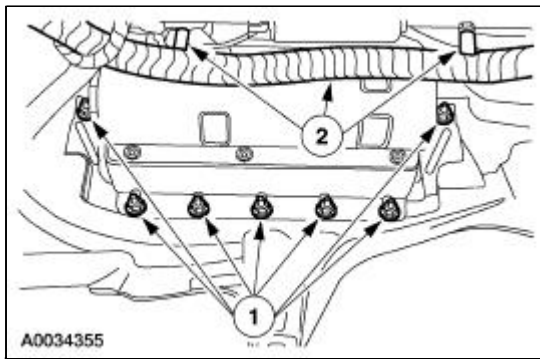
8. Remove the plenum chamber. For additional information, refer to [Section 412-01](#).
9. Remove the center A/C duct.
 1. Remove the screws.
 2. Pull out on the center A/C duct, separating the passenger A/C duct.
 3. Remove the center A/C duct.



10. **NOTE:** If installing a new passenger air bag module, install new retaining nuts and bolts.

Remove the passenger air bag module nuts.

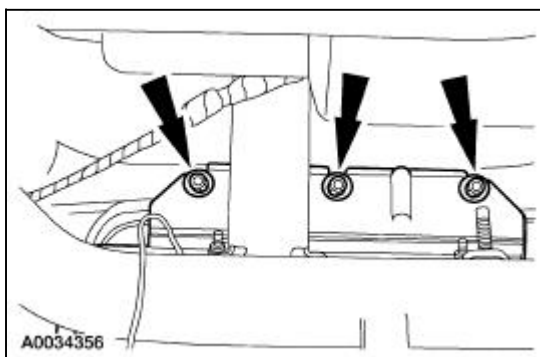
1. Remove the passenger air bag module nuts.
2. Release the three retainers and position the wire harness out of the way.



11. **NOTE:** If installing a new passenger air bag module, install new retaining nuts and bolts.

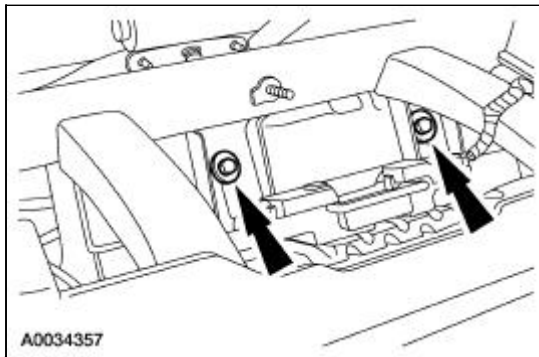
Remove the passenger air bag module nuts.

- Position the passenger side A/C duct out of the way to access the passenger air bag nuts.



12. **NOTE:** If installing a new passenger air bag module, install new retaining nuts and bolts.

Remove the passenger air bag module bolts.



13. Remove the passenger air bag module through the back of the instrument panel.

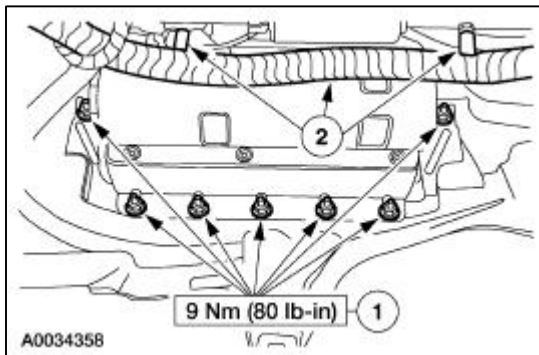
Installation

⚠ WARNING: To reduce the risk of serious personal injury, read and follow all warnings, cautions and notes at the beginning of the removal procedure.

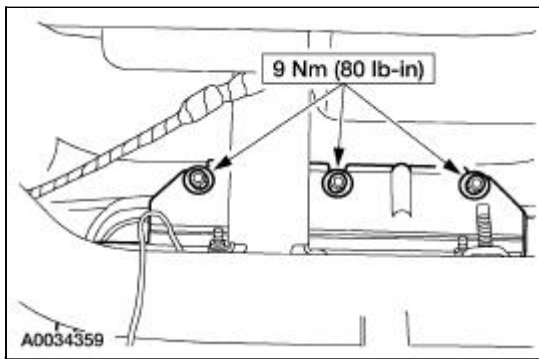
1. Disconnect the battery ground cable (14301) and wait at least one minute. For additional information, refer to [Section 414-01](#).
2. **NOTE:** If installing a new passenger air bag module, install new retaining nuts and bolts.

Position the passenger air bag module to the instrument panel. Start all nuts and bolts by hand. Do not tighten at this time.

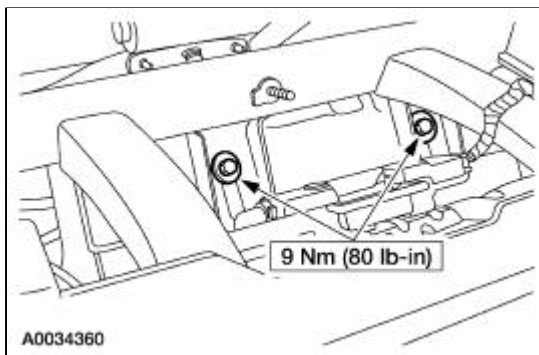
3. Tighten the passenger air bag module nuts.
 1. Tighten the passenger air bag module nuts to specification.
 2. Route the wire harness. Install the retainers.



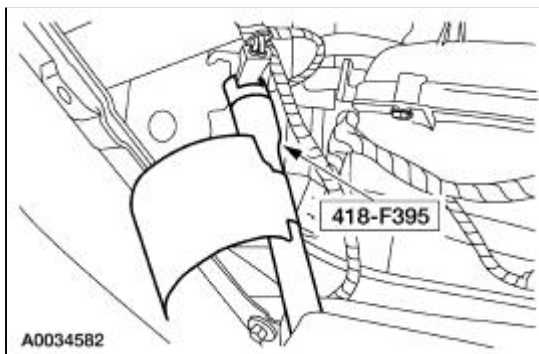
4. Tighten the passenger air bag module nuts to specification.
 - Position the glove box and passenger side A/C duct out of the way to access the passenger air bag nuts.



5. Tighten the passenger air bag module bolts.



6. Remove the restraint system diagnostic tool from the vehicle harness side of the passenger air bag module electrical connector.

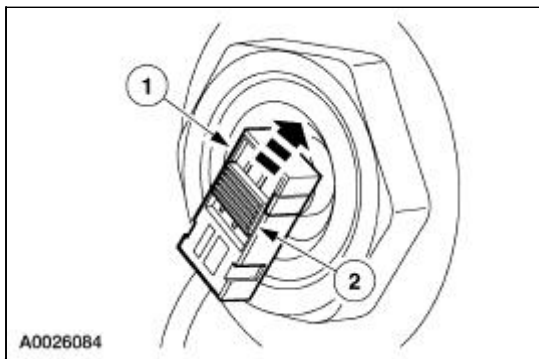


7. **NOTE:** The passenger air bag module is shown with instrument panel removed for clarity.

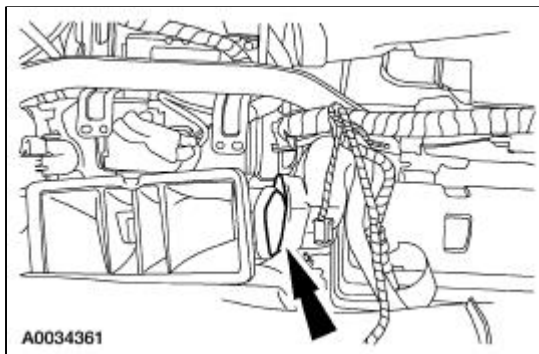
This is a blind operation due to the passenger air bag module electrical connector mounting location.

Connect the passenger air bag module electrical connector (this is a blind operation).

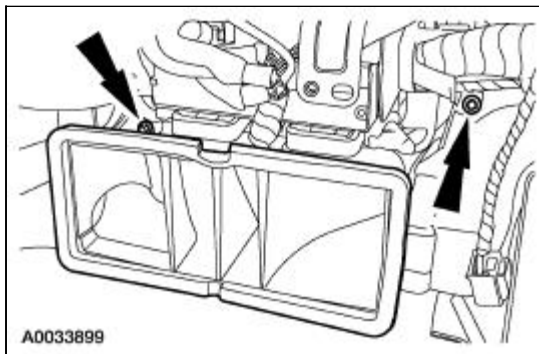
1. Connect the passenger air bag module electrical connector.
2. Slide and engage the driver air bag module electrical connector locking clip.



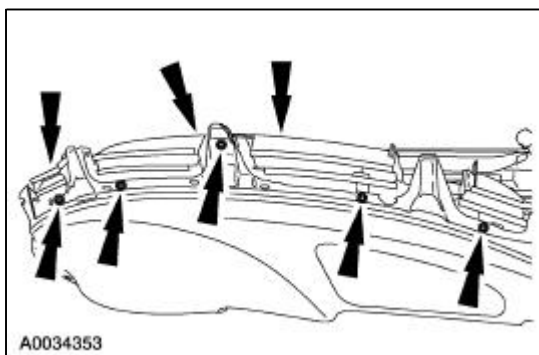
8. Position the center A/C duct into the passenger A/C duct.



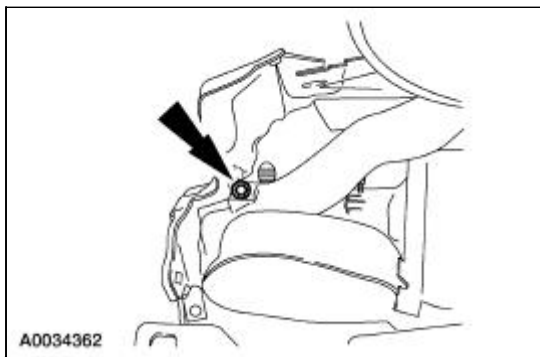
9. Position the center A/C duct to the instrument panel. Install the screws.



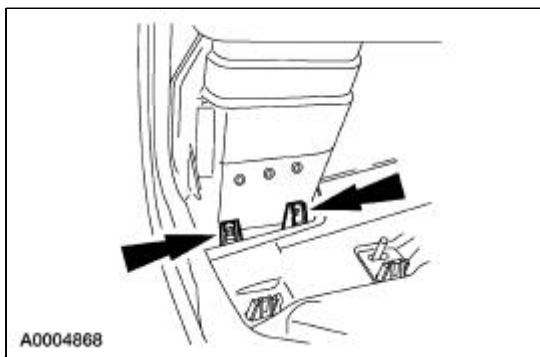
10. Install the plenum chamber. For additional information, refer to [Section 412-01](#).
11. Position the defrost nozzle to the instrument panel while installing the driver side demister duct. Install the eight screws.



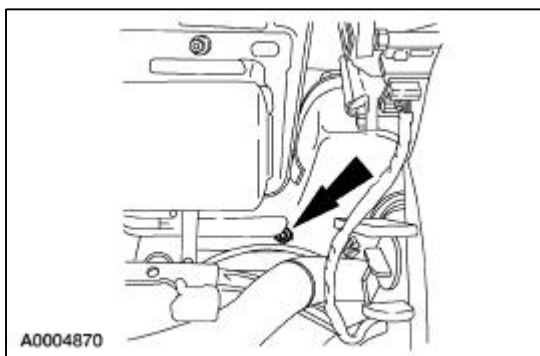
12. Position the passenger side demister duct to the instrument panel. Install the screw.



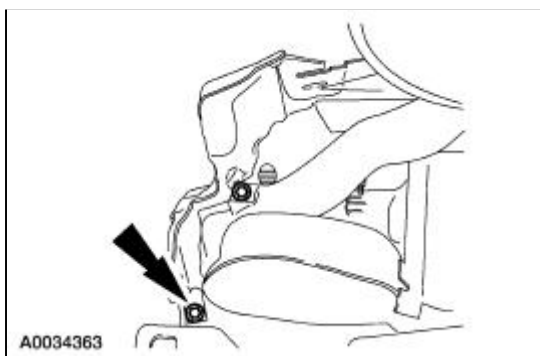
13. Install the passenger side air conditioning register into the instrument panel and engage the retaining clips.
 - Attach the passenger side air conditioning duct to the register.



14. Position the A/C duct and install the screw near the center of the instrument panel.




15. Install the screw for the A/C duct near the passenger register.



16. Install the instrument panel. Do not install the driver air bag module at this time. For additional information, refer to [Section 501-12](#).

17. Install the glove compartment. For additional information, refer to [Section 501-12](#).
18. Connect the battery ground cable. For additional information, refer to [Section 414-01](#).
19. With the restraint system diagnostic tools still installed at the remaining deployable devices, prove out the supplemental restraint system (SRS). For additional information, refer to [Air Bag and Safety Belt Pretensioner Supplemental Restraint System \(SRS\)](#) in the Diagnosis and Testing portion of this section.

20.  **WARNING: To avoid accidental deployment and possible personal injury, the backup power supply must be depleted before repairing or replacing any front or side air bag supplemental restraint system (SRS) components and before servicing, replacing, adjusting or striking components near the front or side air bag sensors, such as doors, instrument panel, console, door latches, strikers, seats and hood latches.**

Please refer to the appropriate vehicle shop manual to determine location of the front air bag sensors.

The side impact sensors are located at or near the base of the B-pillar.


To deplete the backup power supply energy, disconnect the battery ground cable and wait at least one minute. Be sure to disconnect auxiliary batteries and power supplies (if equipped).

Disconnect the battery ground cable and wait at least one minute. For additional information, refer to [Section 414-01](#).


21.  **WARNING: To reduce the risk of serious personal injury, read and follow all warnings, cautions, notes, and instructions in the driver air bag module procedure.**

Install the driver air bag module. For additional information, refer to [Driver Air Bag Module](#) in this section.

22. Restore the vehicle to operating condition.

1.  **WARNING: To reduce the risk of serious personal injury, read and follow all warnings, cautions, notes, and instructions in the supplemental restraint system (SRS) deactivation/reactivation procedure.**


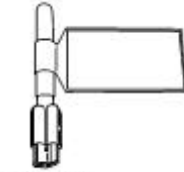
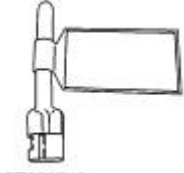
Reactivate the supplemental restraint system (SRS). For additional information, refer to [Supplemental Restraint System \(SRS\) Deactivation and Reactivation](#) in the General Procedures portion of this section.

2.  **WARNING: The restraint system diagnostic tool is for restraint system service only. Remove from the vehicle prior to road use. Failure to remove could result in injury and possible violation of vehicle safety standards.**


With all the restraint system diagnostic tools removed, prove out the supplemental restraint system (SRS). For additional information, refer to [Air Bag and Safety Belt Pretensioner Supplemental Restraint System \(SRS\)](#) in the Diagnosis and Testing portion of this section.

Side Air Bag Module

Special Tool(s)


 ST2502-A	Diagnostic Tool, Restraint System (1 Req'd) 418-F395 (014-R1079)
 ST2506-A	Diagnostic Tool, Restraint System (3 Req'd) 418-F088 (105-R0012)
 ST2507-A	Diagnostic Tool, Restraint System (2 Req'd) 418-133 (40-009)

Removal

 **WARNING:** Always wear safety glasses when repairing an air bag supplemental restraint system (SRS) vehicle and when handling an air bag module. This will reduce the risk of injury in the event of an accidental deployment.

 **WARNING:** Carry a live side air bag module with the air bag and tear seam pointed away from your body. This will reduce the risk of injury in the event of an accidental deployment.

 **WARNING:** Do not set a live side air bag module down on the cover tear seam. This will reduce the risk of injury in the event of an accidental deployment.

 **WARNING:** After deployment, the air bag surface can contain deposits of sodium hydroxide, a product of the gas generant combustion that is irritating to the skin. Wash your hands with soap and water afterwards.

 **WARNING:** Never probe the connectors on the air bag module. Doing so can result in air bag deployment, which can result in personal injury.

 **WARNING:** Side air bag modules with damaged covers must be replaced.


NOTE: If a side air bag deployment took place the seat back pad, trim cover, and side air bag module must be replaced. The seat back frame should be replaced if necessary.

NOTE: When replacing the side air bag after deployment, refer to [Section 501-10](#) for additional information concerning the installation of a new side air bag.

NOTE: Repair is made by installing a new part only. If the new part does not correct the condition, install the original part and perform the diagnostic procedure again.

NOTE: The passenger seat is shown, the driver seat is similar.

1. Prepare the vehicle for side air bag module removal.


1.  **WARNING:** To avoid accidental deployment and possible personal injury, the backup power supply must be depleted before repairing or replacing any front or side air bag supplemental restraint system (SRS) components and before servicing, replacing, adjusting or striking components near the front or side air bag sensors, such as doors, instrument panel, console, door latches, strikers, seats and hood latches.

Please refer to the appropriate vehicle shop manual to determine location of the front air bag sensors.

The side air bag sensors are located at or near the base of the B-pillar.

To deplete the backup power supply energy, disconnect the battery ground cable and wait at least one minute. Be sure to disconnect auxiliary batteries and power supplies (if equipped).

Disconnect the battery ground cable (14301) and wait at least one minute. For additional information, refer to [Section 414-01](#).

2.  **WARNING:** To reduce the risk of serious personal injury, read and follow all warnings, cautions, notes, and instructions in the supplemental restraint system (SRS) deactivation/reactivation procedure.

Deactivate the supplemental restraint system (SRS). For additional information, refer to [Supplemental Restraint System \(SRS\) Deactivation and Reactivation](#) in this section.

3.  **WARNING:** To reduce the risk of serious personal injury, read and follow all warnings, cautions, notes, and instructions in the seat removal and installation procedure.

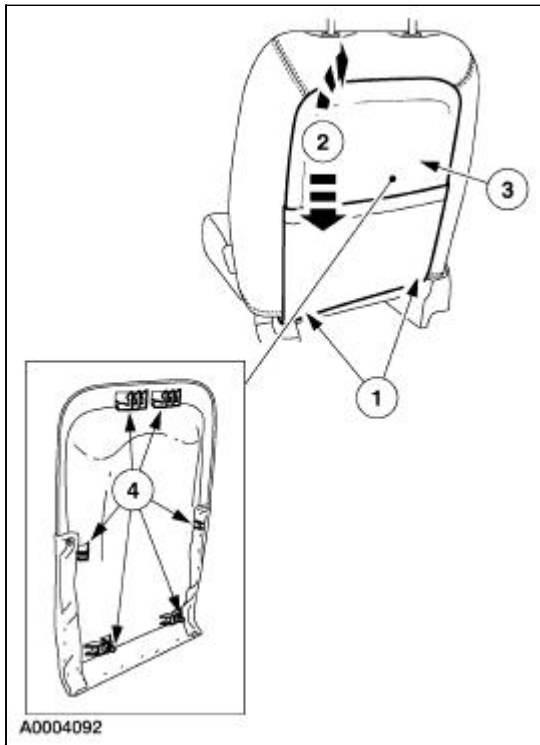
Remove the seat on the side with the affected side air bag module. For additional information, refer to [Section 501-10](#).

2.  **WARNING:** Front seat back trim covers installed on seats equipped with side air bags cannot be repaired, they are to be replaced (cleaning is permissible).

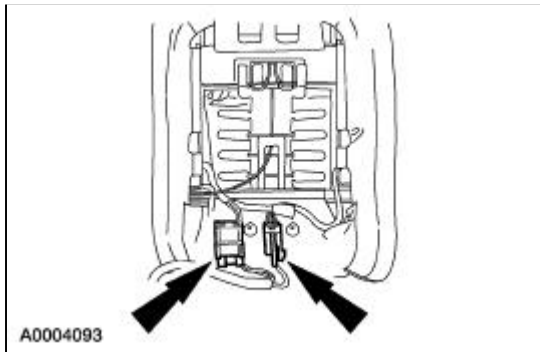
 **CAUTION:** When removing the seat back trim panel, be careful not to damage the J-hooks. If the seat back trim panel J-hooks are damaged, install a new seat back trim panel.

Remove the seat back trim panel.

1. Pull and release the pin-type retainers at the bottom of the seat back trim panel.
2. While pushing in at the top of the seat back trim panel, slide it down to disengage the J-hooks.
3. Pull out evenly at the top of the seat back trim panel and remove it.
4. Inspect the seat back trim panel J-hooks and pin-type retainers for damage.



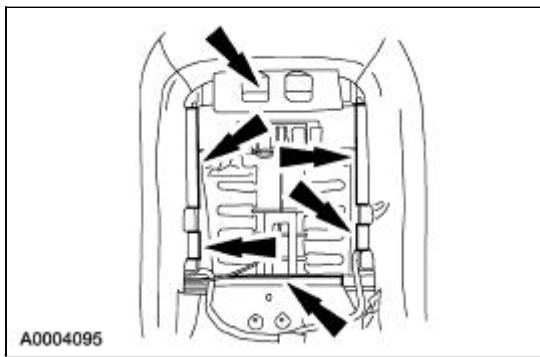
3. Disconnect the electrical connectors.



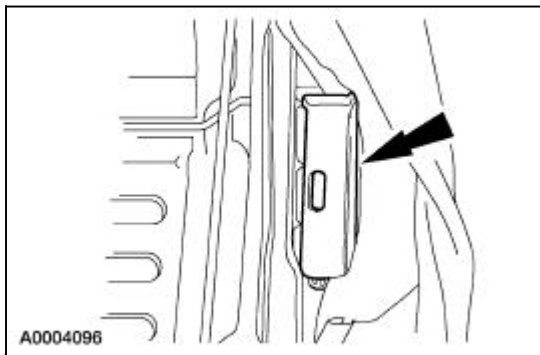
4. Separate the pin-type retainers from the seat back frame as indicated.



5. Detach the seat back trim cover J-clips.



6. Reposition the seat back trim cover and pad and remove the side air bag module retaining nut cover.

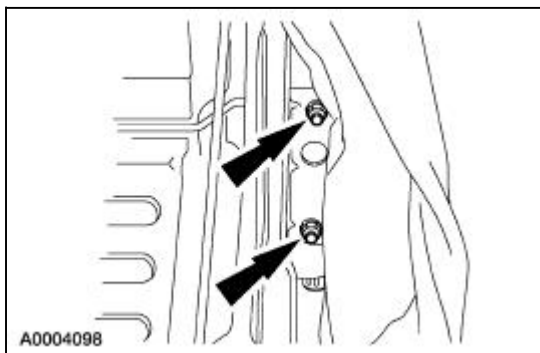


7. Push the wire harness and grommet through the seat back frame.



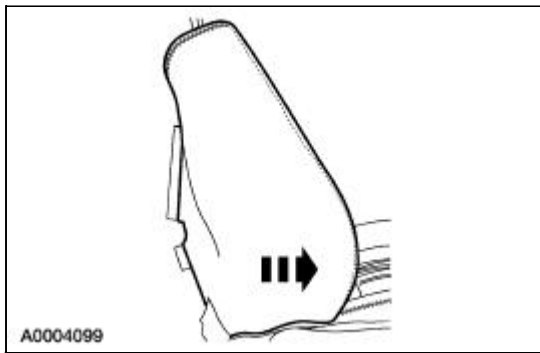
8. **NOTE:** If installing a new side air bag module, use new retaining nuts. If the same side air bag module is to be reused then reuse the side air bag module nuts.

Remove the side air bag module retaining nuts.

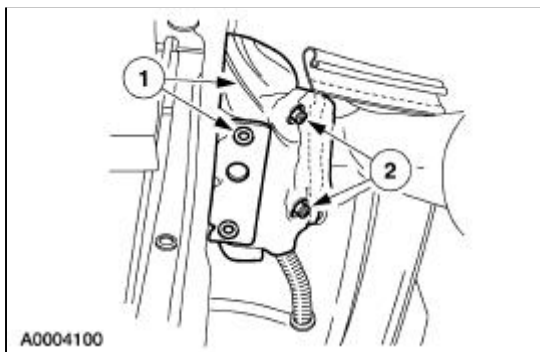


9. With one hand on the side air bag module, position the seat back trim cover and pad forward

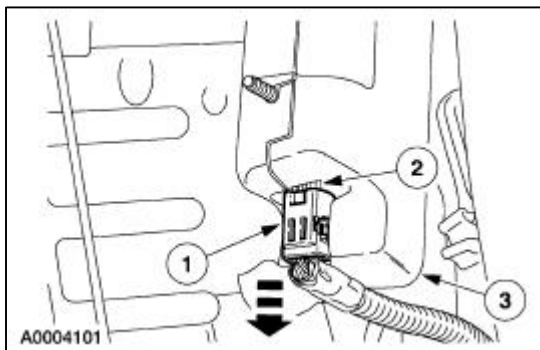
enough to access the side air bag module.



10. Remove the side air bag module from the deployment chute.
 1. Separate the side air bag module and deployment chute from the seat back mounting bracket.
 2. Pull the side air bag module mounting studs back through the deployment chute openings and remove the side air bag module from the deployment chute.



11. Remove the side air bag module.
 1. Slide the side air bag electrical connector locking clip to disengage it.
 2. Release the two connector tabs (one shown) by pushing in on them and disconnect the side air bag module.
 3. Remove the side air bag module.

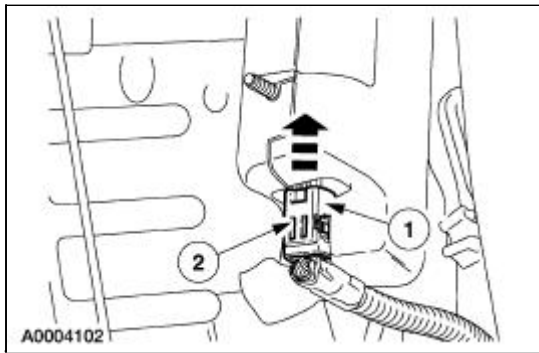


Installation

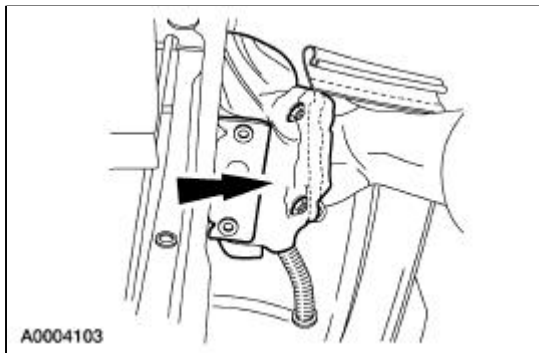



WARNING: To reduce the risk of serious personal injury, read and follow all warnings, cautions and notes at the beginning of the removal procedure.


1. Connect the side air bag module electrical connector.
 1. Install the connector to the side air bag module.
 2. Slide the side air bag module electrical connector locking clip to secure the connector to the side air bag module.





2. Make sure the electrical connector is securely fastened to the side air bag module.




3.  **WARNING:** Inspect the mounting surfaces of the side air bag module for any foreign objects before installing the side air bag module. If any foreign objects are found, remove them. Failure to do so may result in personal injury, in the event of an air bag deployment.

 **WARNING:** Inspect the side air bag deployment chute and the side air bag cavity in the seat back pad for any foreign objects. If any foreign objects are found remove them. Failure to do so may result in personal injury, in the event of an air bag deployment.

 **WARNING:** Before installing the side air bag module into the deployment chute, check it for damage and foreign objects. If the air bag module is damaged, replace it. If any foreign objects are found, remove them. Failure to do so may result in personal injury, in the event of an air bag deployment.

 **WARNING:** If the air bag cover has separated or the air bag material has been exposed, install a new side air bag module. Do not attempt to repair the air bag module. Failure to do so may result in personal injury, in the event of an air bag deployment.


 **WARNING:** Check the side air bag deployment chute for damage. The deployment chute must not be repaired. If there is any damage to the deployment chute, the seat back trim cover and deployment chute must be installed new as a unit.

 **WARNING:** If the air bag deployment chute is not properly positioned, the side air bag may not deploy properly.

NOTE: The alignment pin will only allow the side air bag module to be installed to the seat back mounting bracket one way.

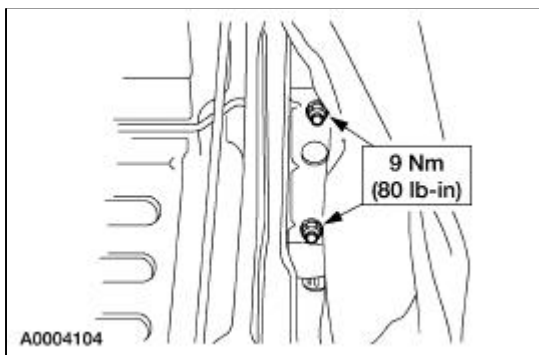
Position the side air bag module into the deployment chute.

- Position the side air bag module into the deployment chute with the alignment pin offset to the top and the electrical connector to the bottom of the seat back. This will position the alignment pin correctly when the side air bag module and deployment chute are mounted to the seat back frame mounting bracket.
- The side air bag module mounting studs must come through the deployment chute stud openings.

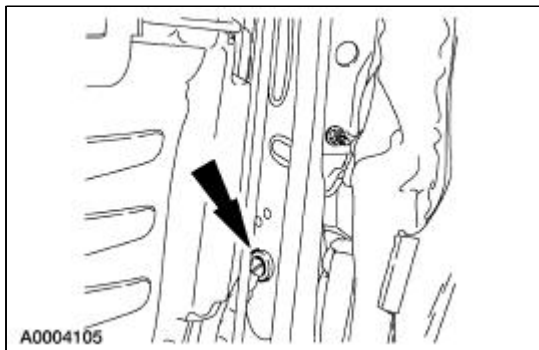
4.  **WARNING: Inspect the mounting surfaces of the deployment chute and the seat back frame mounting bracket for any foreign objects, before installing the side air bag module/deployment chute assembly. If any foreign objects are found, remove them. Failure to do so may result in personal injury, in the event of an air bag deployment.**

Install the side air bag module onto the front seat back frame mounting bracket. Install the nuts.

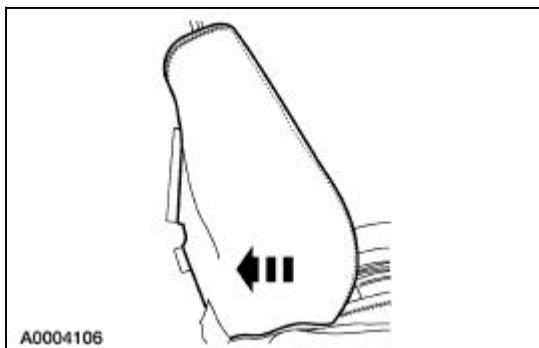
- The deployment chute should not have any wrinkles or folds where it contacts the seat back frame mounting bracket.



5. Pull the wire harness back through the hole in the seat back frame and seat the grommet.

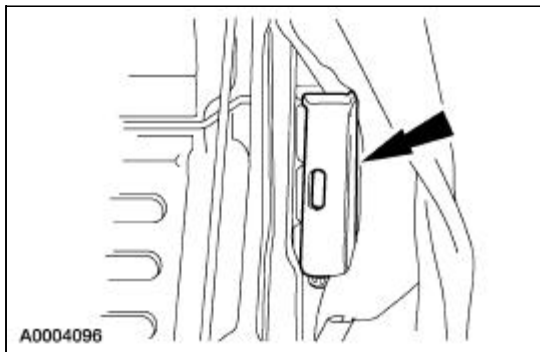


6. Reposition the seat back pad and trim cover to the seat back frame.

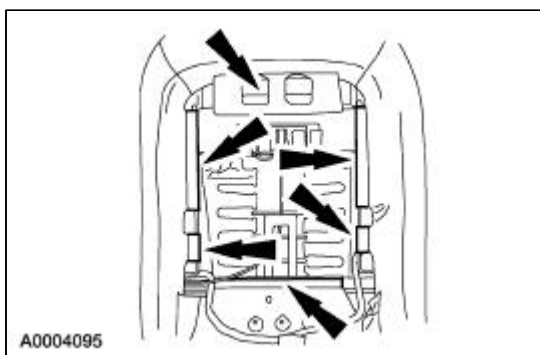


7. Attach the side air bag retaining nuts cover.

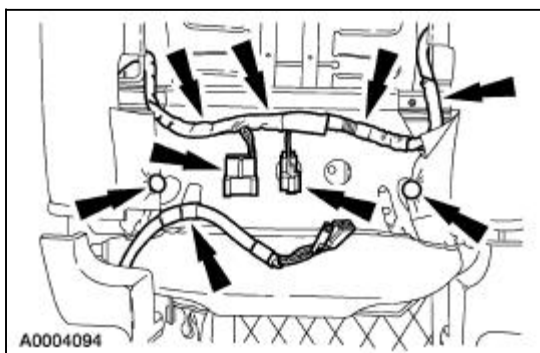
- Check that all three attaching clips on the side air bag nuts cover are correctly installed around the side air bag mounting bracket.



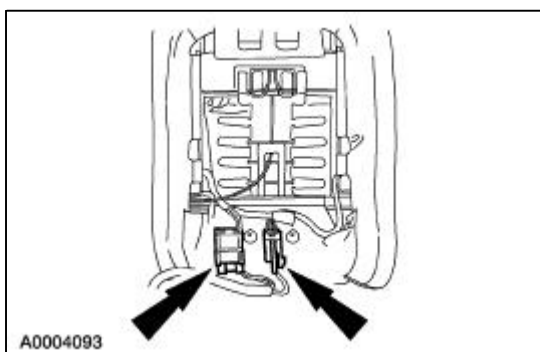
8. Fasten the seat back trim cover J-clips.



9. Install the pin-type retainers indicated.



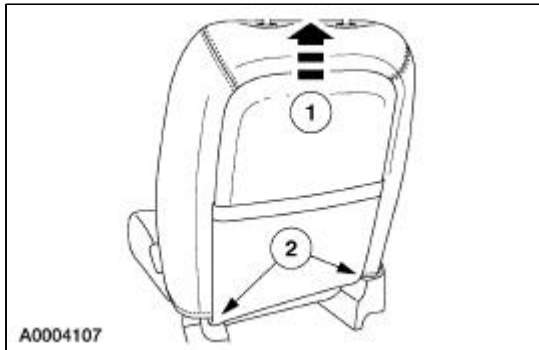
10. Connect the electrical connectors.



11.  **CAUTION: Inspect the seat back trim panel J-hooks for damage. If damaged, install a new seat back trim panel.**

Install the seat back trim panel.


1. Angle the top of the seat back trim panel inward and up to engage the upper J-hooks to the seat back frame.
2. While holding the seat back trim panel up, align the pin-type retainers at the bottom of the seat back trim panel and install them into the seat back frame.




12. Restore the vehicle to operating condition.

1.  **WARNING: To reduce the risk of serious personal injury, read and follow all warnings, cautions, notes, and instructions in the seat removal and installation procedure.**

Install the seat on the side with the affected side air bag. For additional information, refer to [Section 501-10](#).

2.  **WARNING: To reduce the risk of serious personal injury, read and follow all warnings, cautions, notes, and instructions in the supplemental restraint system (SRS) deactivation/reactivation procedure.**

Reactivate the supplemental restraint system (SRS). For additional information, refer to [Supplemental Restraint System \(SRS\) Deactivation and Reactivation](#) in this section.



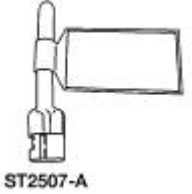
3.  **WARNING: The restraint system diagnostic tool is for restraint system service only. Remove from the vehicle prior to road use. Failure to remove could result in injury and possible violation of vehicle safety standards.**

With all the restraint system diagnostic tools removed, prove out the supplemental restraint system (SRS). For additional information, refer to [Air Bag and Safety Belt Pretensioner Supplemental Restraint System \(SRS\)](#) in this section.


4. Check the active restraint system for correct operation. For additional information, refer to [Section 501-20A](#).
-


Clockspring

Special Tool(s)


 ST2502-A	Diagnostic Tool, Restraint System (2 Req'd) 418-F395 (014-R1079)
 ST2506-A	Diagnostic Tool, Restraint System (3 Req'd) 418-F088 (105-R0012)
 ST2507-A	Diagnostic Tool, Restraint System (2 Req'd) 418-133 (40-009)

Removal

 **WARNING:** Always wear safety glasses when repairing an air bag supplemental restraint system (SRS) vehicle and when handling an air bag module. This will reduce the risk of injury in the event of an accidental deployment.

 **WARNING:** Carry a live air bag module with the air bag and trim cover pointed away from your body. This will reduce the risk of injury in the event of an accidental deployment.

 **WARNING:** Do not set a live air bag module down with the trim cover face down. This will reduce the risk of injury in the event of an accidental deployment.

 **WARNING:** After deployment, the air bag surface can contain deposits of sodium hydroxide, a product of the gas generant combustion that is irritating to the skin. Wash your hands with soap and water afterwards.

 **WARNING:** Never probe the connectors on the air bag module. Doing so can result in air bag deployment, which can result in personal injury.


 **WARNING:** Air bag modules with discolored or damaged trim covers must be replaced, not repainted.

NOTE: A repair is made by installing a new part only. If the new part does not correct the condition,

install the original part and perform the diagnostic procedure again.

All vehicles

1. Prepare the vehicle for clockspring removal.


1.  **WARNING:** To avoid accidental deployment and possible personal injury, the backup power supply must be depleted before repairing or replacing any front or side air bag supplemental restraint system (SRS) components and before servicing, replacing, adjusting or striking components near the front or side air bag sensors, such as doors, instrument panel, console, door latches, strikers, seats and hood latches.

Please refer to the appropriate vehicle shop manual to determine location of the front air bag sensors.

The side air bag sensors are located at or near the base of the B-pillar.

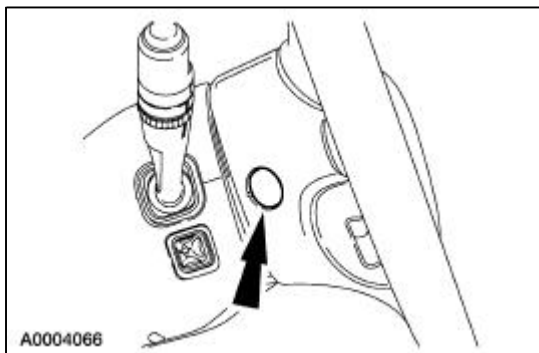
To deplete the backup power supply energy, disconnect the battery ground cable and wait at least one minute. Be sure to disconnect auxiliary batteries and power supplies (if equipped).

Disconnect the battery ground cable (14301) and wait at least one minute. For additional information, refer to [Section 414-01](#).

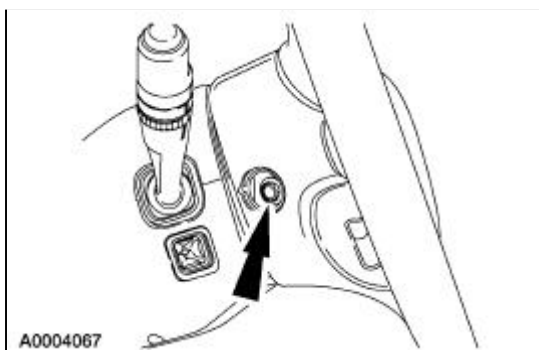
2.  **WARNING:** To reduce the risk of serious personal injury, read and follow all warnings, cautions, notes, and instructions in the supplemental restraint system (SRS) deactivation/reactivation procedure.

Deactivate the supplemental restraint system (SRS). For additional information, refer to [Supplemental Restraint System \(SRS\) Deactivation and Reactivation](#) in this section.

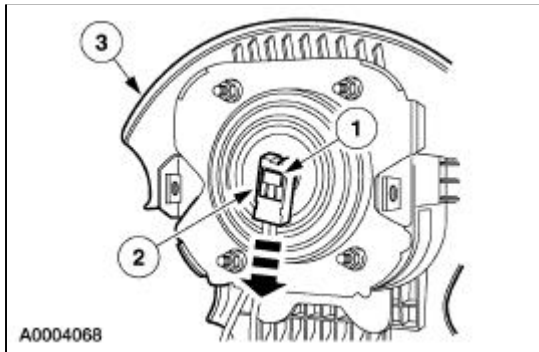
2. Remove the two steering wheel back cover plugs.



3. Remove the two driver air bag module bolts.



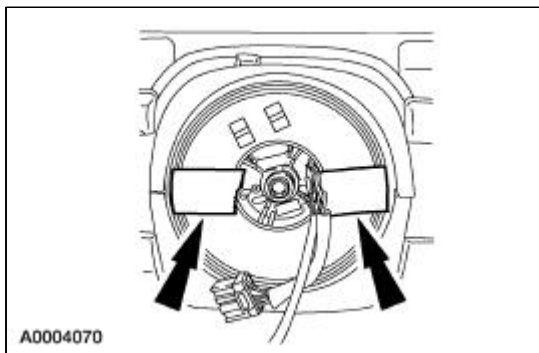
4. Remove the driver air bag module.
 1. Slide and disengage the driver air bag module electrical connector locking clip.
 2. Depressing the locking tabs, disconnect the driver air bag module electrical connector.
 3. Remove the driver air bag module.



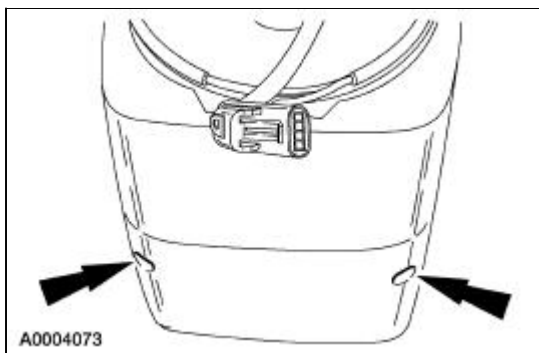
5. **NOTE:** Make sure the wheels are in the straight-ahead position.

Remove the steering wheel. For additional information, refer to [Section 211-04](#).

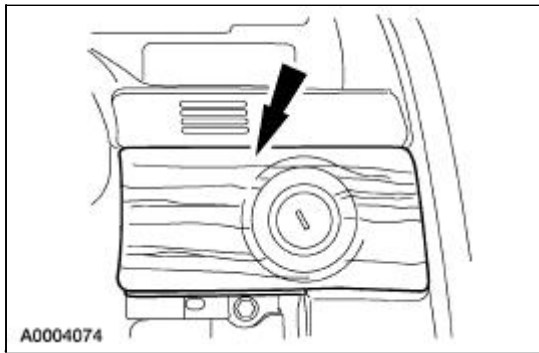
6. Apply two strips of masking tape across the clockspring to prevent accidental rotation when the clockspring is removed.



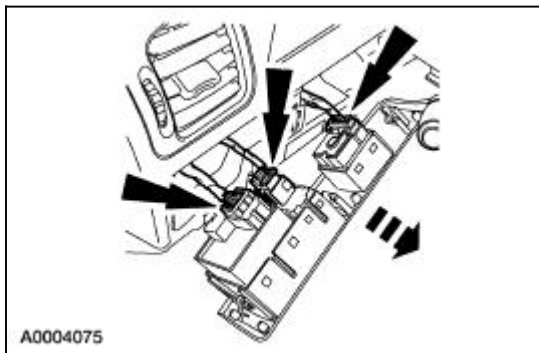
7. Remove the two screws and the lower steering column shroud.



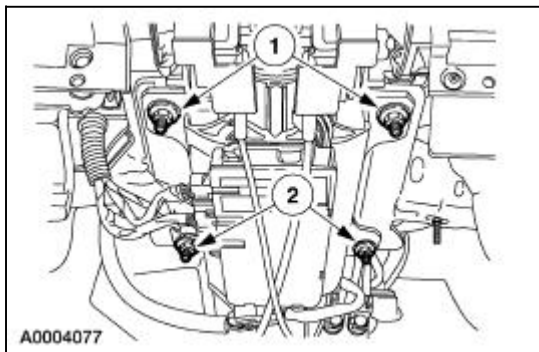
8. Pull out and remove the ignition switch finish panel.



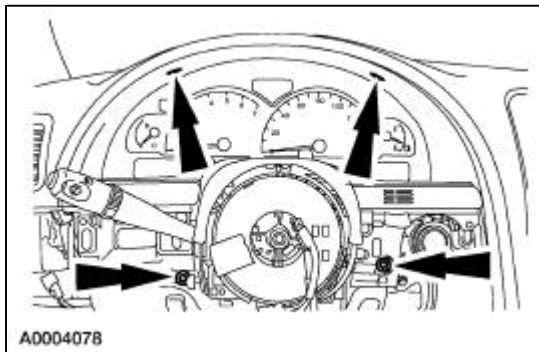
9. Remove the headlight switch finish panel by pulling out on it enough to disconnect the electrical connectors and remove it.



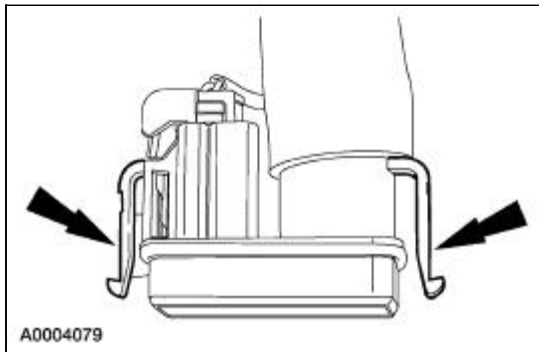
10. Lower the steering column.
 1. Remove the two steering column retaining nuts.
 2. Loosen the two steering column retaining nuts enough to pivot the steering column and remove the instrument cluster finish panel.



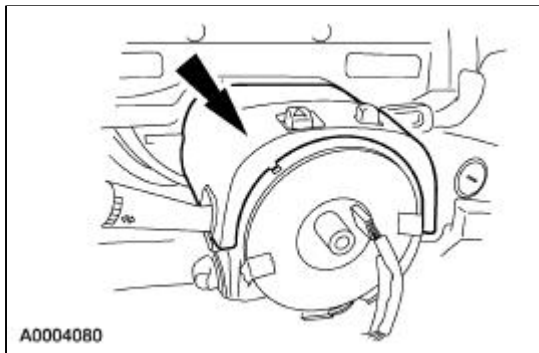
11. Remove the screws and the instrument cluster finish panel enough to access the automatic temperature control sensor assembly.



12. Separate the automatic temperature control sensor assembly from the instrument cluster finish panel by pushing in and releasing the tabs.

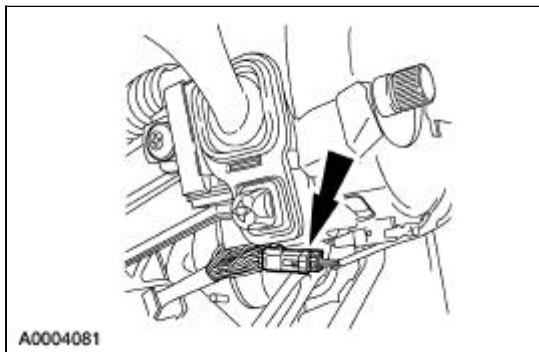


13. Remove the instrument cluster finish panel.
14. Remove the upper steering column shroud.



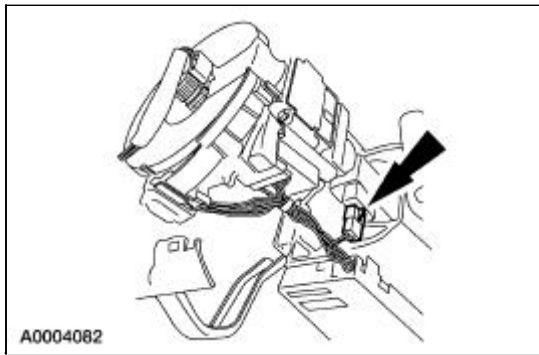
Vehicles with hands free microphone

15. Disconnect the microphone electrical connector.

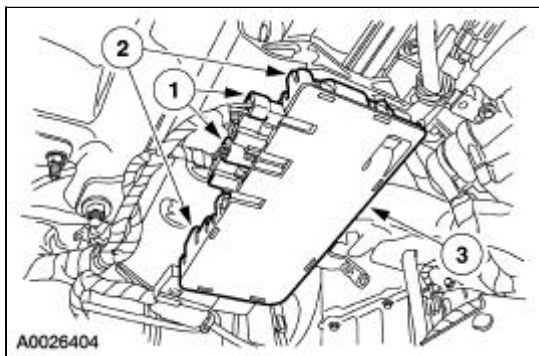


All vehicles

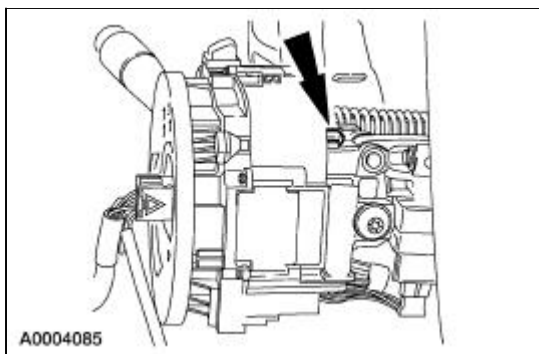
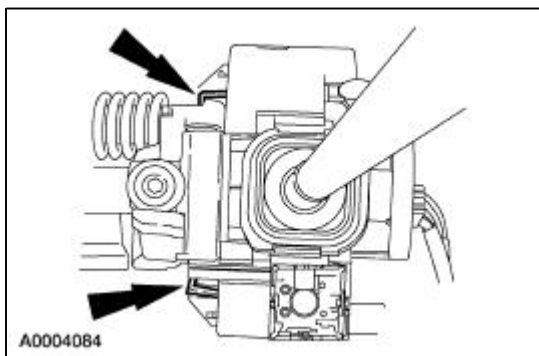
16. Disconnect the steering column position sensor electrical connector.



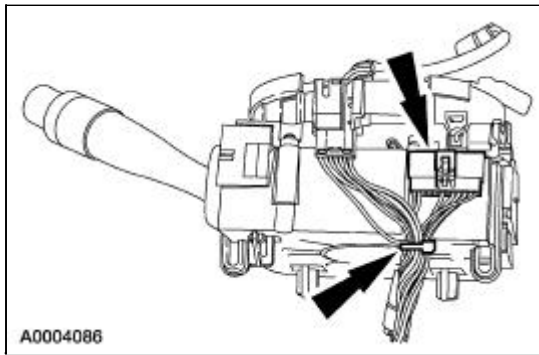
17. Separate the clockspring electrical connector assembly from the steering column.
 1. Disconnect the remaining clockspring electrical connectors.
 2. Release the four clockspring connector assembly retaining clips (two shown).
 3. Separate the clockspring electrical connector assembly from the steering column.



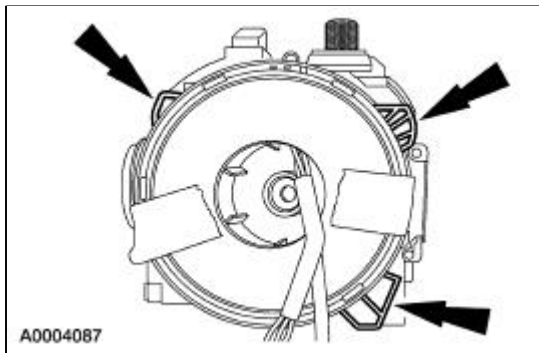
18. Releasing the three clips, remove the clockspring with the multi-function switch.



19. Cut the tie strap. Disconnect the electrical connector.



20. Releasing the tabs, separate the clockspring from the multi-function switch.



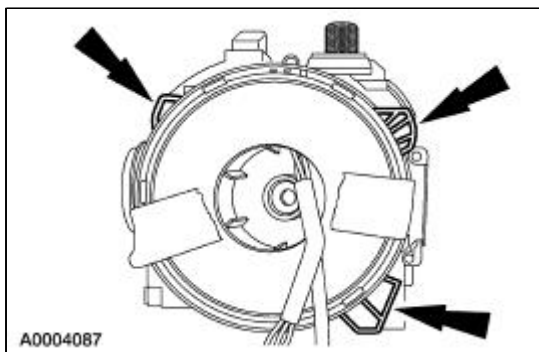
Installation



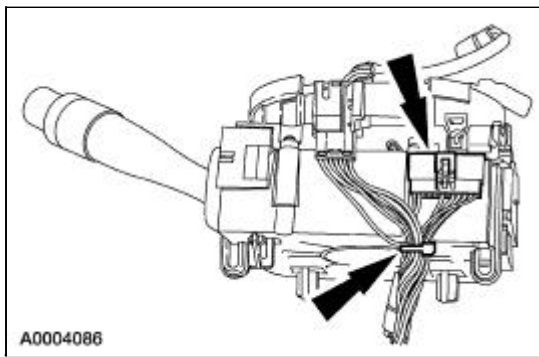
WARNING: To reduce the risk of serious personal injury, read and follow all warnings, cautions and notes at the beginning of the removal procedure.

All vehicles

1. Align the clockspring to the multi-function switch and attach the two, engaging the retaining tabs.



2. Connect the electrical connector. Install a new tie strap to secure the wire harness.

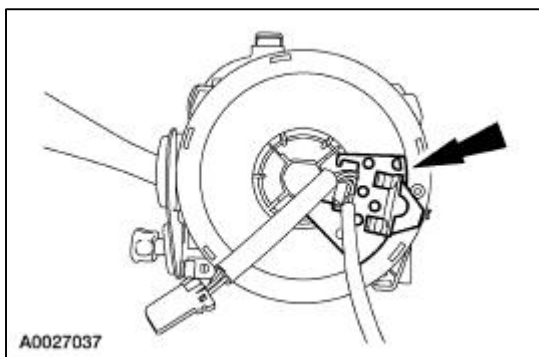


Vehicles receiving a new clockspring

3. **NOTE:** A new clockspring is supplied in a centralized position and held there with a key.

Remove the key from the clockspring, holding the rotor in its centralized position.

- Do not allow the clockspring rotor to turn from this position.



Vehicles needing clockspring recentering

4. **⚠ WARNING:** Incorrect centralization may result in premature component failure. If in doubt when centralizing the clockspring, repeat the centralizing procedure. Failure to follow this instruction may result in personal injury.

⚠ CAUTION: Make sure the road wheels are in the straight ahead position.

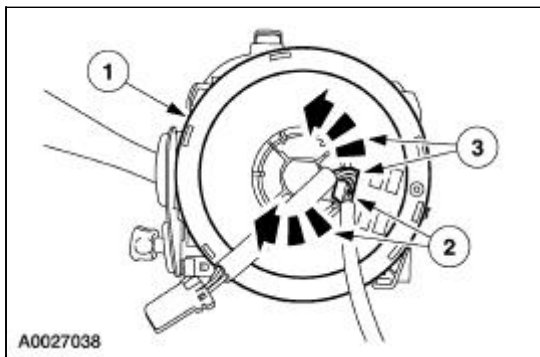
NOTE: If a clockspring has rotated out of center, follow through with this step.

Centralize the clockspring.

1. Hold the clockspring outer housing stationary.
2. **⚠ CAUTION:** Overturning will destroy the clockspring. The internal ribbon wire acts as the stop and can be broken from its internal connection.

While turning the rotor clockwise, carefully feel for the ribbon wire to run out of length, and a slight resistance is felt. Stop turning at this point.

3. Turn the rotor counterclockwise 2-1/2 turns. This is the center point of the clockspring.
 - Do not allow the rotor to turn from this position.



Vehicle repairs reusing the same clockspring

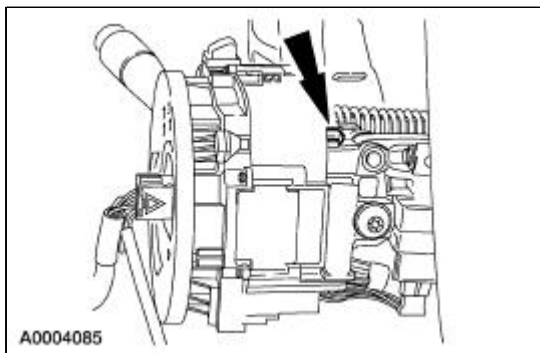
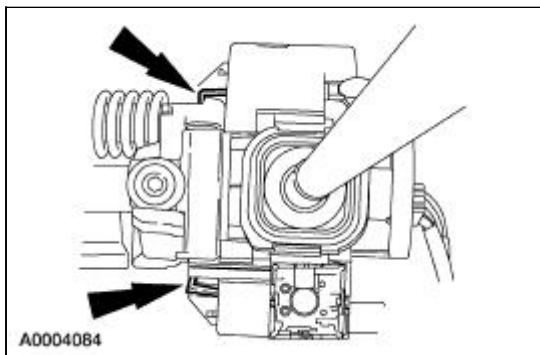
5. **NOTE:** When the tape is removed, do not allow the clockspring to turn.

Remove the tape applied during clockspring removal.

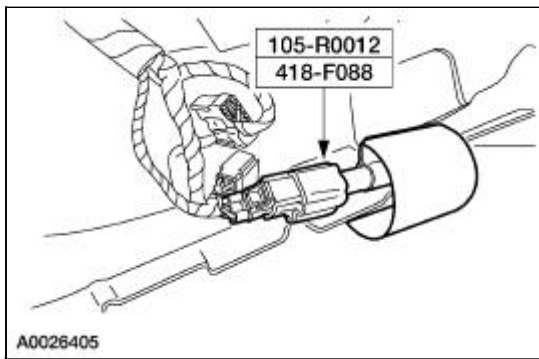
All vehicles

6. **NOTE:** Slight turning of the clockspring rotor is allowable for alignment purposes to the steering column.

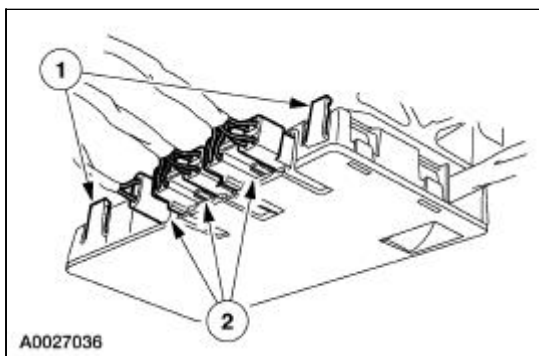
With the flats of the clockspring aligned to the flats of the steering column, slide the clockspring onto the steering column engaging the retaining tabs.



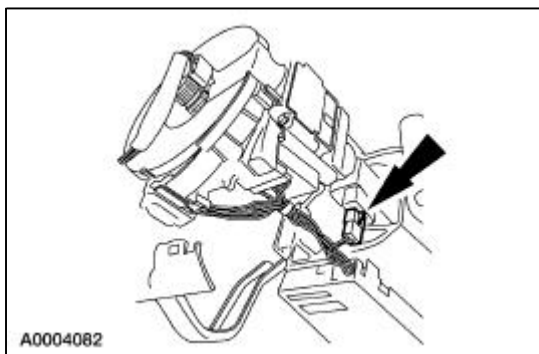
7. Remove the restraint system diagnostic tool from the vehicle harness side of the clockspring electrical connector.



8. Install and connect the clockspring electrical connector assembly.
 1. Align the clockspring electrical connector assembly to the steering column and engage the four retaining tabs (two shown).
 2. Connect the clockspring electrical connector assembly electrical connectors.

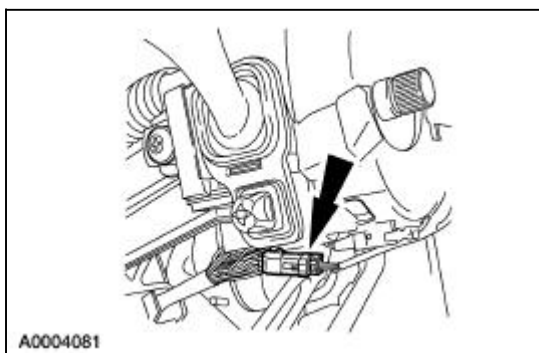


9. Connect the steering column position sensor electrical connector.



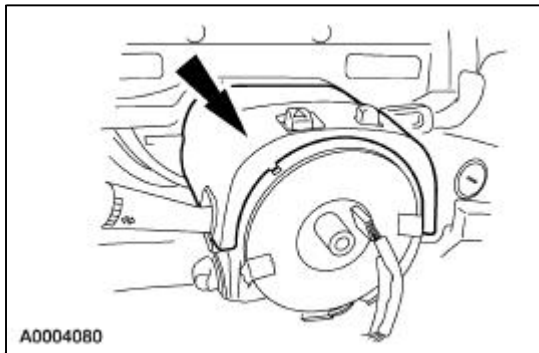
Vehicles with hands free microphone

10. Connect the microphone electrical connector.

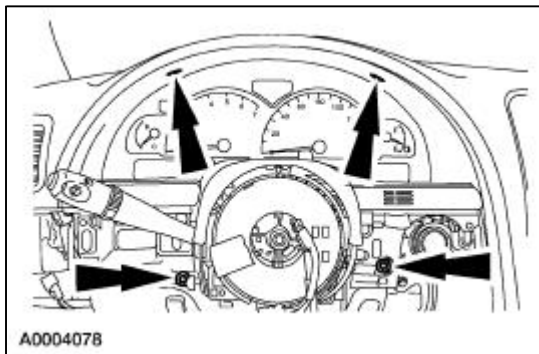


All vehicles

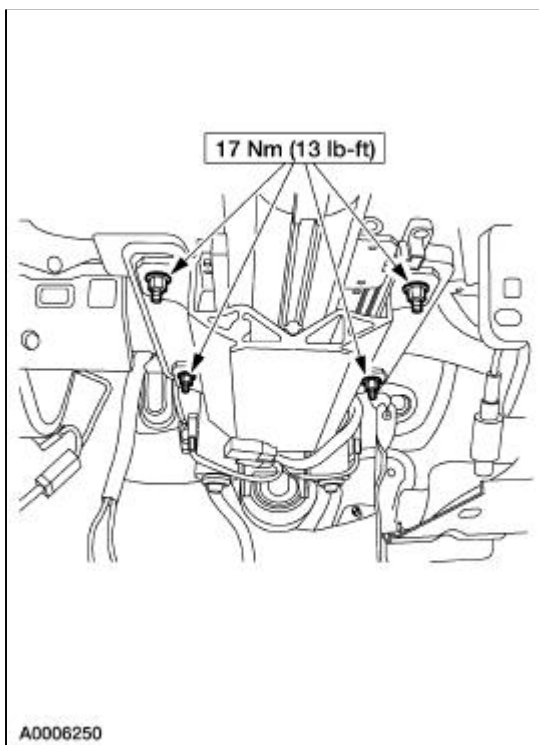
11. Position the upper steering column shroud.



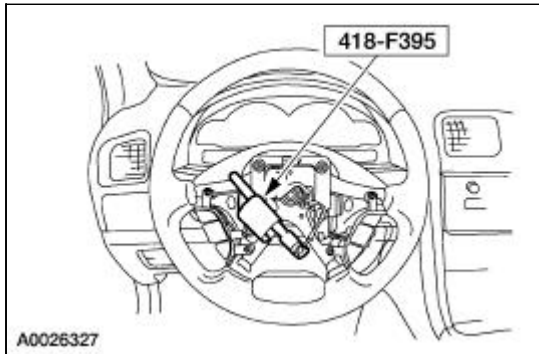
12. Align the instrument cluster finish panel to the instrument panel and install the four screws.
 - Install the automatic temperature sensor to the instrument cluster finish panel (not shown).



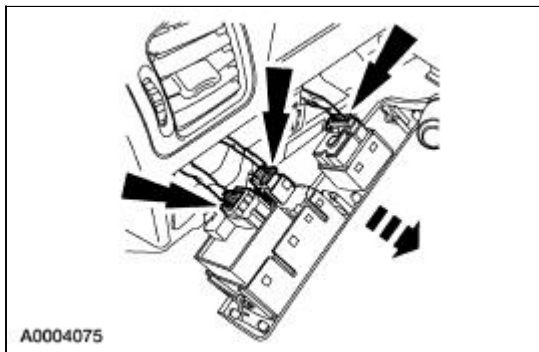
13. Install the nuts.



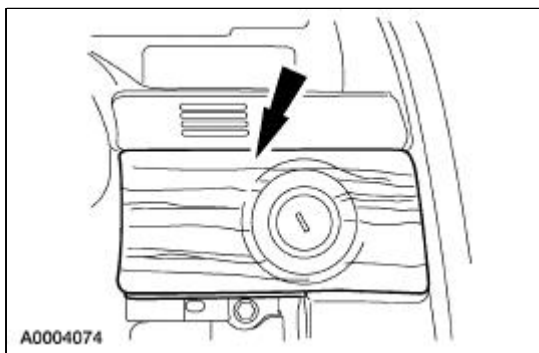
14. Install the steering wheel. Do not install the driver air bag module at this time. For additional information, refer to [Section 211-04](#).
15. Attach the restraint system diagnostic tool to the clockspring electrical connector at the top of the steering column.



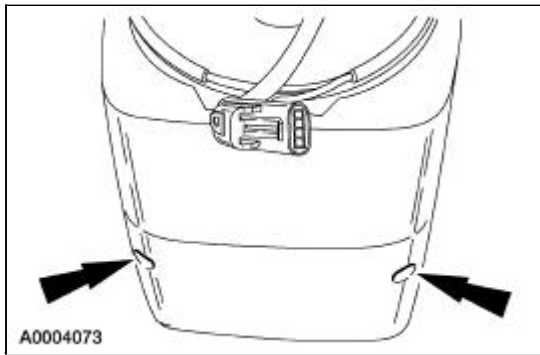
16. Connect the battery ground cable. For additional information, refer to [Section 414-01](#).
17. With the restraint system diagnostic tools installed at all deployable devices, prove out the supplemental restraint system (SRS). For additional information, refer to [Air Bag and Safety Belt Pretensioner Supplemental Restraint System \(SRS\)](#) in this section.
18. Disconnect the battery ground cable and wait at least one minute. For additional information, refer to [Section 414-01](#).
19. Connect the electrical connectors. Aligning the retaining clips, install the headlight switch panel.



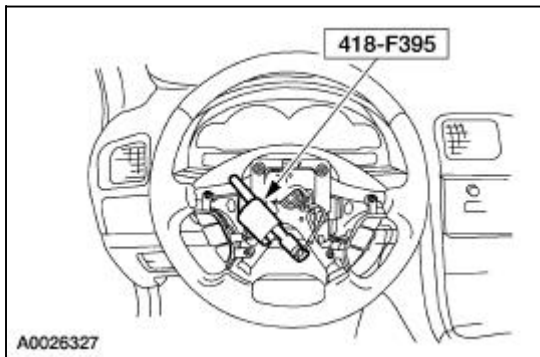
20. Align the ignition switch finish panel and push in, seating the retaining clips.



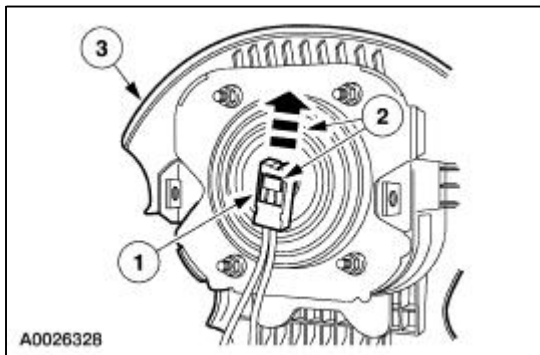
21. Position the lower steering column shroud. Install the screws.



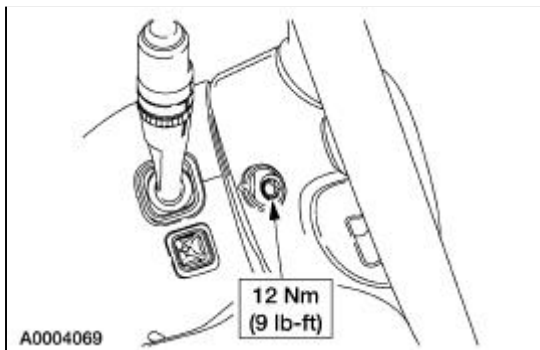
22. Remove the restraint system diagnostic tool from the clockspring electrical connector at the top of the steering column.



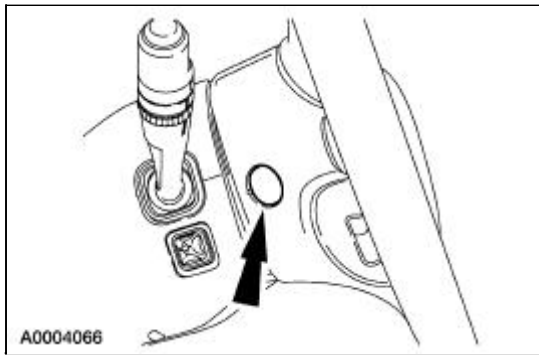
23. Connect and position the driver air bag module to the steering wheel.
1. Connect the driver air bag module electrical connector.
 2. Slide and engage the driver air bag module electrical connector locking clip.
 3. Position the driver air bag module to the steering wheel.




24. Install the two driver air bag module bolts.




25. Install the two steering wheel back cover plugs.



26. Restore the vehicle to operating condition.

1.  **WARNING: To reduce the risk of serious personal injury, read and follow all warnings, cautions, notes, and instructions in the supplemental restraint system (SRS) deactivation/reactivation procedure.**

Reactivate the supplemental restraint system (SRS). For additional information, refer to [Supplemental Restraint System \(SRS\) Deactivation and Reactivation](#) in this section.

2.  **WARNING: The restraint system diagnostic tool is for restraint system service only. Remove from the vehicle prior to road use. Failure to remove could result in injury and possible violation of vehicle safety standards.**

With all the restraint system diagnostic tools removed, prove out the supplemental restraint system (SRS). For additional information, refer to [Air Bag and Safety Belt Pretensioner Supplemental Restraint System \(SRS\)](#) in this section.

General Specifications

Item	Specification
Fluid/Lubricant Specification	
Premium Life Long Grease XG-1-K	ESA-M1C75-B

Torque Specifications

Description	Nm	lb-ft	lb-in
A/C and power steering bracket bolts	10	—	89
Balance nuts	24	18	—
Center bearing bracket bolts	40	30	—
Control arm cam nuts	175	129	—
Driveshaft yoke adjuster	90	66	—
Engine crossmember bolts	103	76	—
Engine mount nuts	63	46	—
Flex coupling bolts	85	63	—
Flex coupling nuts	85	63	—
Front brake capiler bolts	35	26	—
Front I-brace bolts (front)	55	41	—
Front I-brace bolts (rear)	30	22	—
Front I-brace bracket shoulder bolt	30	22	—
Front strut mount bolts	175	129	—
Power steering gear bolts	103	76	—
Radiator support crossmember bolts	103	76	—
Rear anti-lock brake sensor bolts	9	—	80
Rear brake hose bolts	47	35	—
Rear shock mount bolts	133	98	—
Rear subframe bolts	103	76	—
Stabilizer bar bolts	55	41	—
Stabilizer bar link nuts	55	41	—
Tie rod end nuts	80	59	—
Upper ball joint nuts	90	66	—
Water control valve bracket nuts	9	—	80

Body Misalignment Check



CAUTION: Do not attempt to correct any serious misalignment with one pulling/pushing operation. Damage to the structure could occur.

NOTE: All body alignment measurements should be made without trim and from metal to metal.

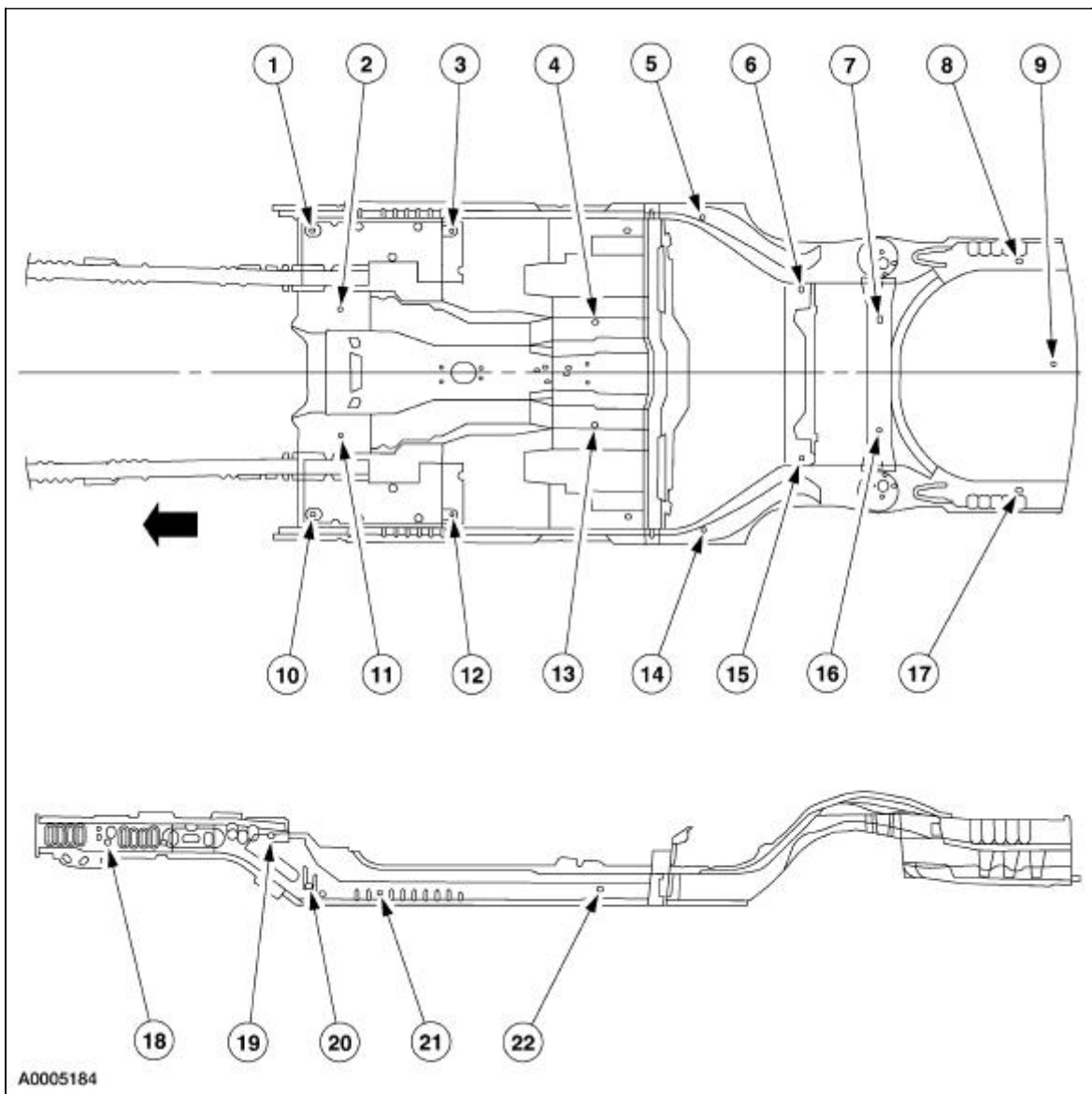
1. To check the body alignment, take two opposite diagonal measurements between the front, center or rear pillars. Take the measurements between reference points, such as crease lines or weld joints which are diagonally opposite each other on the two pillars being measured.
-

Underbody Misalignment Check

1. The dimensions of the underbody must be restored to provide the correct front and rear wheel alignment geometry.
2. All the dimensions are measured between the centers of the existing holes in the underbody unless otherwise specified.
3. Inspect all underbody structural members for cracks, twists or bends. Check all welded connections for cracks. Inspect the support brackets for looseness. Carry out any necessary repairs or install new components as necessary.
4. The X axis is referenced from the front of the vehicle. The Y axis is referenced from the center line of the vehicle.


Underbody Dimensions

Dimension	X axis mm(in)	Y axis mm(in)
1	2,044.59 mm (80.49 in)	614 mm (24.17 in)
2	2,164 mm (85.19 in)	273 mm (10.74 in)
3	2,643 mm (104.05 in)	614 mm (24.17 in)
4	3,258 mm (128.26 in)	224 mm (8.81 in)
5	3,275 mm (146.65 in)	675 mm (26.57 in)
6	4,150 mm (163.38 in)	365 mm (14.37 in)
7	4,490 mm (176.77 in)	240 mm (9.44 in)
8	5,100 mm (200.78 in)	500 mm (19.68)
9	5,250 mm (206.69 in)	50 mm (1.96)
10	2,044.59 mm (80.49 in)	614 mm (24.17 in)
11	2,164 mm (85.19 in)	273 mm (10.74 in)
12	2,643 mm (104.05 in)	614 mm (24.17 in)
13	3,258 mm (128.26 in)	224 mm (8.81 in)
14	3,725 mm (146.65 in)	675 mm (26.57 in)
15	4,150 mm (163.38 in)	365 mm (14.37 in)
16	4,490 mm (176.77 in)	240 mm (9.44 in)
17	5,100 mm (200.78 in)	500 mm (19.68 in)
18	1,118 mm (44.01 in)	—
19	1,825 mm (71.85 in)	—
20	1,990 mm (78.34 in)	—
21	2,300 mm (90.55 in)	—
22	3,258 mm (128.26 in)	—



Subframe —Rear

Special Tool(s)

 ST2455-A	Torque Wrench, Driveshaft Coupler 205-474
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Removal

NOTE: If a new rear subframe is to be installed, the differential and halfshafts must be removed prior to removal of the rear subframe. For all other procedures, the differential, halfshafts and rear subframe are to be removed as an assembly.


All

1. Drain the fuel tank. For additional information, refer to [Section 310-00](#).
2. Remove the rear wheel and tire assemblies. For additional information, refer to [Section 204-04](#).

Installing a new rear subframe only

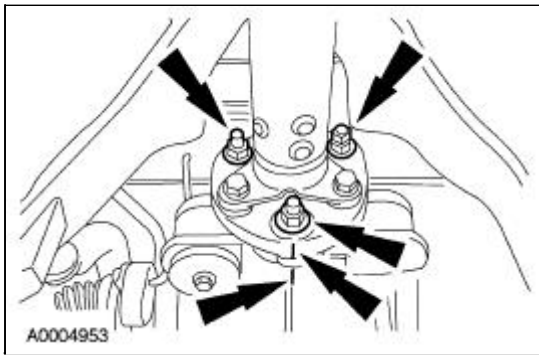
3. Remove the differential and halfshafts. Refer to [Section 205-02](#).

Removing rear subframe assembly (differential and halfshafts attached)

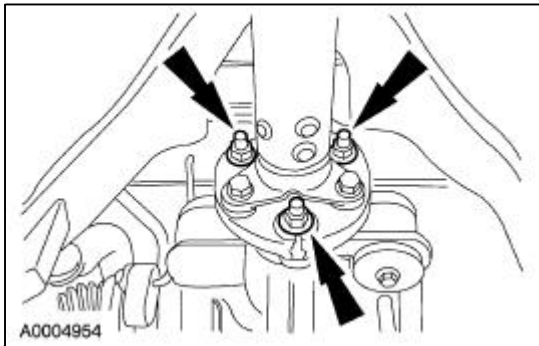
4. Remove the muffler and rear heat shield. For additional information, refer to [Section 309-00](#).
5.  **CAUTION: The differential companion flange bolts, nuts and washers must be removed as matched pairs and installed in the original location. The system balance add-on nuts must be installed in the original location.**

NOTE: Make sure to disconnect the flexible coupling only from the differential companion flange.

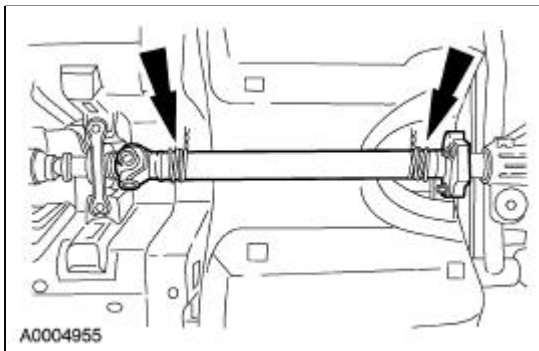
Using different color paint markers, place index matchmarks on the differential companion flange, driveshaft flexible coupling and the differential companion flange bolts, nuts, washers and system balance add-on nuts so the driveshaft and differential may be realigned during installation.



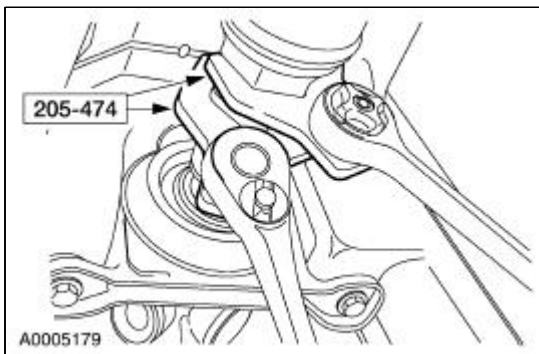
6. Remove the flex coupling bolts, nuts and washers.
 - If equipped, remove the balance nuts prior to the removal of the flex coupling nuts.



7. Support the driveshaft at the center and rear.



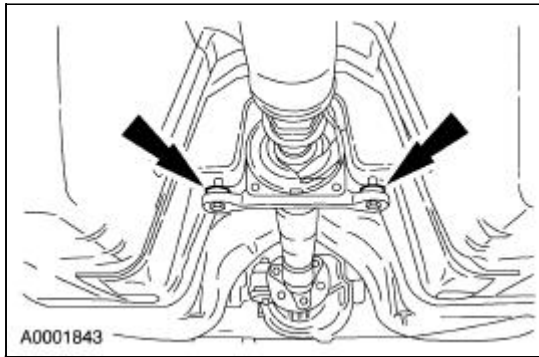
8. Using the special tools, loosen the driveshaft yoke adjuster nut.



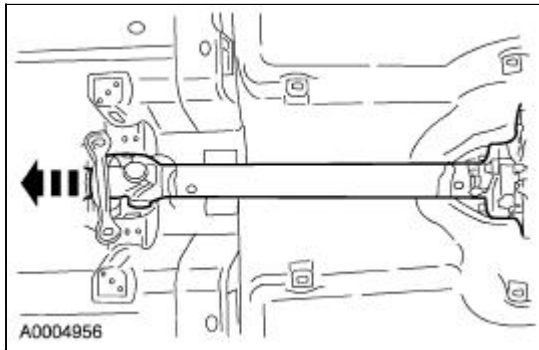
9. **NOTE:** There are shims between the center bearing mounting bracket and the body.

NOTE: The shims must be installed in the original location.

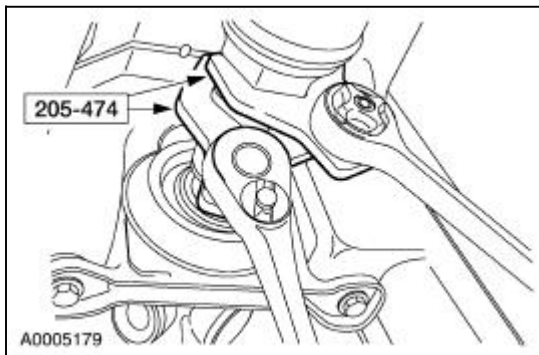
Remove the center bearing bracket bolts and the shims.



10. Slide the rear driveshaft to the full forward position.

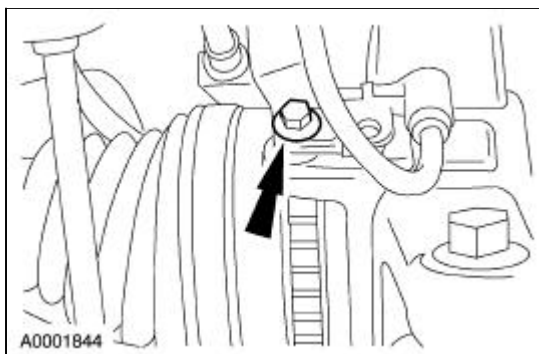


11. Using the special tools, tighten the driveshaft yoke adjuster nut.

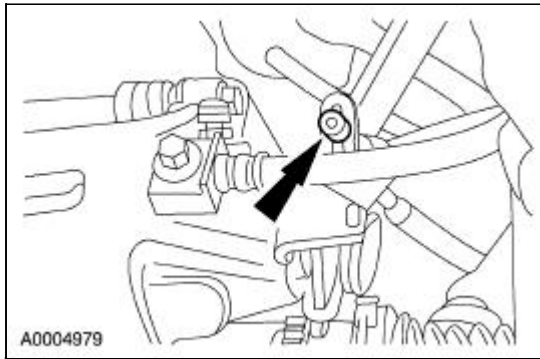


All

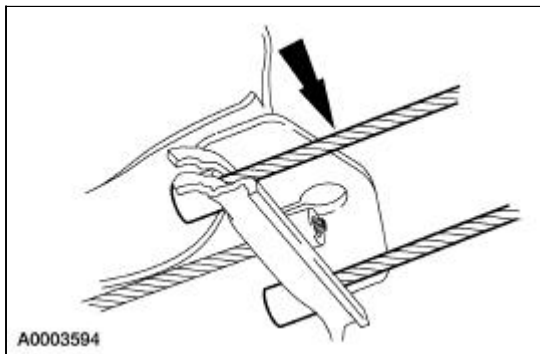
12. Remove the two bolts and position the rear anti-lock brake sensors aside.



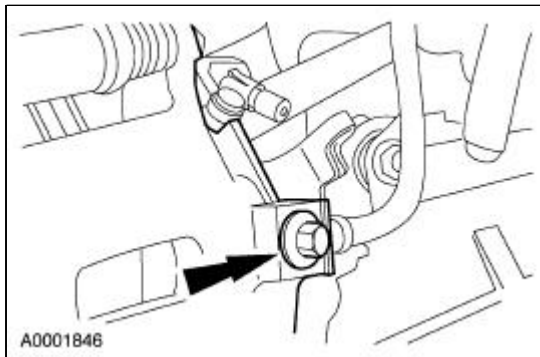
13. Disconnect the two rear parking brake cables.



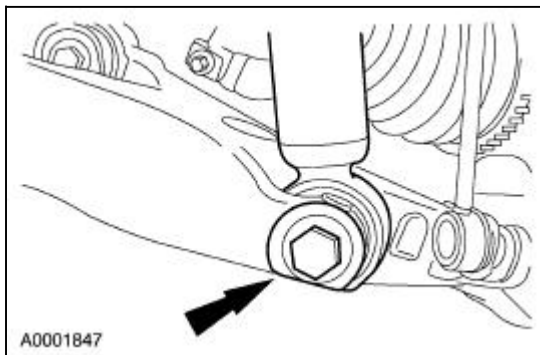
14. Disconnect the two parking brake cables from the junction bracket located to the rear of the fuel tank.



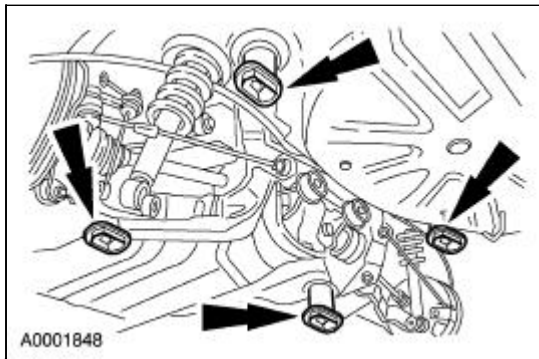
15. Remove the two bolts and position the rear brake hoses aside.




16. Remove and discard the two lower rear shock mount bolts.

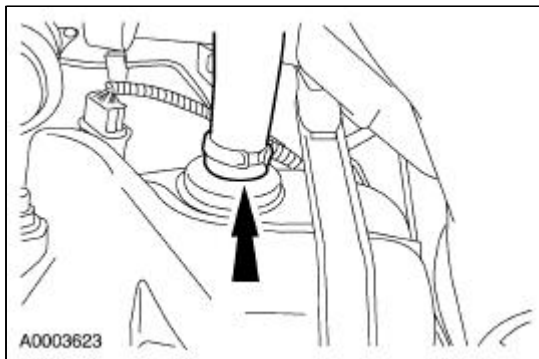


17. Paint or mark the position of the subframe to the body for assembly reference.

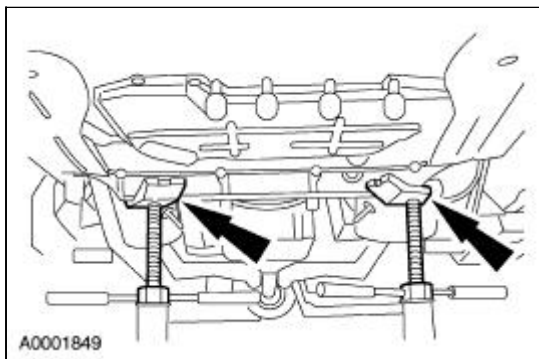


18.  **CAUTION:** Make sure to remove any residual fuel from the fuel filler hose prior to removal to avoid potential spillage.

Loosen the clamp and remove the fuel filler hose from the fuel tank.

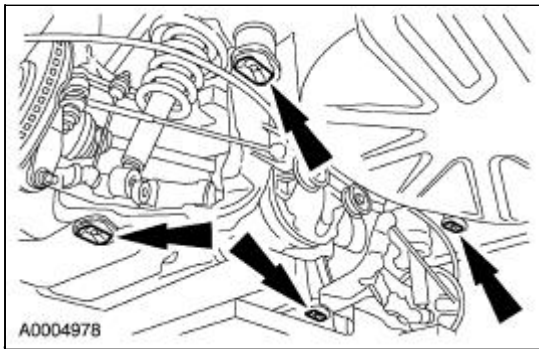


19. Support the vehicle with jack stands at the engine crossmember.



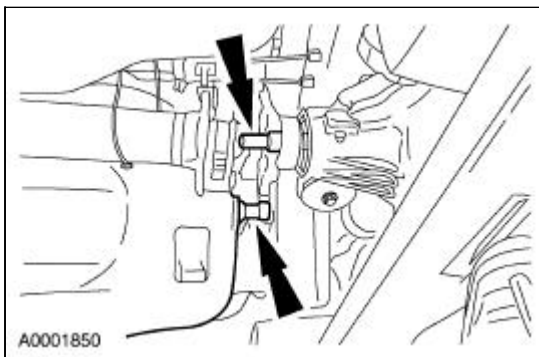
20.  **WARNING:** Make sure the rear subframe is secured to the lift table. Failure to follow these instructions may result in personal injury.

Position the lift table under the rear subframe and remove the rear subframe bolts.



21. **NOTE:** Make sure to clear the fuel filler tube and the differential pinion stem during the subframe removal.

Lower the rear subframe.

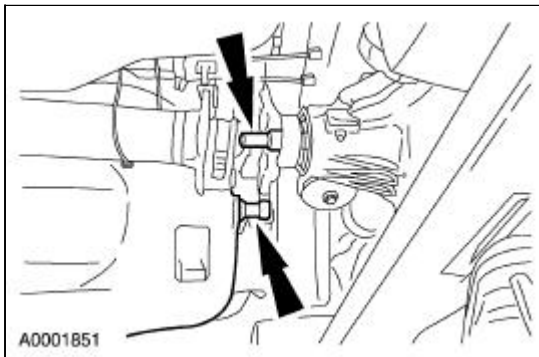


Installation

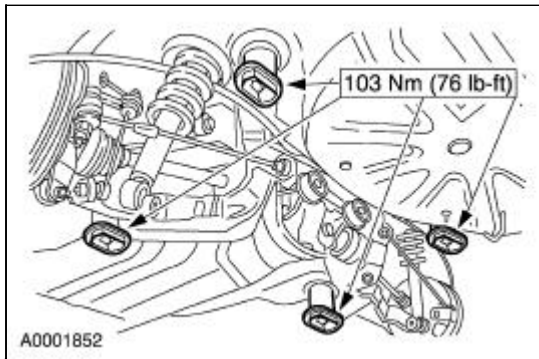
All

1. **NOTE:** Make sure the subframe clears the fuel filler tube and that the differential pinion stem aligns with the driveshaft.

Raise the subframe into contact with the body and hand-start the rear subframe bolts.



2. Align the location marks.
3. Tighten the rear subframe bolts.

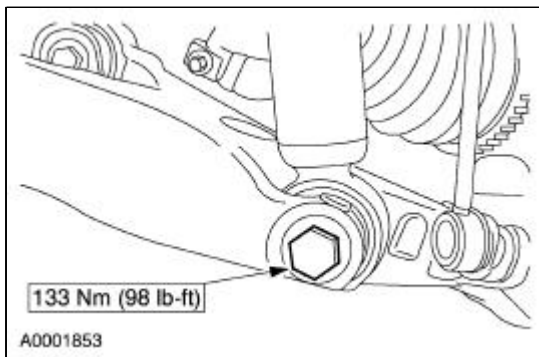


Installing a new rear subframe only

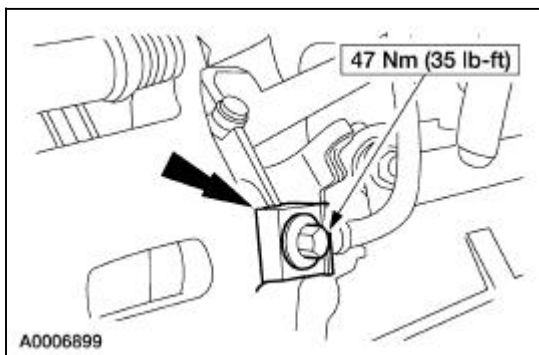
4. Install the differential and halfshafts. Refer to [Section 205-02](#).

All

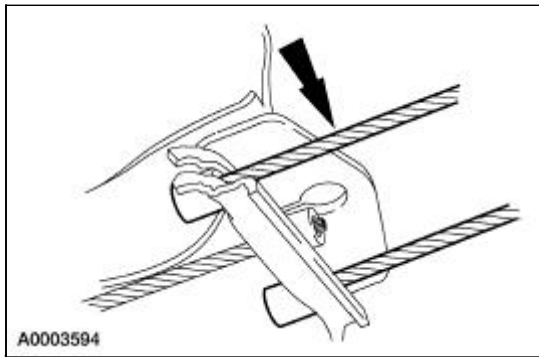
5. Install the two new lower rear shock mount bolts.



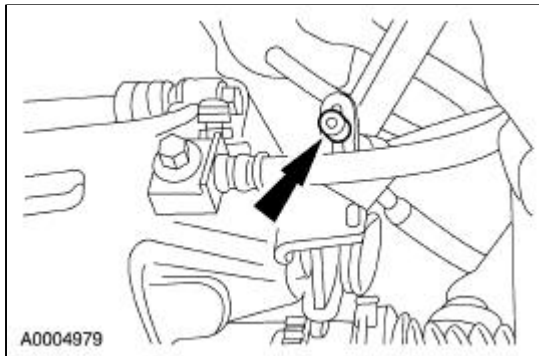
6. Position the two rear brake hoses and install the bolts.



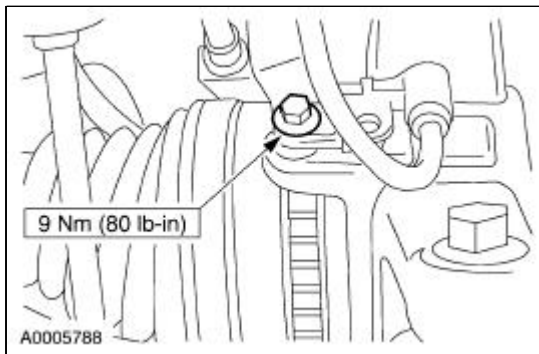
7. Connect the two parking brake cables to the junction bracket located to the rear of the fuel tank.



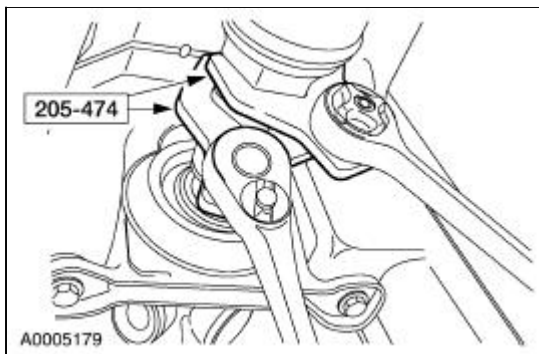
8. Connect the two rear parking brake cables.



9. Position the two rear anti-lock brake sensors and install the bolts.



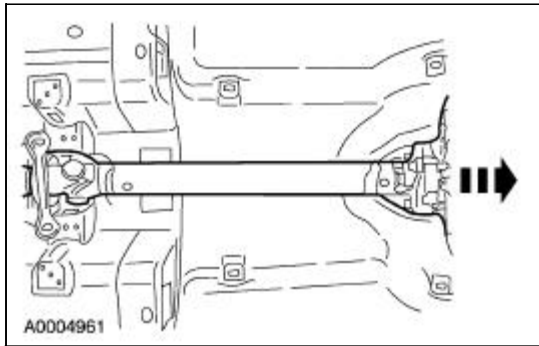
10. Using the special tools, loosen the driveshaft yoke adjuster nut.



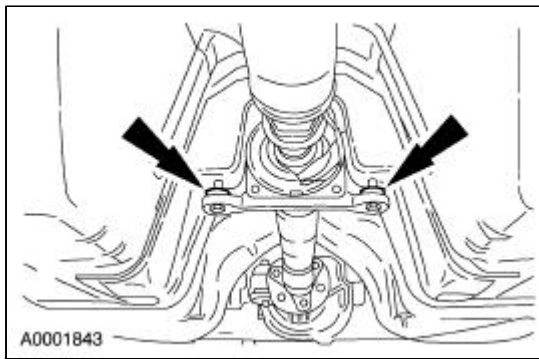
11. **NOTE:** Install one gram (0.04 ounce) of Premium Long Life Grease, XG-1-K or equivalent meeting Ford specification ESA-M1C75-B, in the alignment bushing prior to installation.

Slide the driveshaft rearward until the flexible coupling engages with the differential companion

flange.



12. **NOTE:** Make sure to install the shims between the center bearing bracket and the floor pan.
Install the shims in their original position and loosely install the center bearing bracket bolts.

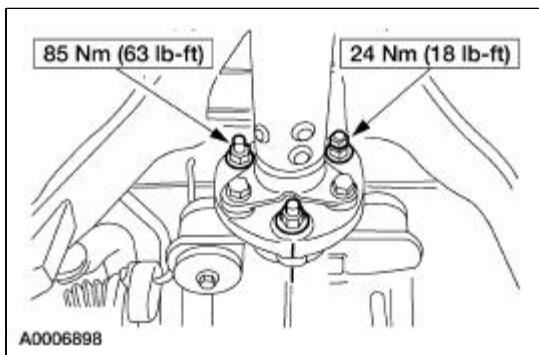


13. **NOTE:** Align the driveshaft index matchmarks.

NOTE: Make sure to match the bolts, washers, attaching nuts and balance nuts (if equipped) to their original locations.

Install the flex coupling bolts, attaching nuts and washers.

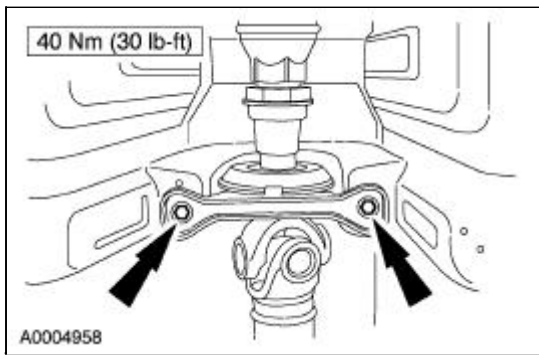
- If equipped, install the balance nut(s).



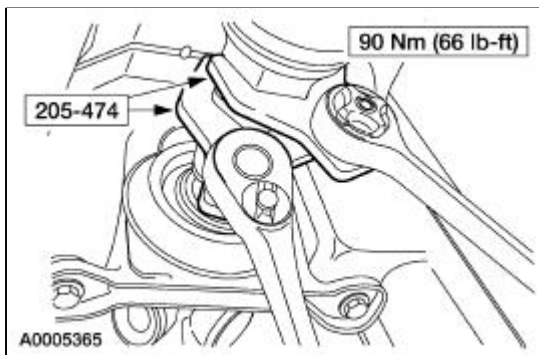
14. **NOTE:** Tighten the bolts using hand tools only.

NOTE: Avoid twisting the center bearing bracket when tightening.

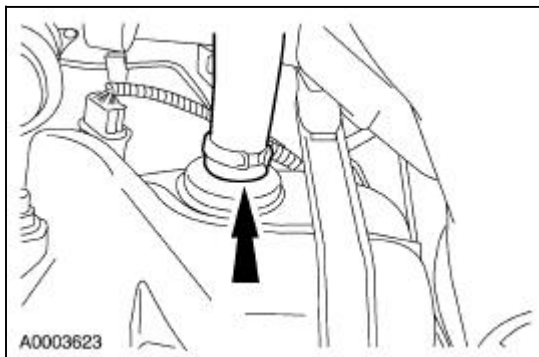
Tighten the center bearing bracket bolts evenly.



- Using the special tools, tighten the driveshaft yoke adjuster nut.



- Install the rear heat shield and muffler exhaust system. For additional information, refer to [Section 309-00](#).
- Install the fuel filler hose and tighten the clamp.



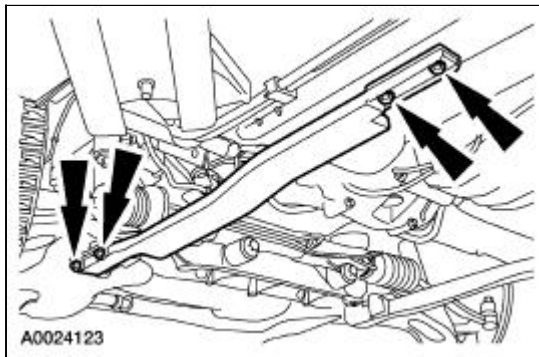
- Install the rear wheel and tire assemblies. For additional information, refer to [Section 204-04](#).
 - Bleed the brake system. For additional information, refer to [Section 206-00](#).
 - Refill the fuel tank.
 - Check and adjust rear alignment. For additional information, refer to [Section 204-00](#).
 - Test drive the vehicle. If any vibration is present, refer to [Section 100-04](#).
-

Crossmember —Front

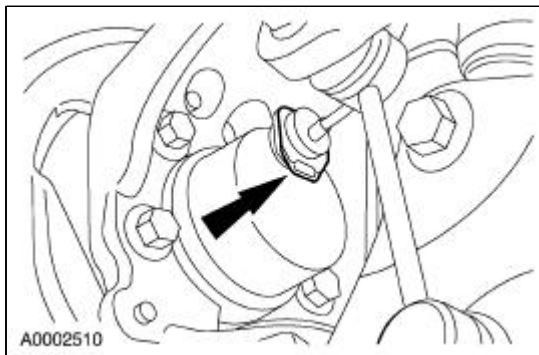
Removal

All Vehicles

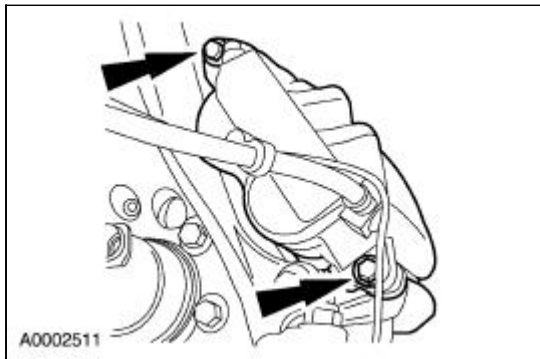
1. Remove the upper radiator sight shield.
2. Support the radiator to the upper radiator support.
3. Install the three-bar engine support.
4. Remove the front wheel and tire assemblies. For additional information, refer to [Section 204-04](#).
5. If equipped, remove the eight bolts and the two I-braces.
 - Discard the bolts.



6. Remove the two clips and position the front anti-lock brake sensors aside.

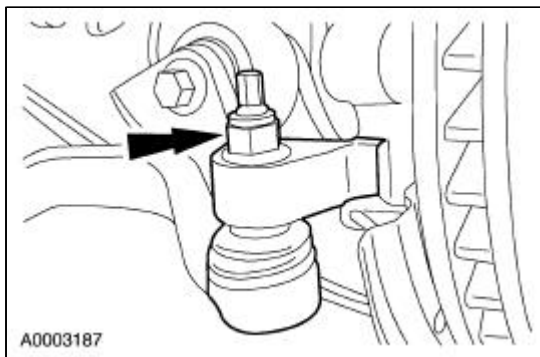


7. Remove the four bolts, position and support the front brake calipers aside.



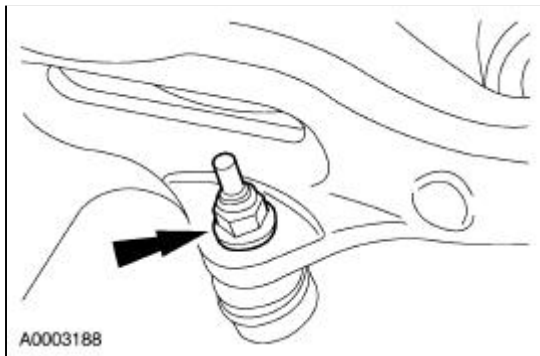
8.  **CAUTION: Hold the external hex of the tie rods when removing the nuts.**

Remove and discard the two nuts and separate the tie rod ends from the front spindles.



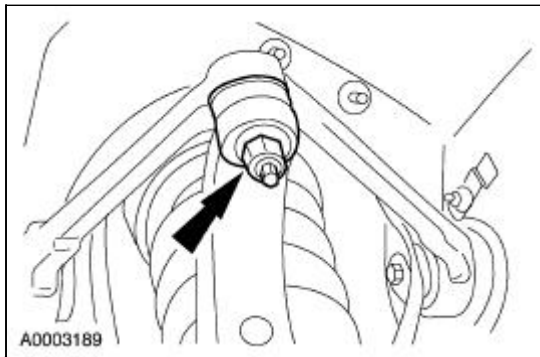
9.  **CAUTION: Hold the external hex of the stabilizer bar links when removing the nuts.**

Remove and discard the two nuts and separate the stabilizer bar links from the lower control arm and position aside.

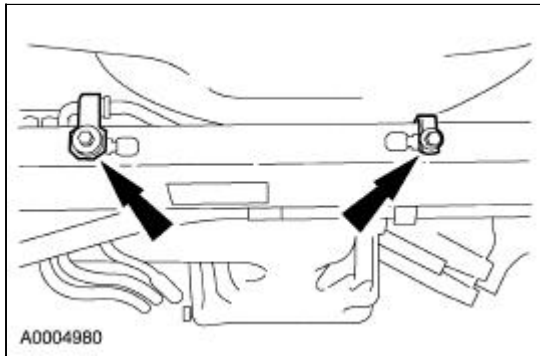


10.  **CAUTION: Hold the external hex of the ball joints when removing the nuts.**

Remove and discard the nuts and separate the upper ball joint from the spindle.

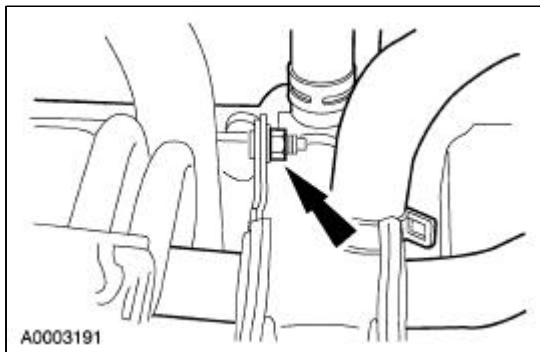


11. Remove the underbody splash shields.
12. Remove the A/C and power steering line bracket bolts.



13. **NOTE:** The nut is most easily accessed from above the front of the radiator support crossmember.

Loosen the nut two turns, remove the bolt and position the water control valve aside.

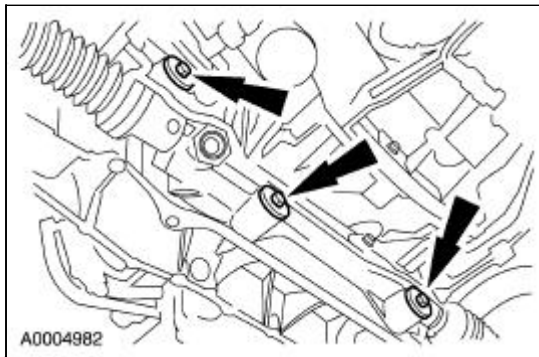


3.9L Only

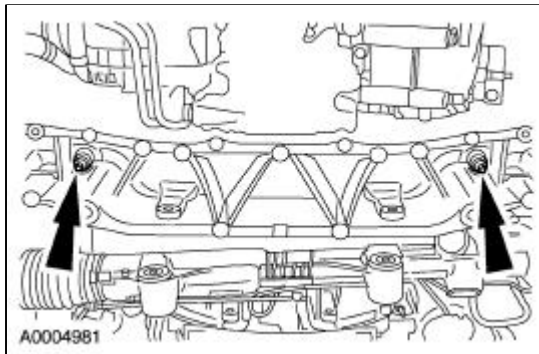
14. Remove the block heater harness retainer.

All Vehicles

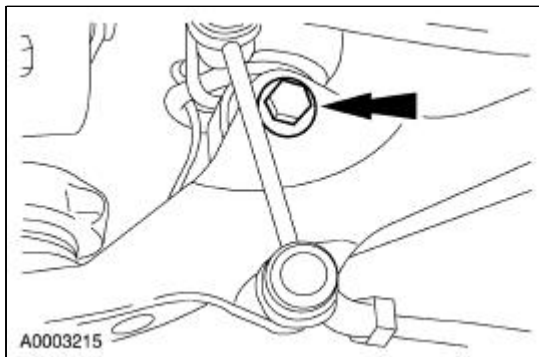
15. Remove the bolts, position and support the power steering gear aside.
 - Discard the nuts.



16. Remove the engine mount nuts.



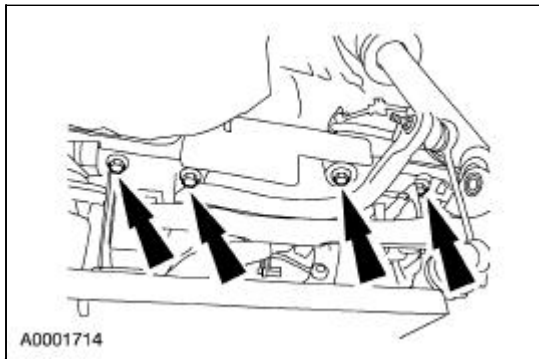
17. Remove and discard the lower front strut mount bolts.



18.  **WARNING:** Make sure the front crossmembers are secured to the lift table. Failure to follow these instructions may result in personal injury.

NOTE: Mark the right and left crossmember locations to the body.

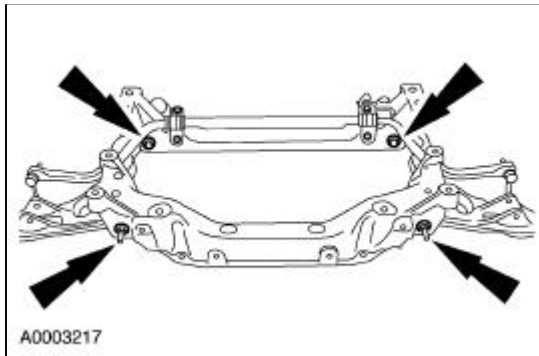
Position the lifting table under the two crossmembers and remove the four engine crossmember bolts and the four radiator support crossmember bolts.



19. Lower the radiator support and engine crossmembers as an assembly.

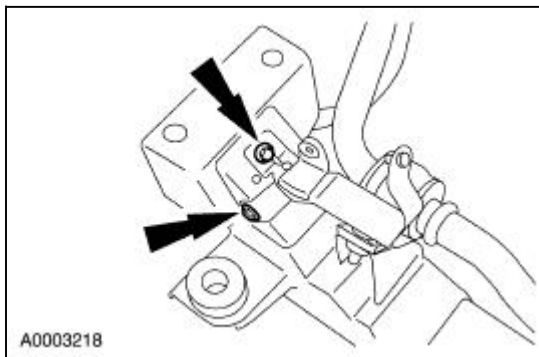
20. **NOTE:** Discard the control arm nuts and bolts.

Remove the control arm nuts and bolts.

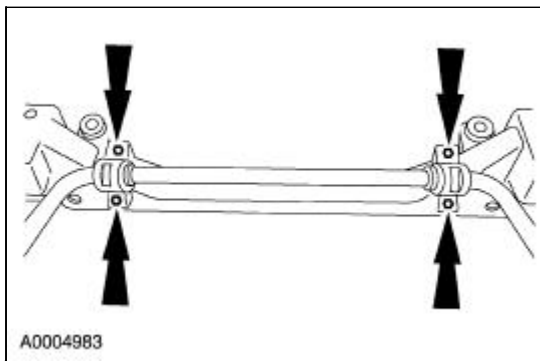


Radiator Support Crossmember Removal

21. Remove the bolts and the water control valve bracket.



22. Remove and discard the bolts and position the stabilizer bar aside.

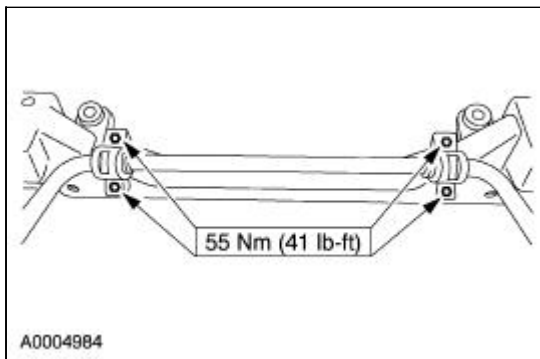


Installation

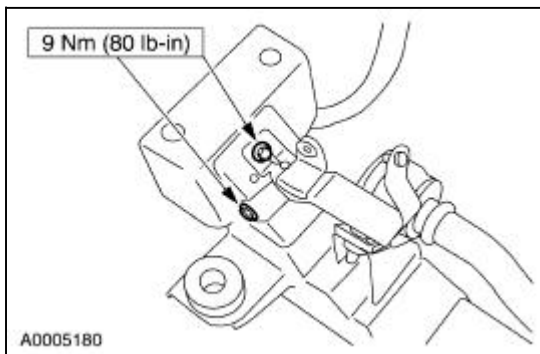
Radiator Support Crossmember

1. **NOTE:** If equipped, the I-brace guide bolt will have 1.5mm (0.059in) of clearance between the I-brace bracket and the bolt. This is normal and the bolt should not be tightened any further.

Position the stabilizer bar and install the new bolts.

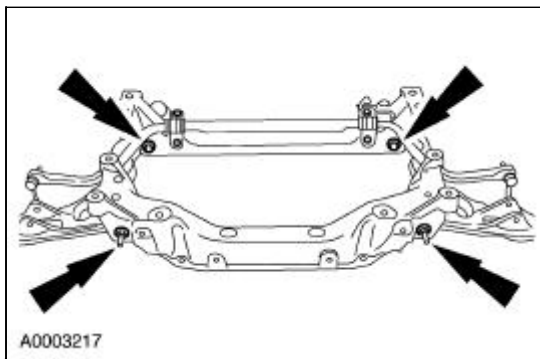


2. Position the water control valve bracket and install the bolts.



All Vehicles

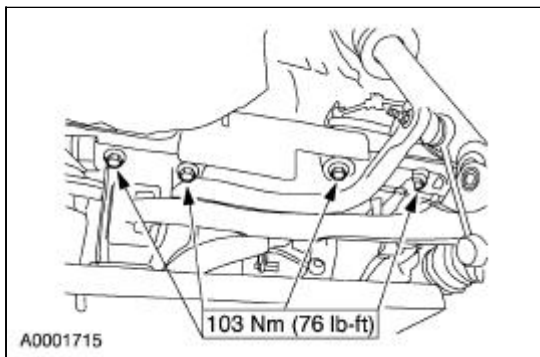
3. Loosely install the new control arm cam bolts and nuts.



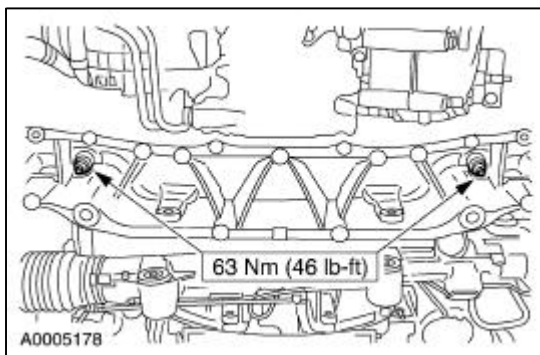
4. Position the radiator support and engine crossmembers as an assembly.
5. **NOTE:** Align the crossmember markings.

NOTE: Make sure the weight of the engine is not contacting the crossmember and make sure the crossmember assembly is in contact with the body before tightening the bolts.

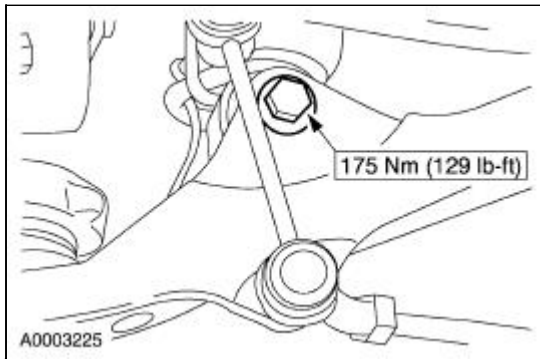
Install the four engine crossmember bolts and the four radiator support crossmember bolts.



6. Install the engine mount nuts.

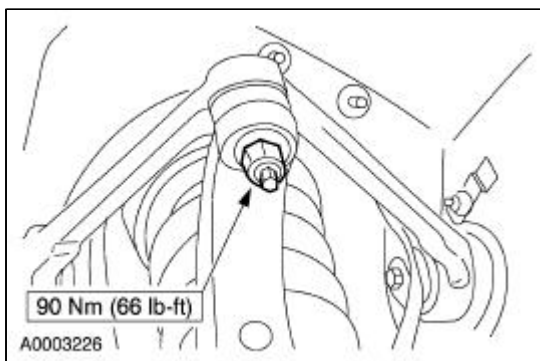



7. Install the new lower front strut mount bolts.



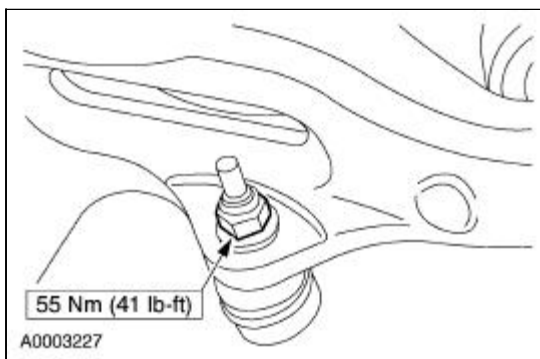
8.  **CAUTION: Hold the external hex of the ball joints when installing the nuts.**

Position the upper ball joints into the spindles and install the new nuts.

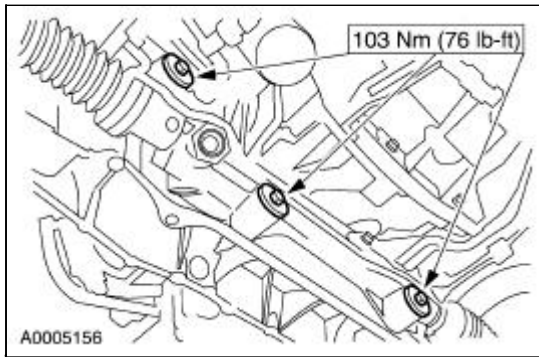


9.  **CAUTION: Hold the external hex of the stabilizer bar links when installing the nuts.**

Position the two stabilizer bar links into the lower control arm and install the new nuts.

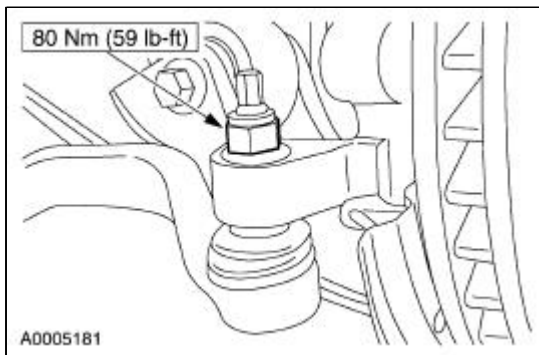


10. Position the power steering gear and install the bolts.

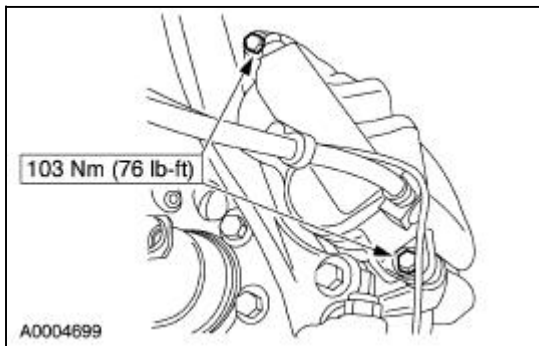


11.  **CAUTION: Hold the external hex of the tie rods when installing the nuts.**

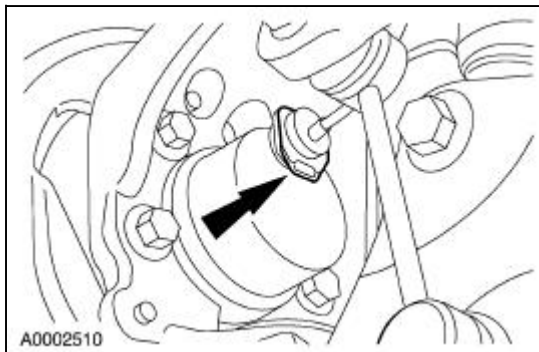
Position the two tie rod ends into the spindles and install the new nuts.



12. Position the two front brake calipers and install the bolts.



13. Position the two front anti-lock brake sensors and install the clips.

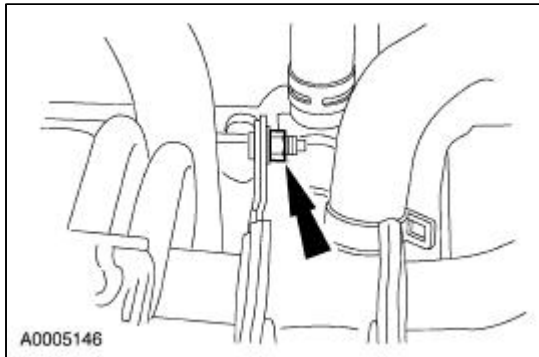


3.9L Only

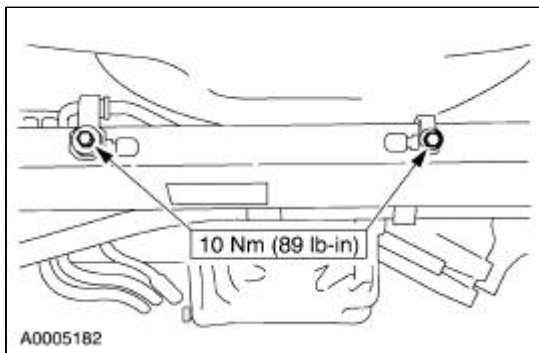
14. Install the block heater harness.

All Vehicles

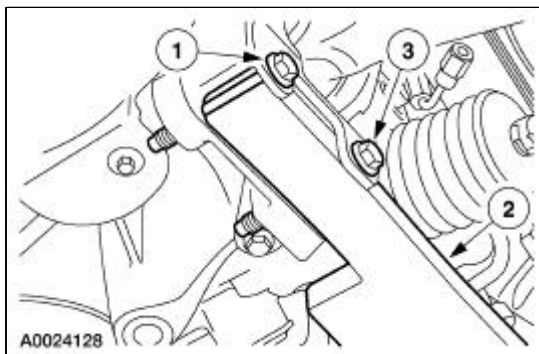
15. Position the water control valve and tighten the nut.



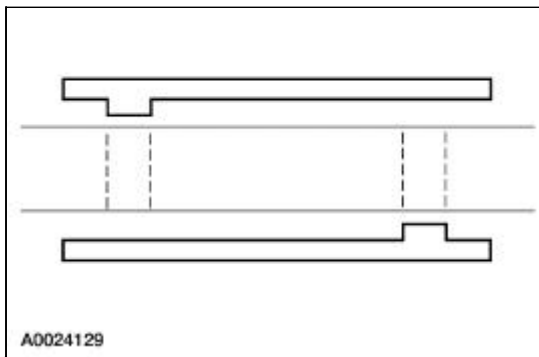
16. Position the A/C and power steering brackets and install the bolts.



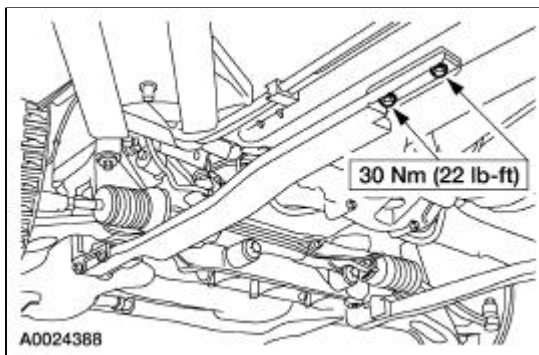
17. If equipped, position the two I-braces and loosely install the bolts.
 1. Loosely install the front bolts.
 2. Position the I-braces.
 3. Loosely install the rear bolts.



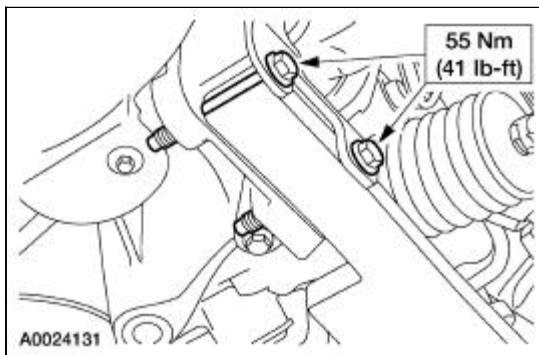
18. If equipped, make sure that the I-brace insulators are correctly positioned.



19. If equipped, install the I-brace bolts.



20. If equipped, tighten the I-brace bolts.

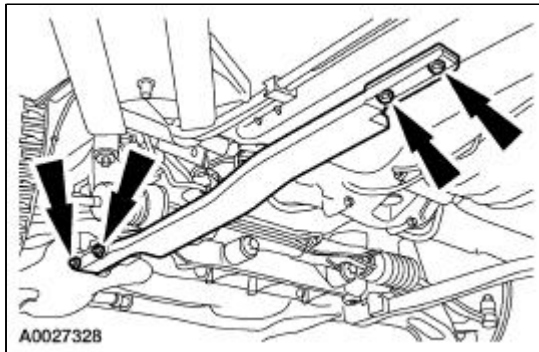


21. Install the underbody splash shields.
 22. Install the front wheel and tire assemblies. For additional information, refer to [Section 204-04](#).
 23. Remove the three-bar engine support.
 24. Remove the support from the radiator.
 25. Install the upper radiator sight shield.
 26. Align the front suspension. For additional information, refer to [Section 204-00](#).
-

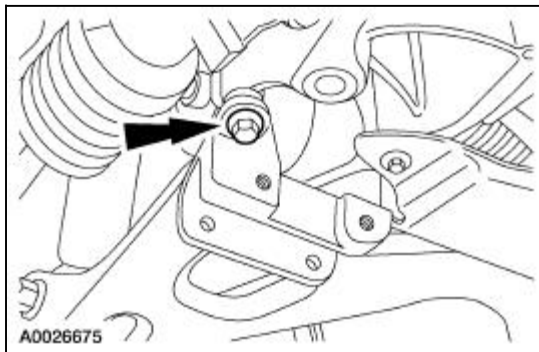
Crossmember —I-Brace Bracket

Removal

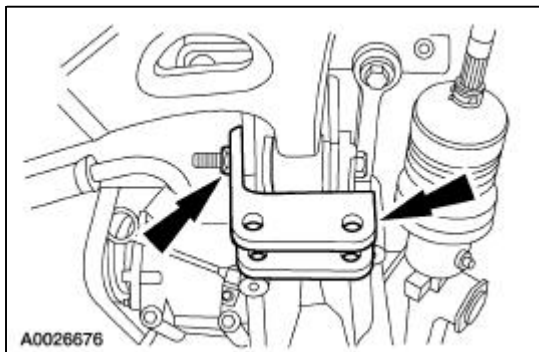
1. Raise and support the vehicle. For additional information, refer to [Section 100-02](#).
2. Remove the four bolts and the front I-brace. Discard the bolts.



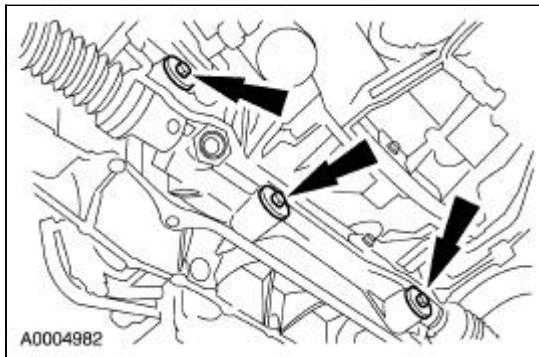
3. Remove and discard the front I-brace bracket shoulder bolt.



4. Remove the rear lower control arm nut and the front I-brace bracket. Discard the nut.



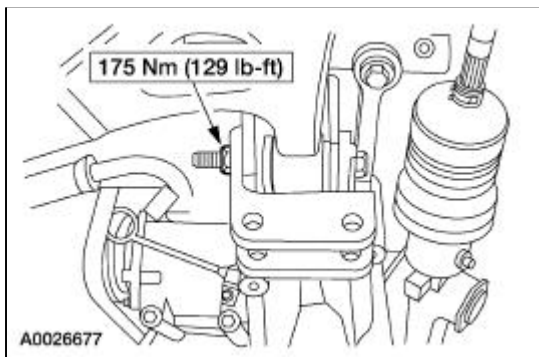
5. Remove the bolts and position the power steering gear aside.
 - Discard the nuts.



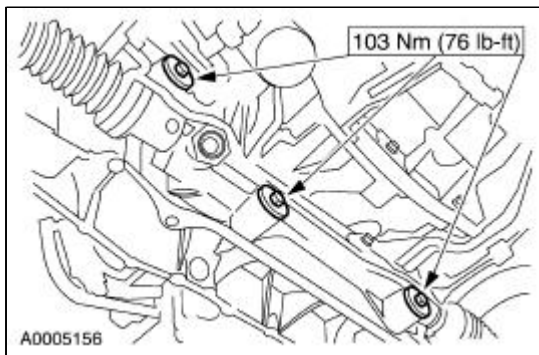
6. Remove and discard the rear lower control arm bolt.

Installation

1. Position the front I-brace bracket and install the rear lower control arm cam bolt and nut.

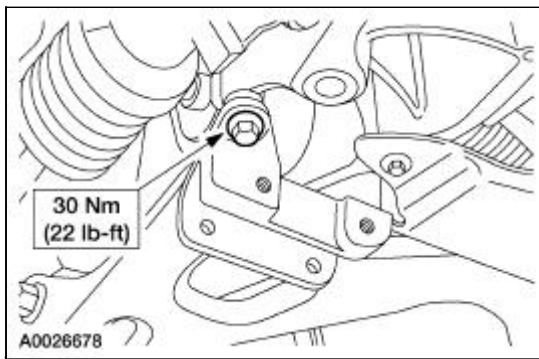


2. Position the power steering gear and install the bolts.

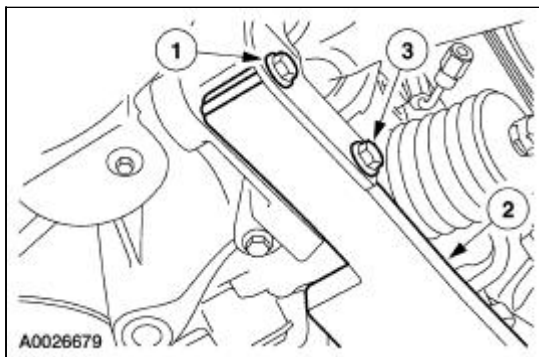


3. **NOTE:** The front I-brace shoulder bolt will have 1.5mm (0.059in) if clearance between the front I-brace bracket and the bolt. This is normal and the bolt should not be tightened any further.

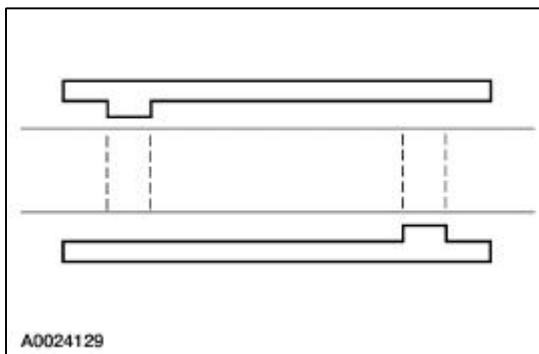
Install the front I-brace bracket shoulder bolt.



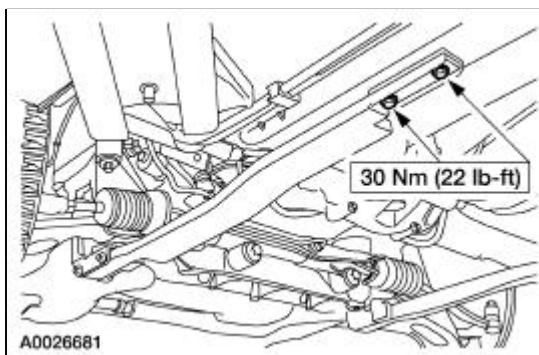
4. Position the front I-brace and loosely install the bolts.
 1. Loosely install the front bolt.
 2. Position the front I-brace.
 3. Loosely install the rear bolt.



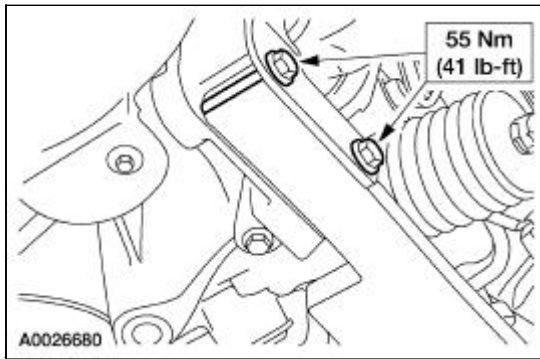
5. Make sure that the front I-brace insulators are correctly positioned.



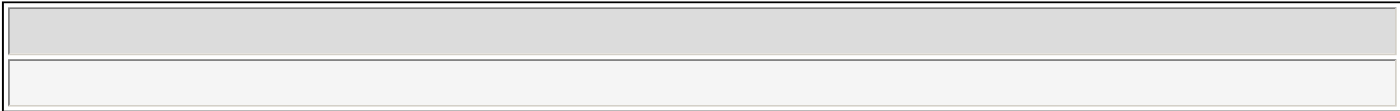
6. Install the front I-brace bolts.



7. Tighten the front I-brace bolts.



8. Align the front suspension. For additional information, refer to [Section 204-00](#).
-



GENERAL INFORMATION

INTRODUCTION

In the past, when cars were simpler, diagrams were simpler. All components were connected by wires, and diagrams seldom exceeded 4 pages in length. Today, some wiring diagrams require more than 16 pages. It would be impractical to expect a service technician to trace a wire from page 1 across every page to page 16.

Components shown with a dashed line instead of a solid line indicate not all circuits are shown in this particular diagram (circuits shown in system diagrams are typically applicable to that system only). The remaining circuits connected to that component will be shown in the appropriate system that they apply to.

Today, the wiring diagram necessary to support a given repair procedure is included within that article or a link is provided to the appropriate SYSTEM WIRING DIAGRAM article. For example, the wiring diagram for a Ford EEC-IV system may be included in ENGINE PERFORMANCE and WIRING DIAGRAMS articles for Ford Motor Co. The wiring diagram for a cruise control system may be included in ACCESSORIES & EQUIPMENT section for the specific vehicle manufacturer, and the wiring diagram for an anti-lock brake system may be included in BRAKES and WIRING DIAGRAMS for the specific manufacturer.

WIRING DIAGRAMS contains all wiring diagrams not included in STARTING & CHARGING SYSTEMS and ACCESSORIES & EQUIPMENT. This includes: Data Link Connectors, Ground Distribution, Power Distribution, Engine Performance, Electric Cooling Fans, Anti-Lock Brakes, Electronic Suspension and Electronic Steering wiring diagrams. The Data Link Connectors wiring diagrams show the circuits by which the various on-board computers exchange information, and the diagnostic connectors used for diagnosis and their location. The Ground Distribution wiring diagrams show all vehicle ground points, their location, and the components common to those ground points. The Power Distribution wiring diagrams show the power feed circuits and the components common to those power feeds.

Wiring diagrams used to support the information in ACCESSORIES & EQUIPMENT are drawn in a "top-down" format. The diagrams are drawn with the power source at the top of the diagram and the ground point at the bottom of the diagram. Component locations are identified on the wiring diagrams. Any wires that do not connect directly to a component are identified on the diagram to indicate where they go.

WIRING DIAGRAM COLOR ABBREVIATIONS

COLOR ABBREVIATIONS

Color

Normal

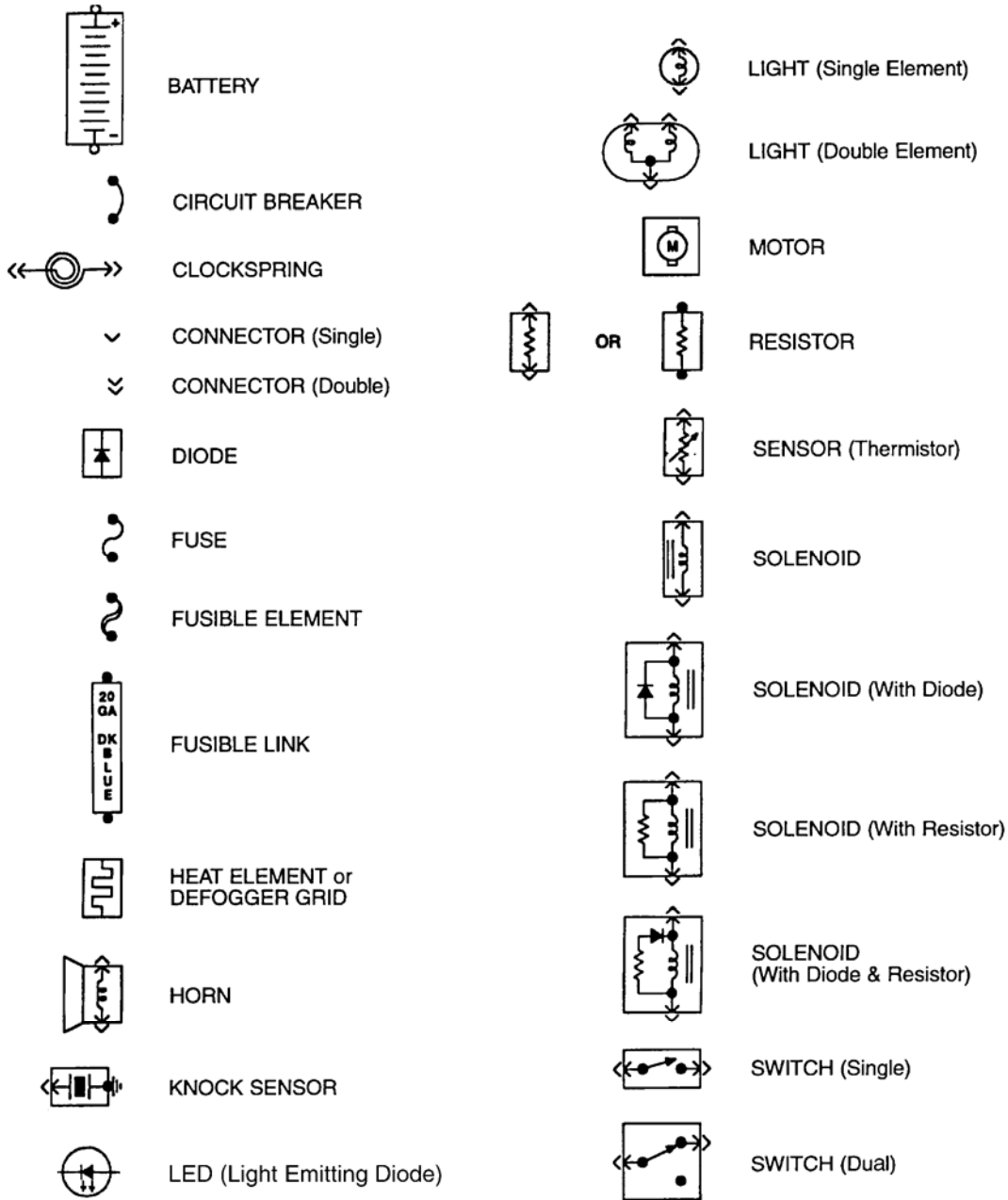
Optional

--	--	--

Black	BLK	BK
Blue	BLU	BU
Brown	BRN	BN
Clear	CLR	CR
Dark Blue	DK BLU	DK BU
Dark Green	DK GRN	DK GN
Green	GRN	GN
Gray	GRY	GY
Light Blue	LT BLU	LT BU
Light Green	LT GRN	LT GN
Orange	ORG	OG
Pink	PNK	PK
Purple	PPL	PL
Red	RED	RD
Tan	TAN	TN
Violet	VIO	VI
White	WHT	WT
Yellow	YEL	YL

WIRING DIAGRAM SYMBOLS

NOTE: Standard wiring symbols are used on all wiring diagrams. The list below will help clarify any symbols that are not easily understood at a glance. Most components are labeled "Motor", "Switch" or "Relay" in addition to being drawn with the standard symbol.



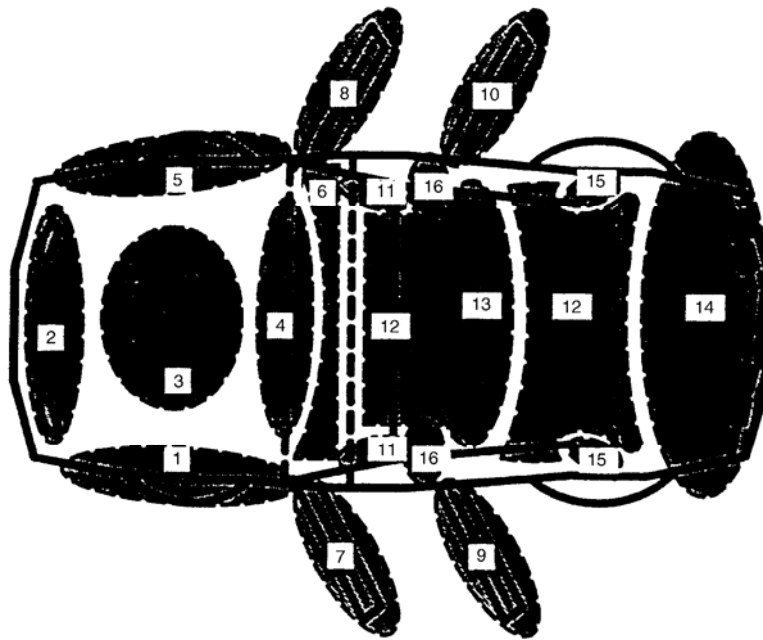
G50E03637

Fig. 1: Identifying Standard Wiring Diagram Symbols

WIRING DIAGRAM GROUND NUMBER LOCATIONS

NOTE: The following illustration depicts standardized ground numbers and locations to be used in conjunction with wiring diagrams applying to 2001 and prior model years only. See Fig. 2 . Wiring diagrams applying to newer model years depict manufacturer-specified ground numbers and locations. Do not utilize the illustration with 2002 and newer

model year wiring diagrams.



- | | | |
|---|---|--|
| <p>1) Left Fender
 G100 Front Of Fender
 G102 On Shock Tower
 G104 Rear Of Fender</p> <p>2) Front of Vehicle
 G106 Behind Left Headlight
 G107 Behind Right Headlight
 G108 Left Radiator Support
 G109 Right Radiator Support</p> <p>3) Engine
 G110 Left Front Of Engine
 G111 Left Front Behind Battery
 G112 Left Side Of Engine
 G114 Left Rear Of Engine
 G115 Rear Of Engine
 G117 Right Rear Of Engine
 G119 Right Front Of Engine
 G120 Right Side Of Engine
 G125 Front Of Engine
 G127 Left Underside Of Hood
 G128 Right Underside Of Hood
 G129 Top Center Of Transaxle</p> <p>4) Safety Wall
 G116 Left Side Of Safety Wall
 G121 Center Of Safety Wall
 G123 Right Side Of Safety Wall</p> <p>5) Right Fender
 G101 Front Of Fender
 G103 On Shock Tower
 G105 Rear Of Fender</p> | <p>6) Instrument Panel
 G200 Left Kick Panel
 G201 Right Side Of I/P
 G202 Left Side Of I/P
 G203 Right Kick Panel
 G204 Left Rear Of Steering Support
 G205 Right Rear Of Steering Support
 G206 Center Of I/P
 G207 Top Of Steering Column</p> <p>7) Left Front Door
 G500 Left Front Door</p> <p>8) Right Front Door
 G600 Right Front Door</p> <p>9) Left Rear Door
 G700 Left Rear Door</p> <p>10) Right Rear Door
 G800 Right Rear Door</p> <p>11) "A" Pillars
 G900 Left "A" Pillar
 G901 Right "A" Pillar</p> <p>12) Passenger Compartment
 G300 Below Left Front Seat
 G301 Below Right Front Seat
 G302 Below Center Console
 G303 Below Right Rear Seat
 G304 Below Left Rear Seat
 G306 Below Center Of Rear Seat
 G307 Below Right Rear Window
 G309 Left Front Door Sill
 G310 Behind Right Rear Seat
 G311 Center Of Rear Shelf
 G312 Behind Left Rear Seat</p> | <p>13) Roof
 G902 Left Front Of Roof
 G903 Right Front Of Roof
 G906 Left Rear Of Roof
 G907 Right Rear Of Roof
 G908 Center Front Of Roof
 G909 Center Rear Of Roof</p> <p>14) Rear Of Vehicle
 G400 Left Front Side Of Trunk
 G401 Right Front Side Of Trunk
 G402 Left Rear Wheelwell
 G403 Right Rear Wheelwell
 G404 Left Rear Side Of Trunk
 G405 Right Rear Side Of Trunk
 G406 Center Rear Of Trunk Lid
 G407 Center Rear Of Trunk
 G408 Center Front Of Trunk
 G409 Rear Of Cargo Bed</p> <p>15) "C" Pillars
 G904 Left "C" Pillar
 G905 Right "C" Pillar</p> <p>16) "B" Pillars
 G305 Right "B" Pillar
 G308 Left "B" Pillar</p> |
|---|---|--|

G00027307

Fig. 2: Ground Numbers & Locations (2001 & Prior Model Years)

WIRING DIAGRAM COMPONENT LOCATIONS

When trying to locate a component in a wiring diagram and you don't know the specific system where it is located, use this handy component locator to find the system wiring diagram in which the component is located. Then, go to that system and locate the component within the wiring diagram.

For example, if you don't know the specific system in which the ignition switch is located, look up ignition switch in the wiring diagram component location tables and go to the appropriate wiring diagram(s) which contain either full or partial views of the ignition switch. The full view of the ignition switch is located in Power Distribution.

The first listing for the component will be the full or most complete view of the component. Additional listings will be partial views of the component. Not all components are used on all models.

All components will have a partial view in Ground Distribution and Power Distribution. Data Link Connectors show connecting circuits between modules. Alternate names for components may be listed in wiring diagram component locations tables.

WIRING DIAGRAM COMPONENT LOCATIONS

Component	Wiring Diagram
ABS Electronic Control Unit	Anti-Lock Brakes; Data Link Connectors
ABS Hydraulic Unit	Anti-Lock Brakes
Acceleration Sensor	Anti-Lock Brakes
Accessory Delay Relay	Power Windows
A/C Compressor Clutch Relay	Engine Performance
A/C Sensor	Engine Performance
A/C Pressure Switch	Engine Performance
Adaptive Lamp Control Module	Exterior Lights
Air Bag(s)	Air Bag Restraint System
Air Bag Module	Air Bag Restraint System
Air Bag Sensor(s)	Air Bag Restraint System
Air Injection Pump Relay	Engine Performance
Air Temperature Sensor	Overhead Console
Alternator (Generator)	Generators & Regulators
Anti-Theft Control Module	Anti-Theft System; Starters
Autolamp Control Relay	Headlight Systems; Daytime Running Lights
Automatic Shutdown (ASD) Relay	Engine Performance; Generators & Regulators
Autostick Switch	Engine Performance
Auxiliary Battery Relay	Generators & Regulators
Back-Up Lights	Back-Up Lights; Exterior Lights
Barometric (BARO) Pressure Sensor	Engine Performance
Battery	Power Distribution
Battery Temperature Sensor	Engine Performance
Body Control Module	Body Control Computer; Anti-Theft System; Daytime Running Lights; Engine Performance; Headlight Systems; Warning Systems
Boost Control Solenoid	Engine Performance
Boost Sensor	Engine Performance
Brake Fluid Level Switch	Analog Instrument Panels
Brake On/Off (BOO) Switch	Cruise Control Systems; Engine Performance; Shift Interlock Systems
Buzzer Module	Warning Systems

Camshaft Position (CMP) Sensor	Engine Performance
Central Control Module	Anti-Theft System
Clockspring	Air Bag Restraint System; Cruise Control Systems; Steering Column Switches
Clutch Pedal Position Switch	Starters
Clutch Start Switch	Starters
Combination Meter	Analog Instrument Panels
Constant Control Relay Module (CCRM)	Engine Performance; Electric Cooling Fans
Convenience Center	Power Distribution; Illumination/Interior Lights
Convertible Top Motor	Power Convertible Top
Convertible Top Switch	Power Convertible Top
Crankshaft Position (CKP) Sensor	Engine Performance
Cruise Control Module	Cruise Control Systems
Cruise Control Switch	Cruise Control Systems
Condenser Fan Relay(s)	Electric Cooling Fans
Data Link Connector (DLC)	Engine Performance
Daytime Running Lights Module	Daytime Running Lights; Exterior Lights
Defogger Relay	Rear Window Defogger
Diagnostic Energy Reserve Module (DERM)	Air Bag Restraint System
Discriminating Sensor (Air Bag)	Air Bag Restraint System
Distributor	Engine Performance
Door Lock Actuators	Power Door Locks; Remote Keyless Entry
Door Lock Relay(s)	Power Door Locks
Electrochromic Mirror	Power Mirrors
Electronic Level Control (ELC) Height Sensor	Electronic Suspension
Electronic Level Control (ELC) Module	Electronic Suspension
Engine Coolant Temperature (ECT) Sending Unit	Analog Instrument Panels
Engine Coolant Temperature (ECT) Sensor	Engine Performance
Engine Control Module	Engine Performance; Generators & Regulators; Starters
ETACS ECU	Warning Systems; Power Windows; Remote Keyless Entry
Evaporative (EVAP) Emissions Canister	Engine Performance
EVAP Canister Purge Solenoid	Engine Performance
EVAP Canister Vent Solenoid	Engine Performance
Exhaust Gas Recirculation (EGR) Valve	Engine Performance
Fuel Tank Vacuum Sensor	Engine Performance
Fog Lights	Headlight Systems; Daytime Running Lights
Fog Light Relay	Headlight Systems; Daytime Running Lights
Fuel Door Release Solenoid	Power Fuel Door Release
Fuel Gauge Sending Unit	Analog Instrument Panels
Fuel Injectors	Engine Performance
Fuel Pump	Engine Performance
Fuel Pump Relay	Engine Performance; Power Distribution

Fuse/Relay Block	Power Distribution
Fusible Links	Power Distribution; Generators & Regulators; Starters
Generator	Generators & Regulators; Engine Performance; Power Distribution
Generic Electronic Module (GEM)	Body Control Modules; Electronic Suspension
Glow Plug Relay	Engine Performance
Glow Plugs	Engine Performance
Grounds	Ground Distribution
Headlight Door Module	Headlight Doors
Headlight Relay	Headlight Systems; Daytime Running Lights
Headlights	Headlight Systems; Daytime Running Lights
Heated Oxygen Sensor(s) (HO2S)	Engine Performance
Heated Windshield Control Module	Heated Windshields
Height Sensor	Electronic Suspension
Horns	Steering Column Switches
Horn Relay	Steering Column Switches
Idle Air Control (IAC) Motor/Valve	Engine Performance
Ignition Coil(s)	Engine Performance
Ignition Key Lock Cylinder	Anti-Theft System
Ignition Module	Engine Performance
Ignition Switch	Power Distribution; Engine Performance; Generators & Regulators; Starters
Illuminated Entry Module	Illumination/Interior Lights
Illumination Lights	Illumination/Interior Lights
Impact Sensor	Air Bag Restraint System
Inertia Fuel Shutoff Switch	Engine Performance
Inhibit Relay	Starters
Instrument Cluster	Analog Instrument Panels
Intake Air Temperature (IAT) Sensor	Engine Performance
Interior Lights	Illumination/Interior Lights
Interlock Switch	Starters
Junction Block	Power Distribution
Keyless Entry Receiver	Remote Keyless Entry
Key Reminder Switch	Starters
Knock Sensor	Engine Performance
Lamp Control Module	Exterior Lights
License Plate Lamp	Exterior Lights
Lighting Control Module	Lighting Control Modules; Anti-Theft System; Daytime Running Lights; Headlight Systems
Lower Relay	Power Convertible Top
Malfunction Indicator Light (MIL)	Engine Performance; Instrument Panels
Manifold Absolute Pressure (MAP) Sensor	Engine Performance
Mass Airflow (MAF) Sensor	Engine Performance

Mega Fuse	Generators & Regulators
Memory Seat/Mirror Module	Memory Systems
Mirror Defogger	Rear Window Defogger
Moon Roof Motor	Power Moon Roof
Moon Roof Relay	Power Moon Roof
Multi-Function Control Module	Warning Systems
Neutral Safety Switch	Starters
Oil Level Switch	Engine Performance
Oil Pressure Switch/Sending Unit	Analog Instrument Panels; Engine Performance
Overhead Console	Overhead Console
Oxygen Sensor(s) (O2S)	Engine Performance
Parking Brake Switch	Analog Instrument Panels
Park Lights	Exterior Lights
Park/Neutral Position Switch	Starters; Engine Performance; Anti-Theft System; Body Control Module
Perimeter Lighting Control Relay	Exterior Lights
Power Amplifier	Power Antennas
Power Antenna Module	Power Antennas
Power Antenna Motor	Power Antennas
Power Distribution Center	Power Distribution; Generators & Regulators; Starters
Power Door Lock Motors	Power Door Locks
Power Mirror Motors	Power Mirrors; Memory Systems
Power Sliding Door Controller	Power Sliding Side Door
Power Seat Motors	Power Seats; Memory Systems
Power Steering Pressure Switch	Engine Performance
Power Top Motor	Power Convertible Top
Power Top Relay(s)	Power Convertible Top
Powertrain Control Module	Engine Performance; Analog Instrument Panels; Cruise Control Systems; Data Link Connectors; Generators & Regulators; Starters
Power Window Motors	Power Windows
Power Window Relay(s)	Power Windows
Radiator Fan Motor(s)	Electric Cooling Fans
Radiator Fan Relay(s)	Engine Performance; Electric Cooling Fans;
Rainsense Module	Wiper/Washer Systems
Raise Relay	Power Convertible Top
Remote Anti-Theft Personality (RAP) Module	Anti-Theft System; Starters; Warning Systems
Seat Belt Pretensioners	Air Bag Restraint System
Seat Belt Retractor Solenoid	Passive Restraints
Seat Belt Switch	Air Bag Restraint System; Passive Restraints
Shift Interlock Solenoid	Shift Interlock Systems
Shift Lock Actuator	Shift Interlock Systems
Side Marker Lights	Exterior Lights

SIR Coil Assembly (Clockspring)	Air Bag Restraint System
Slip Ring (Clockspring)	Air Bag Restraint System; Steering Column Switches
SRS Control Module	Air Bag Restraint System
Starter Motor	Starters
Starter Interrupt Relay	Starters
Starter Solenoid	Starters
Starter Relay	Starters
Steering Wheel Position Sensor	Anti-Lock Brakes
Stoplights	Exterior Lights
Stoplight Switch	Engine Performance; Cruise Control Systems; Anti-Lock Brakes
Sun Roof ECU	Power Sun Roof
Sun Roof Motor	Power Sun Roof
Sun Roof Position Sensor	Power Sun Roof
Taillights	Exterior Lights
Throttle Position (TP) Sensor	Engine Performance
Torque Converter Clutch Solenoid/Switch	Engine Performance
Traction Control Switch	Anti-Lock Brakes
Trailer Tow Connector	Exterior Lights
Trailer Tow Relay	Exterior Lights
Transmission/Transaxle	Engine Performance
Transmission Control Module (TCM)	Engine Performance; Starters
Transmission Range Sensor	Starters; Back-Up Lights; Engine Performance
Transmission Range Switch	Back-Up Lights; Engine Performance; Anti-Theft System
Turn Signal Flasher	Exterior Lights
Turn Signal Lights	Exterior Lights
Twilight Sentinel Switch	Headlight Systems; Daytime Running Lights
Vapor Canister Leak Detection Pump	Engine Performance
Vehicle Control Module (VCM)	Engine Performance
Vehicle Dynamic Module	Electronic Suspension
Vehicle Speed Control Servo	Cruise Control Systems
Vehicle Speed Sensor	Data Link Connectors; Analog Instrument Panels; Cruise Control Systems; Electronic Suspension
Voltage Regulator	Generators & Regulators
Water-In-Fuel Sensor	Engine Performance; Analog Instrument Panels
Wheel Speed Sensors	Anti-Lock Brakes
Window Timer Module	Power Convertible Top
Windshield Intermittent Wiper Relay	Wiper/Washer Systems
Windshield Washer Motor	Wiper/Washer Systems
Wiper Motor	Wiper/Washer Systems

2000 Lincoln LS

2000 SYSTEM WIRING DIAGRAMS Lincoln - LS

AIR CONDITIONING

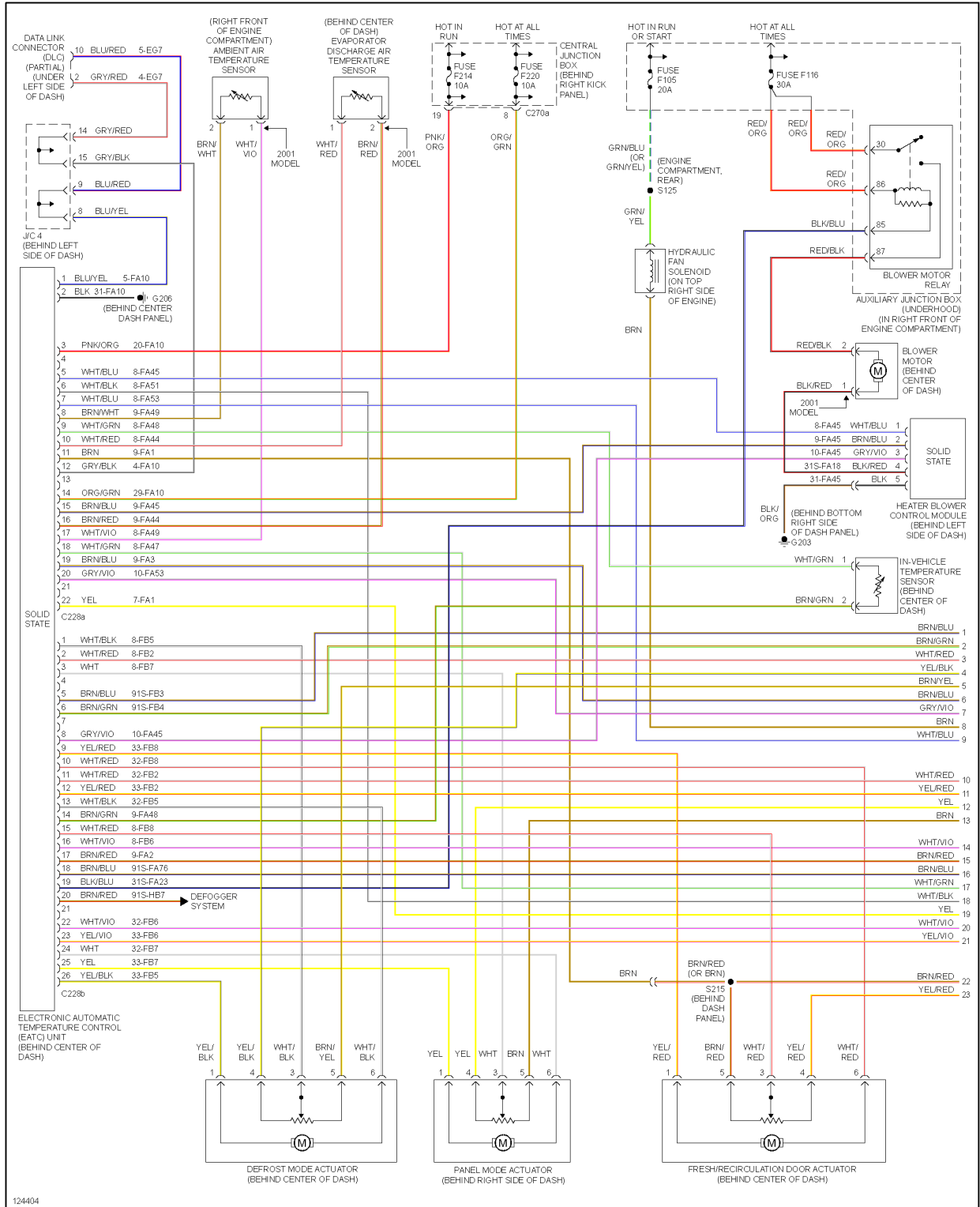


Fig. 1: Automatic A/C Circuit (1 of 2)

2000 Lincoln LS

2000 SYSTEM WIRING DIAGRAMS Lincoln - LS

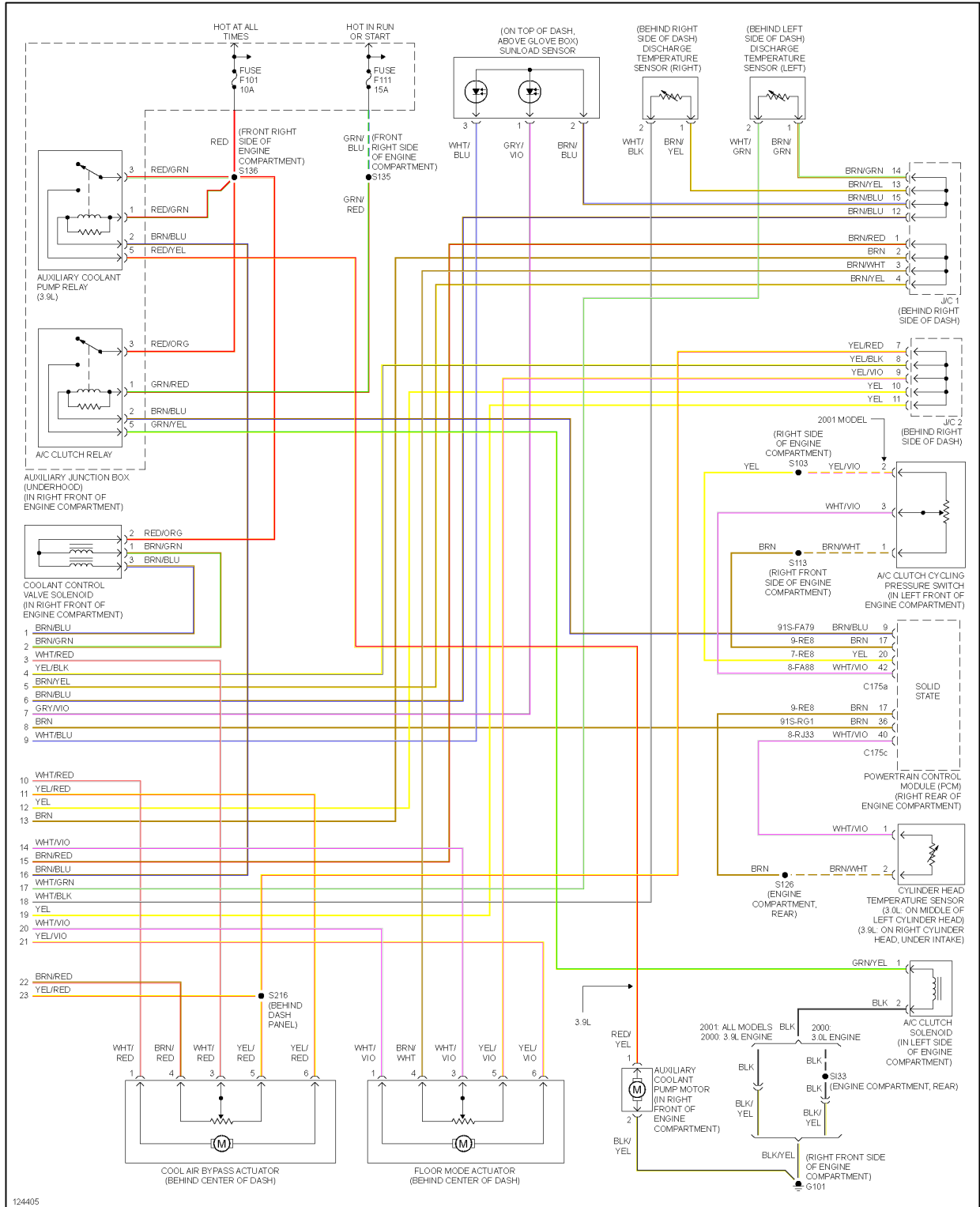


Fig. 2: Automatic A/C Circuit (2 of 2)

ANTI-LOCK BRAKES

2000 Lincoln LS

2000 SYSTEM WIRING DIAGRAMS Lincoln - LS

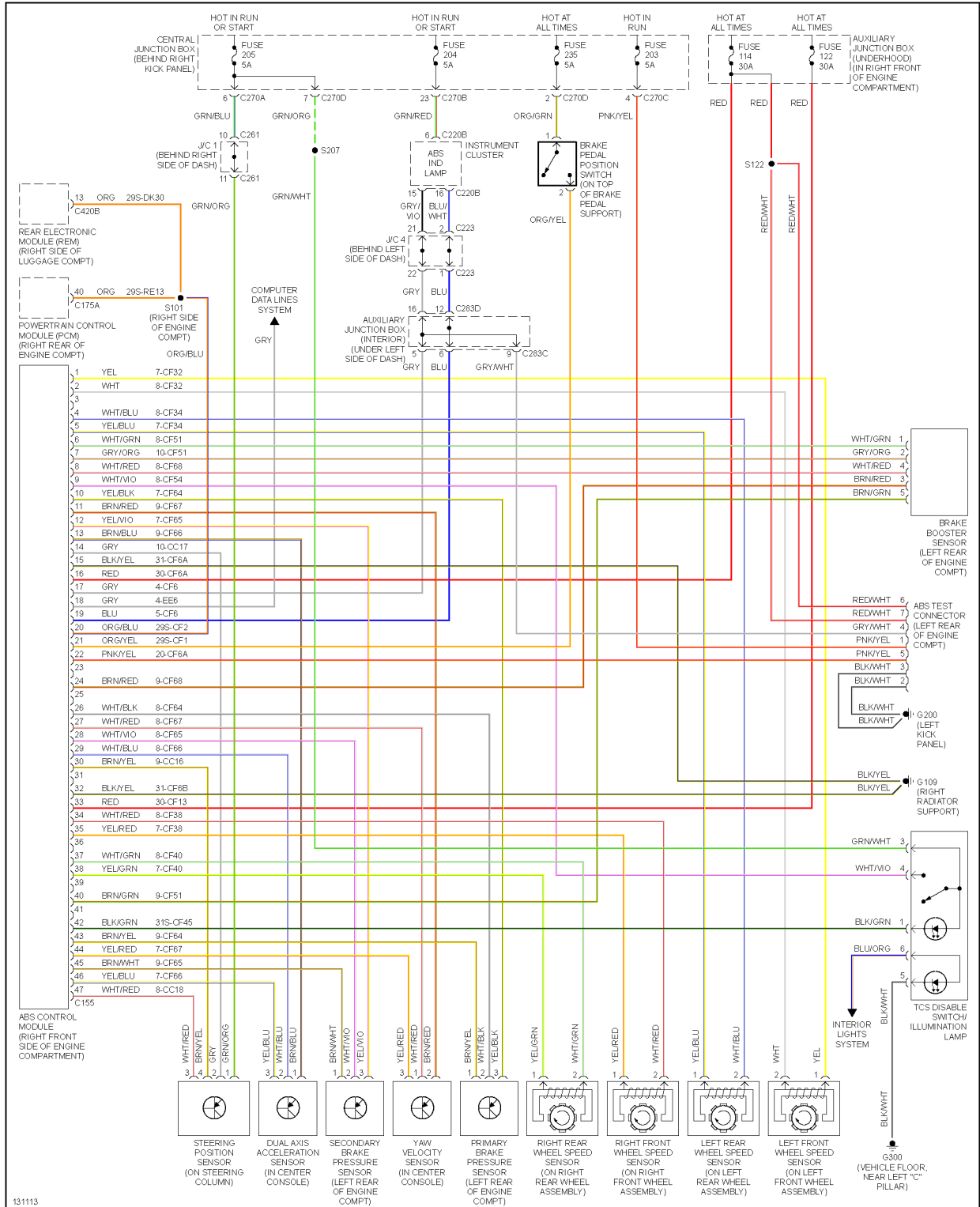


Fig. 3: Anti-lock Brakes Circuit, W/ Traction Control & Stability Assist

2000 Lincoln LS

2000 SYSTEM WIRING DIAGRAMS Lincoln - LS

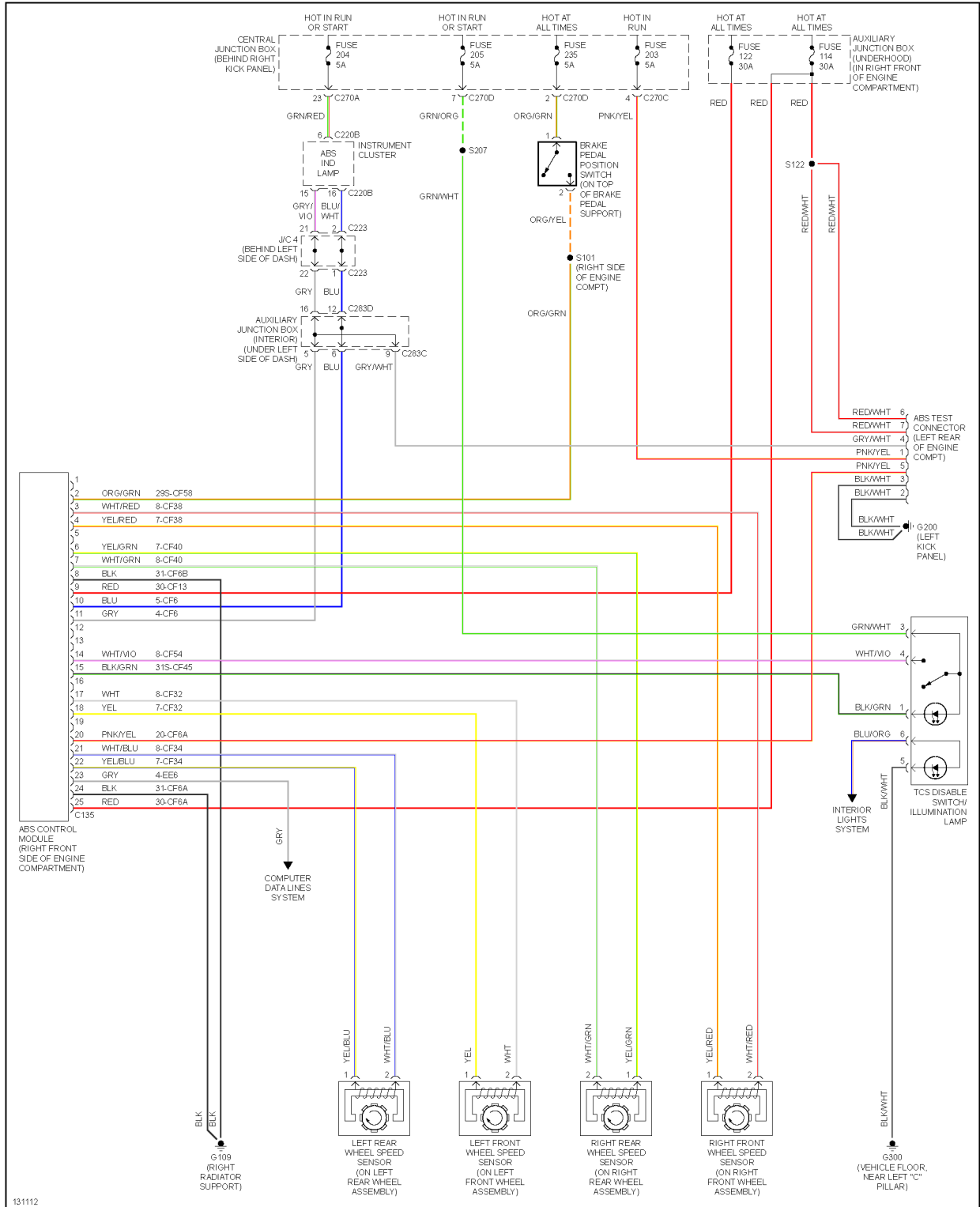


Fig. 4: Anti-lock Brakes Circuit, W/ Traction Control

2000 Lincoln LS

2000 SYSTEM WIRING DIAGRAMS Lincoln - LS

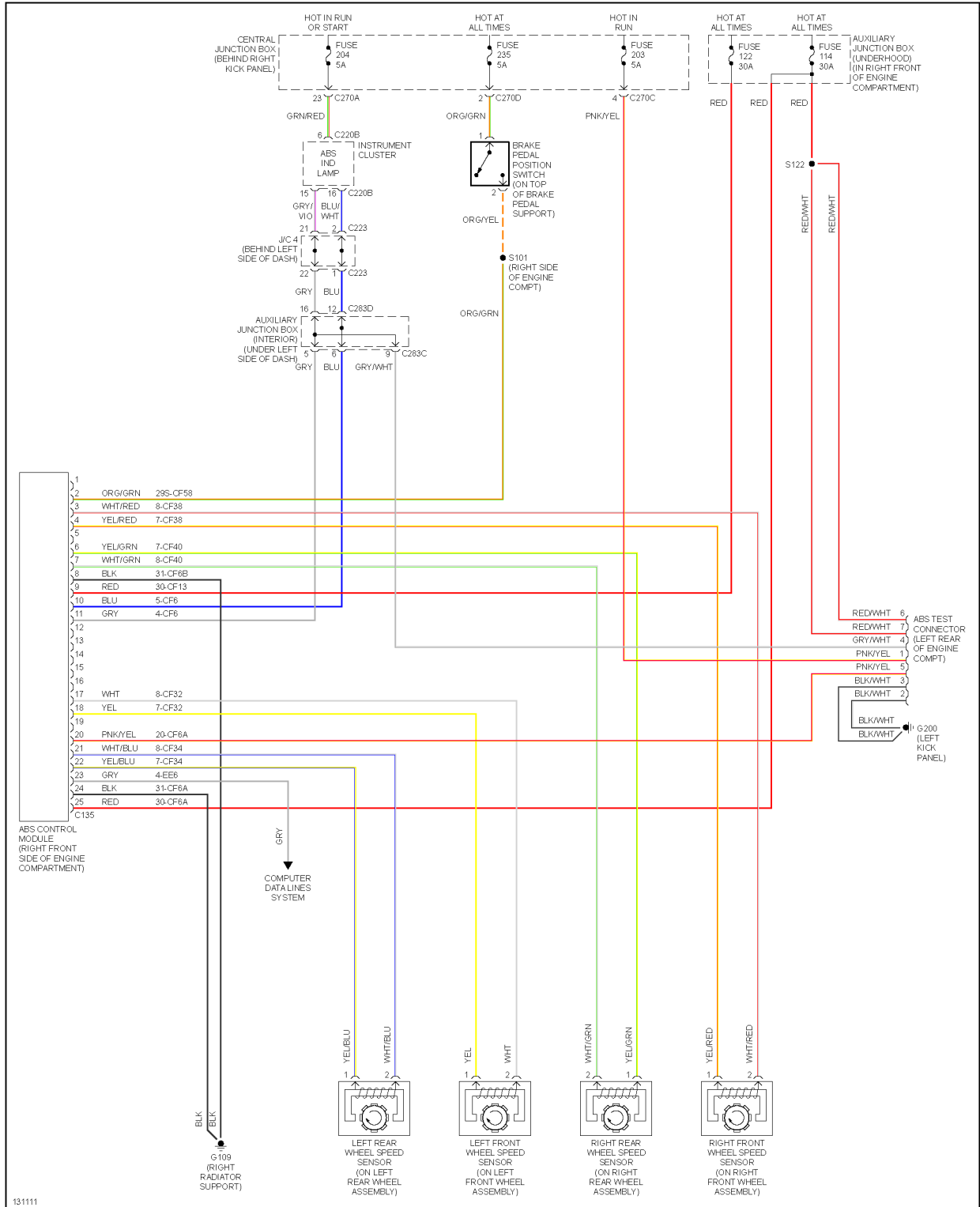


Fig. 5: Anti-lock Brakes Circuit, W/O Traction Control

ANTI-THEFT

2000 Lincoln LS

2000 SYSTEM WIRING DIAGRAMS Lincoln - LS

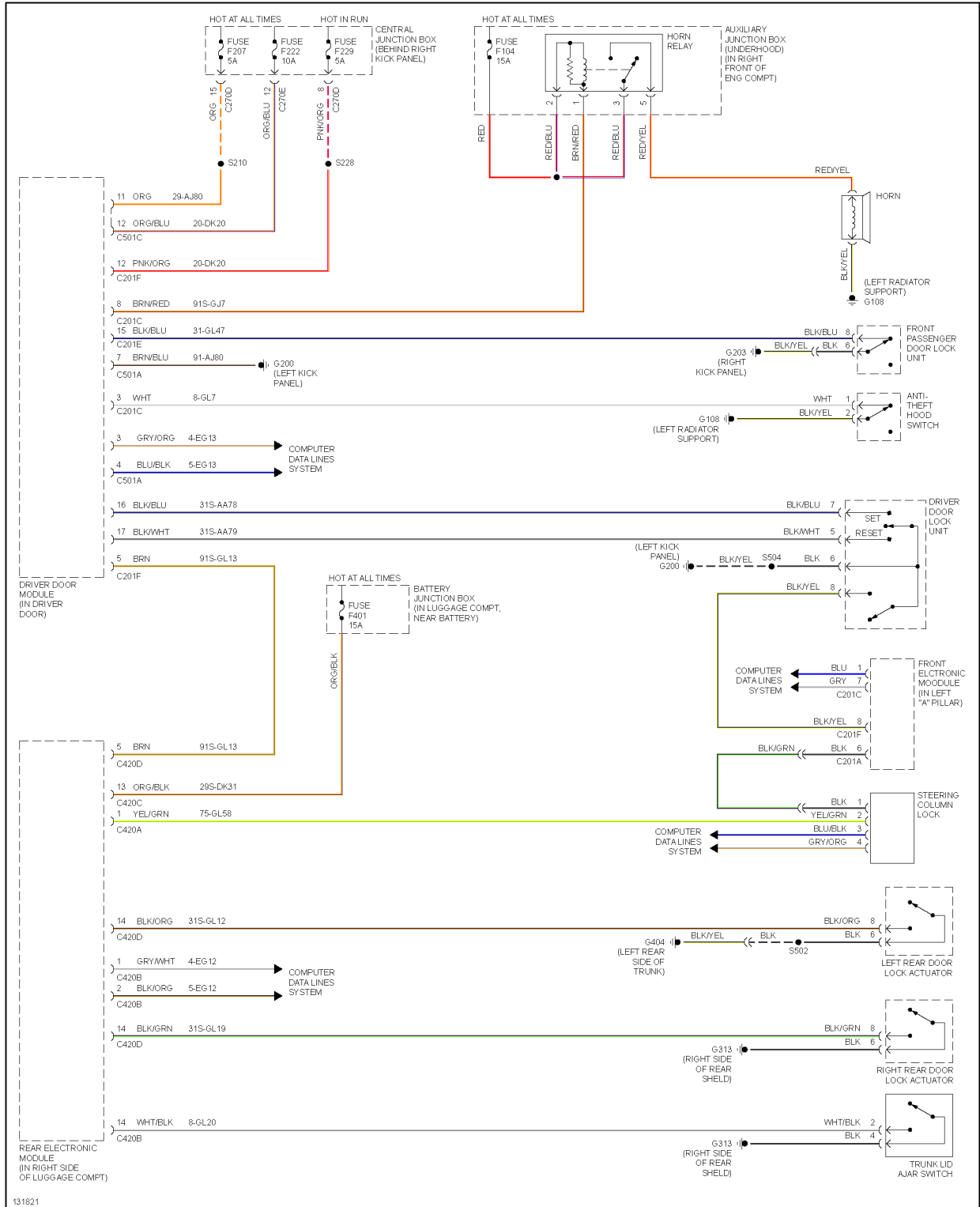


Fig. 6: Forced Entry Circuit

2000 Lincoln LS

2000 SYSTEM WIRING DIAGRAMS Lincoln - LS

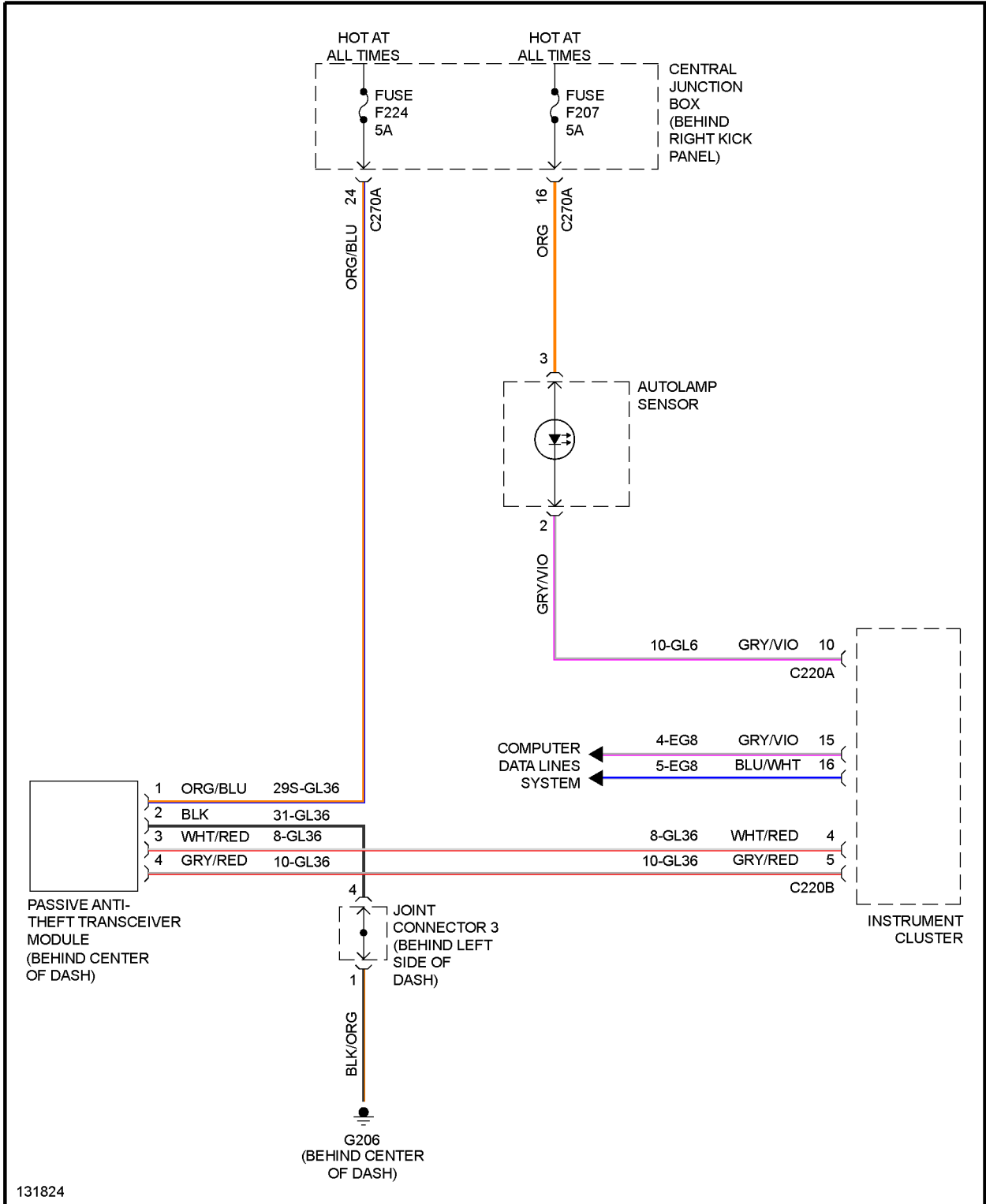


Fig. 7: Passive Anti-theft Circuit

2000 Lincoln LS

2000 SYSTEM WIRING DIAGRAMS Lincoln - LS

BODY CONTROL MODULES

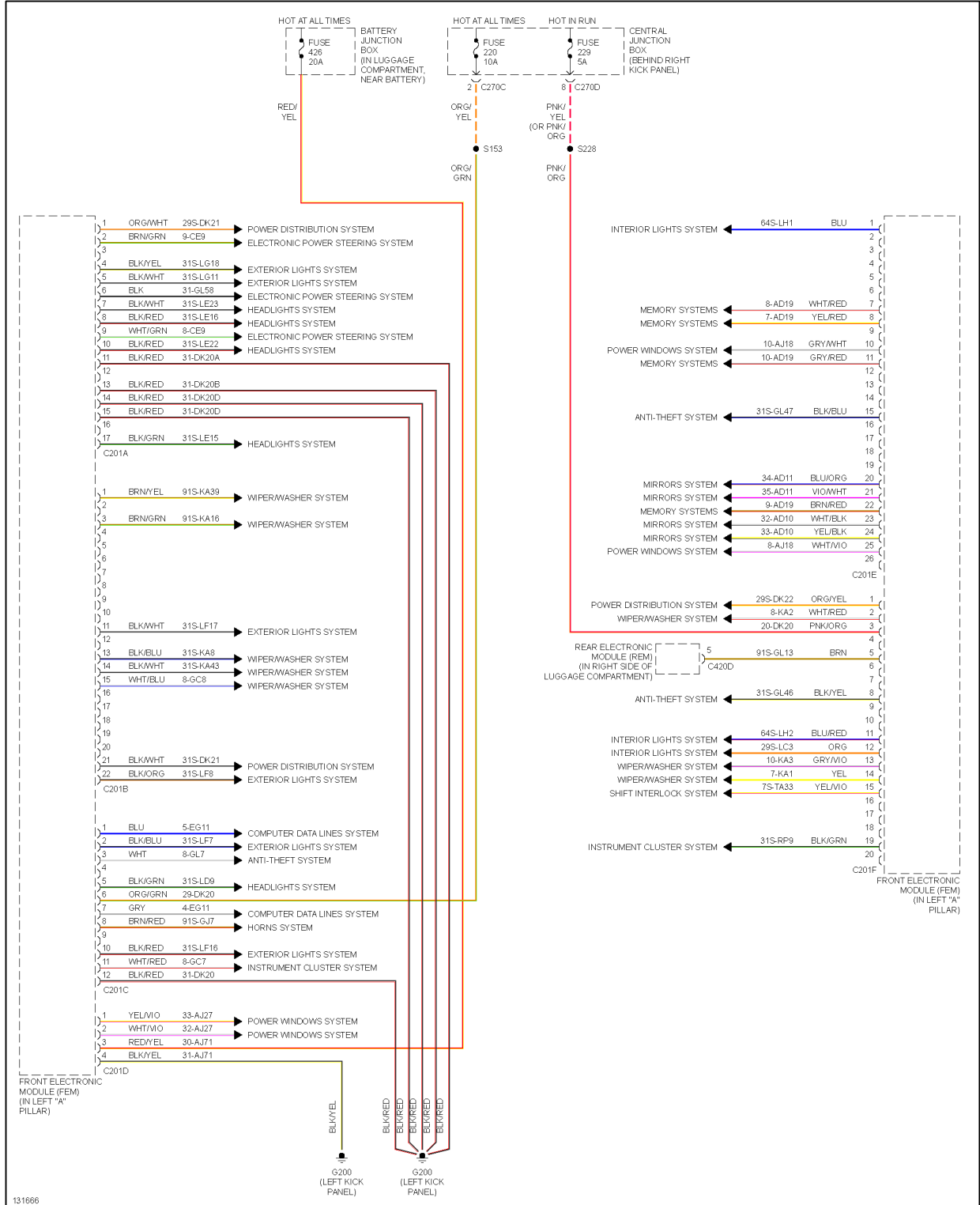


Fig. 8: Body Control Modules Circuit (1 of 2)

2000 Lincoln LS

2000 SYSTEM WIRING DIAGRAMS Lincoln - LS

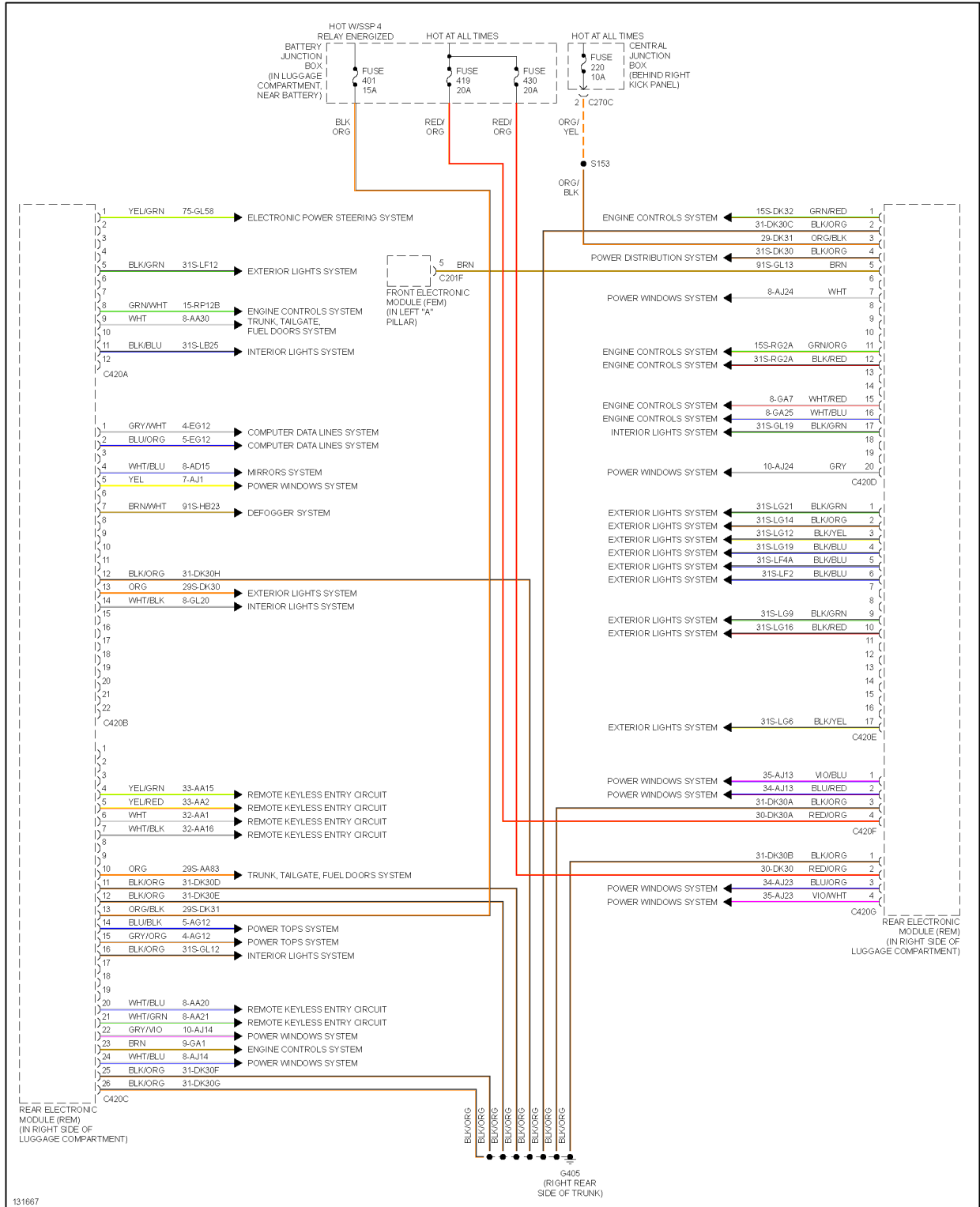


Fig. 9: Body Control Modules Circuit (2 of 2)

COMPUTER DATA LINES

2000 Lincoln LS

2000 SYSTEM WIRING DIAGRAMS Lincoln - LS

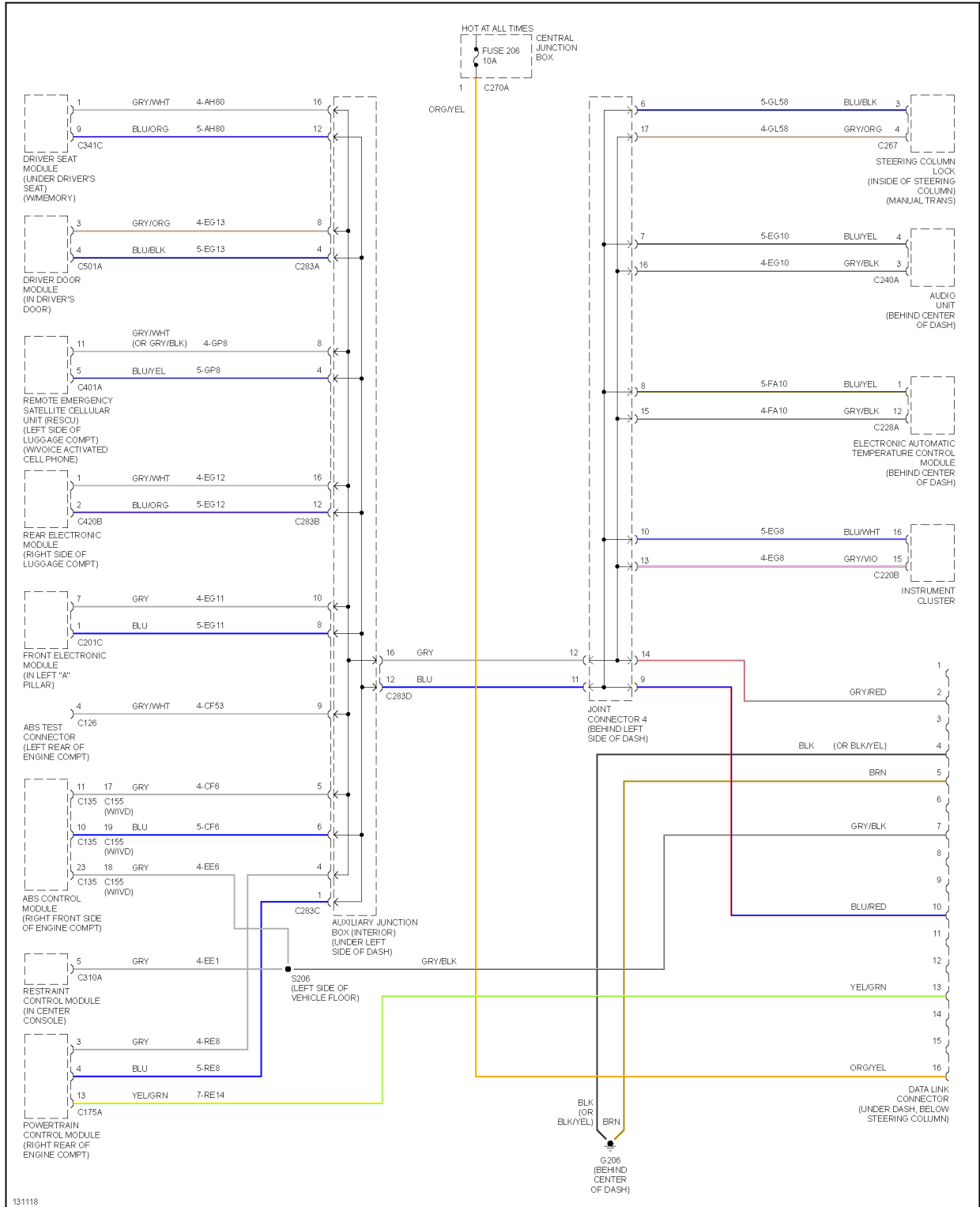


Fig. 10: Computer Data Lines Circuit

COOLING FAN

2000 Lincoln LS

2000 SYSTEM WIRING DIAGRAMS Lincoln - LS

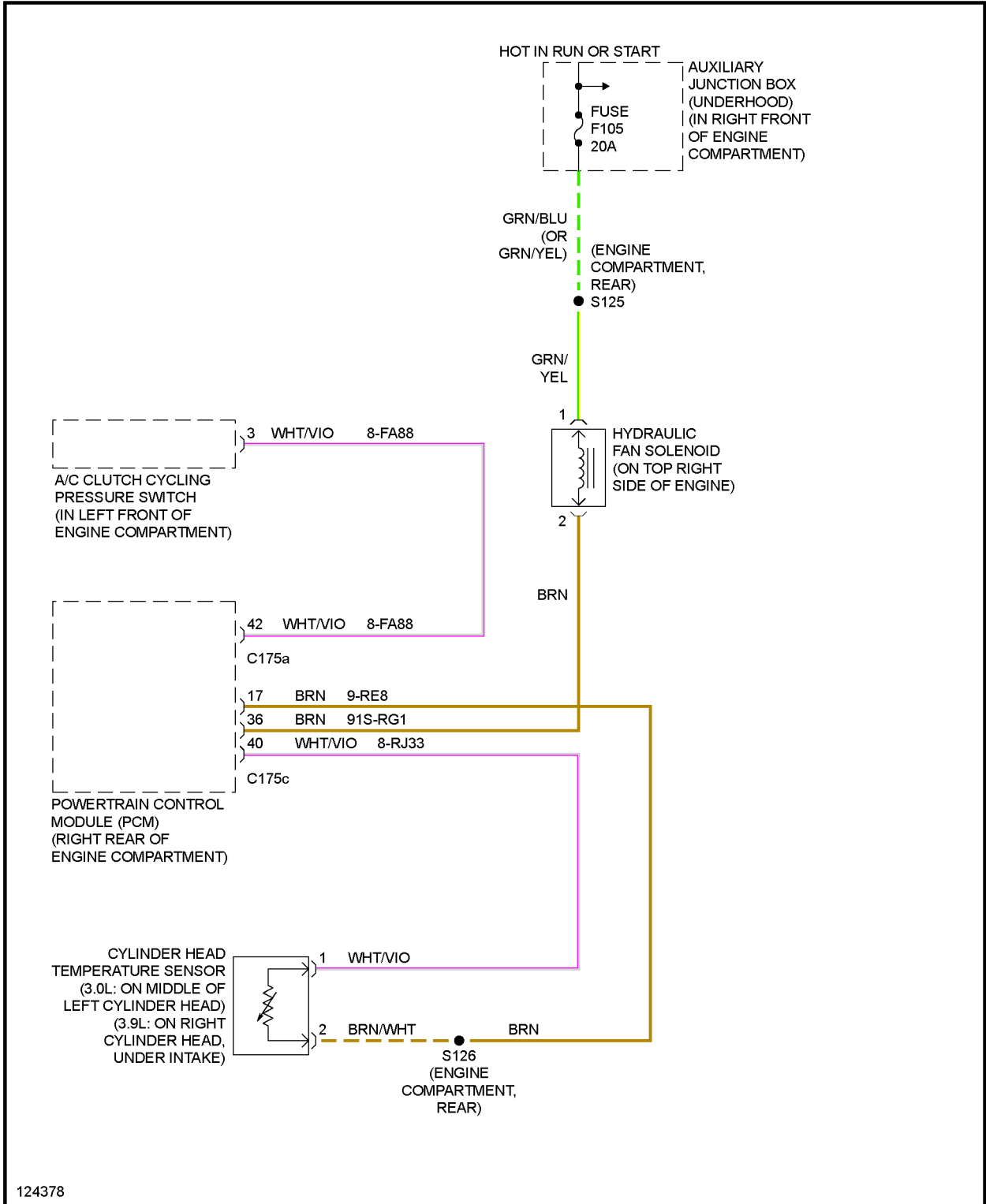


Fig. 11: Cooling Fan Circuit

CRUISE CONTROL

2000 Lincoln LS

2000 SYSTEM WIRING DIAGRAMS Lincoln - LS

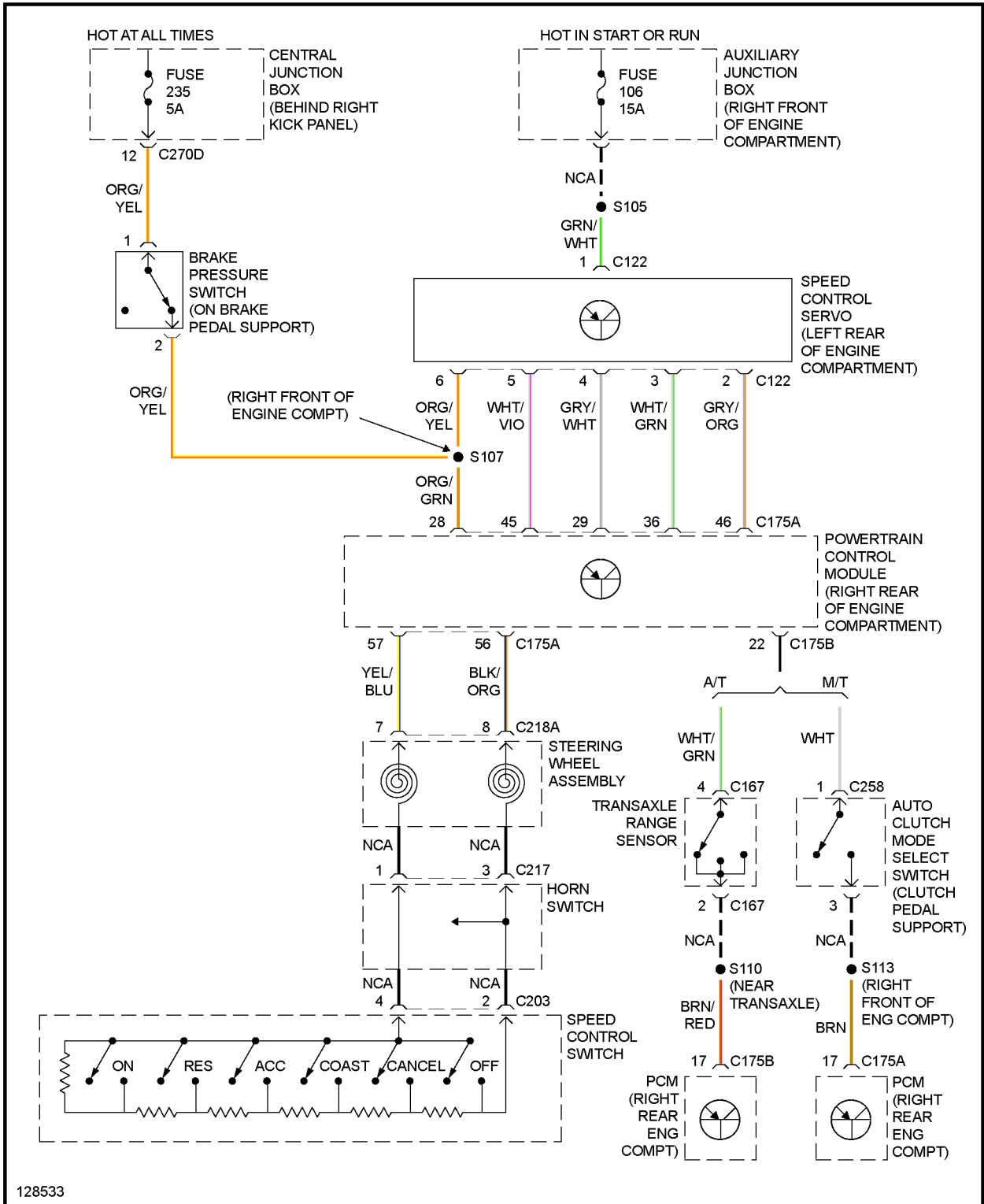


Fig. 12: Cruise Control Circuit

DEFOGGERS

2000 Lincoln LS

2000 SYSTEM WIRING DIAGRAMS Lincoln - LS

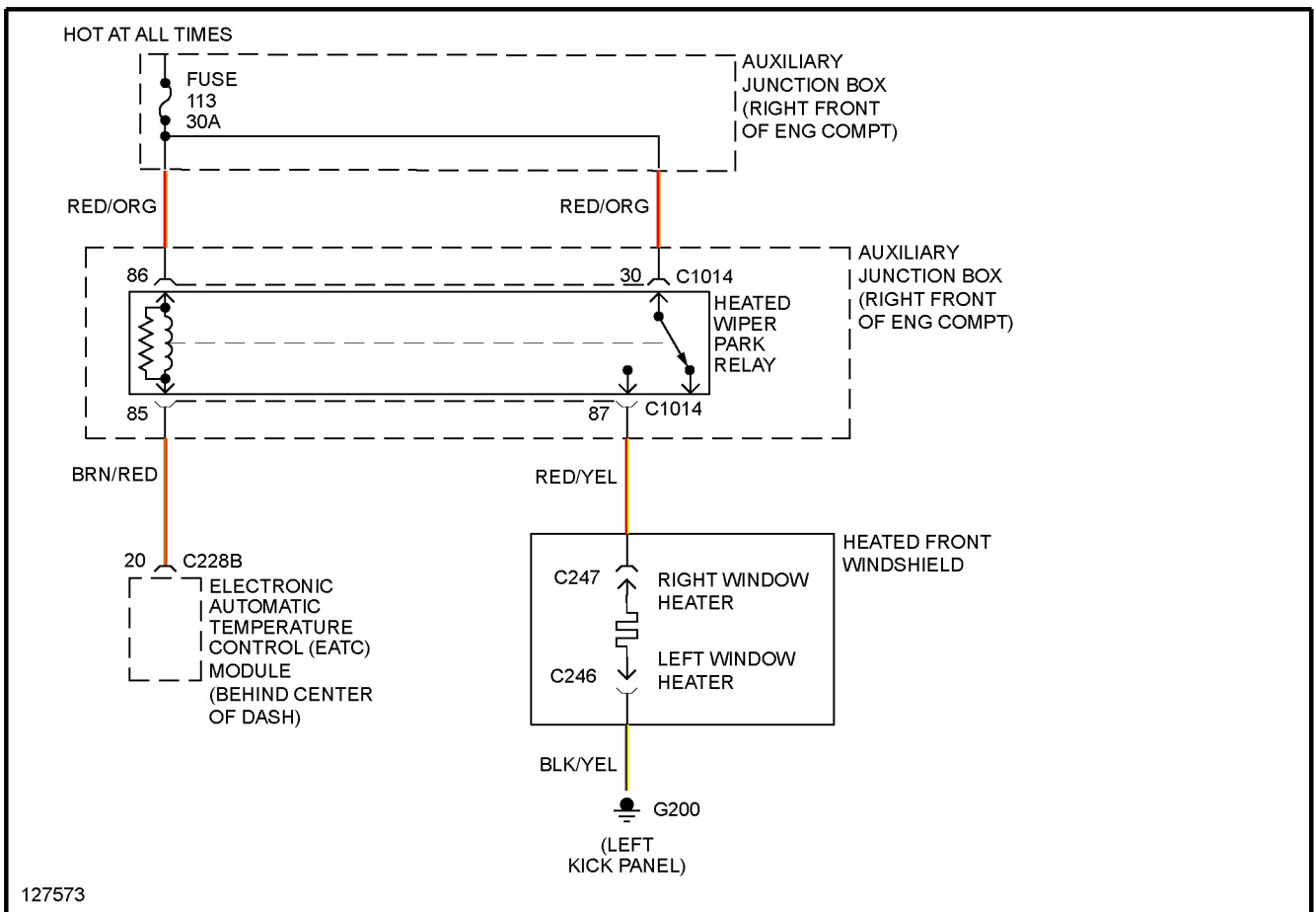


Fig. 13: Front Defogger Circuit

2000 Lincoln LS

2000 SYSTEM WIRING DIAGRAMS Lincoln - LS

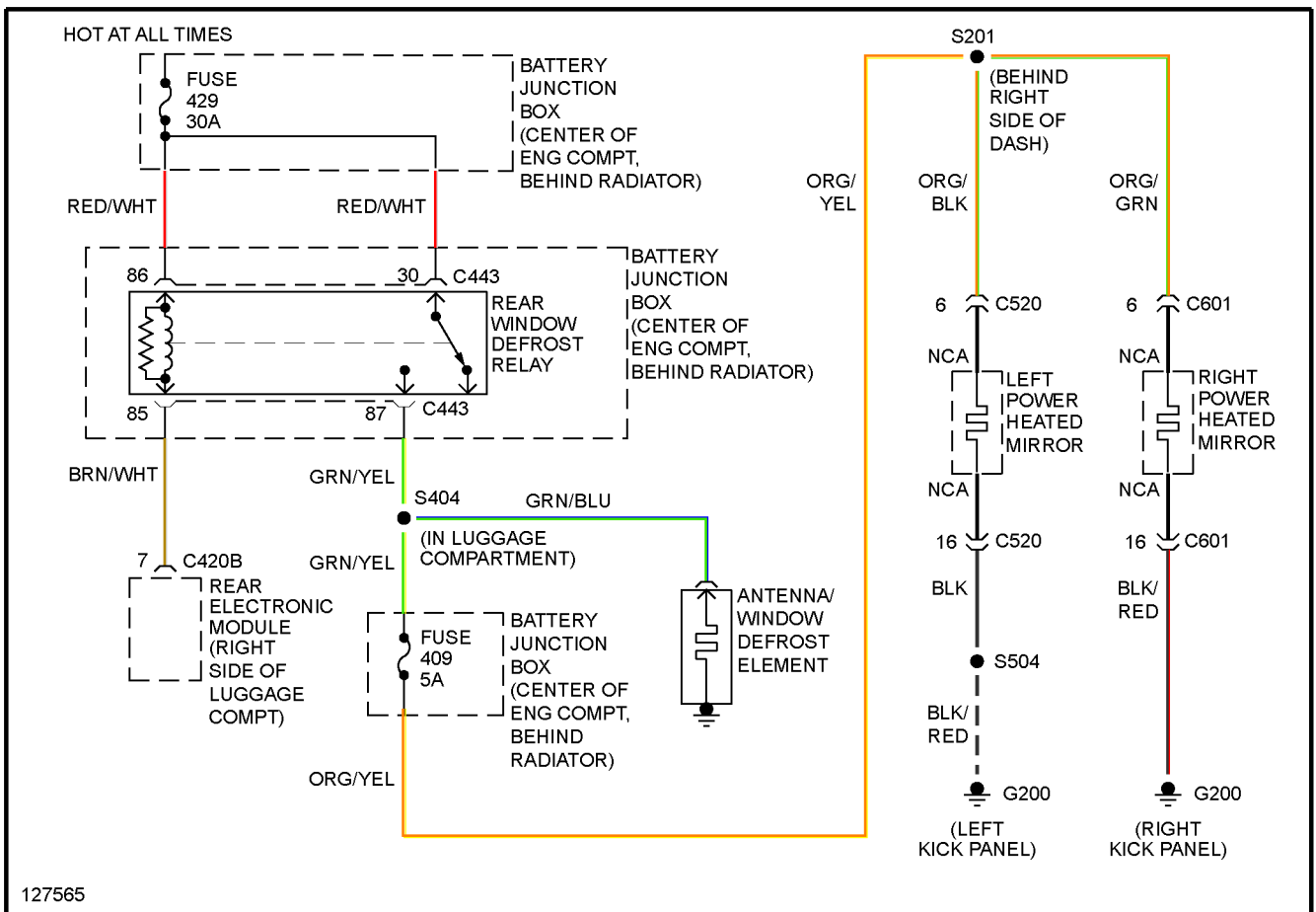


Fig. 14: Rear Defogger & Heated Mirrors Circuit

ELECTRONIC POWER STEERING

2000 Lincoln LS

2000 SYSTEM WIRING DIAGRAMS Lincoln - LS

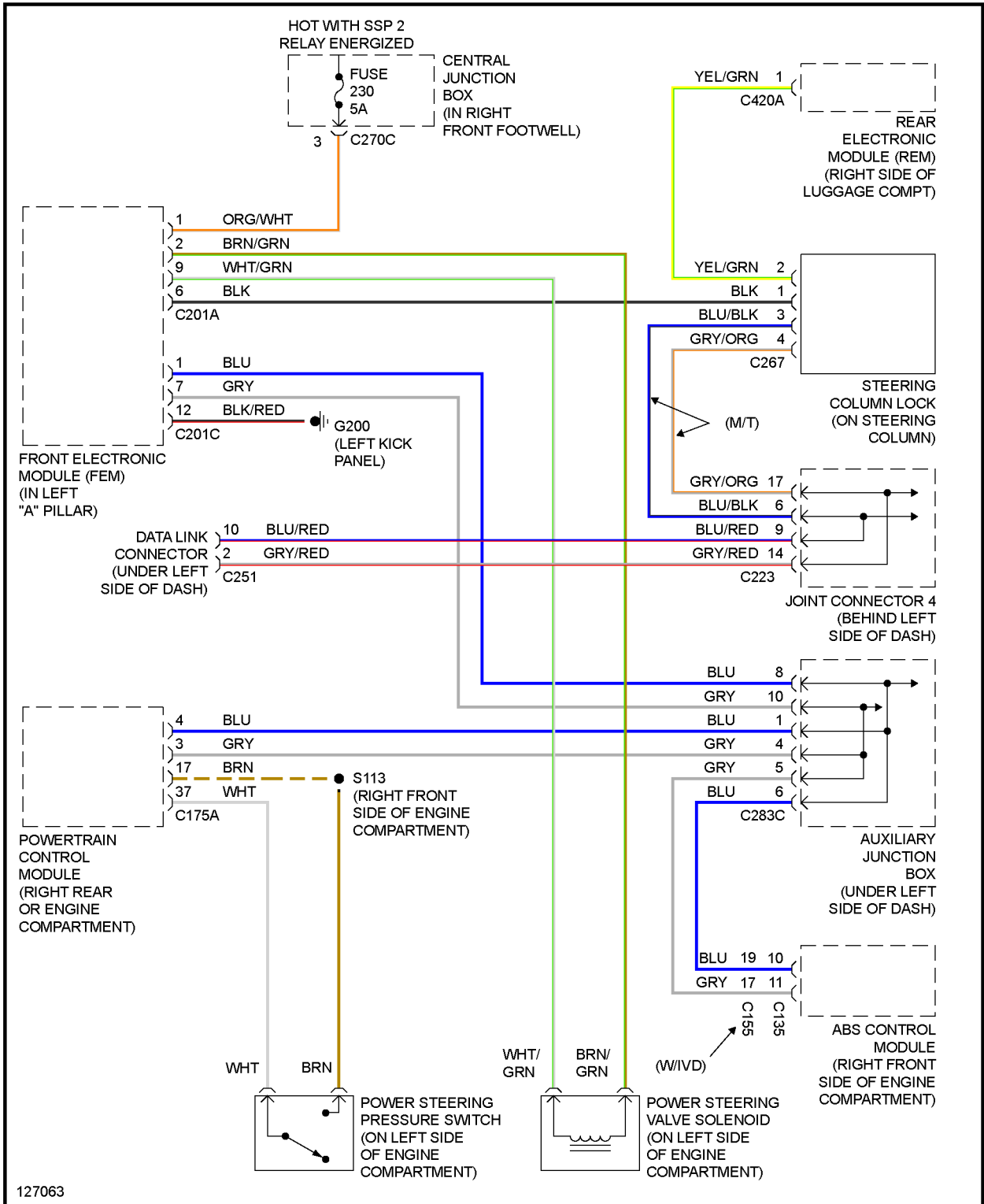


Fig. 15: Electronic Power Steering Circuit

ENGINE PERFORMANCE

2000 Lincoln LS

2000 SYSTEM WIRING DIAGRAMS Lincoln - LS

3.0L

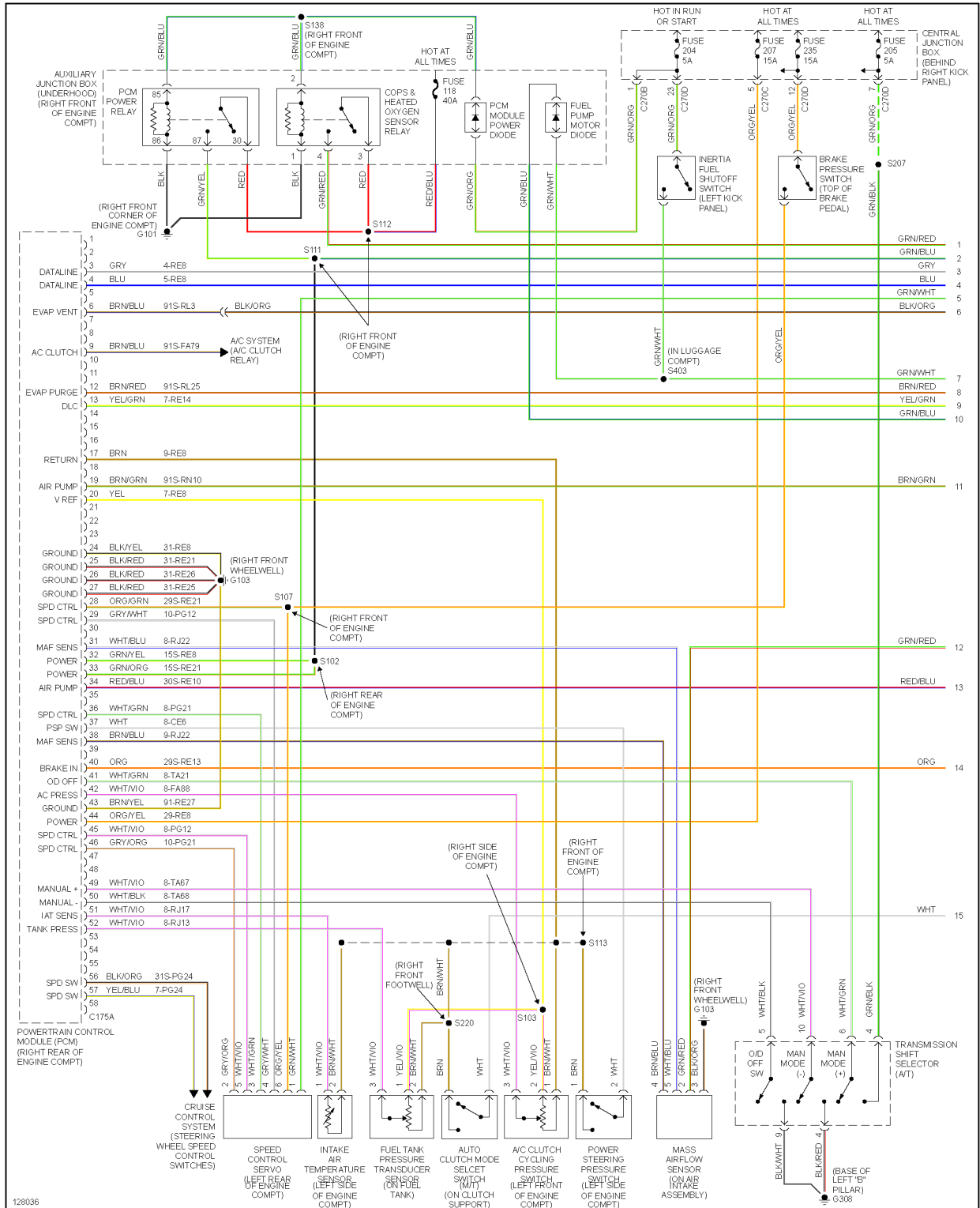


Fig. 16: 3.0L, Engine Performance Circuit (1 of 4)

2000 Lincoln LS

2000 SYSTEM WIRING DIAGRAMS Lincoln - LS

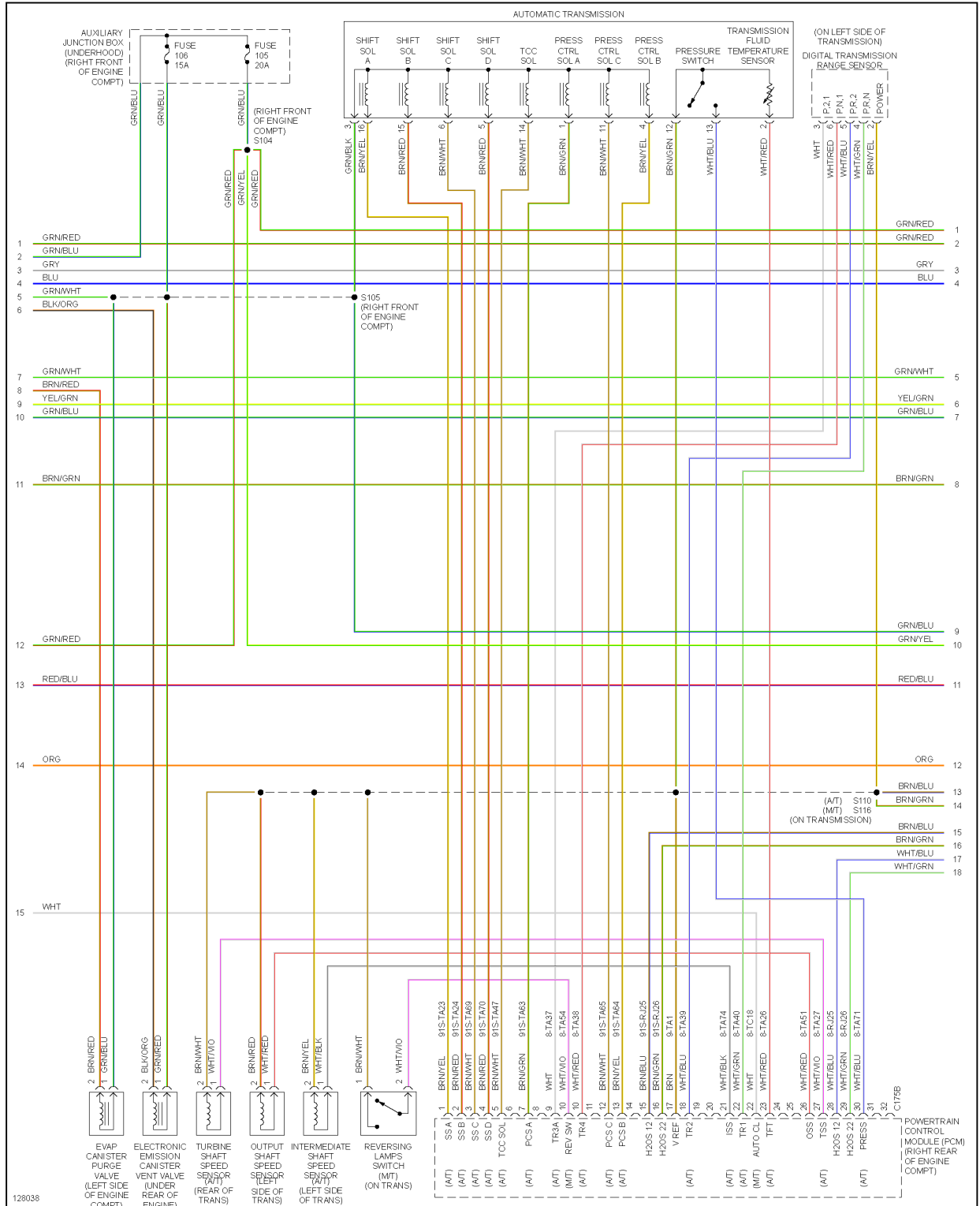


Fig. 17: 3.0L, Engine Performance Circuit (2 of 4)

2000 Lincoln LS

2000 SYSTEM WIRING DIAGRAMS Lincoln - LS

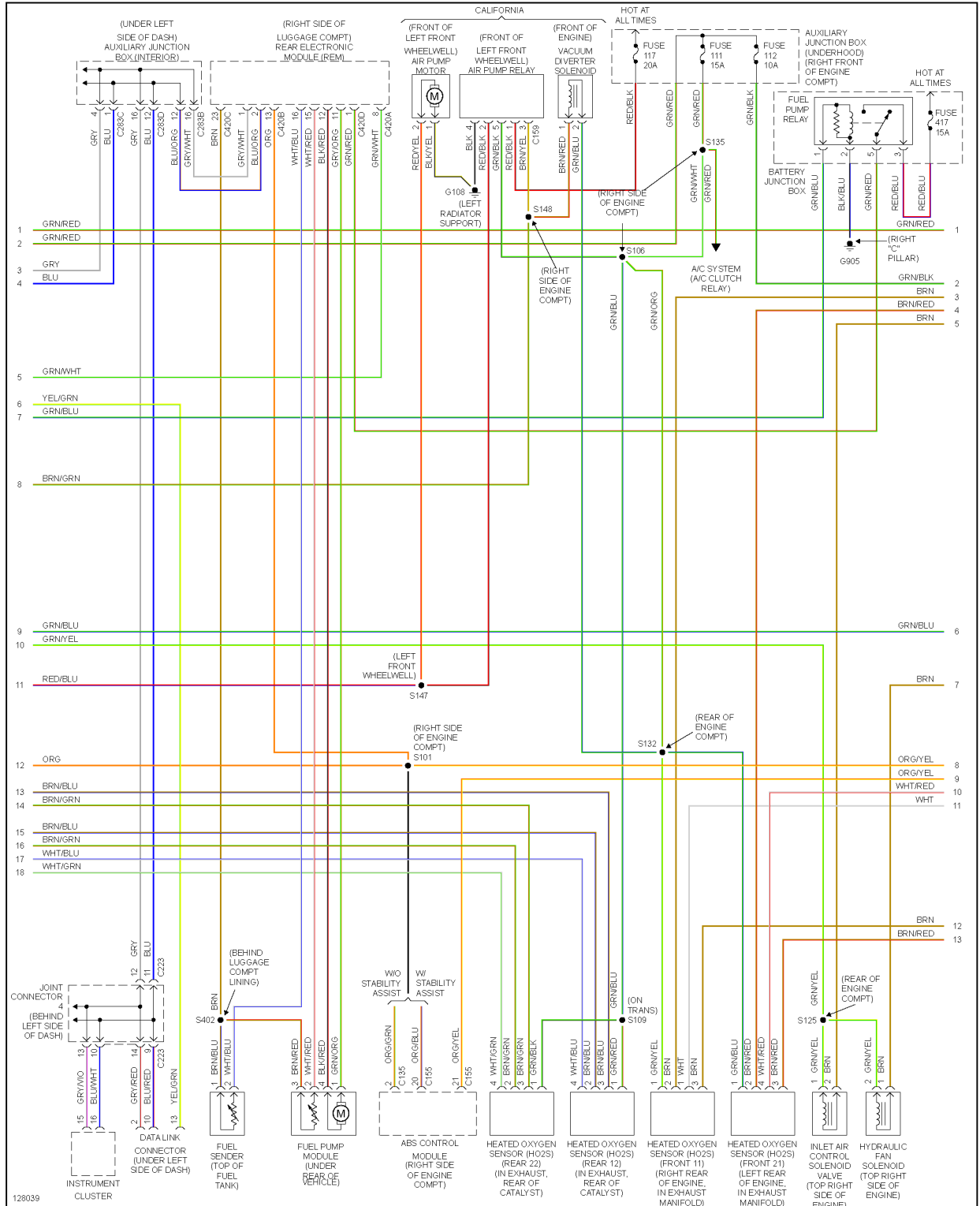


Fig. 18: 3.0L, Engine Performance Circuit (3 of 4)

2000 Lincoln LS

2000 SYSTEM WIRING DIAGRAMS Lincoln - LS

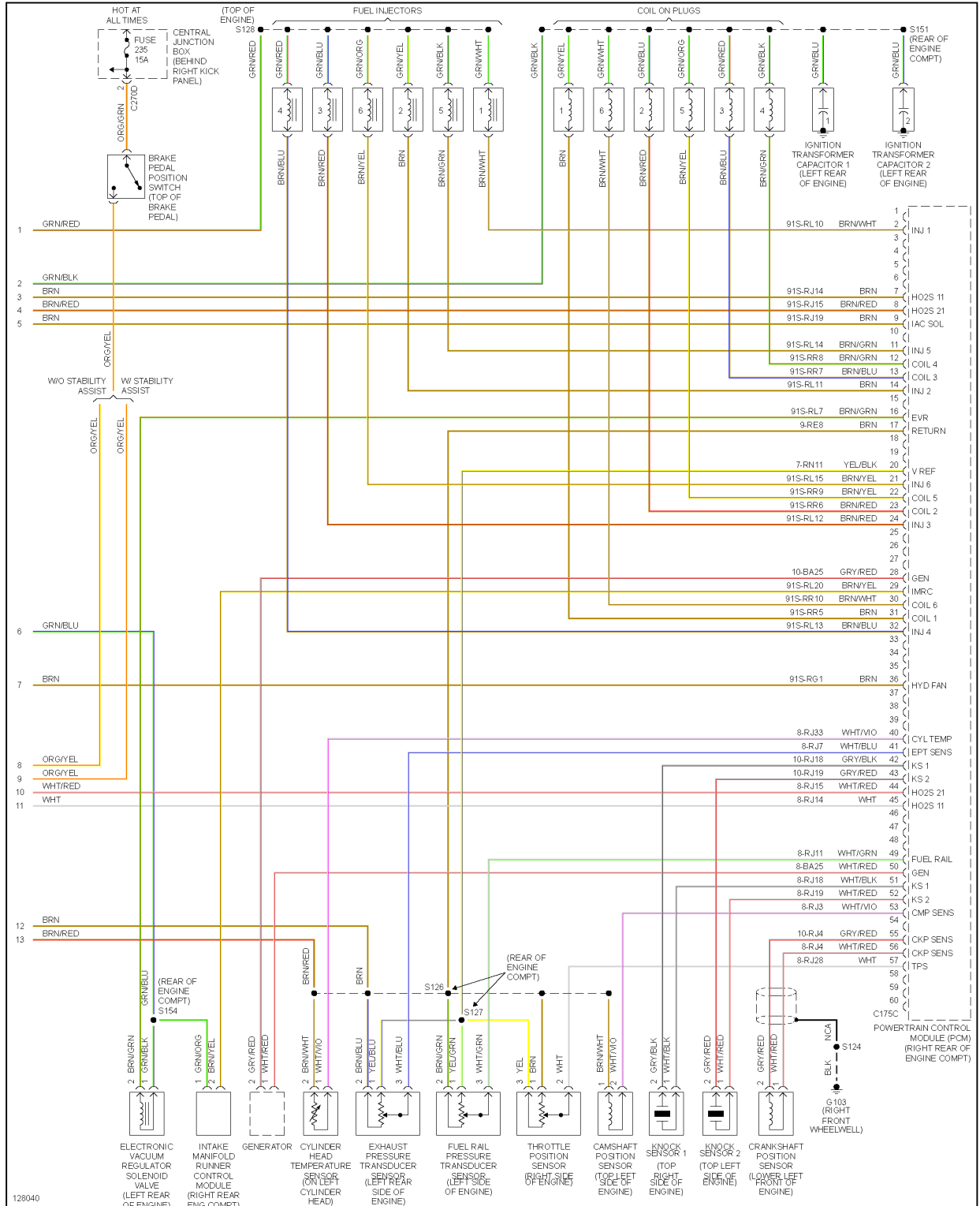


Fig. 19: 3.0L, Engine Performance Circuit (4 of 4)

2000 Lincoln LS

2000 SYSTEM WIRING DIAGRAMS Lincoln - LS

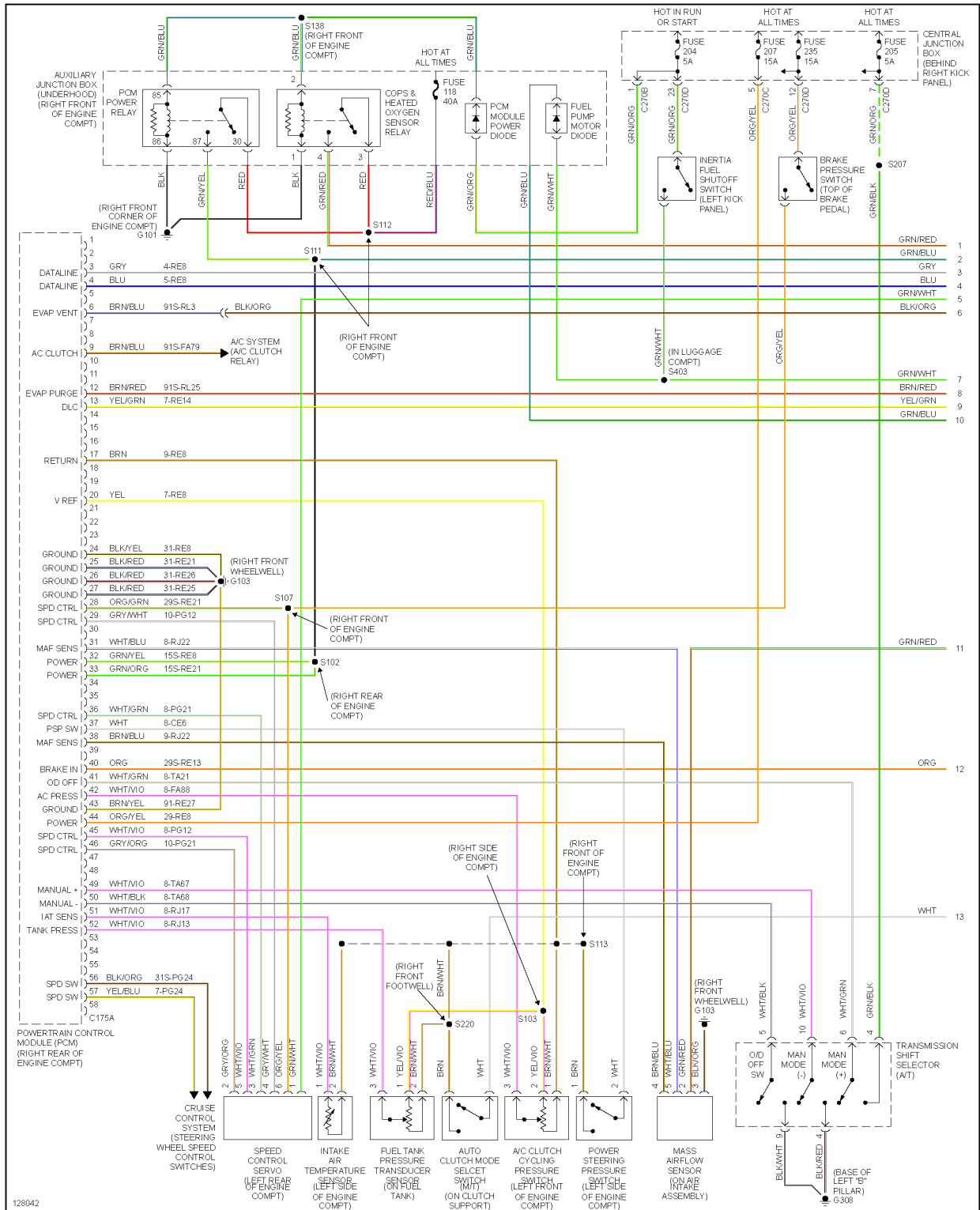


Fig. 20: 3.9L, Engine Performance Circuit (1 of 4)

2000 Lincoln LS

2000 SYSTEM WIRING DIAGRAMS Lincoln - LS

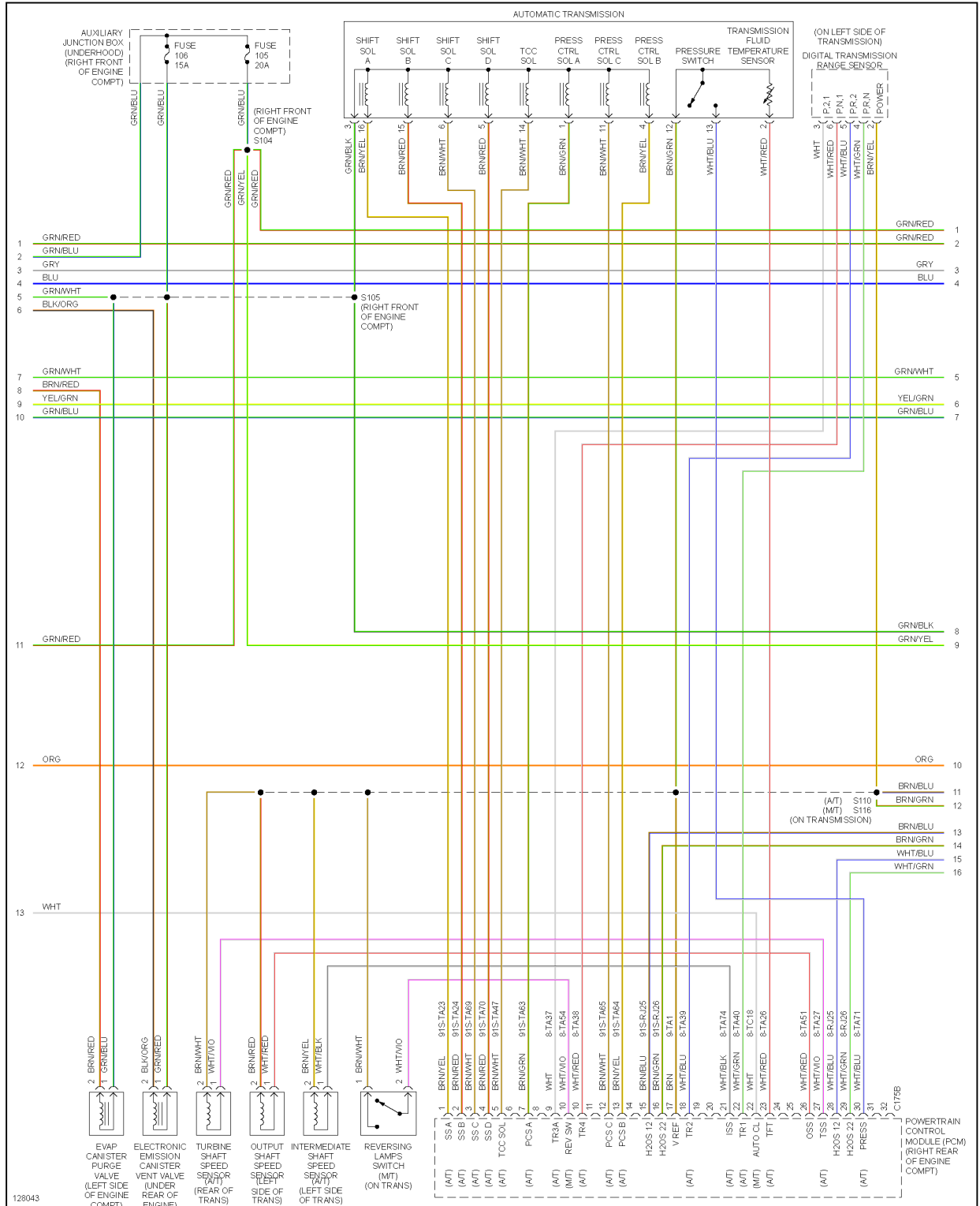


Fig. 21: 3.9L, Engine Performance Circuit (2 of 4)

2000 Lincoln LS

2000 SYSTEM WIRING DIAGRAMS Lincoln - LS

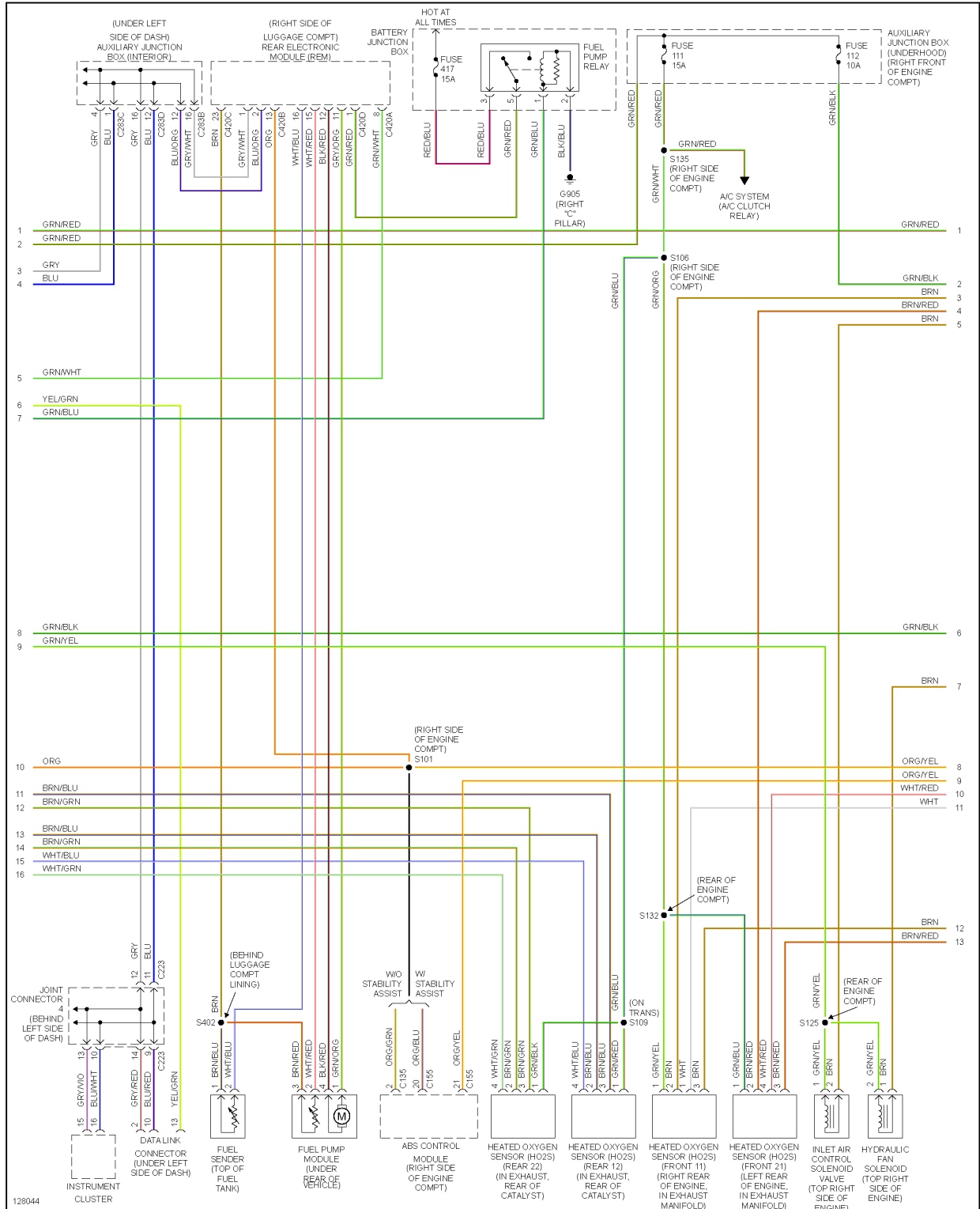


Fig. 22: 3.9L, Engine Performance Circuit (3 of 4)

2000 Lincoln LS

2000 SYSTEM WIRING DIAGRAMS Lincoln - LS

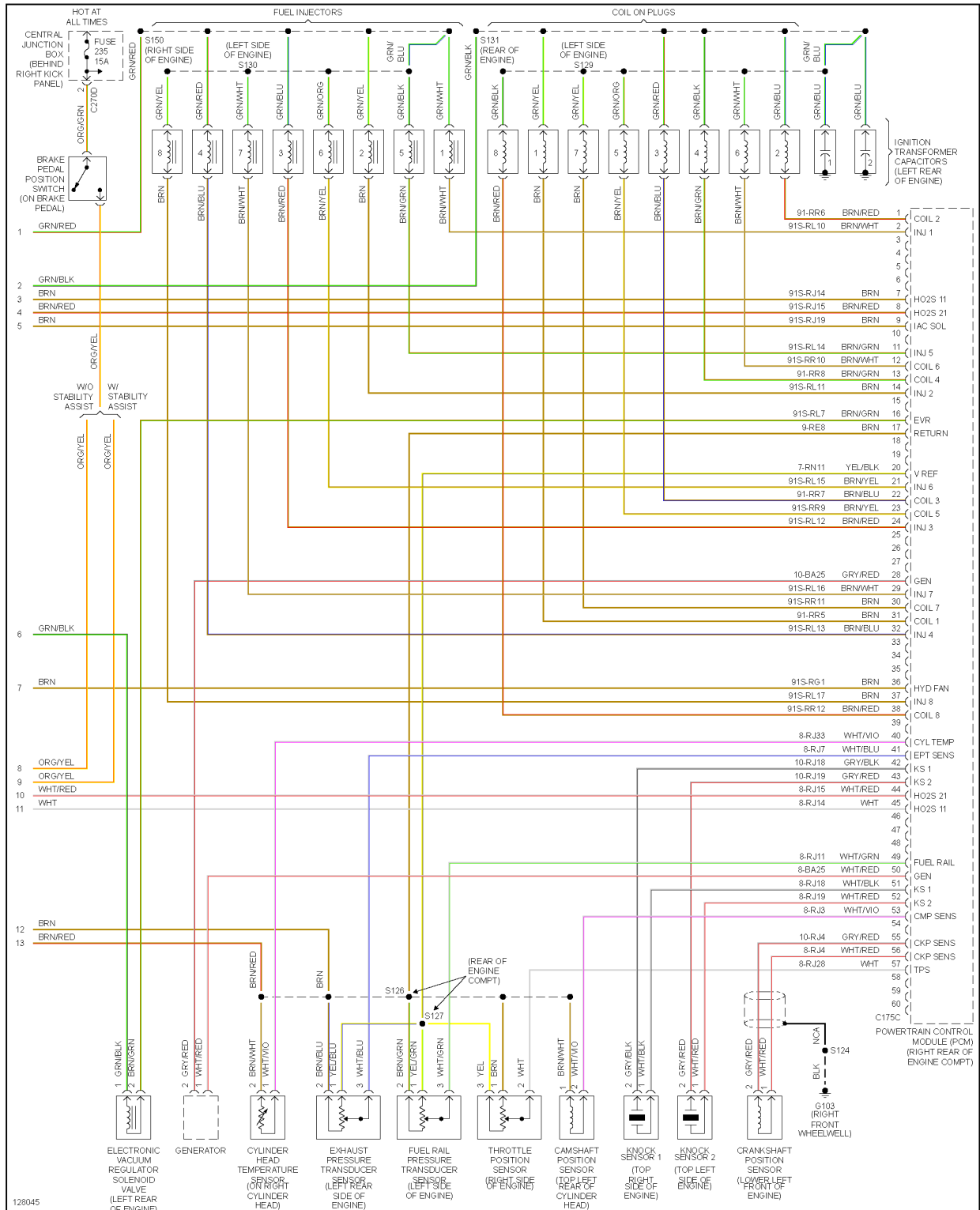


Fig. 23: 3.9L, Engine Performance Circuit (4 of 4)

EXTERIOR LIGHTS

2000 Lincoln LS

2000 SYSTEM WIRING DIAGRAMS Lincoln - LS

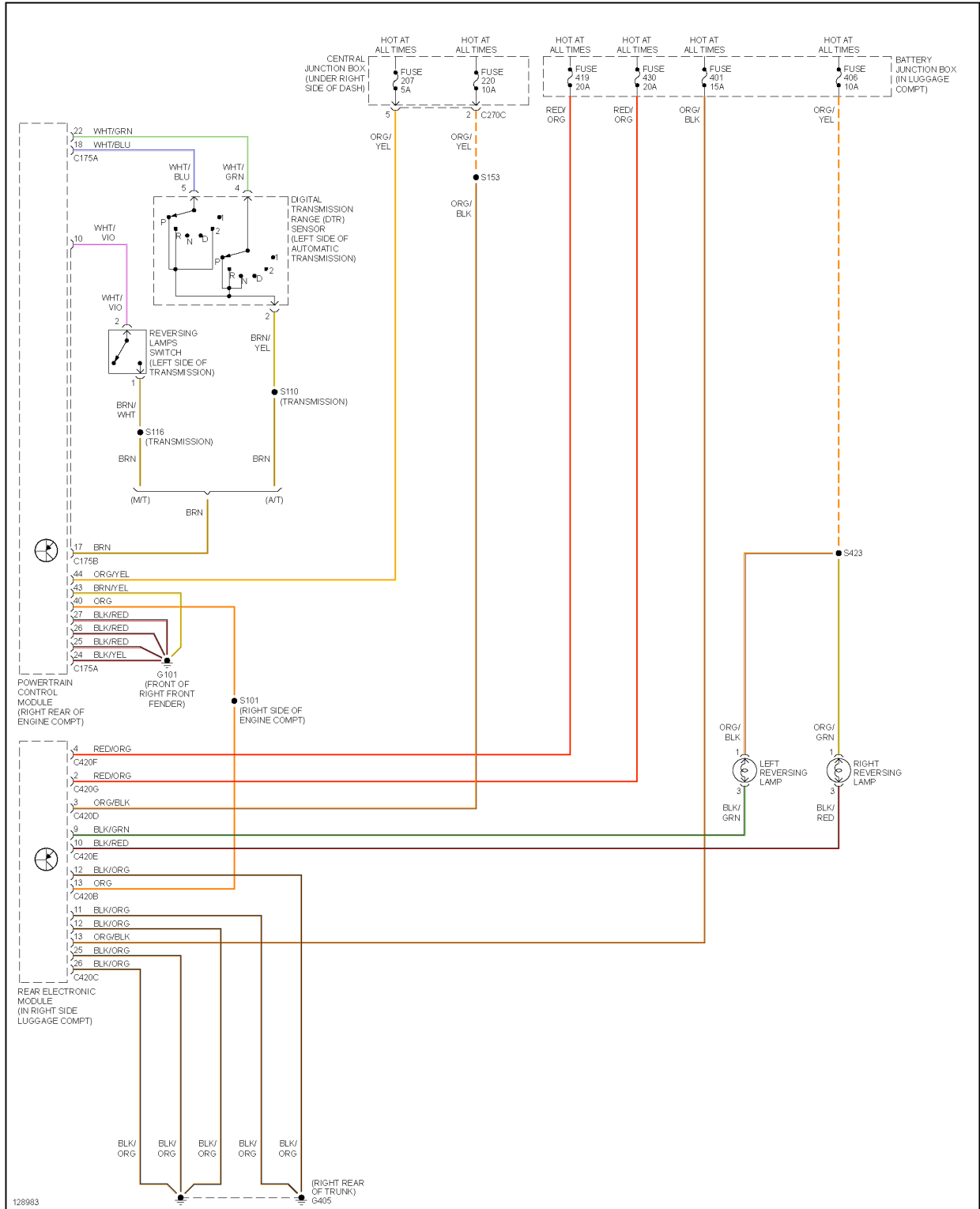


Fig. 24: Backup Lamps Circuit

2000 Lincoln LS

2000 SYSTEM WIRING DIAGRAMS Lincoln - LS

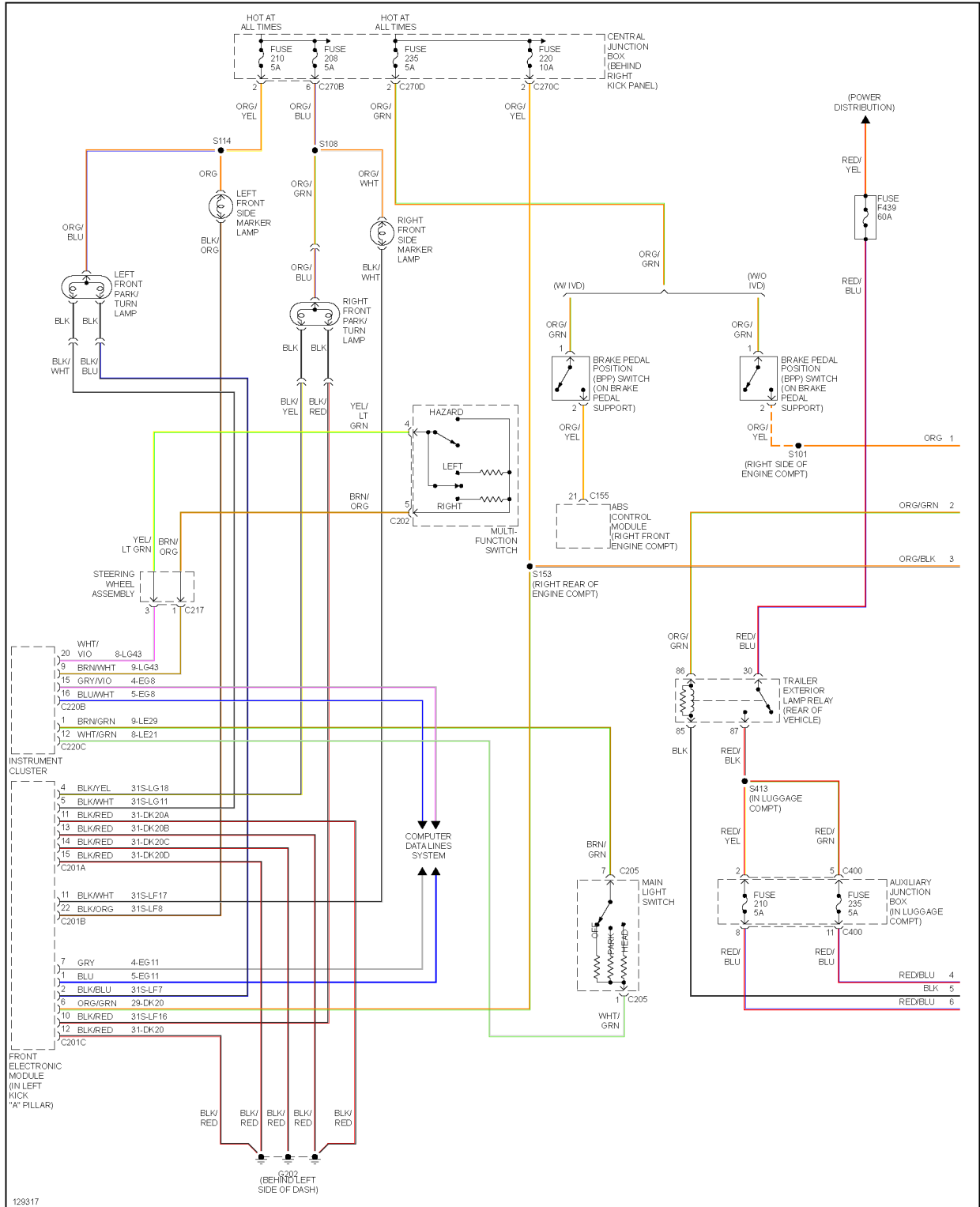


Fig. 25: Exterior Lamps Circuit (1 of 2)

2000 Lincoln LS

2000 SYSTEM WIRING DIAGRAMS Lincoln - LS

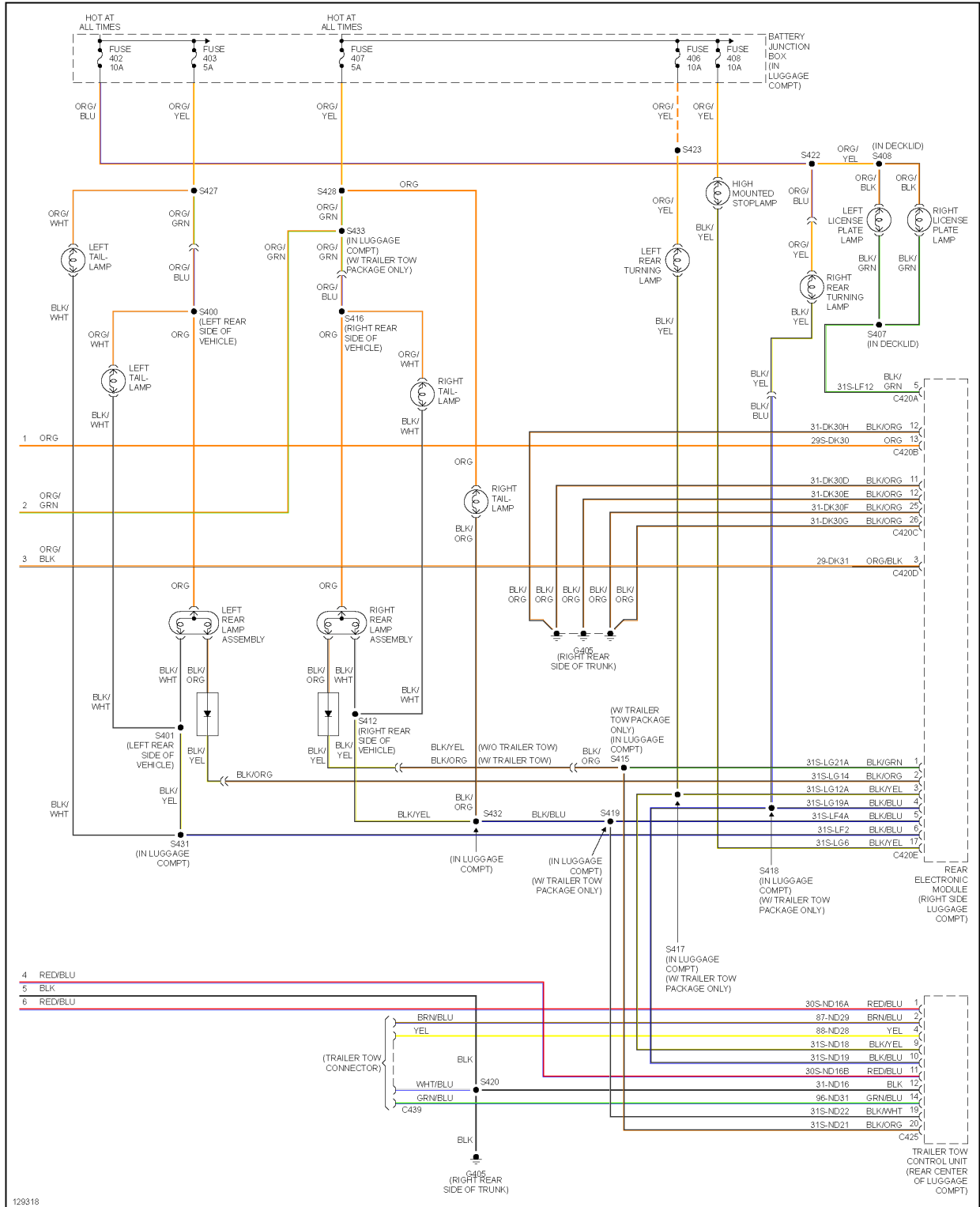
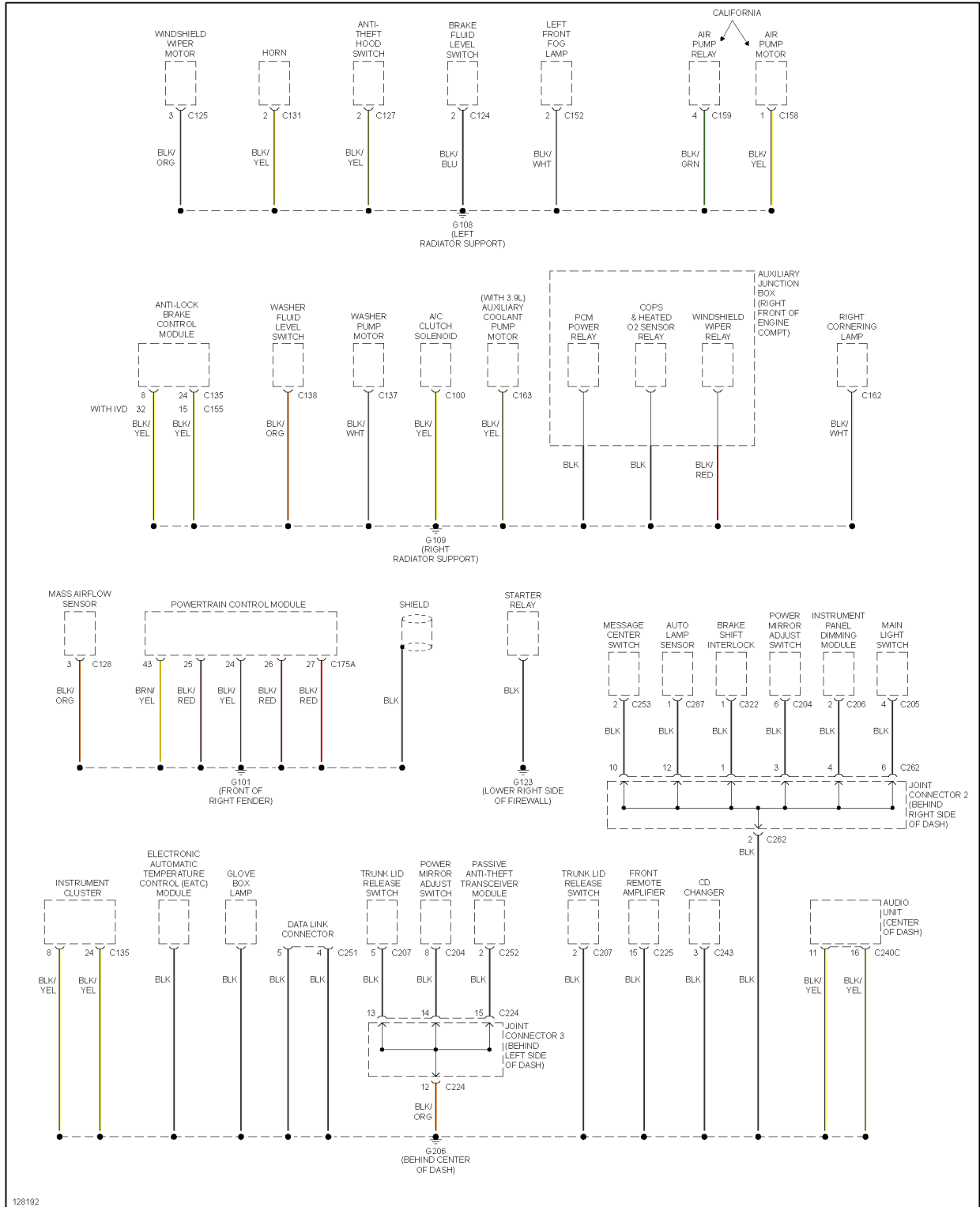


Fig. 26: Exterior Lamps Circuit (2 of 2)

GROUND DISTRIBUTION

2000 Lincoln LS

2000 SYSTEM WIRING DIAGRAMS Lincoln - LS



128192

Fig. 27: Ground Distribution Circuit (1 of 3)

2000 Lincoln LS

2000 SYSTEM WIRING DIAGRAMS Lincoln - LS

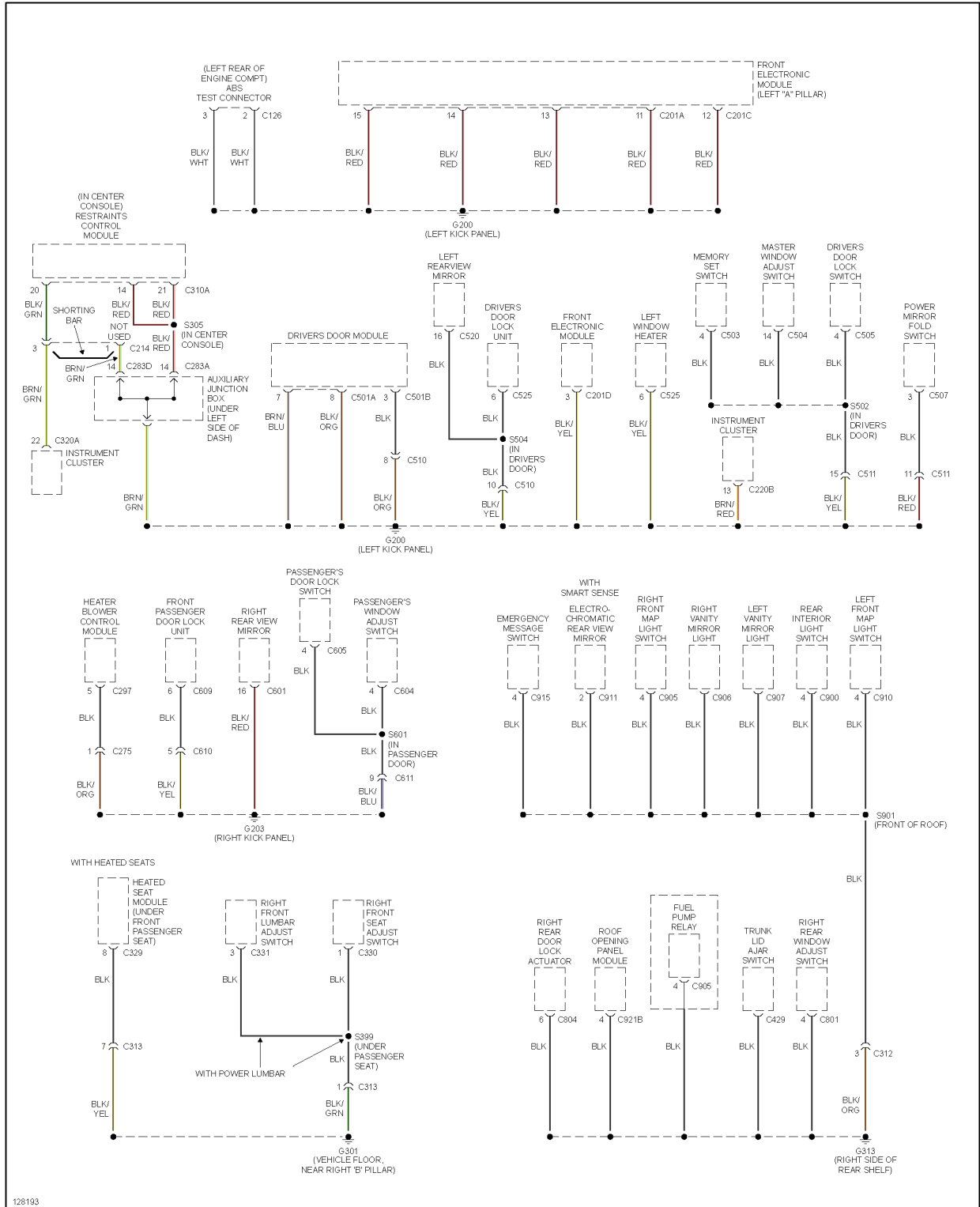


Fig. 28: Ground Distribution Circuit (2 of 3)

2000 Lincoln LS

2000 SYSTEM WIRING DIAGRAMS Lincoln - LS

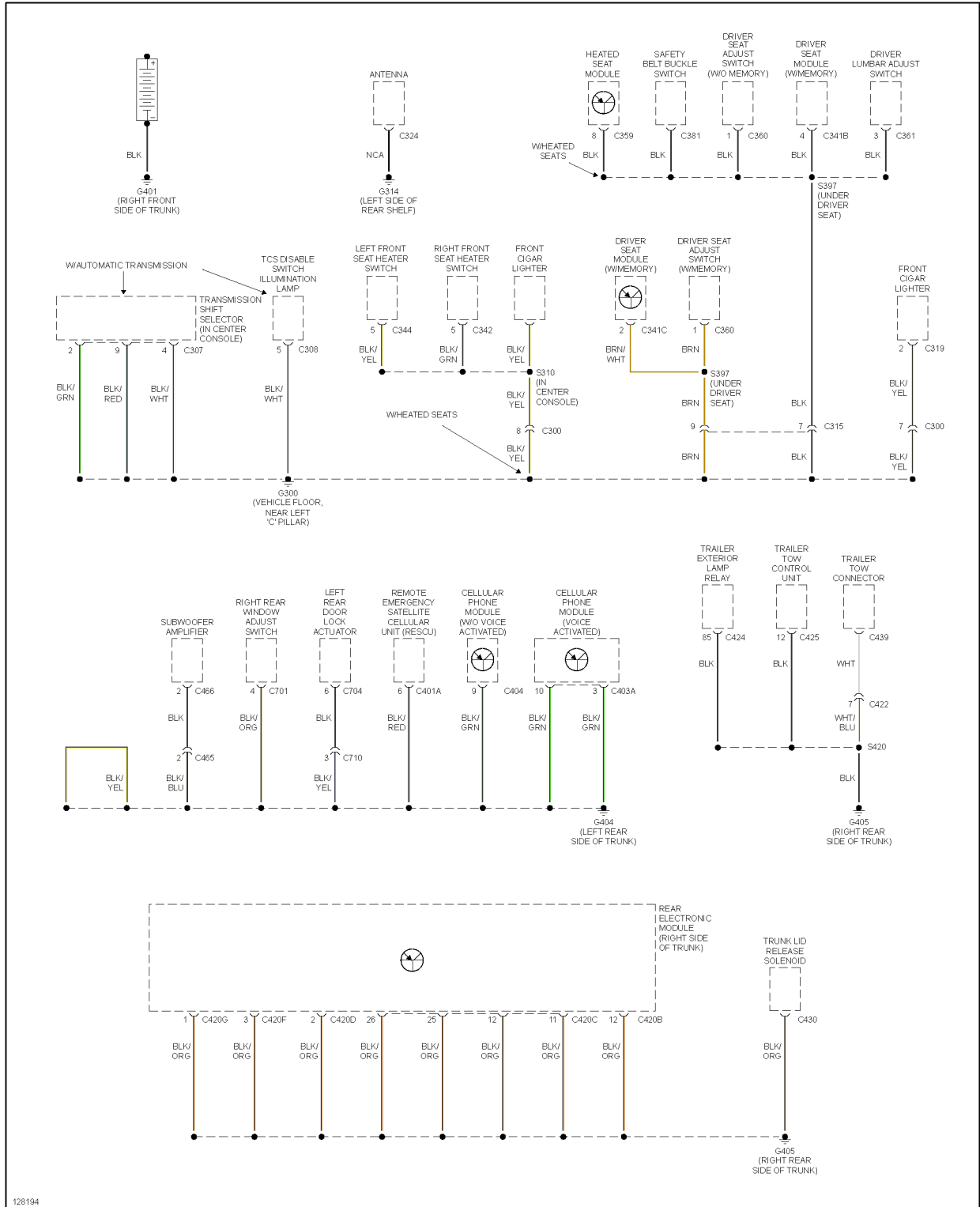


Fig. 29: Ground Distribution Circuit (3 of 3)

HEADLIGHTS

2000 Lincoln LS

2000 SYSTEM WIRING DIAGRAMS Lincoln - LS

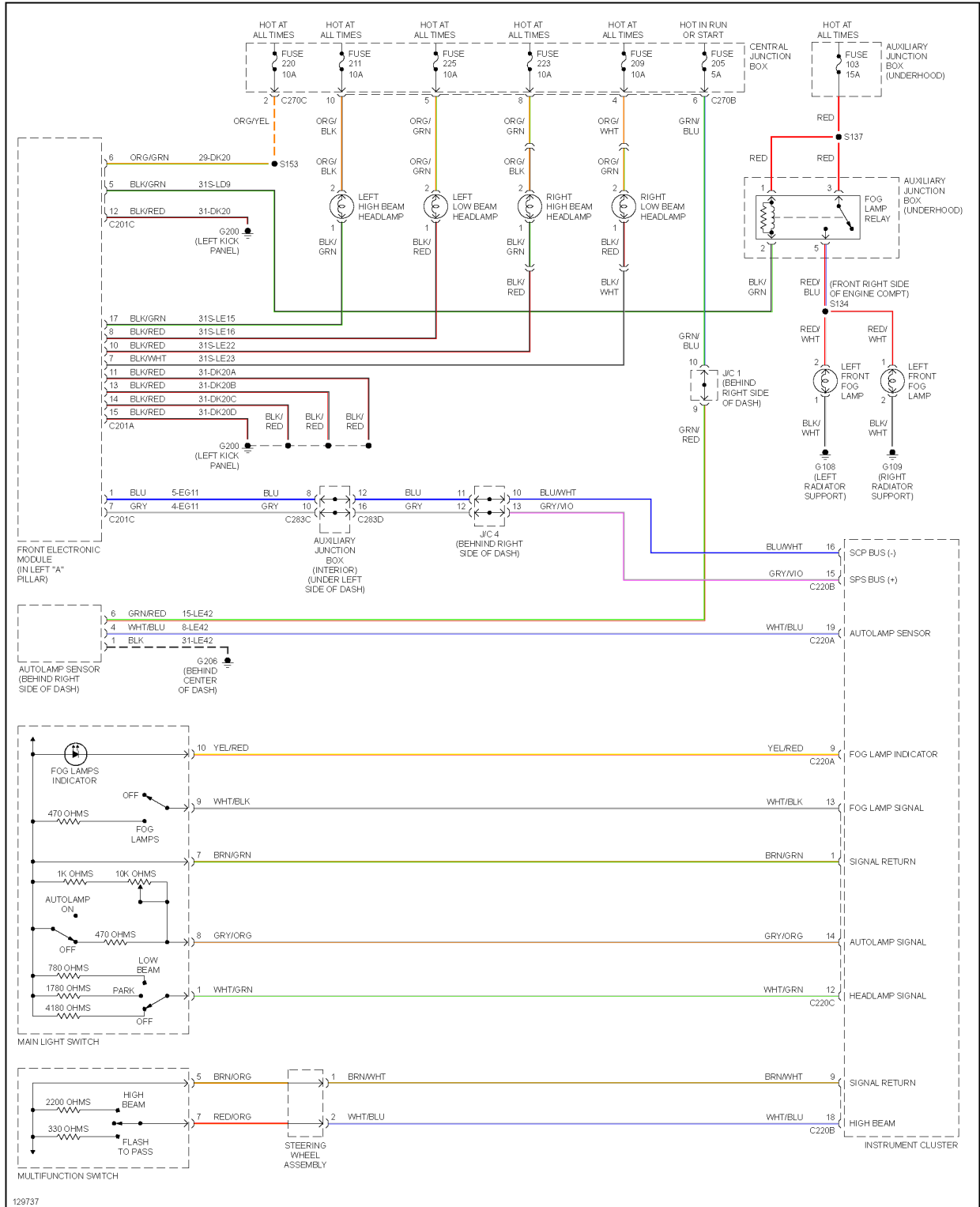


Fig. 30: Headlights Circuit

HORN

2000 Lincoln LS

2000 SYSTEM WIRING DIAGRAMS Lincoln - LS

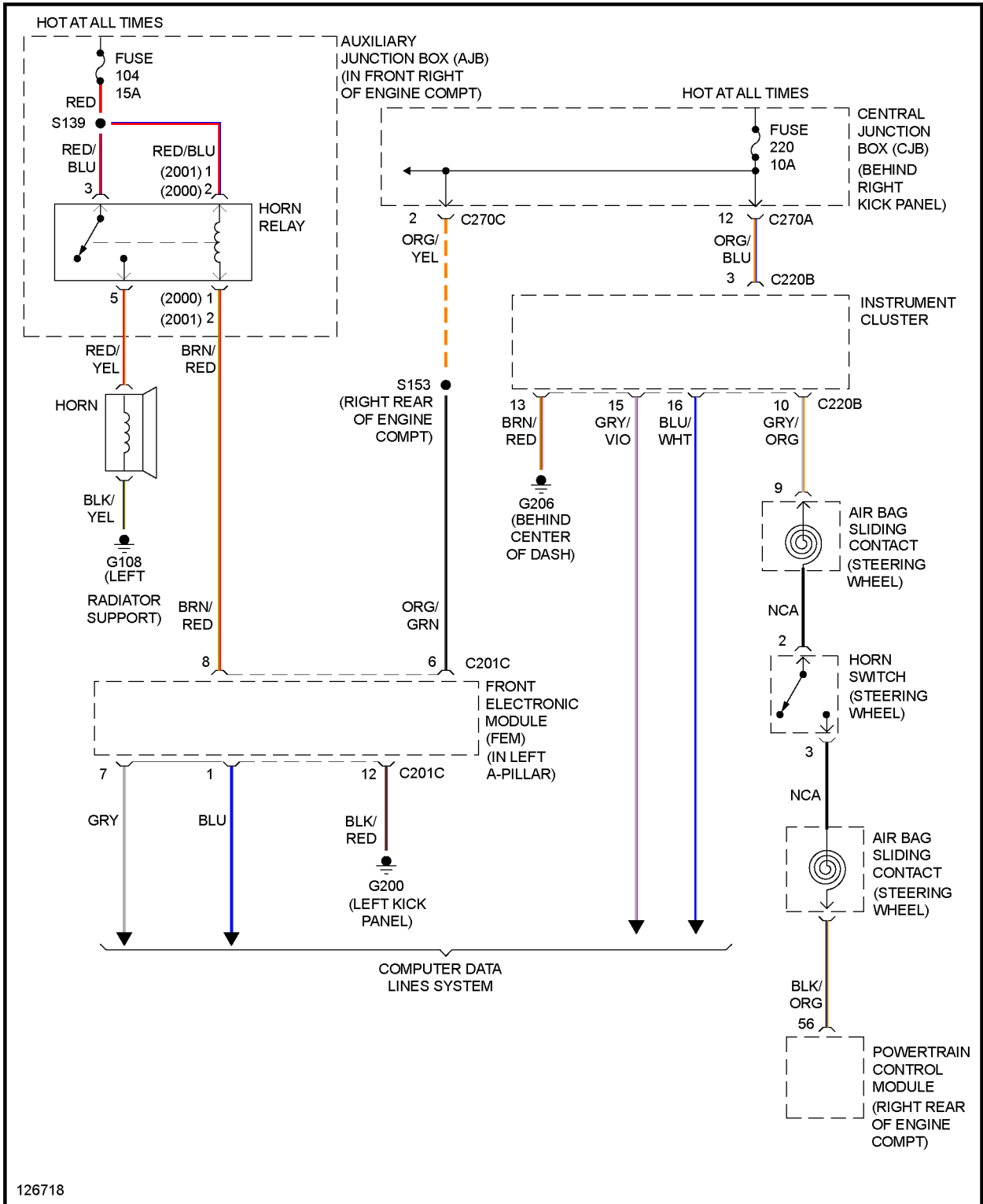


Fig. 31: Horn Circuit

2000 Lincoln LS

2000 SYSTEM WIRING DIAGRAMS Lincoln - LS

INSTRUMENT CLUSTER

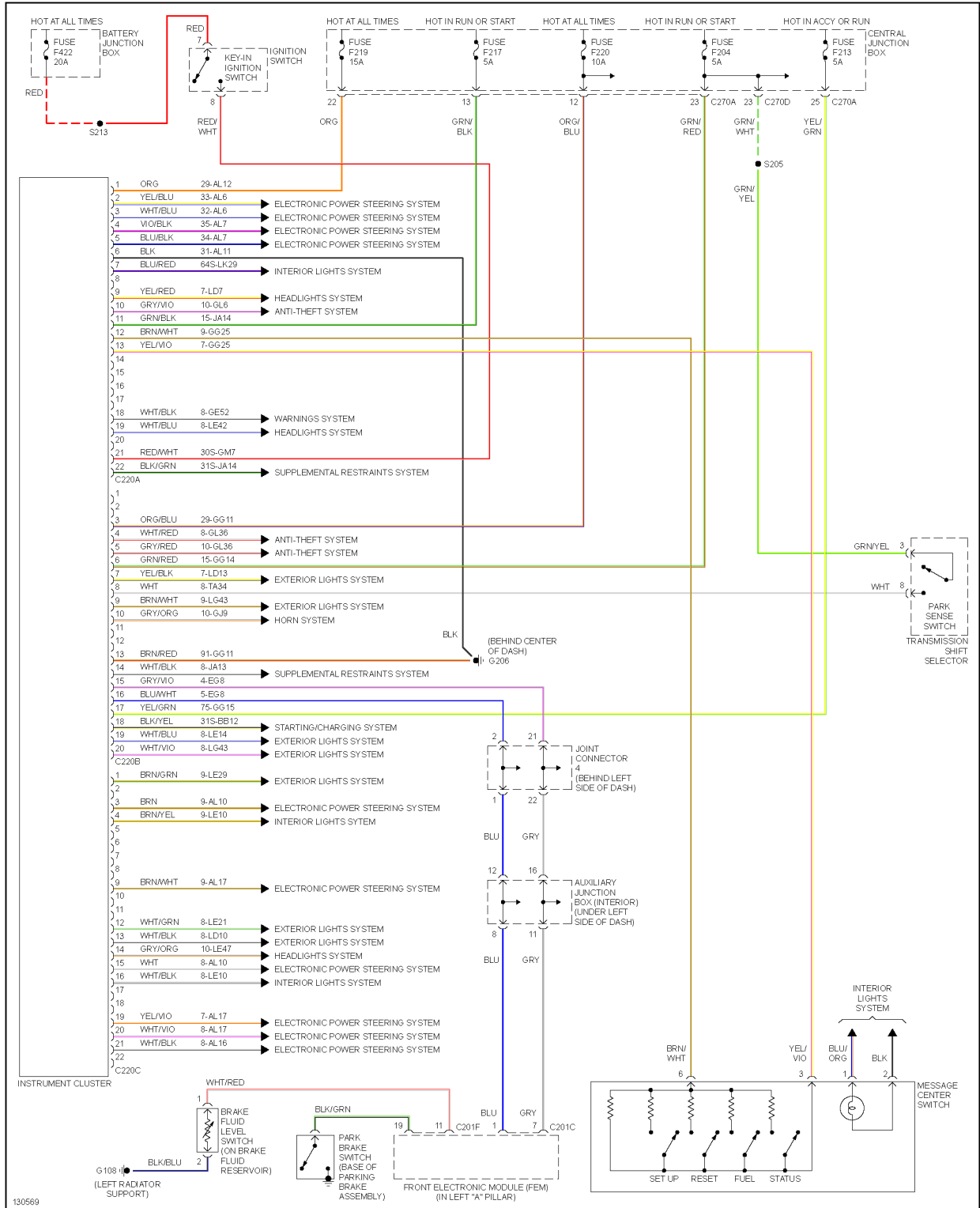


Fig. 32: Instrument Cluster Circuit

2000 Lincoln LS

2000 SYSTEM WIRING DIAGRAMS Lincoln - LS

INTERIOR LIGHTS

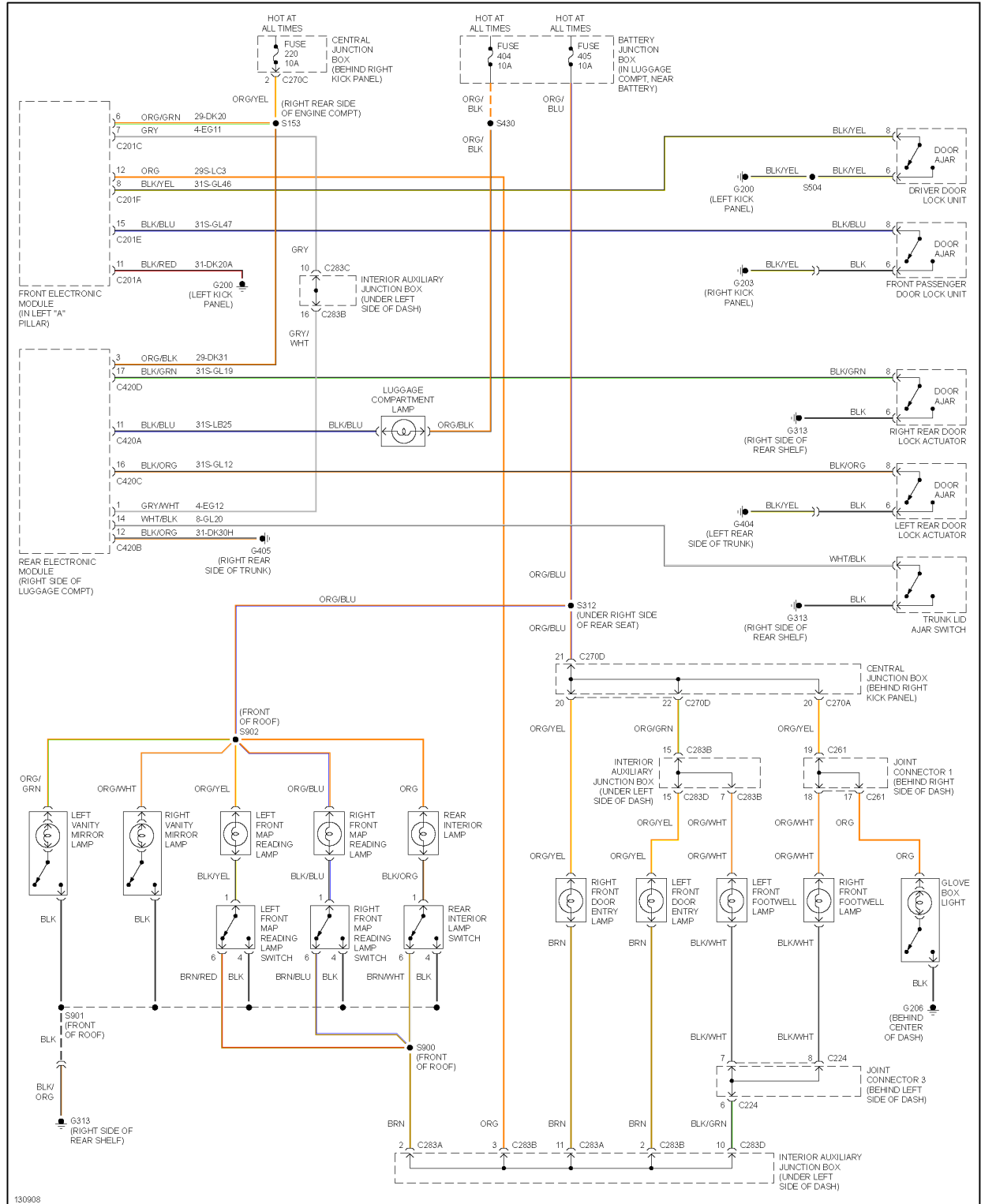


Fig. 33: Courtesy Lamps Circuit

2000 Lincoln LS

2000 SYSTEM WIRING DIAGRAMS Lincoln - LS

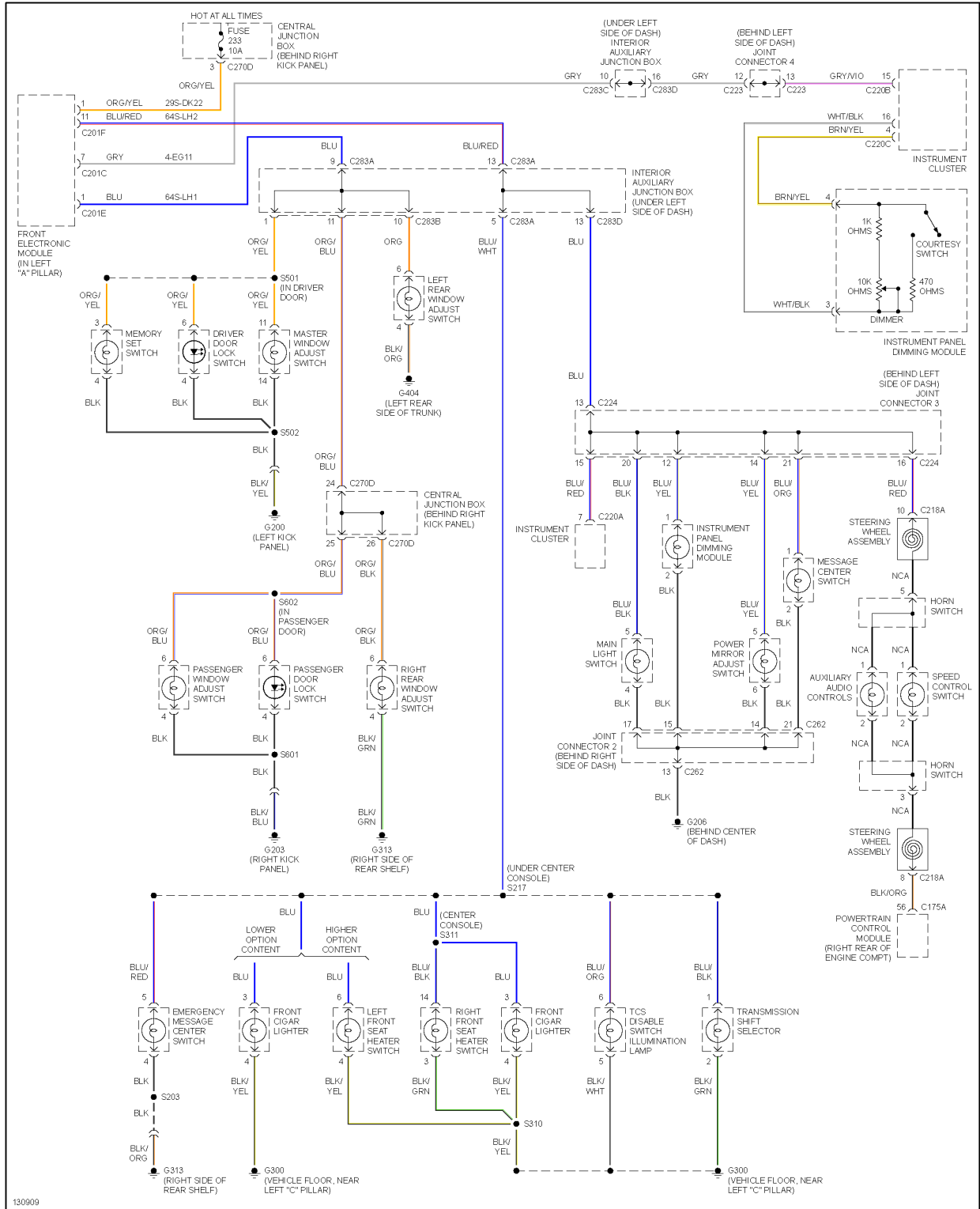


Fig. 34: Instrument Illumination Circuit

MEMORY SYSTEMS

2000 Lincoln LS

2000 SYSTEM WIRING DIAGRAMS Lincoln - LS

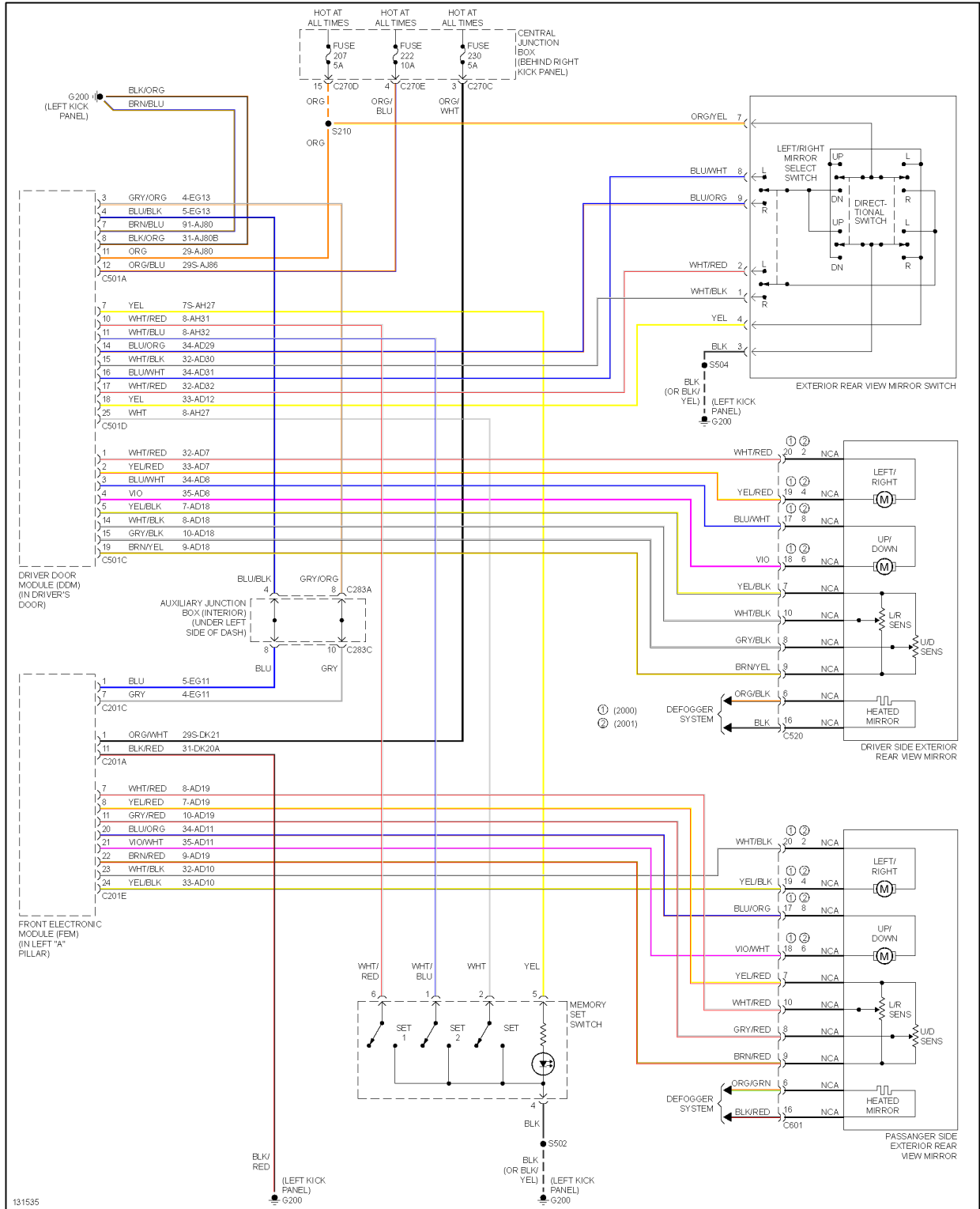


Fig. 35: Memory Mirrors Circuit

2000 Lincoln LS

2000 SYSTEM WIRING DIAGRAMS Lincoln - LS

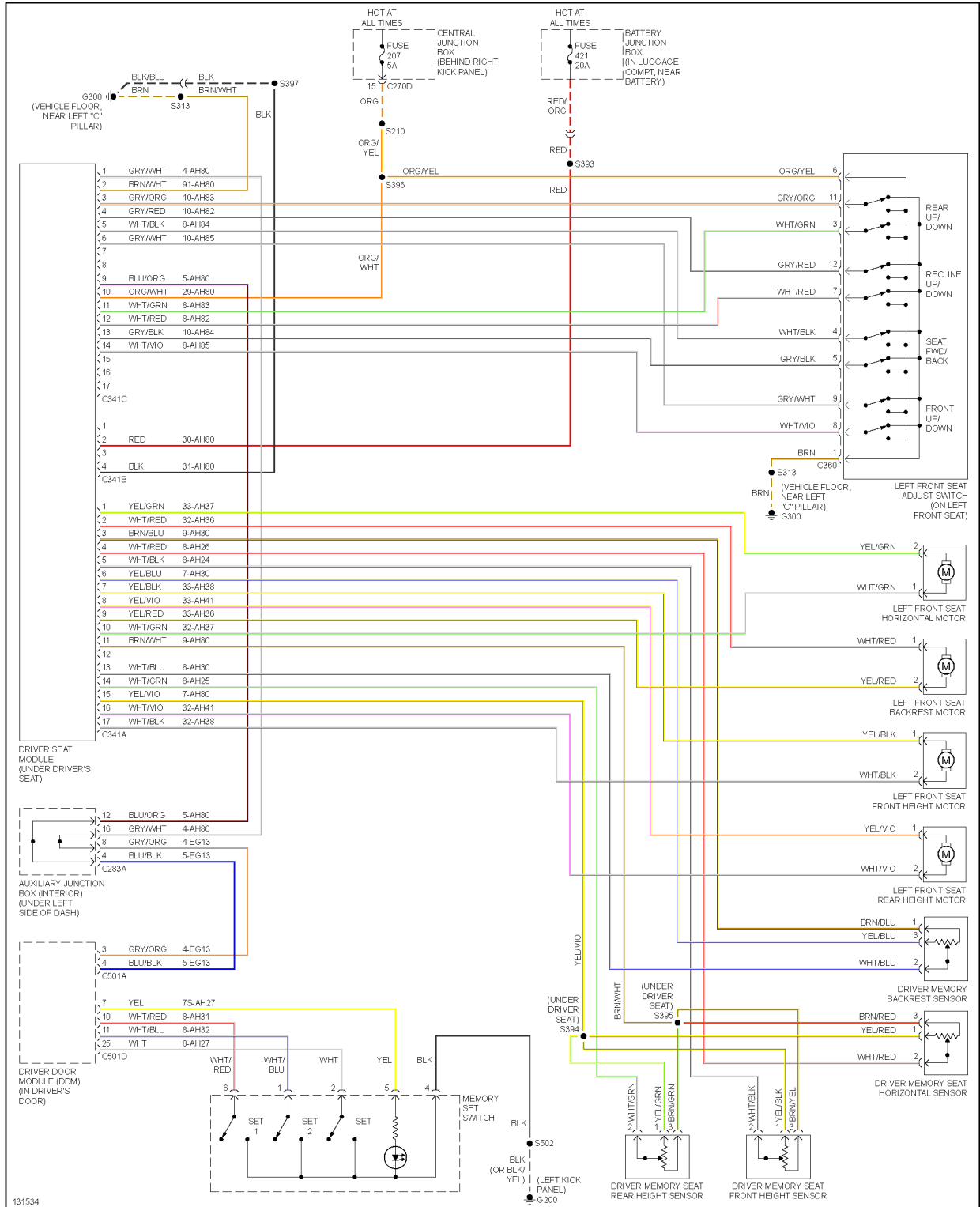


Fig. 36: Memory Seat Circuit

2000 Lincoln LS

2000 SYSTEM WIRING DIAGRAMS Lincoln - LS

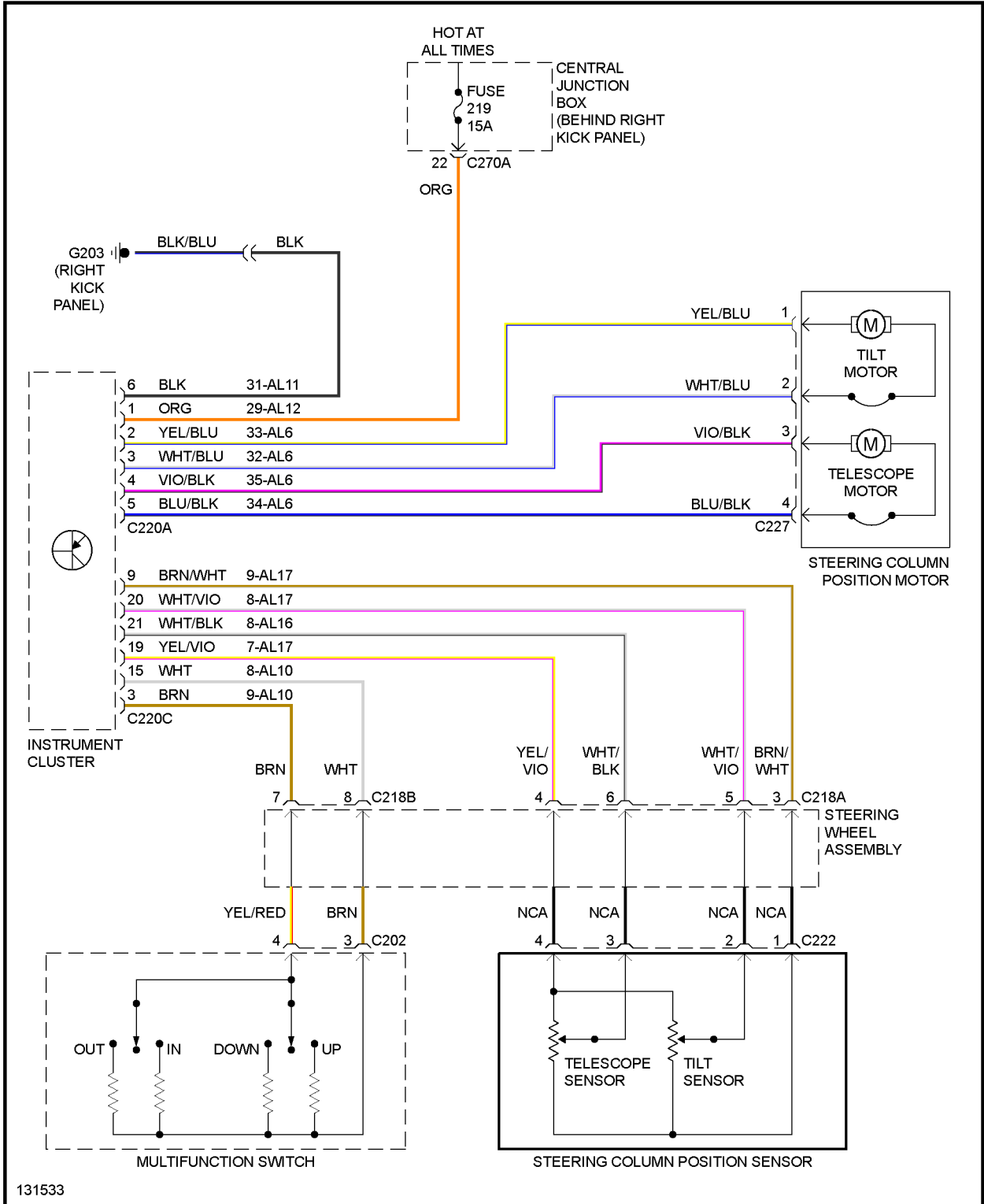


Fig. 37: Steering Column Memory Circuit

NAVIGATION

2000 Lincoln LS

2000 SYSTEM WIRING DIAGRAMS Lincoln - LS

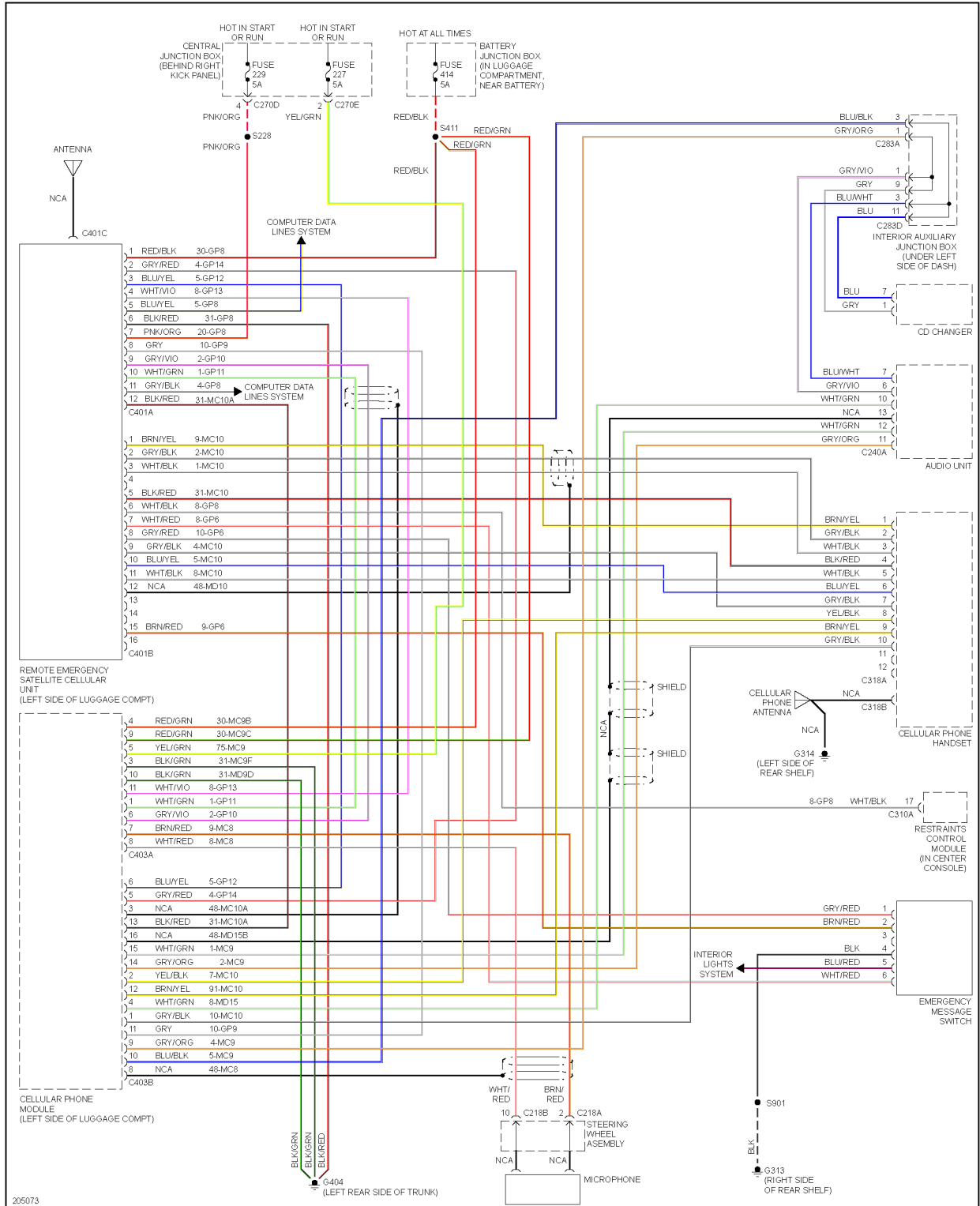


Fig. 38: Vehicle Emergency Messaging Circuit

POWER DISTRIBUTION

2000 Lincoln LS

2000 SYSTEM WIRING DIAGRAMS Lincoln - LS

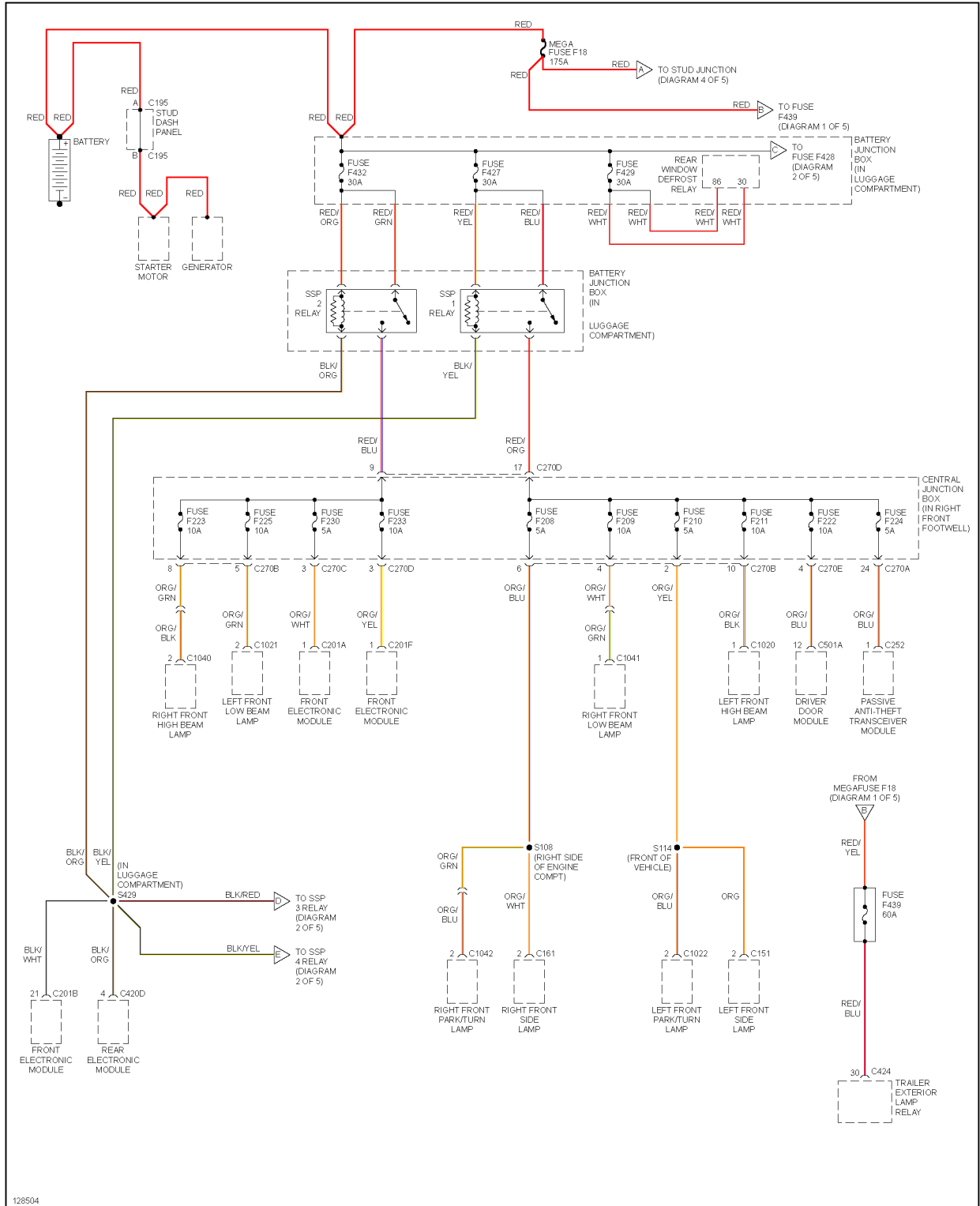


Fig. 39: Power Distribution Circuit (1 of 5)

2000 Lincoln LS

2000 SYSTEM WIRING DIAGRAMS Lincoln - LS

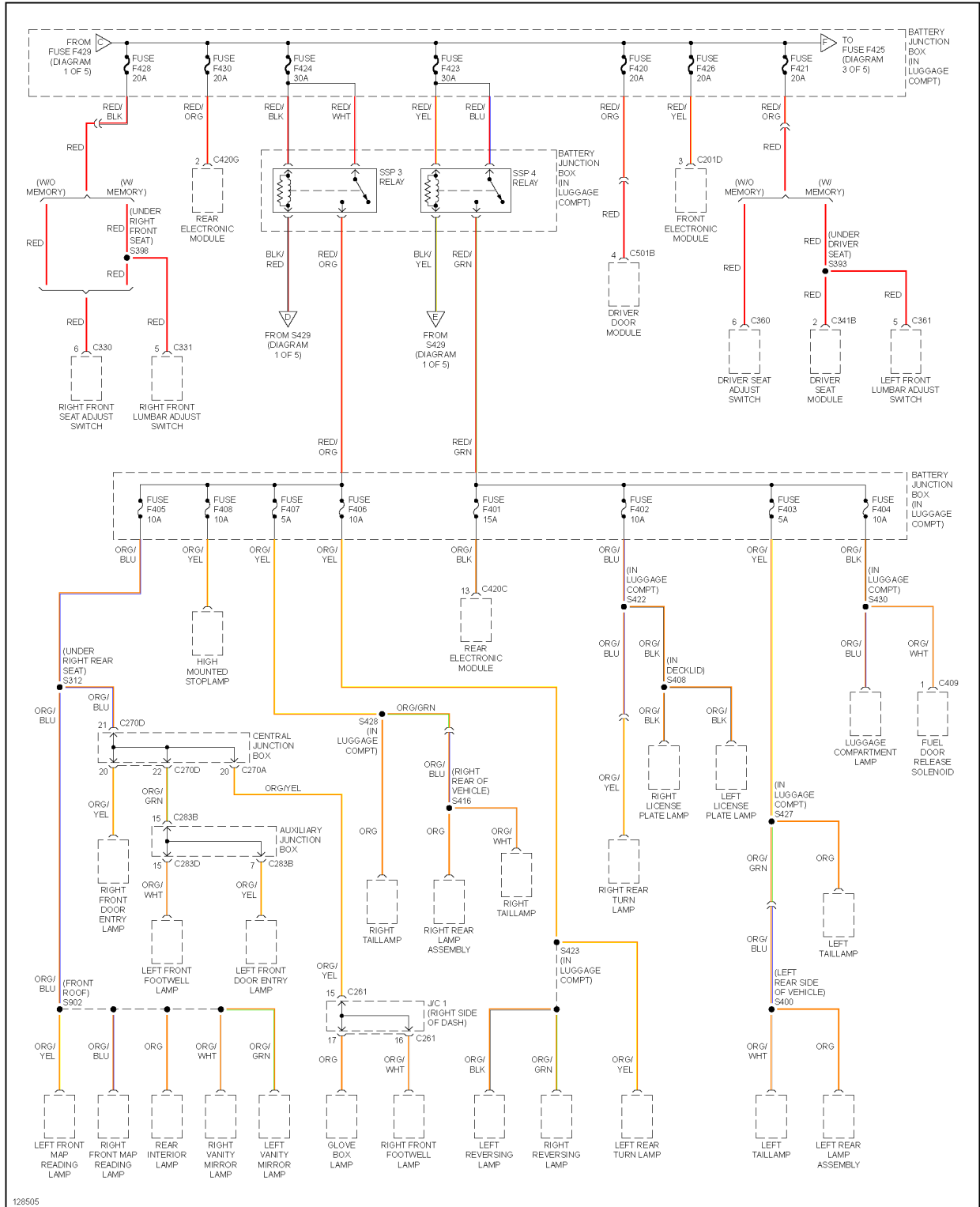


Fig. 40: Power Distribution Circuit (2 of 5)

2000 Lincoln LS

2000 SYSTEM WIRING DIAGRAMS Lincoln - LS

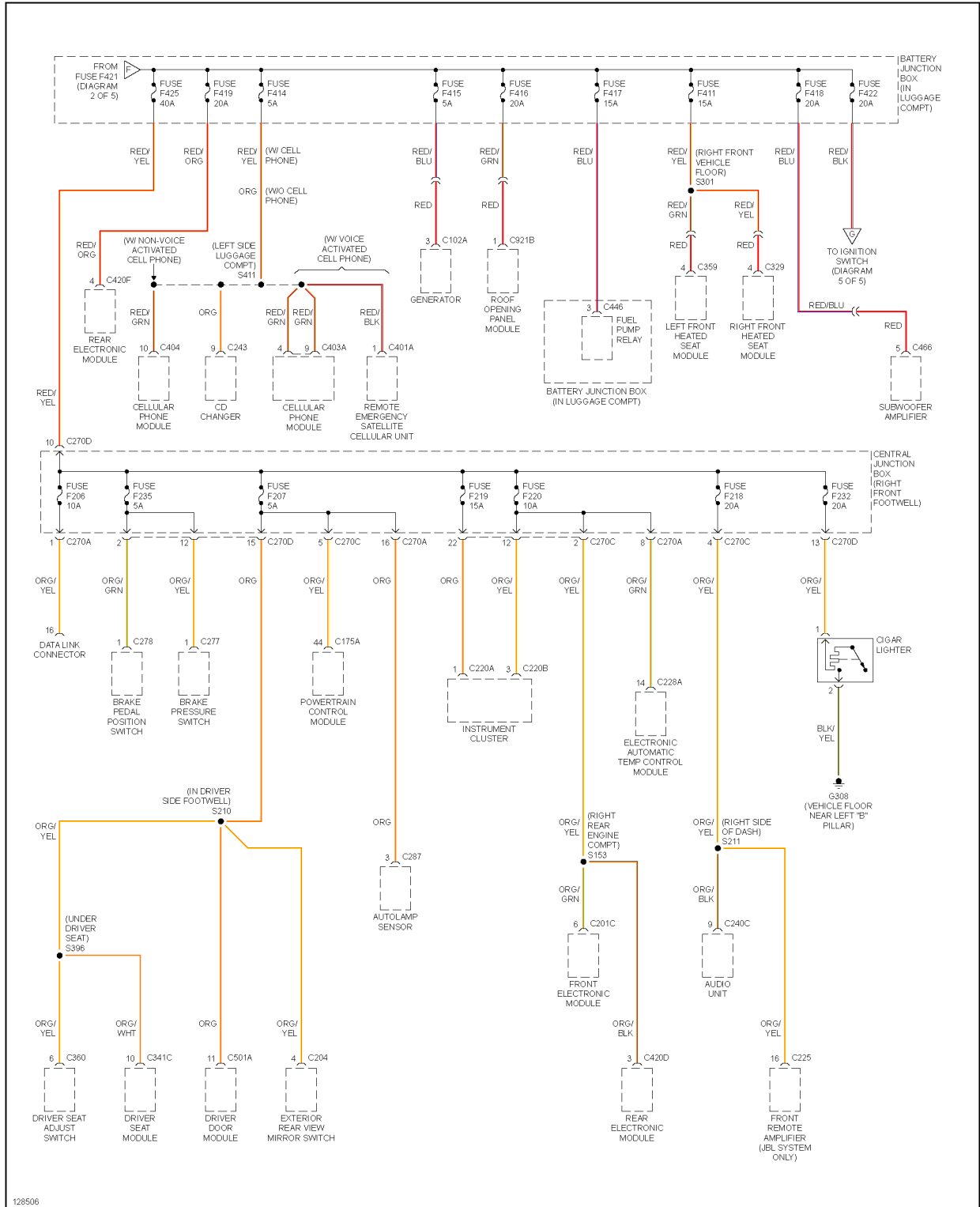


Fig. 41: Power Distribution Circuit (3 of 5)

2000 Lincoln LS

2000 SYSTEM WIRING DIAGRAMS Lincoln - LS

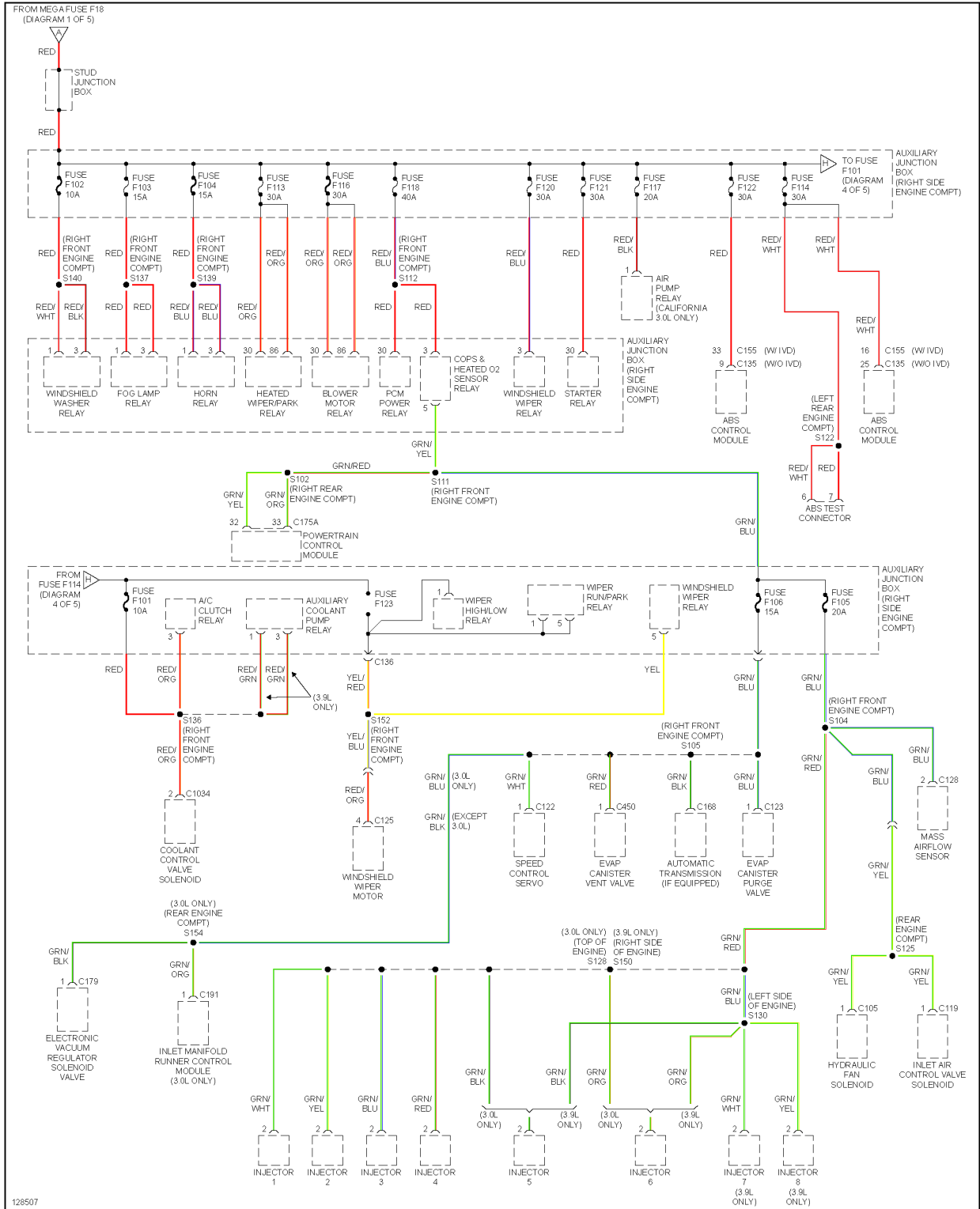


Fig. 42: Power Distribution Circuit (4 of 5)

2000 Lincoln LS

2000 SYSTEM WIRING DIAGRAMS Lincoln - LS

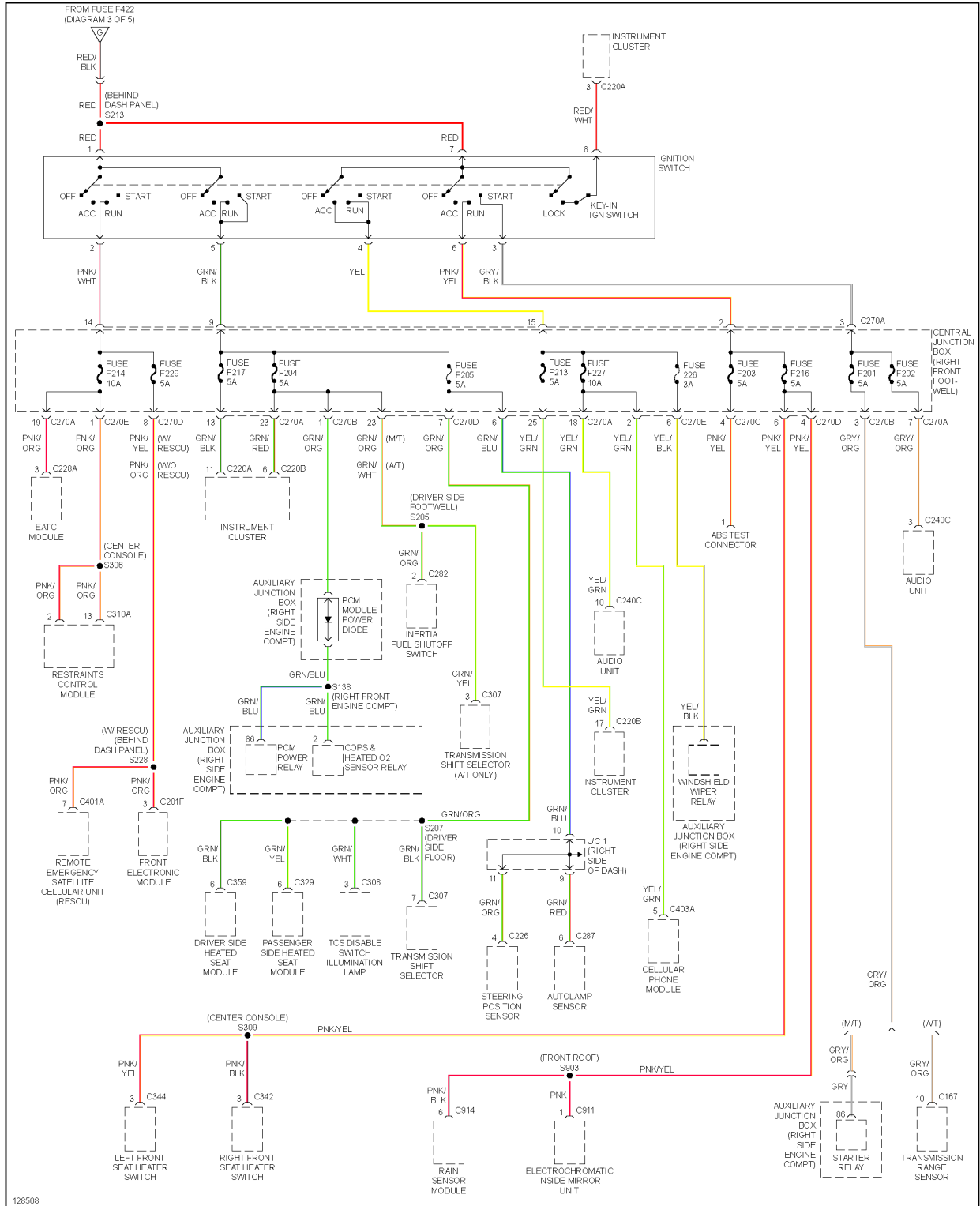


Fig. 43: Power Distribution Circuit (5 of 5)

POWER DOOR LOCKS

2000 Lincoln LS

2000 SYSTEM WIRING DIAGRAMS Lincoln - LS

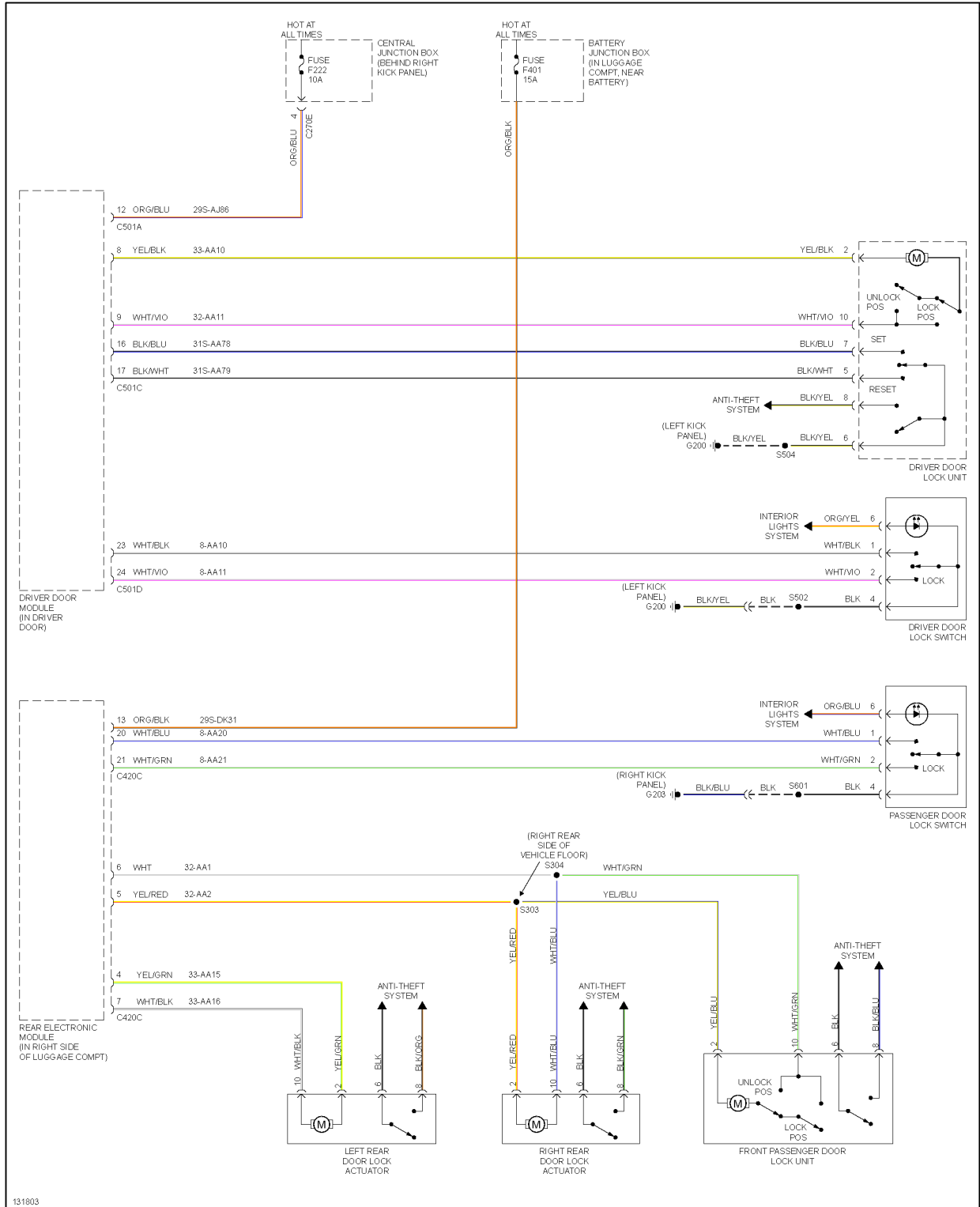


Fig. 44: Power Door Locks Circuit

POWER MIRRORS

2000 Lincoln LS

2000 SYSTEM WIRING DIAGRAMS Lincoln - LS

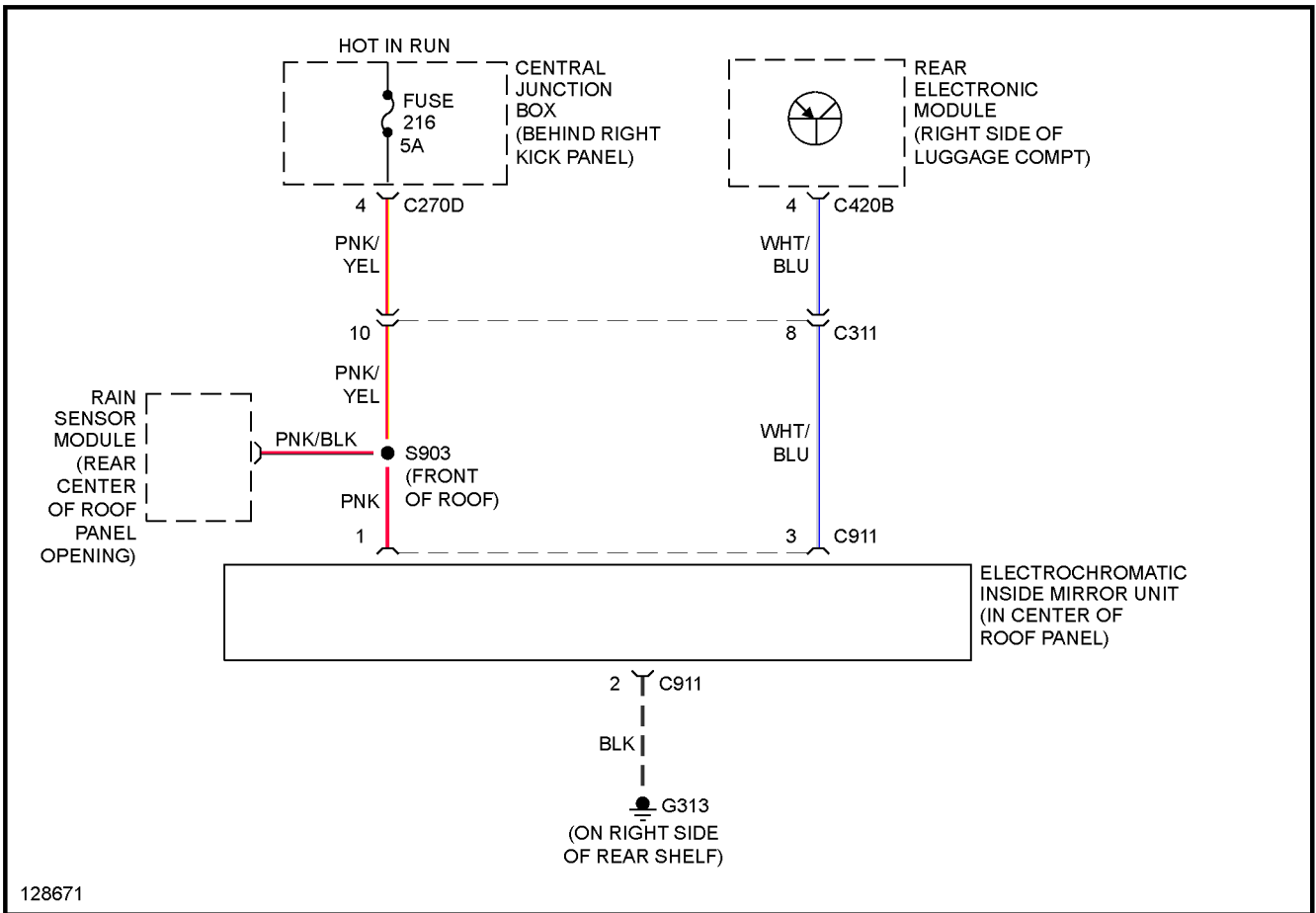


Fig. 45: Electrochromic Mirror Circuit

2000 Lincoln LS

2000 SYSTEM WIRING DIAGRAMS Lincoln - LS

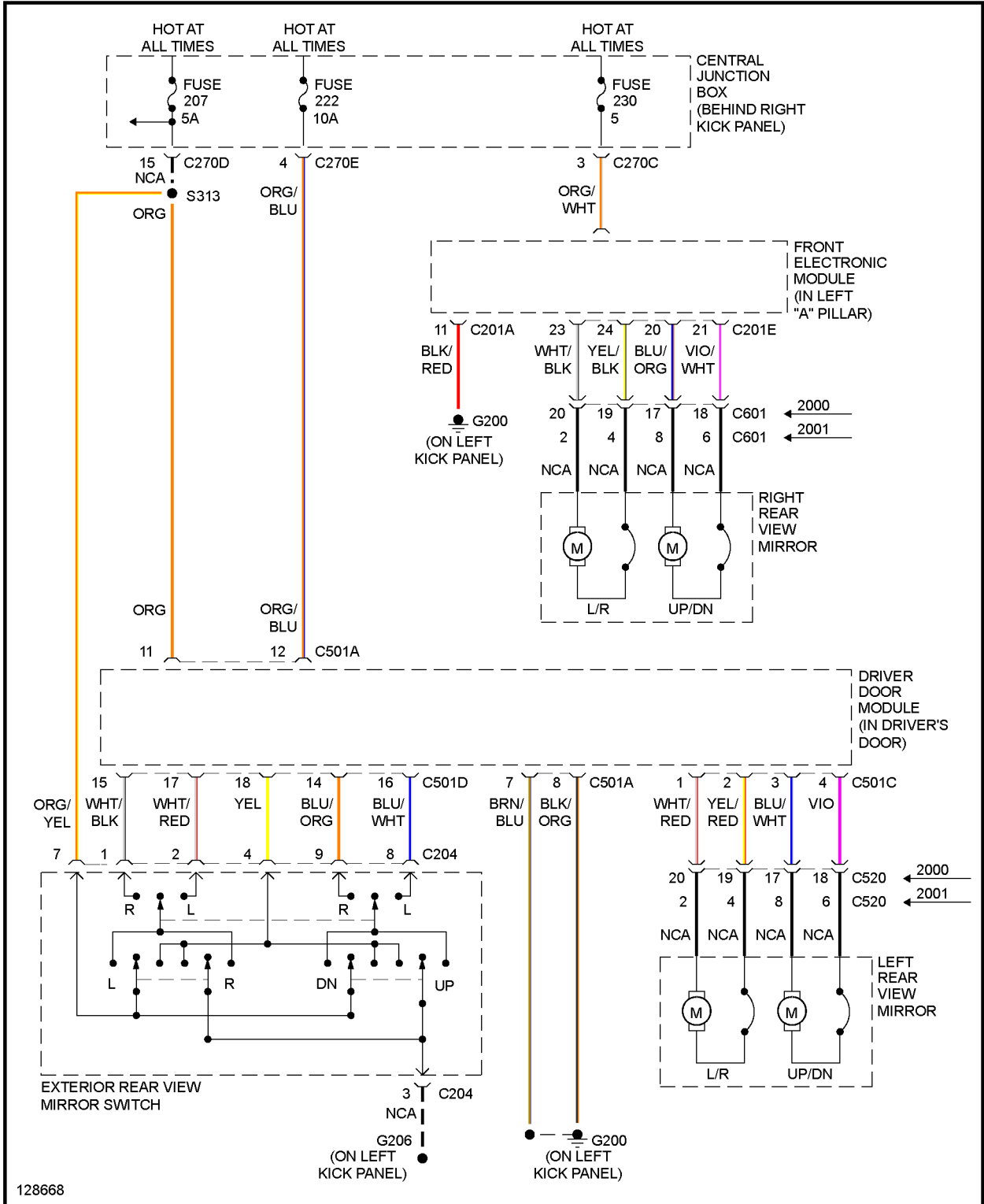


Fig. 46: Power Mirror Circuit

POWER SEATS

2000 Lincoln LS

2000 SYSTEM WIRING DIAGRAMS Lincoln - LS

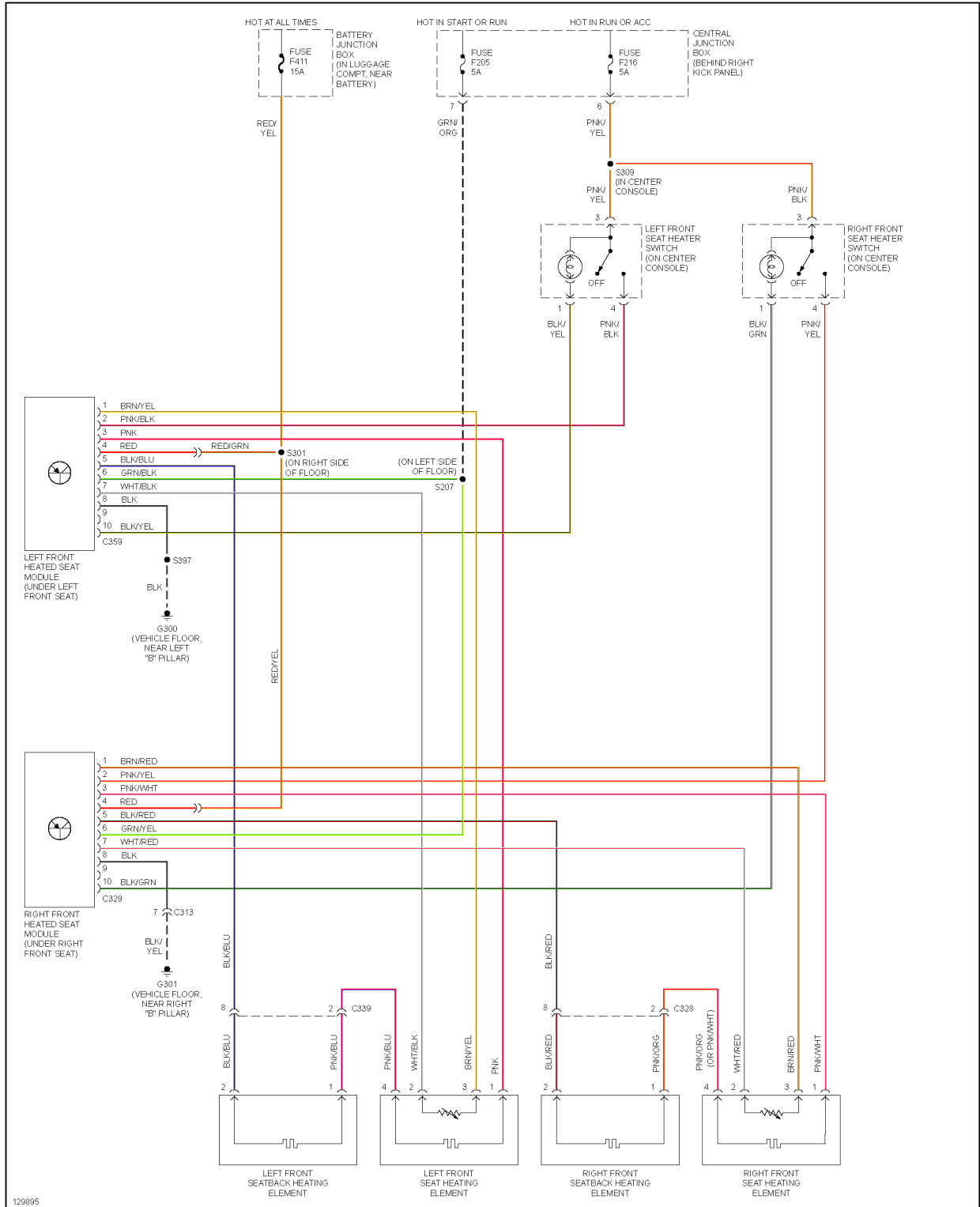


Fig. 47: Heated Seats Circuit

2000 Lincoln LS

2000 SYSTEM WIRING DIAGRAMS Lincoln - LS

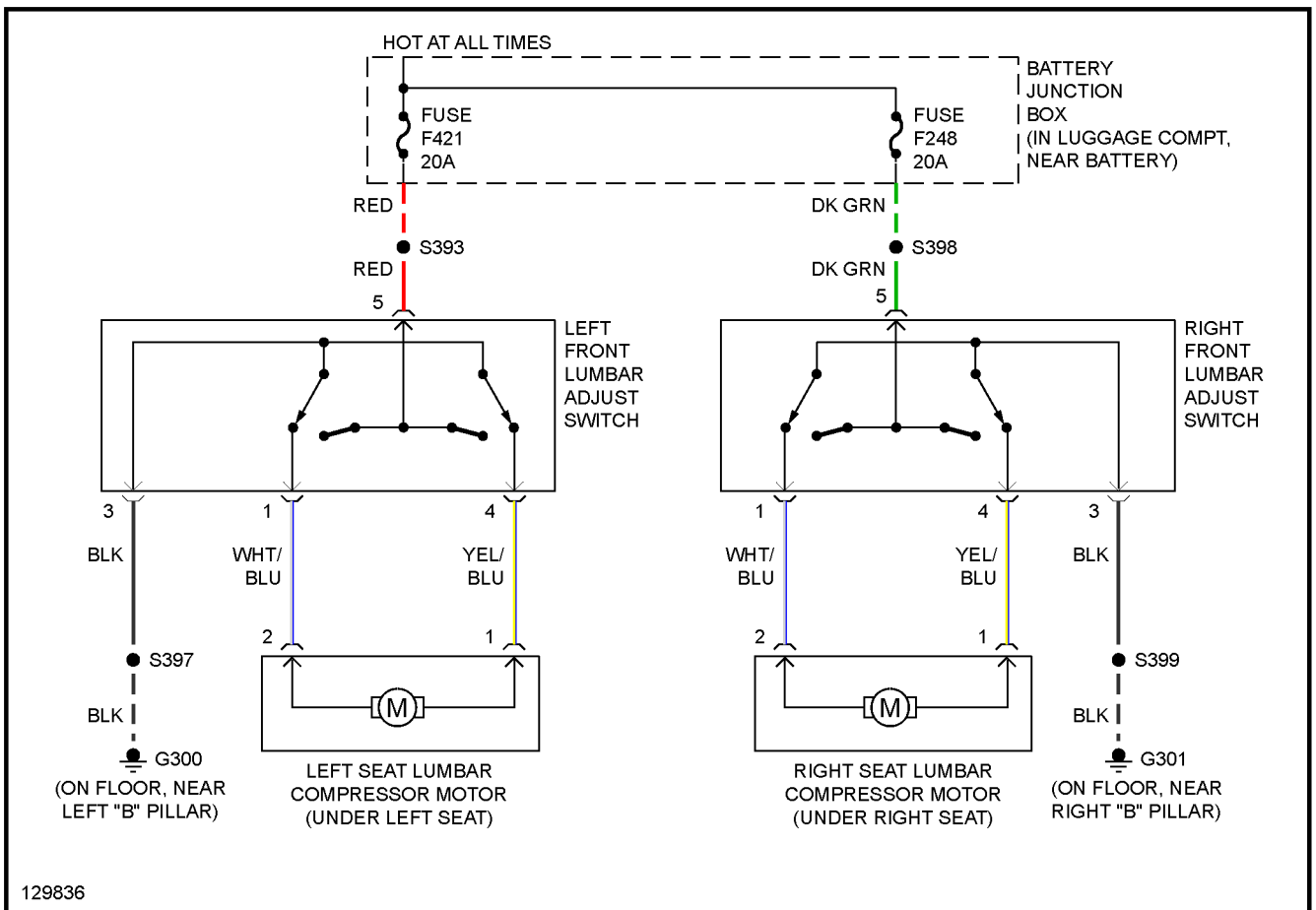


Fig. 48: Power Lumbar Seat Circuit

2000 Lincoln LS

2000 SYSTEM WIRING DIAGRAMS Lincoln - LS

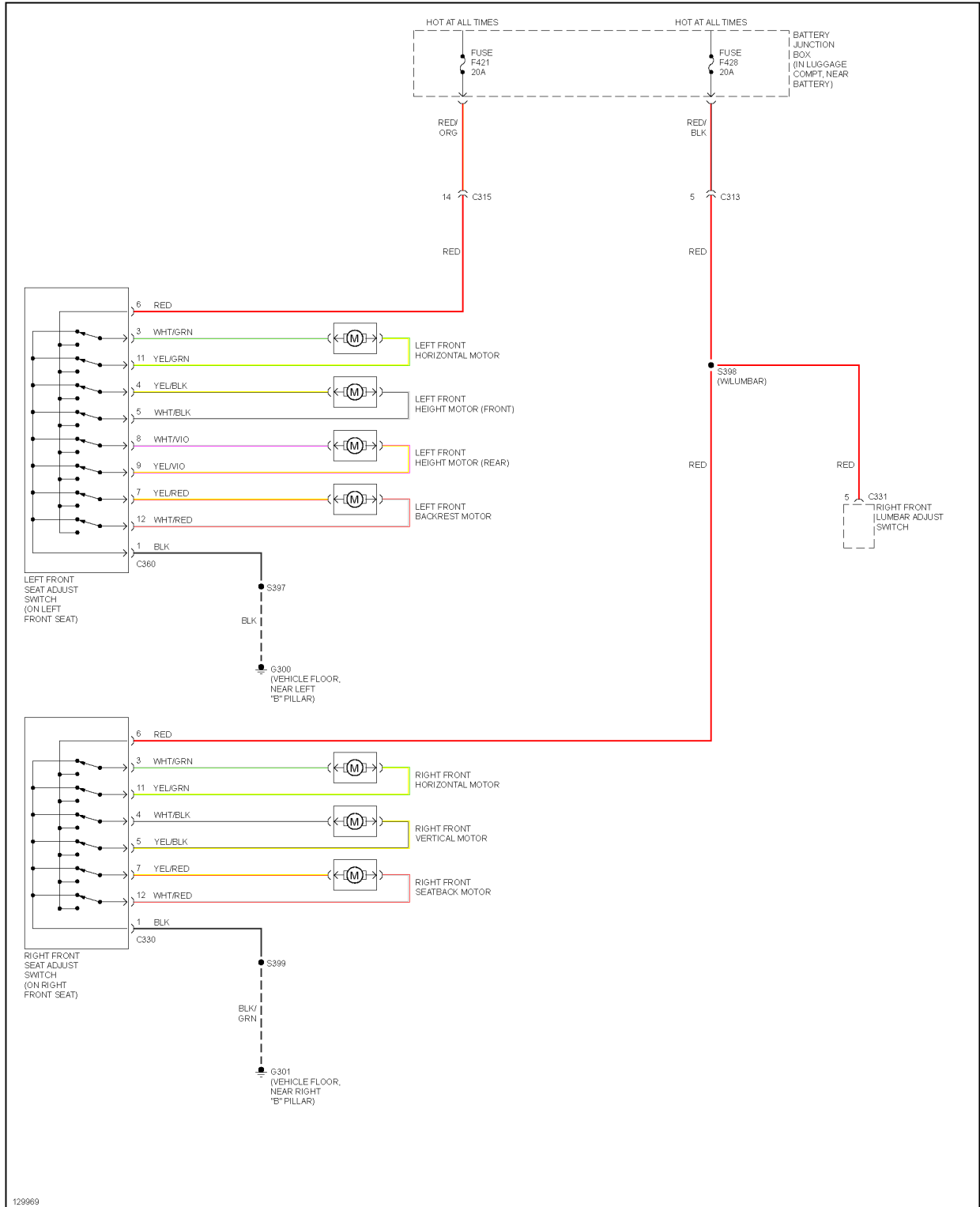


Fig. 49: Power Seats Circuit

POWER TOP/SUNROOF

2000 Lincoln LS

2000 SYSTEM WIRING DIAGRAMS Lincoln - LS

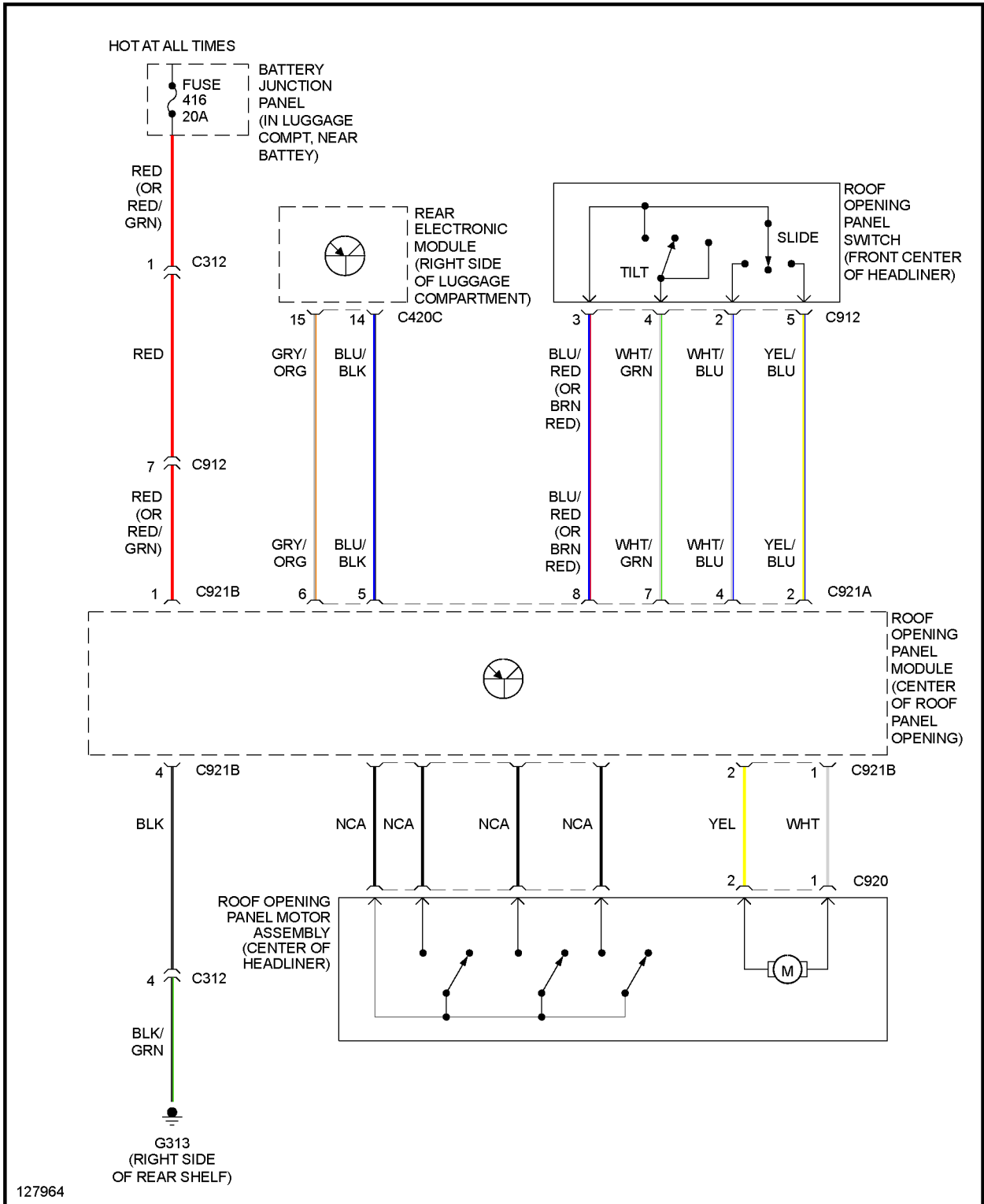


Fig. 50: Power Top/Sunroof Circuit

POWER WINDOWS

2000 Lincoln LS

2000 SYSTEM WIRING DIAGRAMS Lincoln - LS

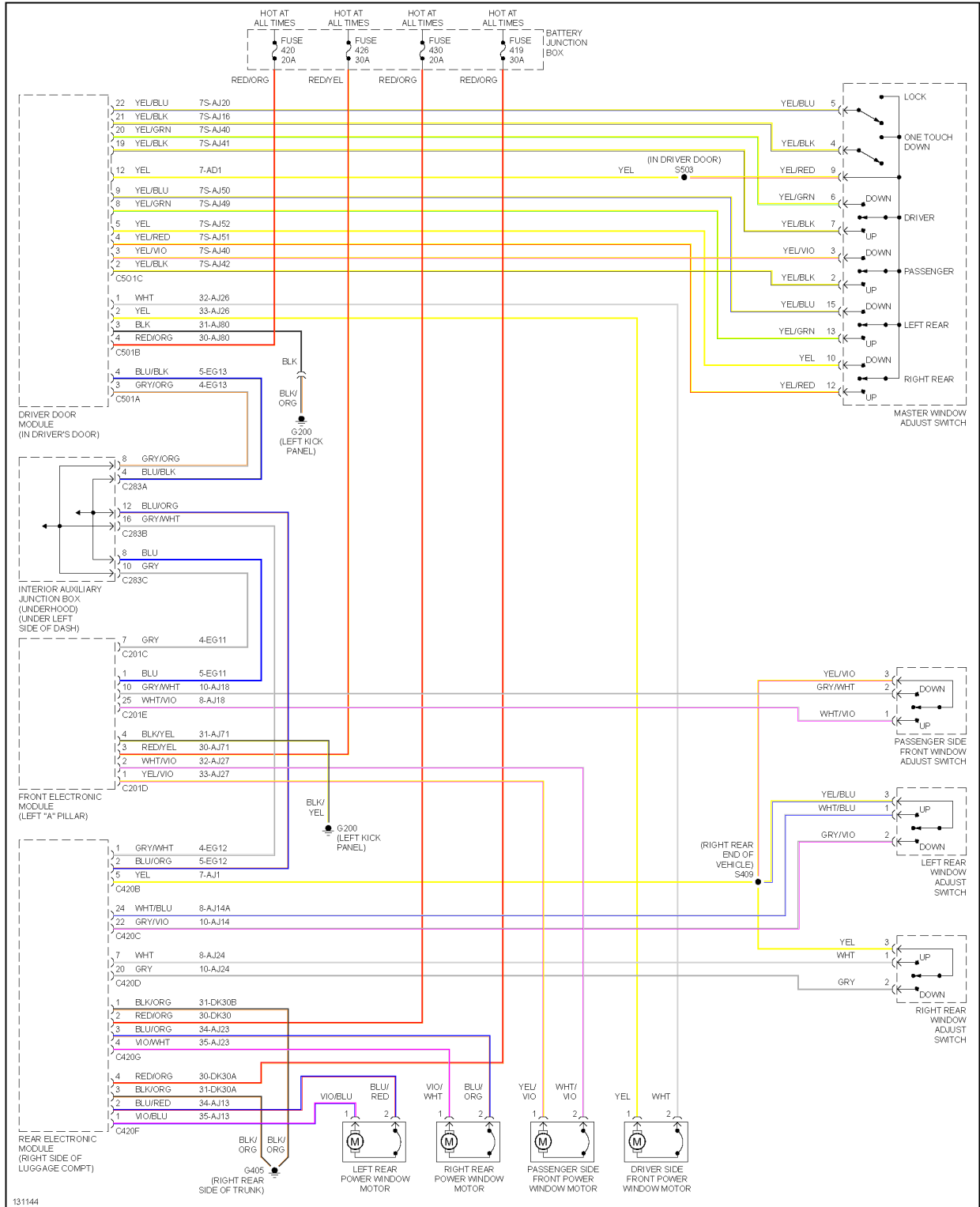


Fig. 51: Power Windows Circuit

RADIO

2000 Lincoln LS

2000 SYSTEM WIRING DIAGRAMS Lincoln - LS

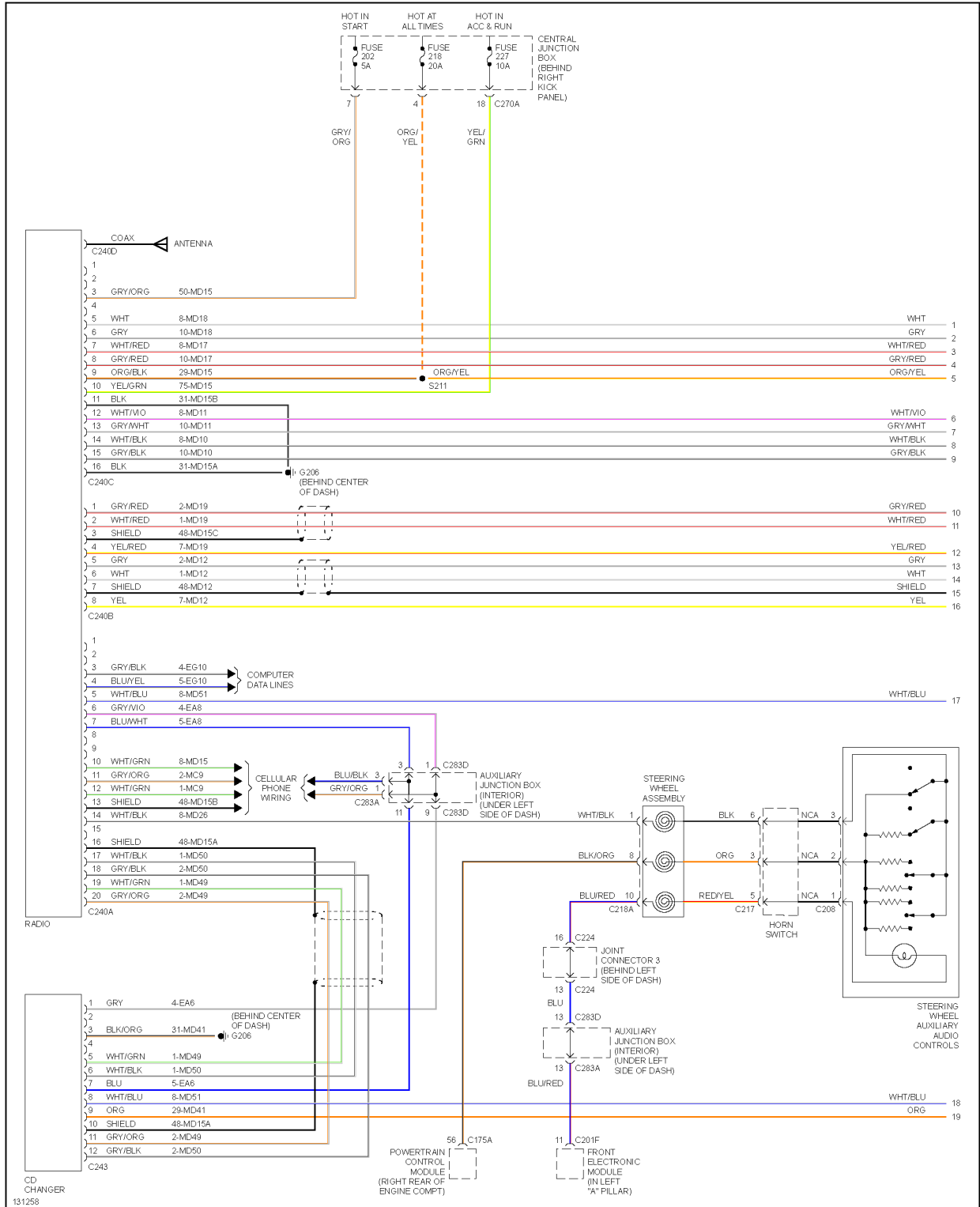


Fig. 52: Radio Circuit (1 of 2)

2000 Lincoln LS

2000 SYSTEM WIRING DIAGRAMS Lincoln - LS

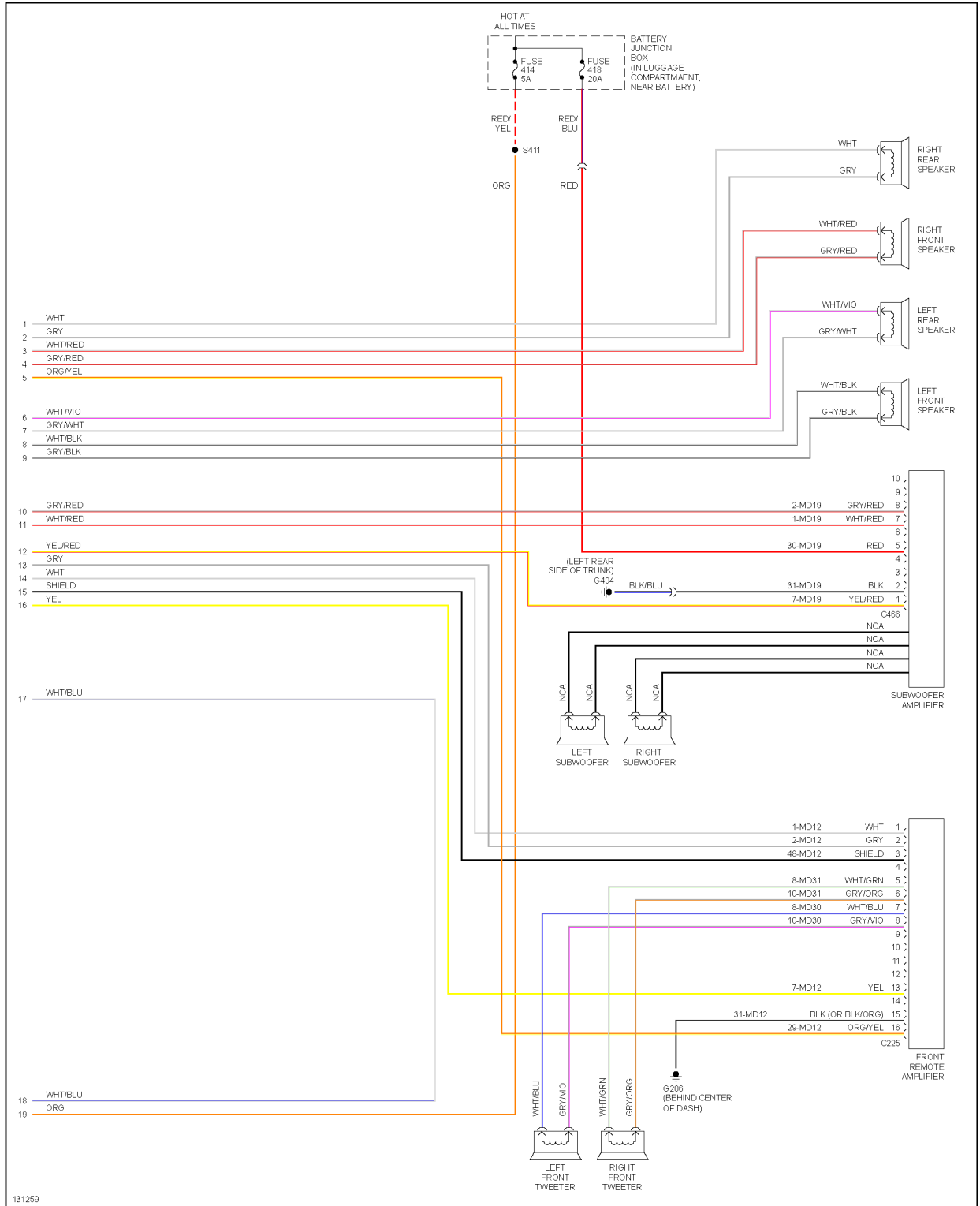


Fig. 53: Radio Circuit (2 of 2)

SHIFT INTERLOCK

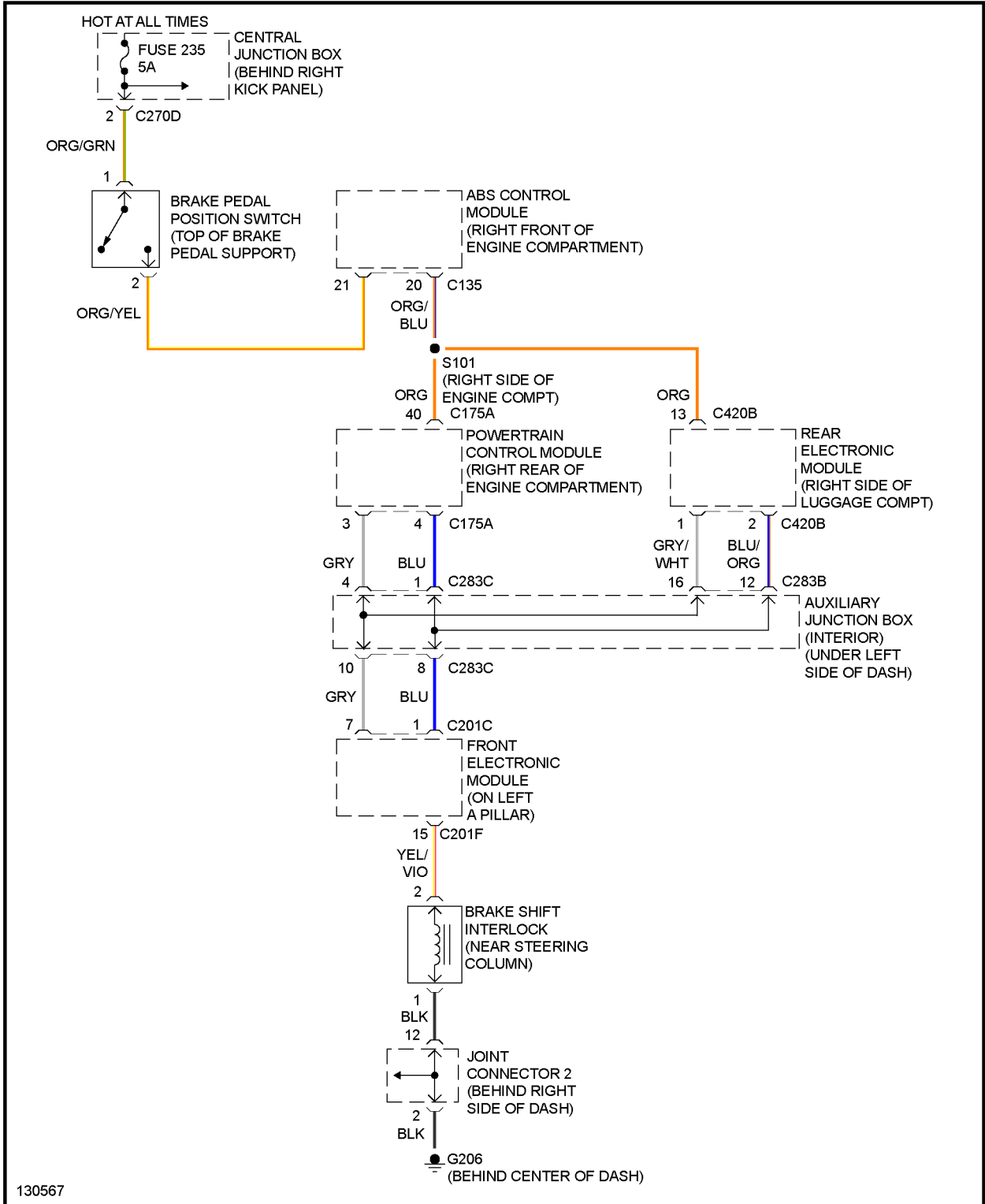


Fig. 54: Shift Interlock Circuit, W/ IVD

2000 Lincoln LS

2000 SYSTEM WIRING DIAGRAMS Lincoln - LS

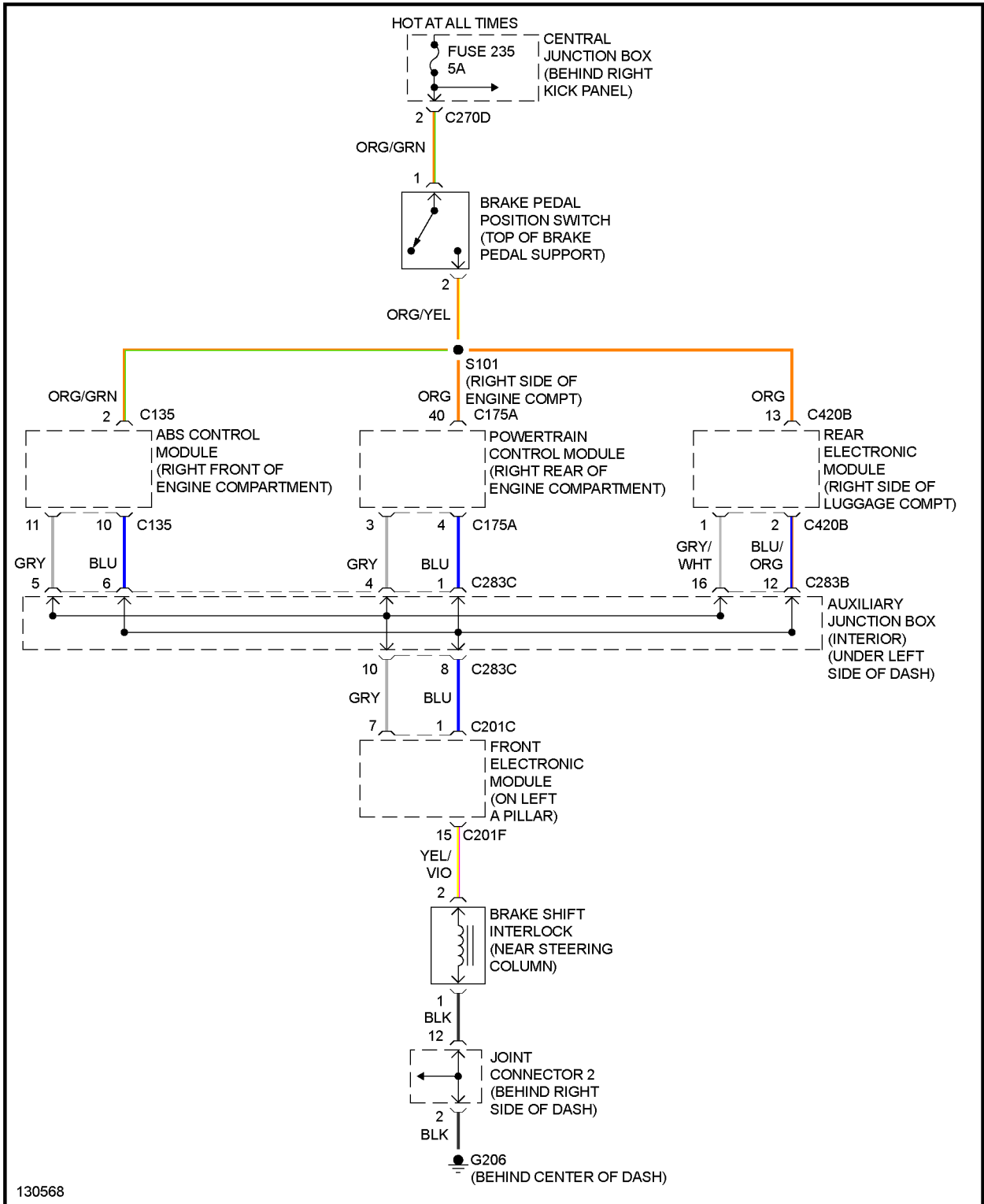


Fig. 55: Shift Interlock Circuit, W/O IVD

STARTING/CHARGING

2000 Lincoln LS

2000 SYSTEM WIRING DIAGRAMS Lincoln - LS

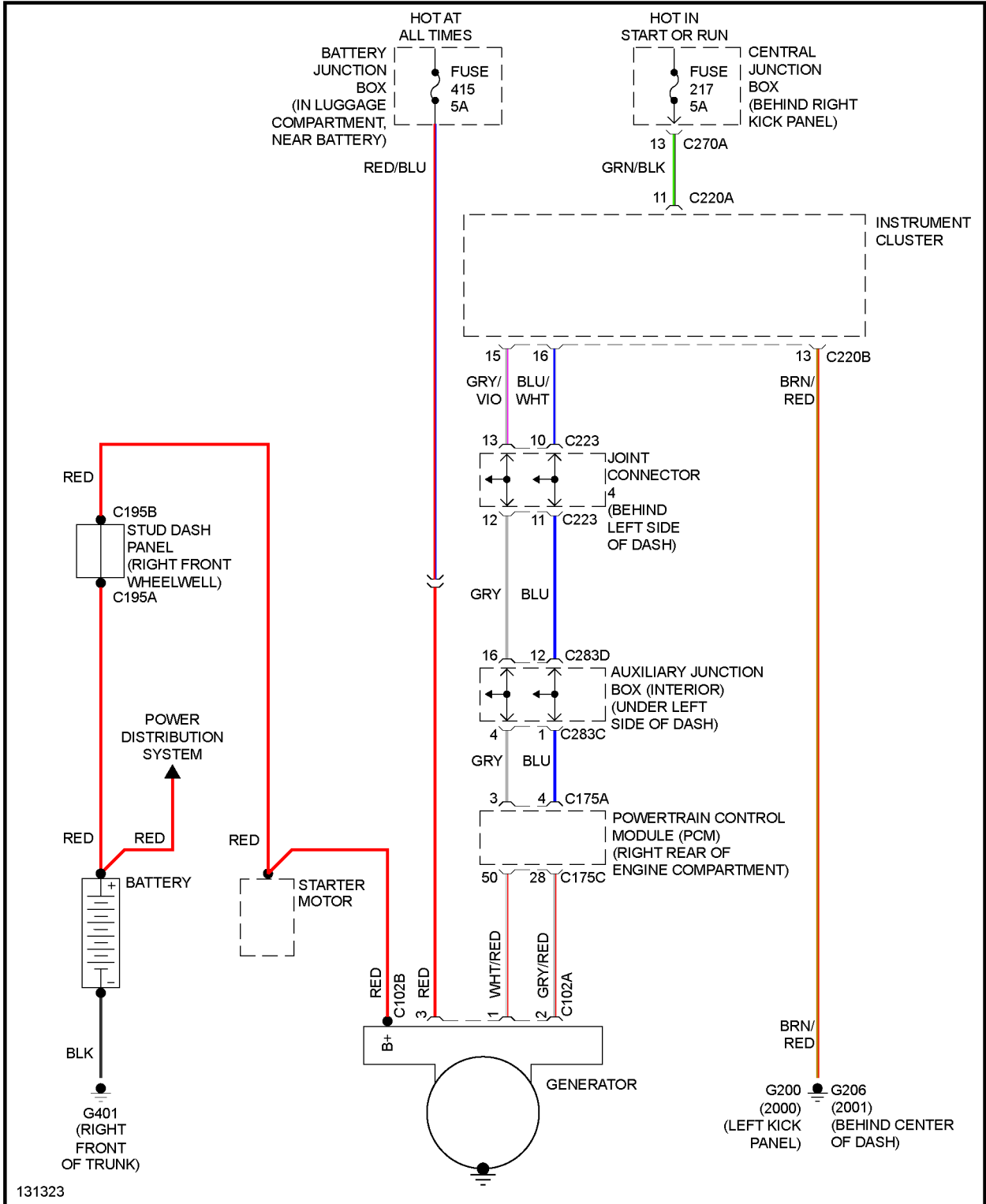


Fig. 56: Charging Circuit

2000 Lincoln LS

2000 SYSTEM WIRING DIAGRAMS Lincoln - LS

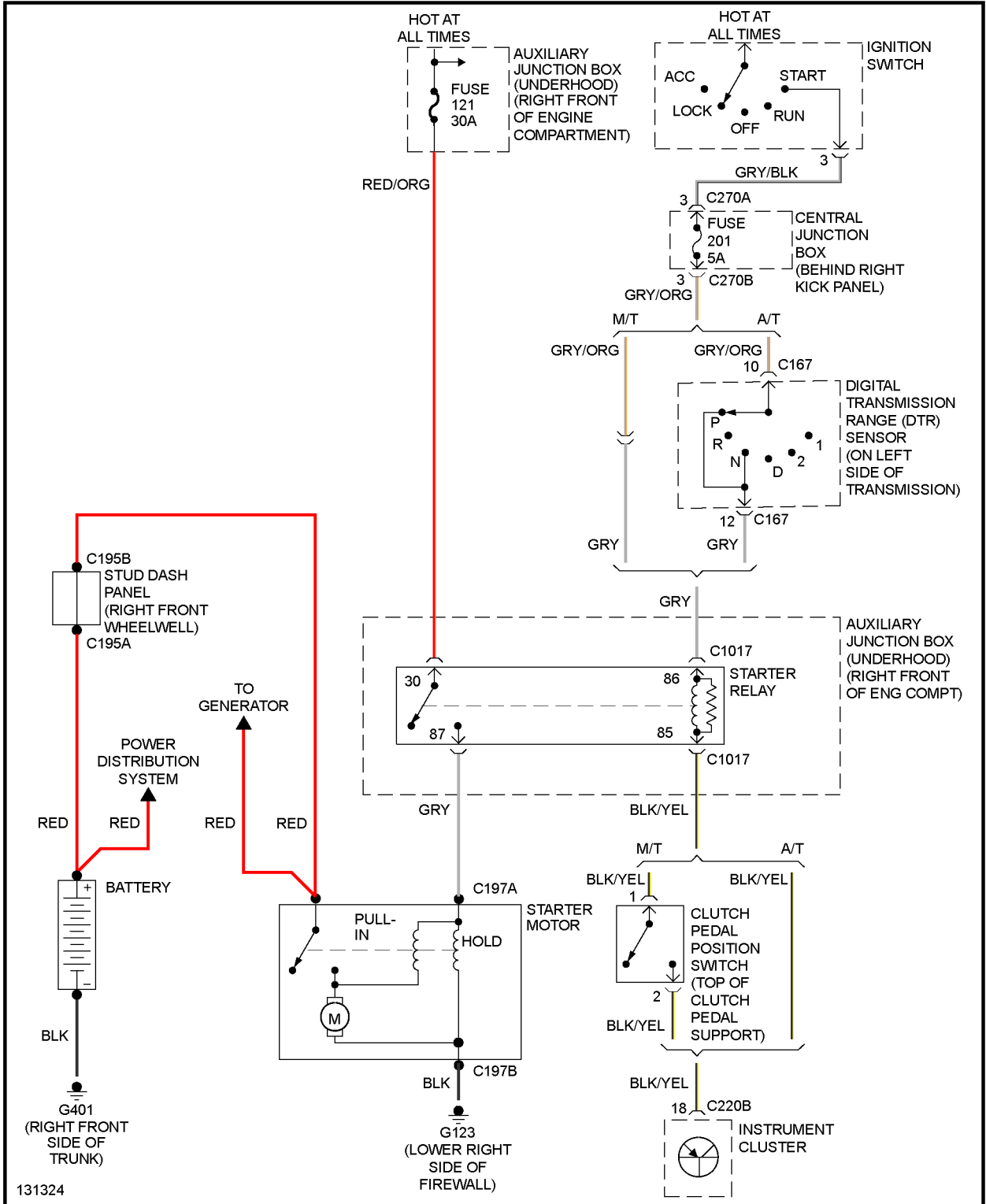


Fig. 57: Starting Circuit

2000 Lincoln LS

2000 SYSTEM WIRING DIAGRAMS Lincoln - LS

SUPPLEMENTAL RESTRAINTS

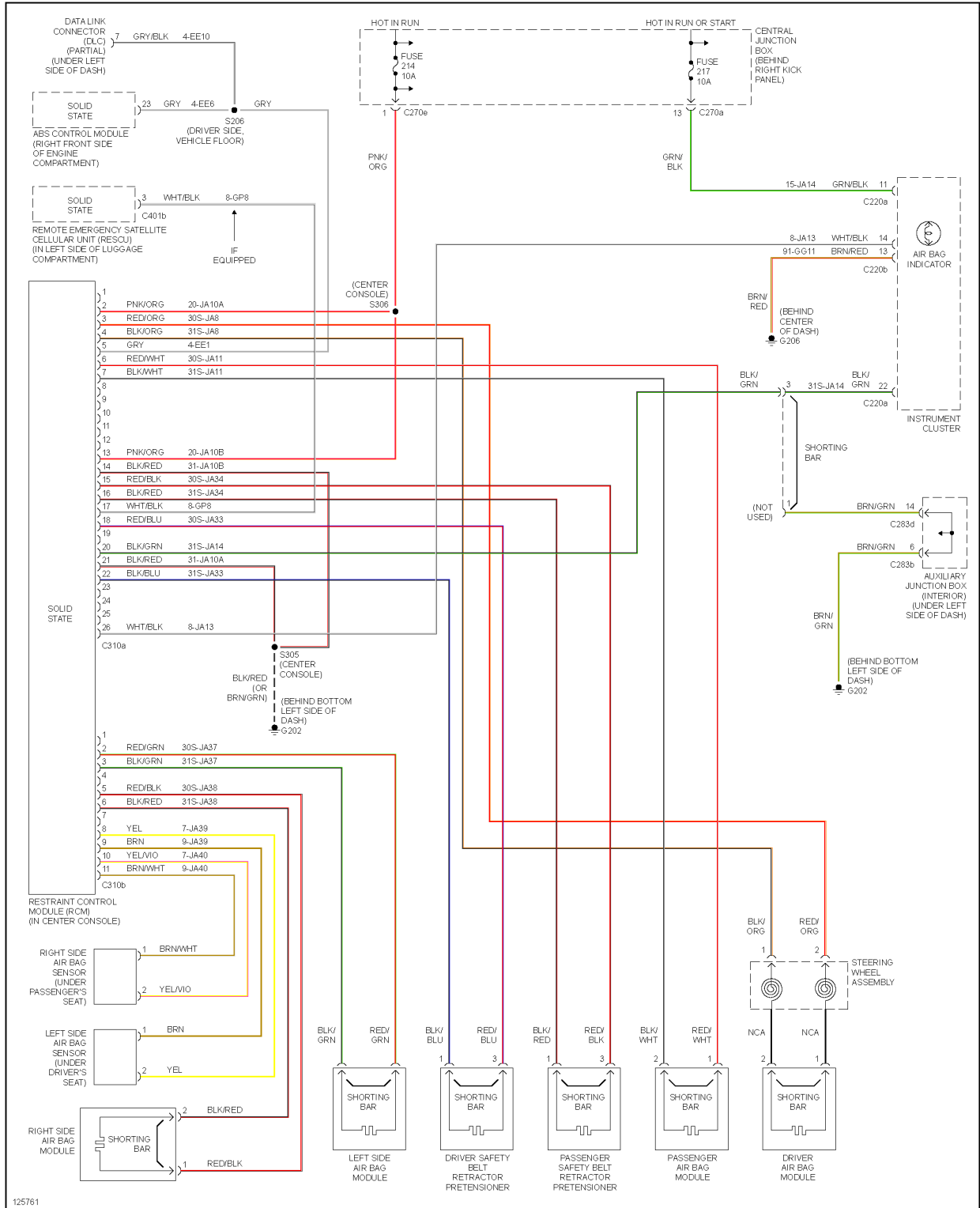


Fig. 58: Supplemental Restraints Circuit

2000 Lincoln LS

2000 SYSTEM WIRING DIAGRAMS Lincoln - LS

TRANSMISSION

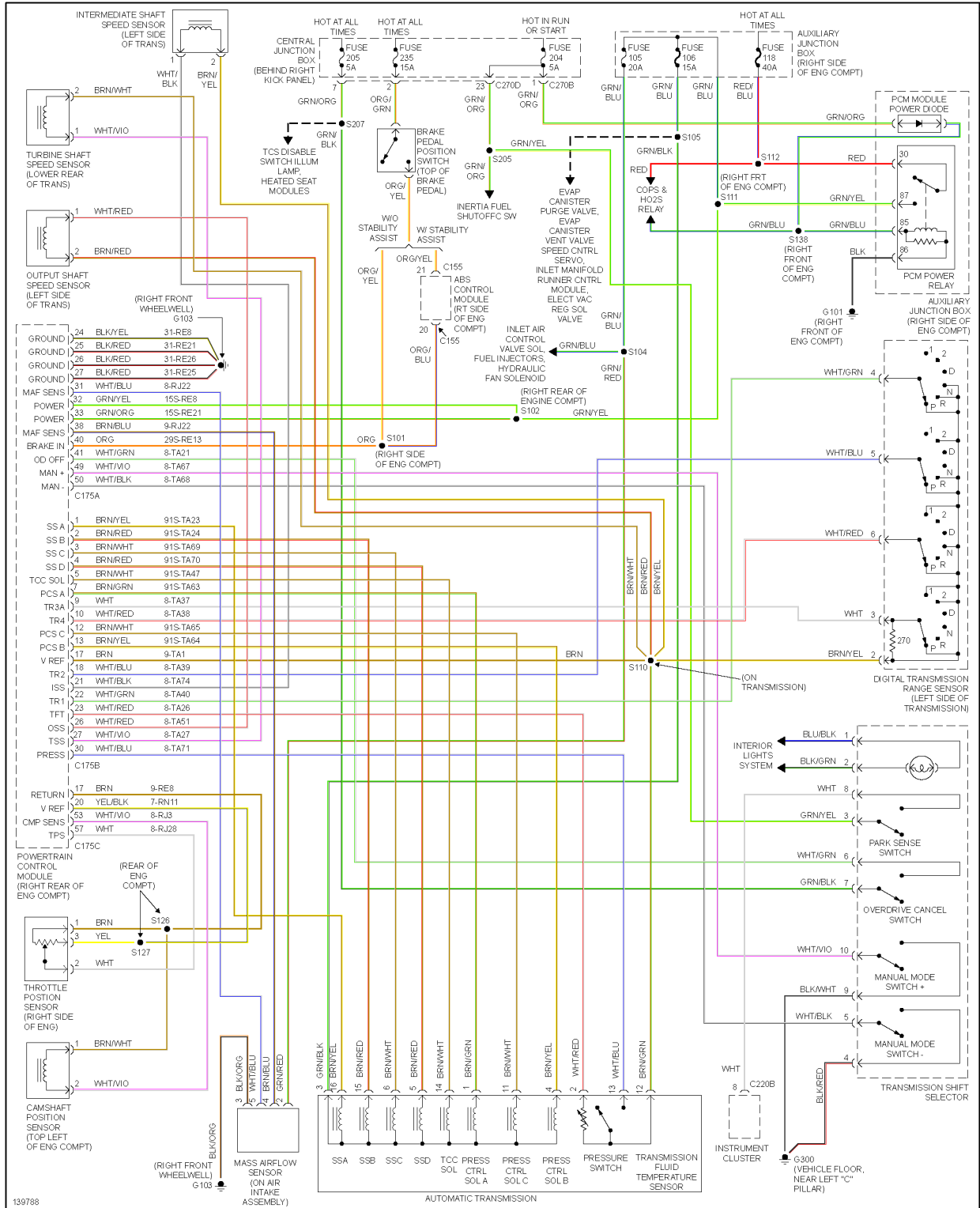


Fig. 59: A/T Circuit

TRUNK, TAILGATE, FUEL DOOR

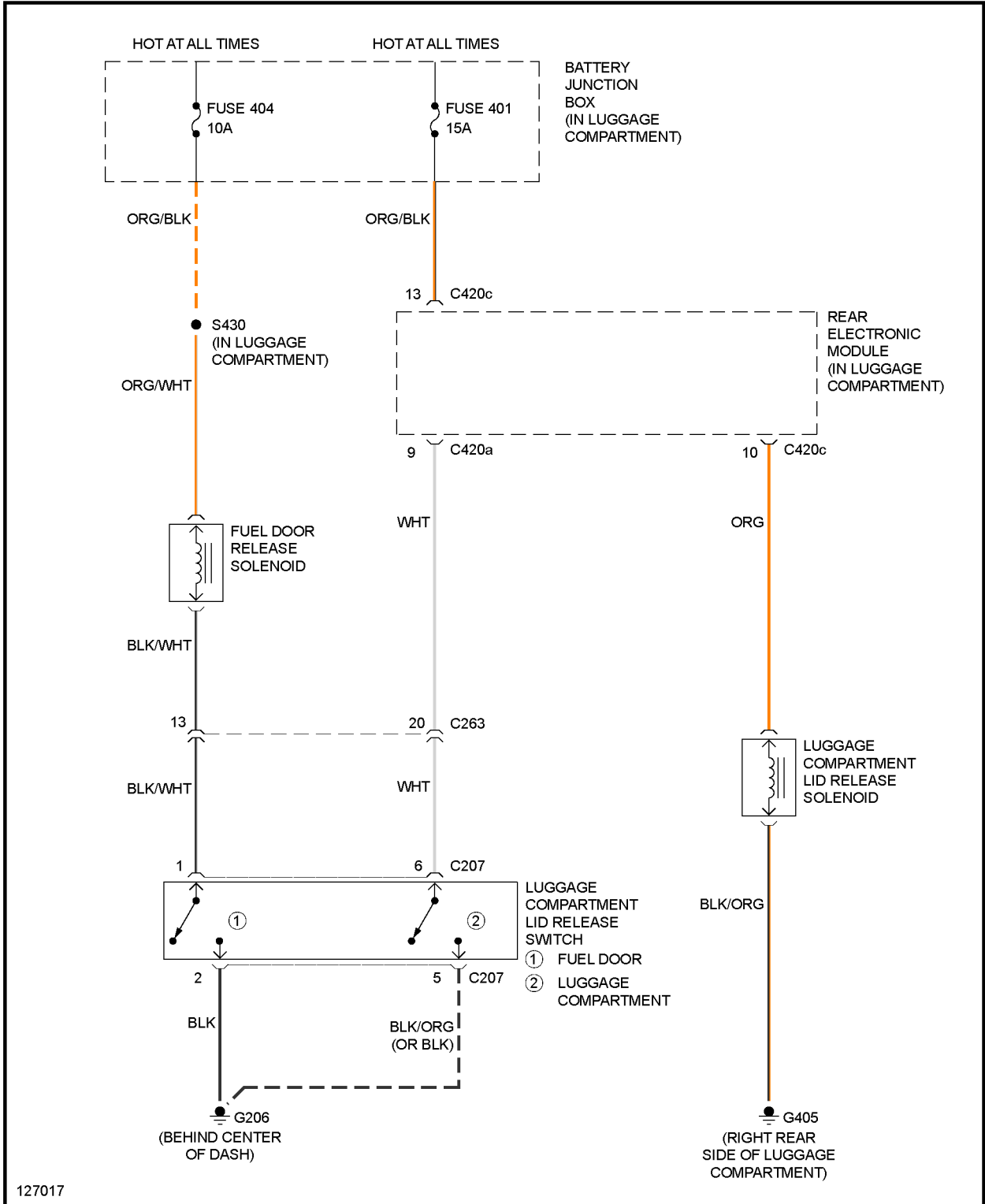


Fig. 60: Trunk, Tailgate, Fuel Door Circuit

2000 Lincoln LS

2000 SYSTEM WIRING DIAGRAMS Lincoln - LS

WARNING SYSTEMS

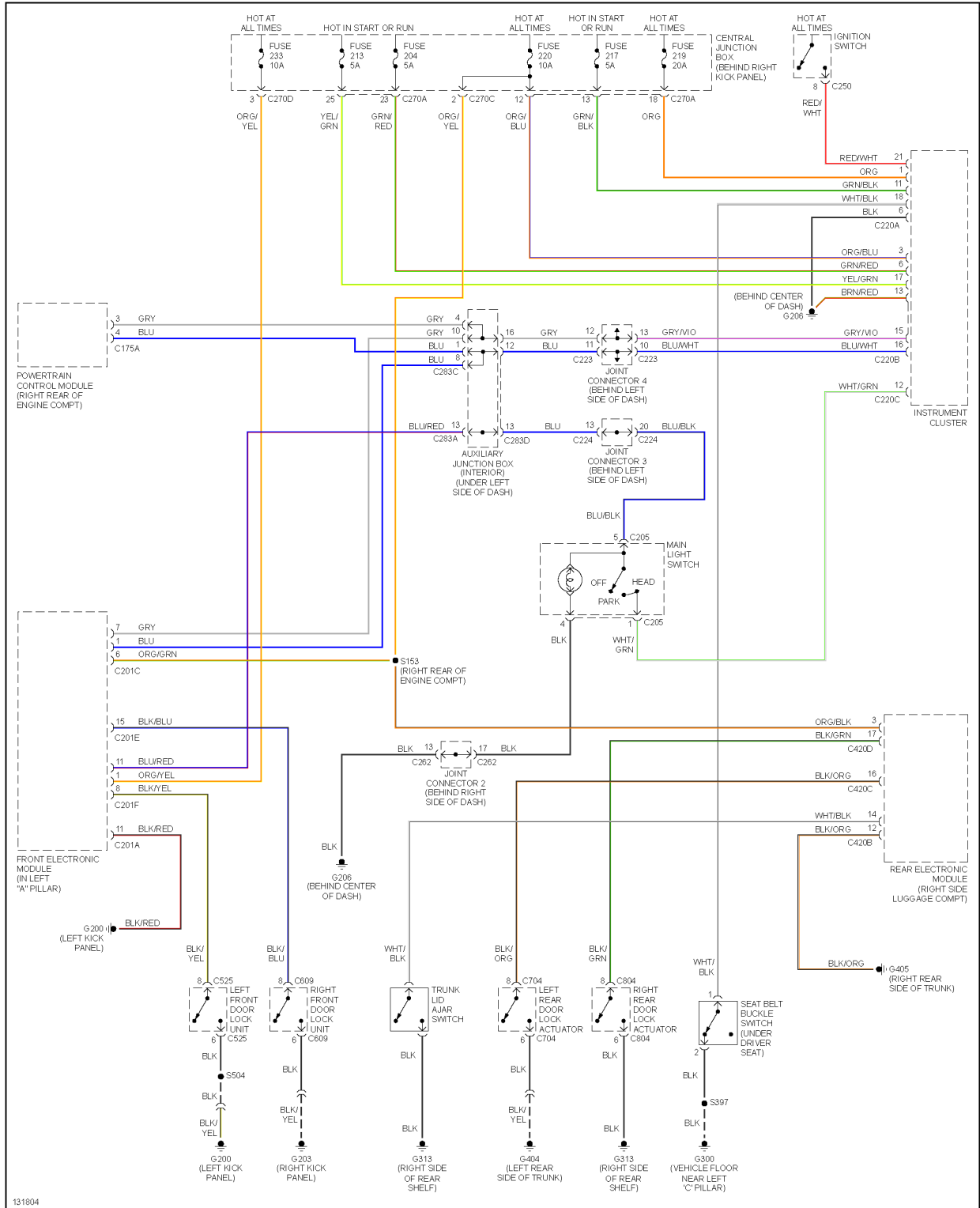


Fig. 61: Warning Systems Circuit

2000 Lincoln LS

2000 SYSTEM WIRING DIAGRAMS Lincoln - LS

WIPER/WASHER

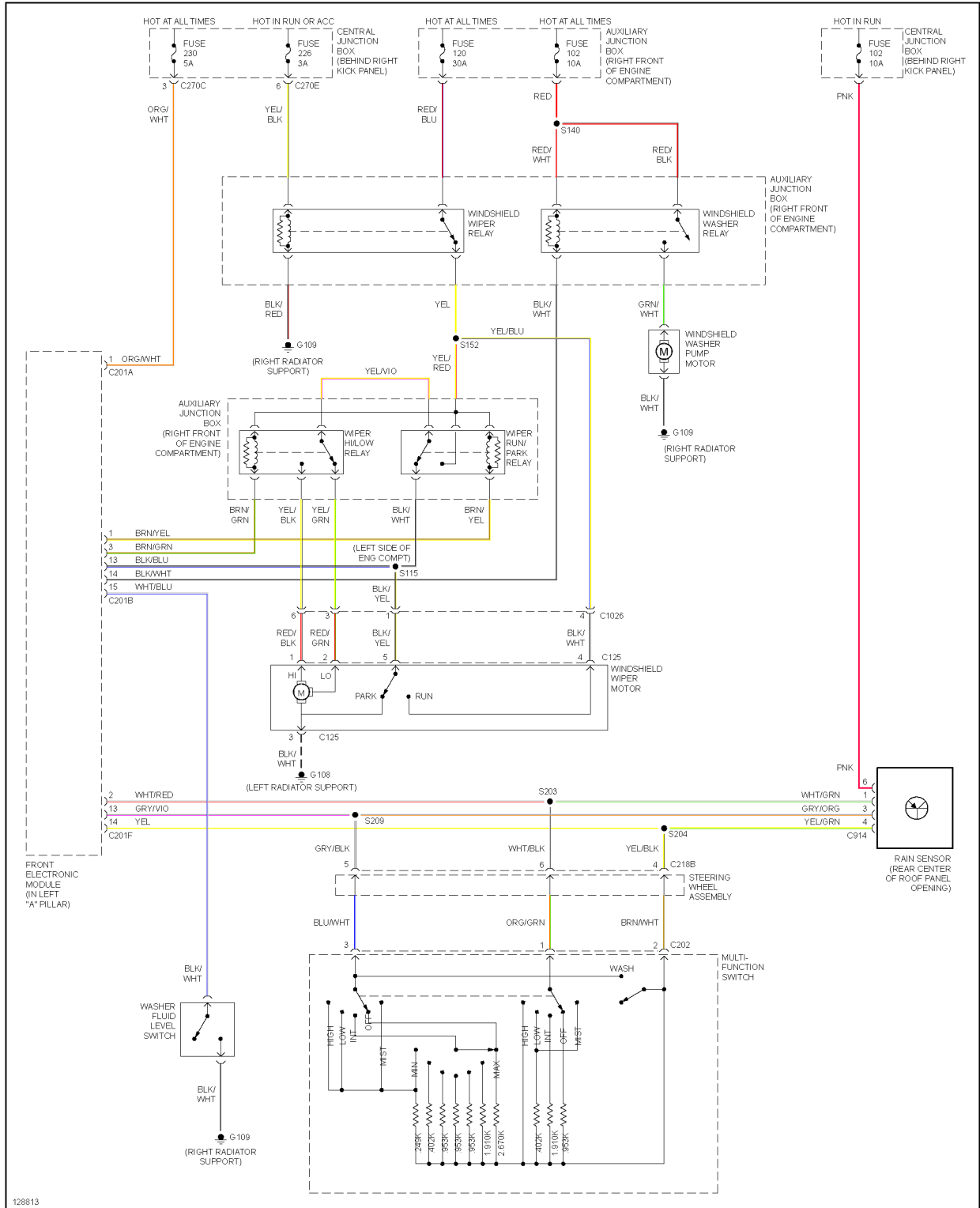


Fig. 62: Wiper/Washer Circuit

2000 Lincoln LS

2000 FORD LS

2000 FORD**LS****BUZZERS, RELAYS & TIMERS****BUZZERS, RELAYS & TIMERS**

Component	Location
A/C Clutch Relay	In underhood auxiliary junction box.
Air Pump Relay	Front of left front wheelwell.
Auxiliary Coolant Pump Relay	In underhood auxiliary junction box.
Blower Motor Relay	In underhood auxiliary junction box.
Compressor Relay	In front center of engine compartment, above right cooling fan.
COPS & Heated Oxygen Sensor (HO2S) Relay	In underhood auxiliary junction box.
Foglight Relay	In underhood auxiliary junction box.
Fuel Pump Relay	In battery junction box.
Heated Wiper Park Relay	In underhood auxiliary junction box.
Horn Relay	In underhood auxiliary junction box.
PCM Power Relay	In underhood auxiliary junction box.
Rear Window Defrost Relay	In battery junction box.
SSP 1 Relay	In battery junction box.
SSP 2 Relay	In battery junction box.
SSP 3 Relay	In battery junction box.
SSP 4 Relay	In battery junction box.
Starter Relay	In underhood auxiliary junction box.
Trailer Exterior Lamp Relay	Rear end of vehicle.
Windshield Washer Relay	In underhood auxiliary junction box.
Windshield Wiper Relay	In underhood auxiliary junction box.
Wiper High/Low Relay	In underhood auxiliary junction box.
Wiper Run/Park Relay	In underhood auxiliary junction box.

CIRCUIT PROTECTION DEVICES**CIRCUIT PROTECTION DEVICES**

Component	Location
Auxiliary Junction Box (Interior)	Under left side of dash. See Fig. 10 .
Auxiliary Junction Box (Underhood)	In right front of engine compartment. See Fig. 7 .
Battery Junction Box	In luggage compartment, near battery. See Fig. 11 .
Central Junction Box	Behind right kick panel.
Circuit Breaker 2	In right side of luggage compartment.
Mega Fuse	In luggage compartment, near battery junction box. See Fig. 11 .

2000 Lincoln LS

2000 FORD LS

CONTROL UNITS**CONTROL UNITS**

Component	Location
ABS Control Module	Right front side of engine compartment. See Fig. 8 .
Audio Unit	Behind center of dash.
Cellular Phone Module	In left side of luggage compartment.
Driver Door Lock Unit	In driver's door.
Driver Door Module (DDM)	In driver's door.
Driver Heated Seat Module	Under driver's seat.
Driver Seat Module	Under driver's seat.
Electrochromatic Inside Mirror Unit	In center of roof panel.
Electronic Automatic Temperature Control (ETAC) Unit	Behind center of dash.
Front Electronic Module (FEM)	In left "A" pillar.
Fuel Pump Module	Under rear of vehicle.
Heater Blower Control Module	Behind left side of dash. See Fig. 10 .
Instrument Panel Dimming Module	Behind left side of dash.
Intake Manifold Runner Control (IMRC) Module (3.0L)	Right rear of engine compartment. See Fig. 1 .
Intake Manifold Runner Control (IMRC) Module (3.9L)	Right rear of engine compartment.
Passenger Door Lock Unit	In passenger's door.
Passenger Heated Seat Module	Under passenger's seat.
Passive Anti-Theft Transceiver Module	Behind center of dash.
Powertrain Control Module (PCM)	Right rear of engine compartment.
Rain Sensor Module	In rear center of roof panel opening.
Rear Electronic Module (REM)	In right side of luggage compartment. See Fig. 11 .
Remote Emergency Satellite Cellular Unit (RESCU)	In left side of luggage compartment.
Restraint Control Module (RCM)	In center console.
Roof Opening Panel Module	In center of roof panel opening.
Trailer Tow Control Unit	Rear center of luggage compartment.

MOTORS**MOTORS**

Component	Location
Air Pump Motor	Front of left front wheelwell.
Auxiliary Coolant Pump Motor	In right front of engine compartment. See Fig. 6 .
Blower Motor	Behind center of dash.
Speed Control Servo	In left rear of engine compartment.
Steering Column Position Motor	On steering column.

2000 Lincoln LS

2000 FORD LS

Washer Pump Motor	On windshield washer fluid reservoir.
Windshield Wiper Motor	On center of firewall. See Fig. 5 .

SENDING UNITS & SENSORS

SENDING UNITS & SENSORS

Component	Location
Ambient Air Temperature Sensor	Right front of engine compartment.
Autolamp Sensor	Behind right side of dash.
Brake Booster Sensor	In left rear of engine compartment. See Fig. 5 .
Camshaft Position (CMP) Sensor (3.0L)	On top left side of engine compartment. See Fig. 1 .
Camshaft Position (CMP) Sensor (3.9L)	On top left rear of cylinder head. See Fig. 2 .
Crankshaft Position (CKP) Sensor (3.0L)	Lower left front of engine. See Fig. 1 .
Crankshaft Position (CKP) Sensor (3.9L)	Lower left front of engine.
Cylinder Head Temperature Sensor (3.0L)	On middle of left cylinder head. See Fig. 1 .
Cylinder Head Temperature Sensor (3.9L)	On right cylinder head, under intake. See Fig. 2 .
Digital Transmission Range (DTR) Sensor	On left side of transmission. See Fig. 9 .
Discharge Temperature Sensor (Left)	Behind left side of dash.
Discharge Temperature Sensor (Right)	Behind right side of dash.
Driver Memory Backrest Sensor	In driver's seat.
Driver Memory Seat Front Height Sensor	Under driver's seat.
Driver Memory Seat Horizontal Sensor	Under driver's seat.
Driver Memory Seat Rear Height Sensor	Under driver's seat.
Dual Axis Acceleration Sensor	In center console.
Evaporator Discharge Air Temperature Sensor	Behind center of dash.
Exhaust Pressure Transducer (EPT) Sensor (3.0L)	Left rear side of engine compartment. See Fig. 1 .
Exhaust Pressure Transducer (EPT) Sensor (3.9L)	Left rear side of engine compartment. See Fig. 4 .
Fuel Pump/Fuel Gauge Sender	On top of fuel tank.
Fuel Rail Pressure Transducer Sensor (3.0L)	On left side of engine.
Fuel Rail Pressure Transducer Sensor (3.9L)	On left side of engine. See Fig. 4 .
Fuel Tank Pressure Transducer Sensor	Under rear of vehicle.
Heated Oxygen Sensor (HO2S) No. 11 (Front)	Lower right rear of engine in exhaust manifold.
Heated Oxygen Sensor (HO2S) No. 21 (Front)	Lower left rear of engine in exhaust manifold.
Heated Oxygen Sensor (HO2S) No. 12 (Rear)	In exhaust, rear of catalyst.
Heated Oxygen Sensor (HO2S) No. 22 (Rear)	In exhaust, rear of catalyst.
Intake Air Temperature (IAT) Sensor	On left side of engine compartment.
Intermediate Shaft Speed (ISS) Sensor	On left side of transmission. See Fig. 9 .
In-Vehicle Temperature Sensor	Behind center of dash.
Knock Sensor 1 (3.0L)	On top right side of engine. See Fig. 1 .
Knock Sensor 1 (3.9L)	On top right side of engine. See Fig. 2 .
Knock Sensor 2 (3.0L)	On top left side of engine. See Fig. 1 .
Knock Sensor 2 (3.9L)	On top left side of engine. See Fig. 2 .
Mass Airflow (MAF) Sensor	On air intake assembly.
Output Shaft Speed (OSS) Sensor	On left side of transmission. See Fig. 9 .

2000 Lincoln LS

2000 FORD LS

Primary Brake Pressure Sensor	In left rear of engine compartment. See Fig. 5 .
Secondary Brake Pressure Sensor	In left rear of engine compartment. See Fig. 5 .
Side Air Bag Sensor (Left)	Under driver's seat.
Side Air Bag Sensor (Right)	Under passenger's seat.
Steering Column Position Sensor	On steering column.
Steering Position Sensor	On steering column.
Sun Load Sensor	On top of dash, above glove box.
Throttle Position (TPS) Sensor (3.0L)	On right side of engine. See Fig. 1 .
Throttle Position (TPS) Sensor (3.9L)	On right side of engine. See Fig. 3 .
Turbine Shaft Speed (TSS) Sensor	On lower rear of transmission. See Fig. 9 .
Wheel Speed Sensor (Left Front)	On left front wheel assembly, on spindle assembly.
Wheel Speed Sensor (Left Rear)	On left rear wheel assembly, on brake knuckle.
Wheel Speed Sensor (Right Front)	On right front wheel assembly, on spindle assembly.
Wheel Speed Sensor (Right Rear)	On right rear wheel assembly, on brake knuckle.
Yaw Velocity Sensor	In center console.

SOLENOIDS & SOLENOID VALVES**SOLENOIDS & SOLENOID VALVES**

Component	Location
A/C Clutch Solenoid (3.0L)	In left side of engine compartment. See Fig. 1 .
A/C Clutch Solenoid (3.9L)	In left side of engine compartment.
Brake Shift Interlock	Behind left side of dash, near steering column.
Coolant Control Valve Solenoid	In right front of engine compartment. See Fig. 6 .
Electronic Vacuum Regulator (EVR) Solenoid Valve (3.0L)	On left rear of engine. See Fig. 1 .
Electronic Vacuum Regulator (EVR) Solenoid Valve (3.9L)	On left rear of engine. See Fig. 4 .
EVAP Canister Purge Valve	In left side of engine compartment. See Fig. 5 .
Evaporative Emission (EVAP) Canister Vent Valve	Under rear of vehicle.
Fuel Door Release Solenoid	In luggage compartment on right side. See Fig. 11 .
Hydraulic Fan Solenoid (3.0L)	On top right side of engine. See Fig. 1 .
Hydraulic Fan Solenoid (3.9L)	On top right side of engine. See Fig. 3 .
Inlet Air Control Valve Solenoid (3.0L)	On top right side of engine. See Fig. 1 .
Inlet Air Control Valve Solenoid (3.9L)	On top right side of engine. See Fig. 3 .
Luggage Compartment Lid Release Solenoid	In luggage compartment deck lid.
Power Steering Valve Solenoid	On left side of engine compartment. See Fig. 5 .
Shift Lock Actuator	In top of steering column.
Vacuum Diverter Valve Solenoid (3.0L)	On front of engine. See Fig. 1 .
Vacuum Diverter Valve Solenoid (3.9L)	On front of engine.

2000 Lincoln LS

2000 FORD LS

SWITCHES**SWITCHES**

Component	Location
A/C Clutch Cycling Pressure Switch	In left front of engine compartment.
Anti-Theft Hood Switch	In top left front of engine compartment.
Brake Fluid Level Switch	In left rear of engine compartment, on brake fluid reservoir. See Fig. 5 .
Brake Pedal Position Switch	On top of brake pedal support.
Brake Pressure Switch	On top of brake pedal support.
Clutch Pedal Position Switch	On top of clutch pedal support.
Emergency Message Switch	In center of roof panel.
Inertia Fuel Shut-Off (IFS) Switch	Inside left kick panel. See Fig. 10 .
Luggage Compartment Lid Ajar Switch	In deck lid.
Luggage Compartment Lid Release Switch	On left side of dash panel.
Oil Pressure Switch (3.0L)	On lower left side of engine. See Fig. 1 .
Oil Pressure Switch (3.9L)	On lower left side of engine.
Park Brake Switch	At base of parking brake assembly in center console.
Power Steering Pressure Switch	In left side of engine compartment. See Fig. 5 .
Safety Belt Buckle Switch	In seat belt buckle.
Washer Fluid Level Switch	In windshield washer fluid reservoir.

MISCELLANEOUS**MISCELLANEOUS**

Component	Location
ABS Test Connector	In left rear of engine compartment. See Fig. 5 .
Battery	In right side of luggage compartment.
Data Link Connector (DLC)	Under left side of dash.
Fuel Pump Motor Diode	In luggage compartment under floor lining.
Ignition Transformer Capacitor 1 (3.0L)	In left rear of engine compartment. See Fig. 1 .
Ignition Transformer Capacitor 1 (3.9L)	In left rear of engine compartment. See Fig. 4 .
Ignition Transformer Capacitor 2 (3.0L)	In right rear of engine compartment. See Fig. 1 .
Ignition Transformer Capacitor 2 (3.9L)	In right rear of engine compartment. See Fig. 3 .
Joint Connector 1	Behind right side of dash.
Joint Connector 2	Behind right side of dash.
Joint Connector 3	Behind left side of dash.
Joint Connector 4	Behind left side of dash.
PCM Module Power Diode	In right front side of engine compartment.
Remote Amplifier	Behind front center of dash.
Subwoofer Amplifier	In front of luggage compartment.

CONNECTORS

2000 Lincoln LS

2000 FORD LS

CONNECTORS

Component	Location
C110 (8 Pin)	At left front of vehicle.
C133 (8 Pin)	At right front of vehicle.
C134 (6 Pin)	At right front of engine compartment. See Fig. 6 .
C139 (A/T) (6 Pin)	Behind upper center of engine. See Fig. 9 .
C139 (M/T) (6 Pin)	Behind upper center of engine.
C140 (3.0L) (Black, 12 Pin)	At right rear of engine. See Fig. 1 .
C140 (3.9L) (Black, 12 Pin)	At right rear of engine. See Fig. 3 .
C144 (20 Pin)	At right front footwell.
C145 (Gray, 4 Pin)	At right front footwell.
C146 (2 Pin)	At right front wheelwell.
C192 (12 Pin)	At rear of engine. See Fig. 1 .
C210 (12 Pin)	Under left side of dash, at footwell. See Fig. 10 .
C211 (20 Pin)	Under left side of dash, at footwell. See Fig. 10 .
C212 (20 Pin)	Under left side of dash, at footwell. See Fig. 10 .
C213 (16 Pin)	Under left side of dash, at footwell. See Fig. 10 .
C214 (3 Pin)	Under left side of dash, at footwell. See Fig. 10 .
C215 (3 Pin)	Under left side of dash, at footwell. See Fig. 10 .
C219 (7 Pin)	Behind right side of dash.
C248 (4 Pin)	On steering column.
C260 (16 Pin)	Behind center of dash. See Fig. 10 .
C263 (20 Pin)	Under right side of dash, at footwell.
C264 (16 Pin)	Under right side of dash, at footwell.
C265 (3 Pin)	Under right side of dash, at footwell.
C274 (1 Pin)	Under left side of dash, at footwell. See Fig. 10 .
C275 (2 Pin)	Behind center of dash. See Fig. 10 .
C300 (12 Pin)	Under center console.
C311 (10 Pin)	At right "C" pillar.
C312 (8 Pin)	At right "C" pillar.
C313 (8 Pin)	Under right front seat.
C314 (2 Pin)	Under right front seat.
C315 (14 Pin)	Under left front seat.
C316 (2 Pin)	Under left front seat.
C327 (3 Pin)	Under right front seat.
C328 (10 Pin)	Under right front seat.
C339 (10 Pin)	Under left front seat.
C340 (3 Pin)	Under left front seat.
C406 (6 Pin)	At right side of luggage compartment.
C408 (6 Pin)	At left rear of luggage compartment.
C410 (14 Pin)	At left side of luggage compartment.
C411 (6 Pin)	At right rear of luggage compartment.
C421 (17 Pin)	At right side of luggage compartment.
C422 (8 Pin)	At right side of luggage compartment.

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2000 FORD LS

C431 (8 Pin)	Beneath right rear of vehicle.
C432 (6 Pin)	Beneath right rear of vehicle.
C465 (10 Pin)	At front of luggage compartment.
C510 (14 Pin)	In left front door.
C511 (16 Pin)	In left front door.
C610 (14 Pin)	In right front door.
C611 (10 Pin)	In right front door.
C710 (14 Pin)	In left rear door.
C810 (14 Pin)	In right rear door.
C913 (8 Pin)	At right side of roof panel.
C1019 (3.9L) (Gray, 2 Pin)	At left front of vehicle. See Fig. 4 .
C1026 (6 Pin)	At left rear of engine compartment. See Fig. 5 .

GROUND S

GROUND S

Component	Location
G100	On left side of engine compartment.
G101	On right front of engine compartment. See Fig. 6 .
G102	On right front of engine compartment.
G103	On right side of engine compartment.
G201	Behind center of dash.
G202	Behind lower left side of dash. See Fig. 10 .
G203	Behind lower left side of dash. See Fig. 10 .
G204	Behind lower right side of dash.
G300	At right "C" pillar.
G301	Below right front seat.
G302	Below left front seat.
G324	At top left side of speaker shelf.
G400	At left rear of luggage compartment.
G401	At right rear of luggage compartment.
G402	At right side of luggage compartment.
G403	At right side of luggage compartment. See Fig. 11 .

SPLICES

SPLICES

Component	Location
S101	At right side of engine compartment.
S102	At right rear of engine compartment.
S103	At right side of engine compartment.
S104	At right front of engine compartment.
S105	At right front of engine compartment.
S106	At right front of engine compartment.

2000 Lincoln LS

2000 FORD LS

S107	At right front of engine compartment.
S108	At right front of engine compartment.
S109	At transmission.
S110	At transmission.
S111	At right front of engine compartment.
S112	At right front of engine compartment.
S113	At right front of engine compartment.
S114	At front of vehicle.
S115	At left side of engine compartment.
S116	At transmission.
S122	At left rear of engine compartment.
S124	At right side of engine compartment.
S125	At rear of engine compartment.
S126	At rear of engine compartment.
S127	At rear of engine compartment.
S128	At top of engine.
S129	At left side of engine.
S130	At left side of engine.
S131	At rear of engine compartment.
S132	At rear of engine compartment.
S133	At rear of engine compartment.
S134	At right front of engine compartment.
S135	At right front of engine compartment.
S136	At right front of engine compartment.
S137	At right front of engine compartment.
S138	At right front of engine compartment.
S139	At right front of engine compartment.
S140	At right front of engine compartment.
S147	At front left wheelwell.
S148	At right side of engine compartment.
S150	At right side of engine.
S151	At rear of engine compartment.
S152	At right front of engine compartment.
S153	At right rear of engine compartment.
S154	At rear of engine compartment.
S201	Behind right side of dash.
S203	Behind left side of dash.
S204	Behind left side of dash.
S205	In left front footwell.
S206	At left side of vehicle floor.
S207	At left side of vehicle floor.
S209	In left front footwell.
S210	In left front footwell.
S211	Behind right side of dash.

2000 Lincoln LS

2000 FORD LS

	Behind dash.
S214	Behind left side of dash.
S215	Behind dash.
S216	Behind dash.
S217	Under center console.
S219	Behind left side of dash.
S220	At right front footwell.
S221	Behind left side of dash.
S228	Behind dash.
S301	On right side of vehicle floor.
S303	At right rear of vehicle floor.
S304	At right rear of vehicle floor.
S305	At center console.
S306	At center console.
S309	At center console.
S310	At center console.
S311	At center console.
S312	Under right rear seat.
S313	Under left front seat.
S393	Under left front seat.
S394	Under left front seat.
S395	Under left front seat.
S396	Under left front seat.
S397	Under left front seat.
S398	Under right front seat.
S399	Under right front seat.
S400	At left rear of vehicle.
S401	At left rear of vehicle.
S402	Behind luggage compartment lining.
S403	In luggage compartment.
S404	In luggage compartment.
S407	In trunk lid.
S408	In trunk lid.
S409	At right rear of vehicle.
S411	At left side of luggage compartment.
S412	At right rear of vehicle.
S413	In luggage compartment.
S415	In luggage compartment.
S416	At right rear of vehicle.
S417	In luggage compartment.
S418	In luggage compartment.
S419	In luggage compartment.
S420	In luggage compartment.
S422	In luggage compartment.

2000 Lincoln LS

2000 FORD LS

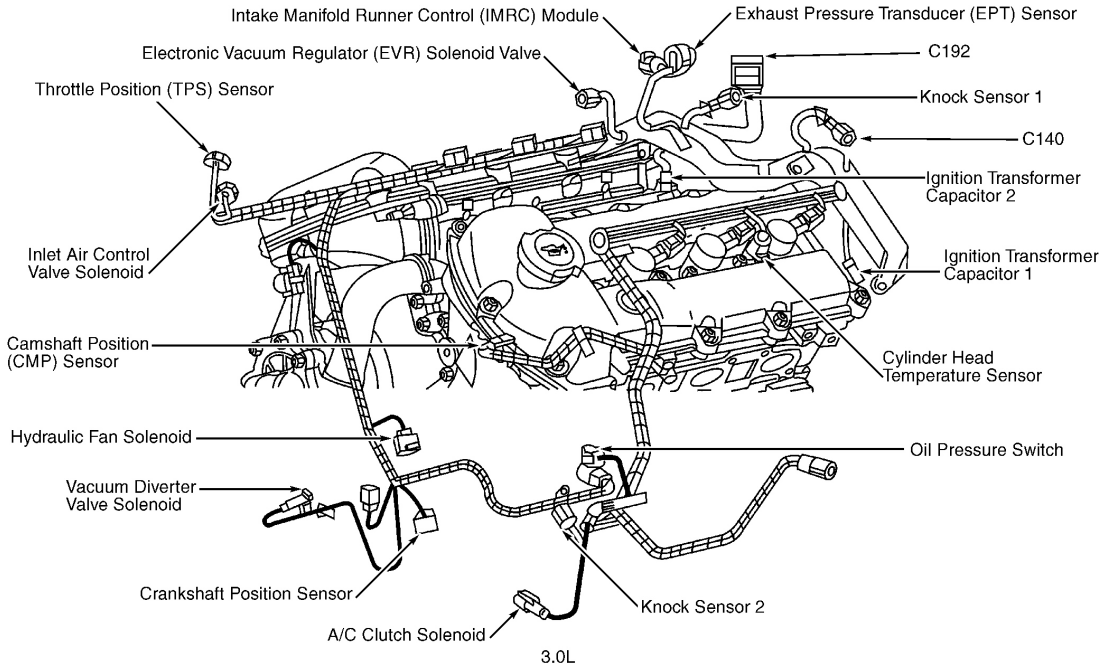
	In luggage compartment.
S427	In luggage compartment.
S428	In luggage compartment.
S429	In luggage compartment.
S430	In luggage compartment.
S431	In luggage compartment.
S432	In luggage compartment.
S433	In luggage compartment.
S434	In luggage compartment.
S435	In luggage compartment.
S436	In luggage compartment.
S437	Behind dash.
S438	Behind dash.
S501	In left front door.
S502	In left front door.
S503	In left front door.
S504	In left front door.
S601	In right front door.
S602	In right front door.
S900	At front of roof.
S901	At front of roof.
S902	At front of roof.
S903	At front of roof.

LOCATION GRAPHICS

NOTE: Figures may show multiple Locations. Refer to appropriate table for proper figure references.

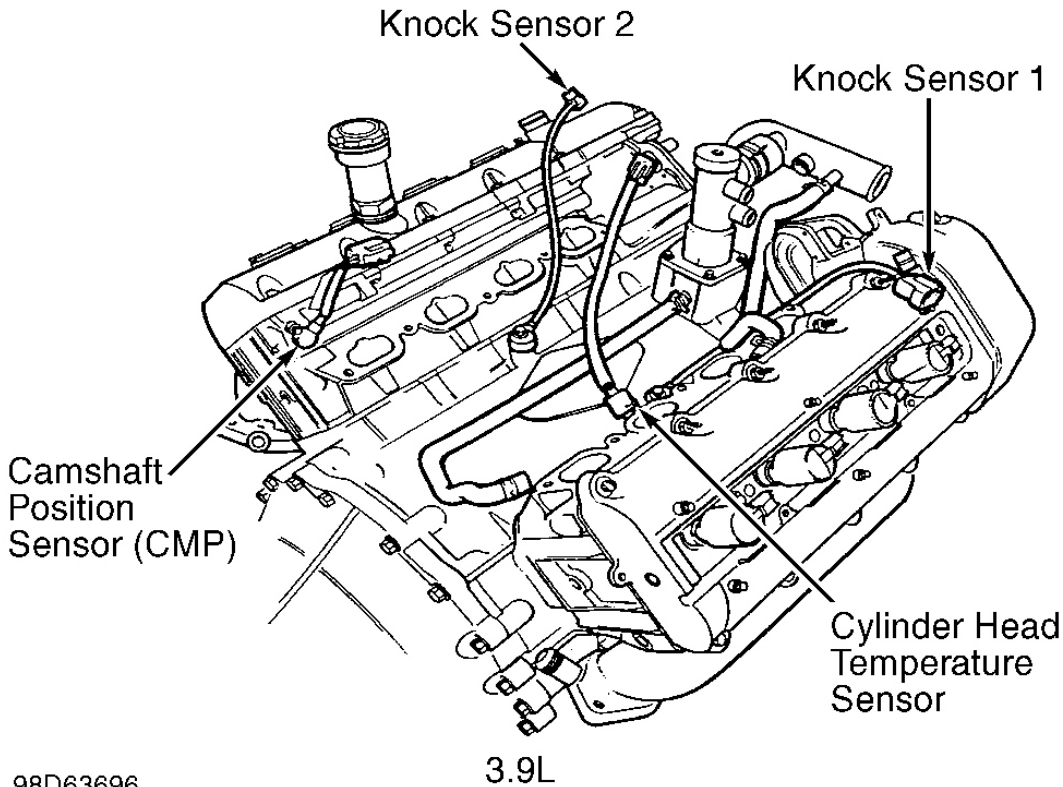
2000 Lincoln LS

2000 FORD LS



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Fig. 1: Left Side Of Engine (3.0L)

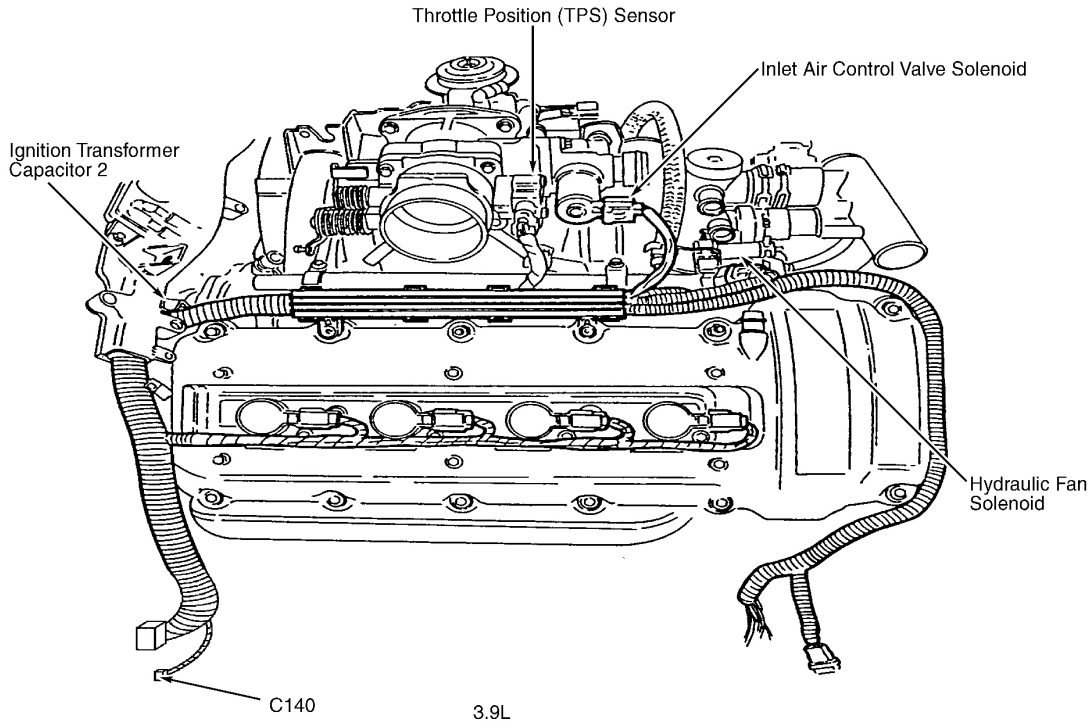


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Fig. 2: Right Rear Of Engine (3.9L)

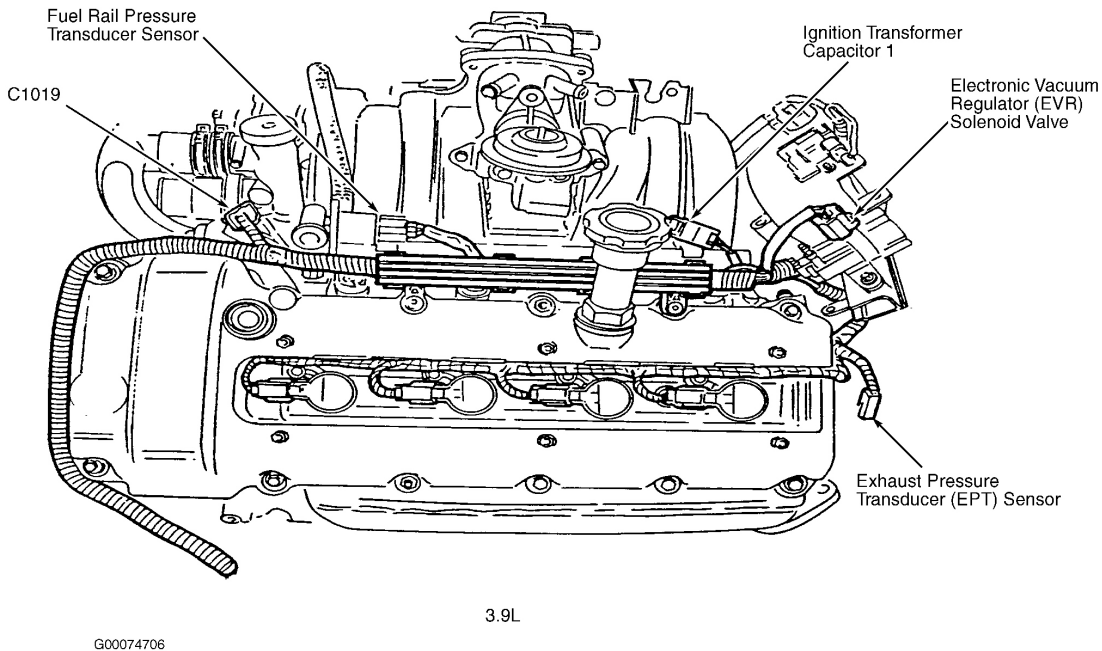
2000 Lincoln LS

2000 FORD LS



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Fig. 3: Right Side Of Engine (3.9L)

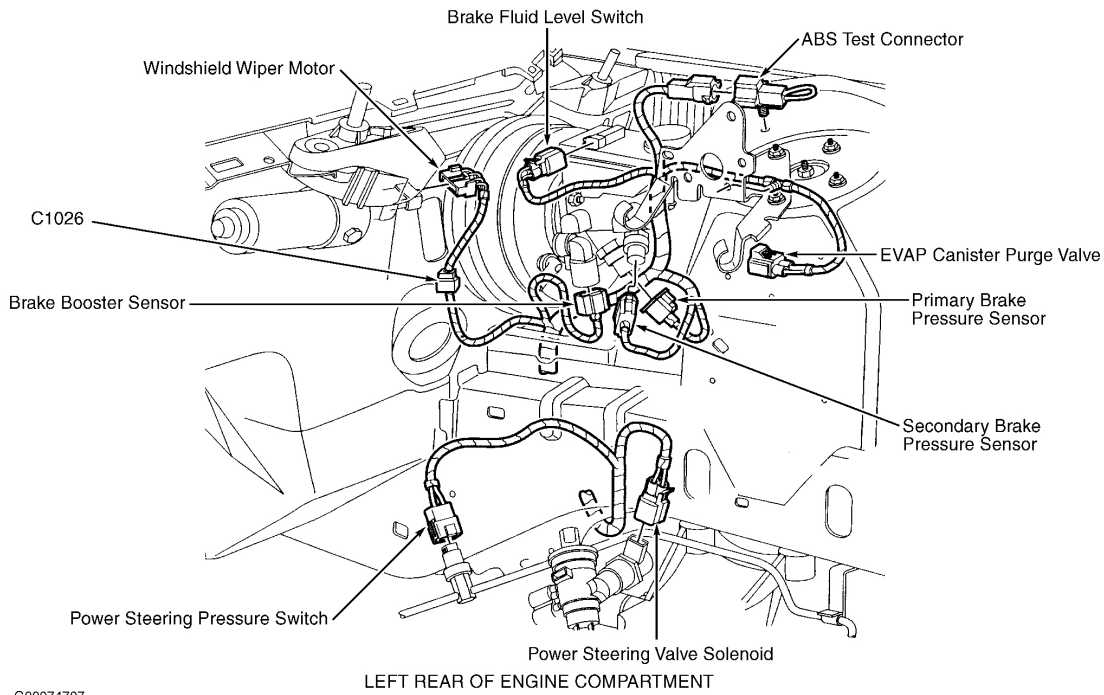


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Fig. 4: Left Side Of Engine (3.9L)

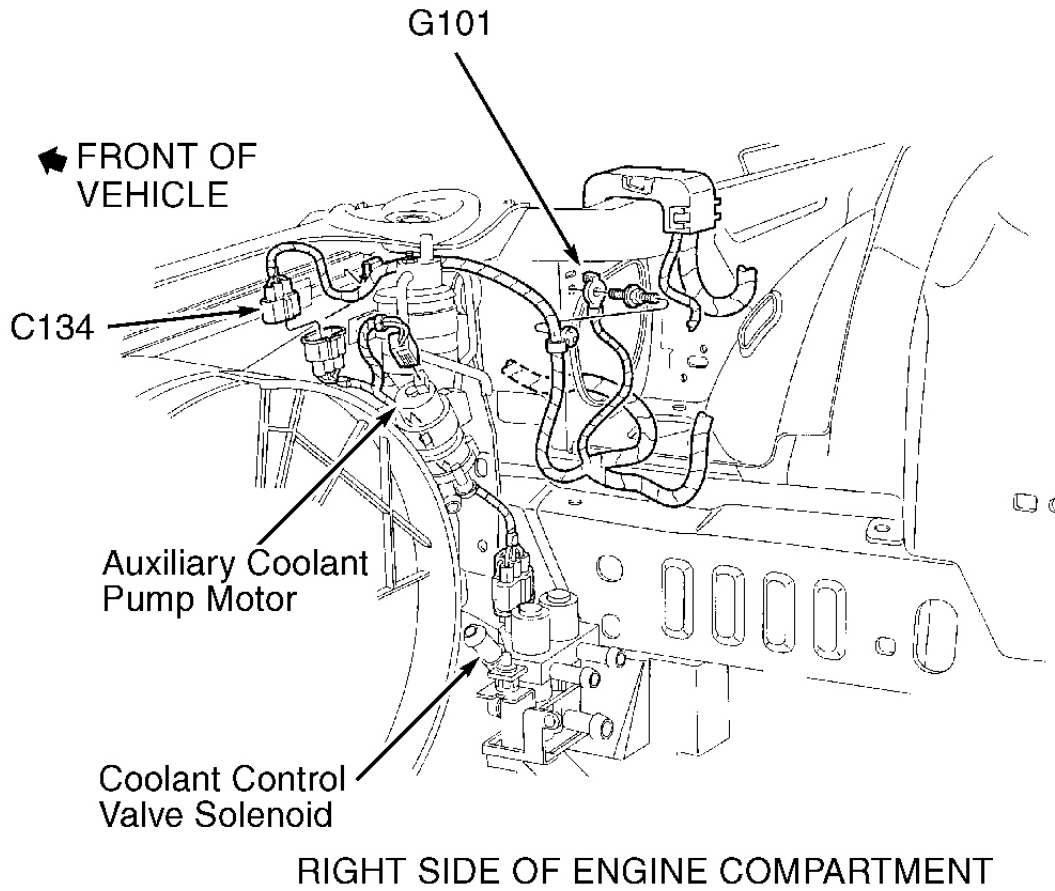
2000 Lincoln LS

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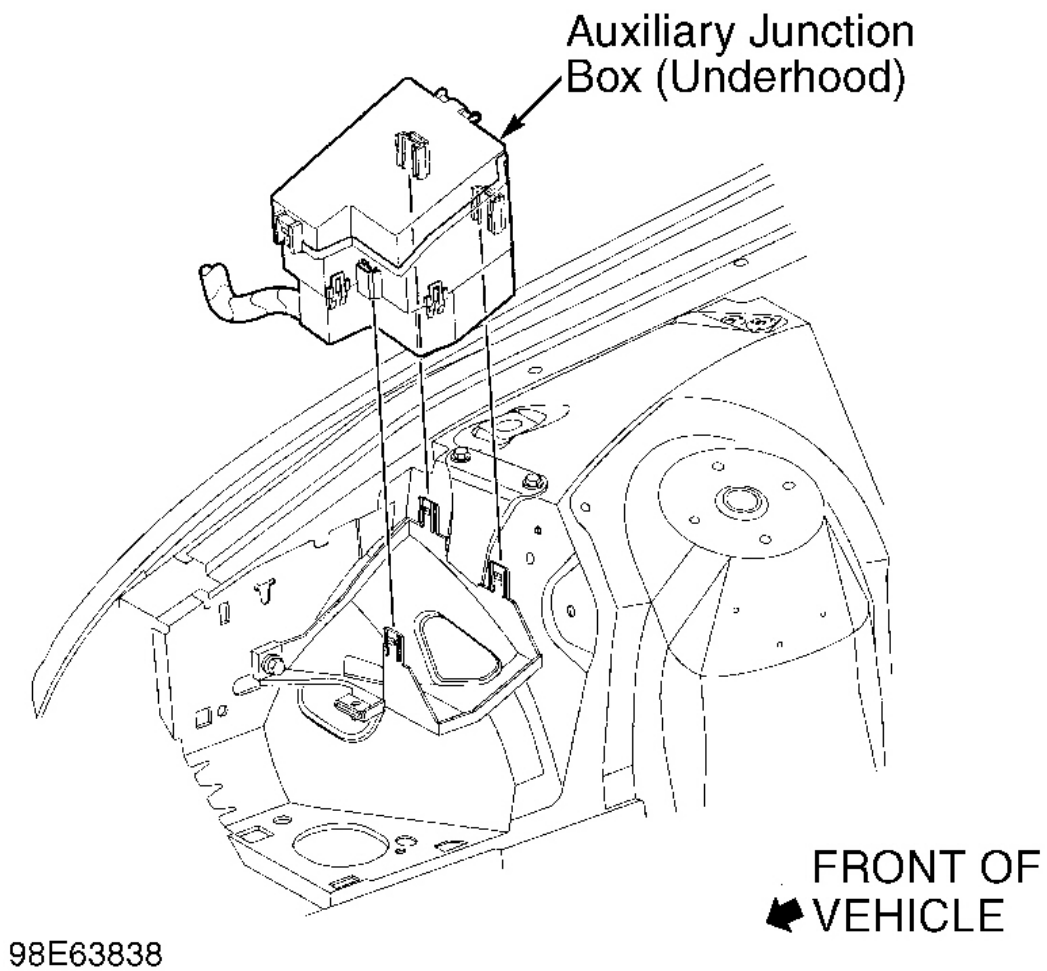
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Fig. 5: Left Rear Of Engine Compartment



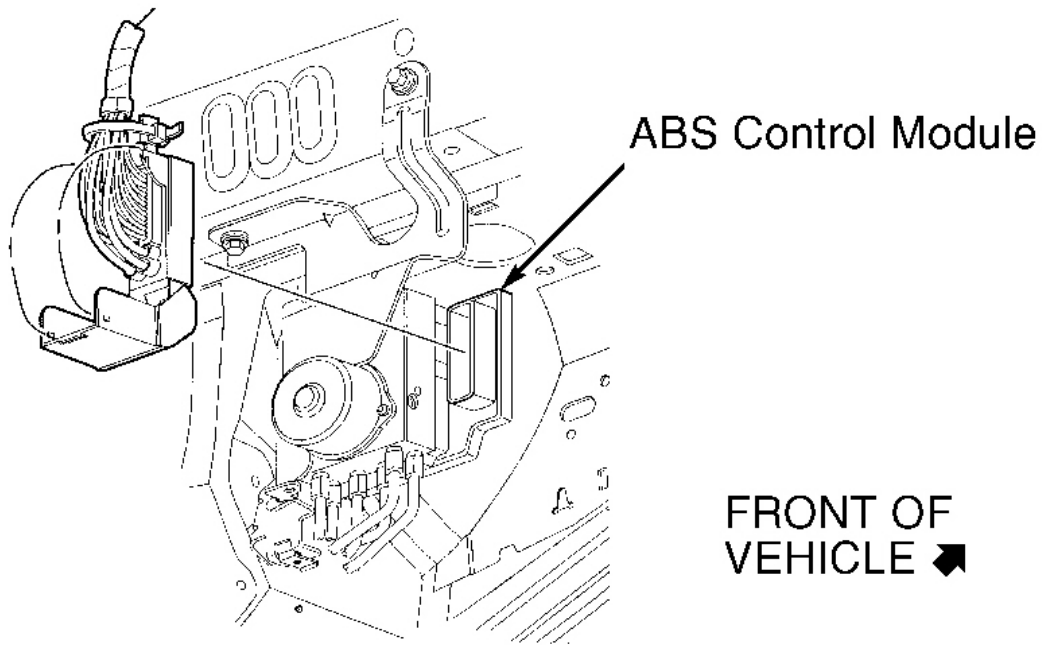
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Fig. 6: Right Side Of Engine Compartment



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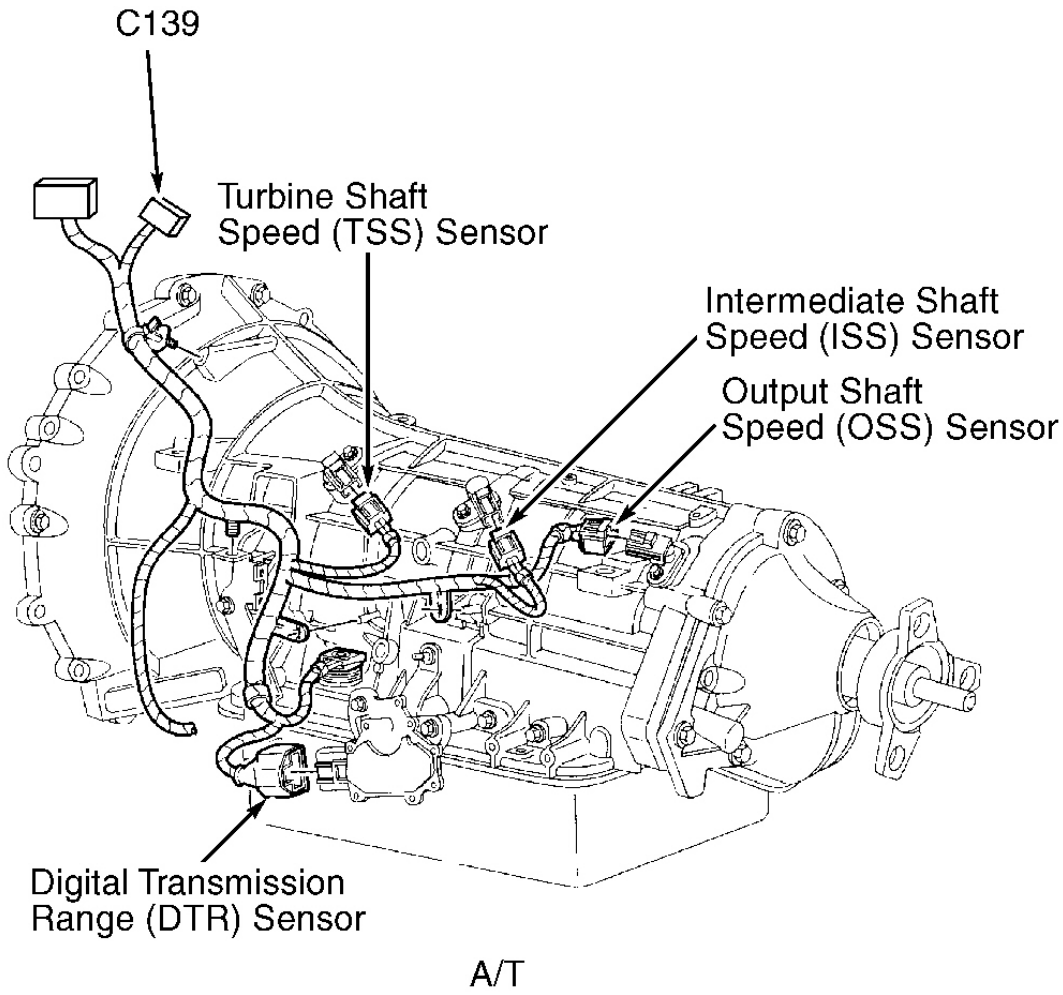
Fig. 7: Right Front Of Engine Compartment



RIGHT SIDE OF ENGINE COMPARTMENT

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Fig. 8: Right Side Of Engine Compartment



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Fig. 9: Left Side Of Transmission

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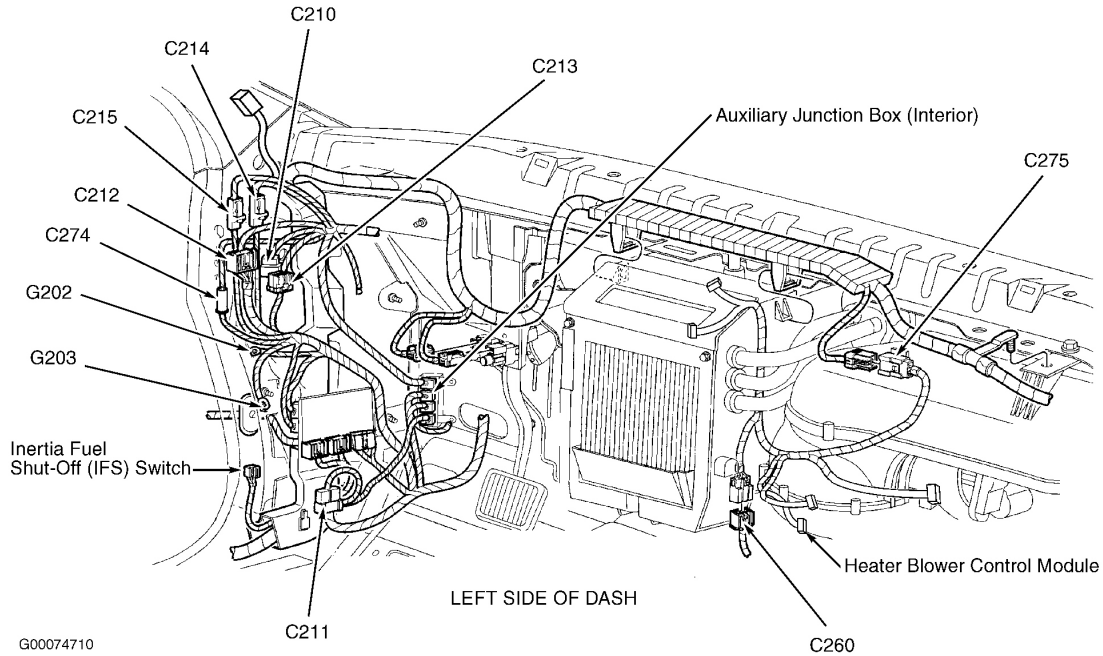


Fig. 10: Behind Left Side Of Dash

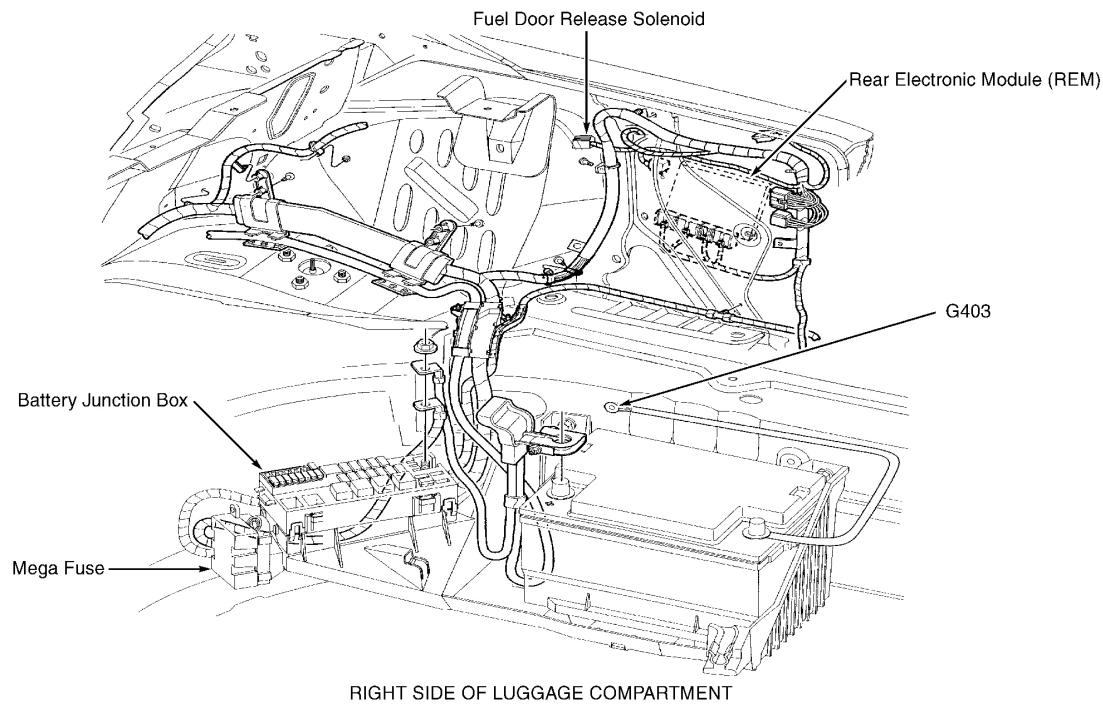


Fig. 11: Right Side Of Luggage Compartment

2000 Lincoln LS

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2000 ELECTRICAL

Fuses & Circuit Breakers - LS

IDENTIFICATION

CAUTION: When battery is disconnected, vehicle computer and memory systems may lose memory data. Driveability problems may exist until computer systems have completed a relearn cycle. See **COMPUTER RELEARN PROCEDURES** article in **GENERAL INFORMATION** before disconnecting battery.

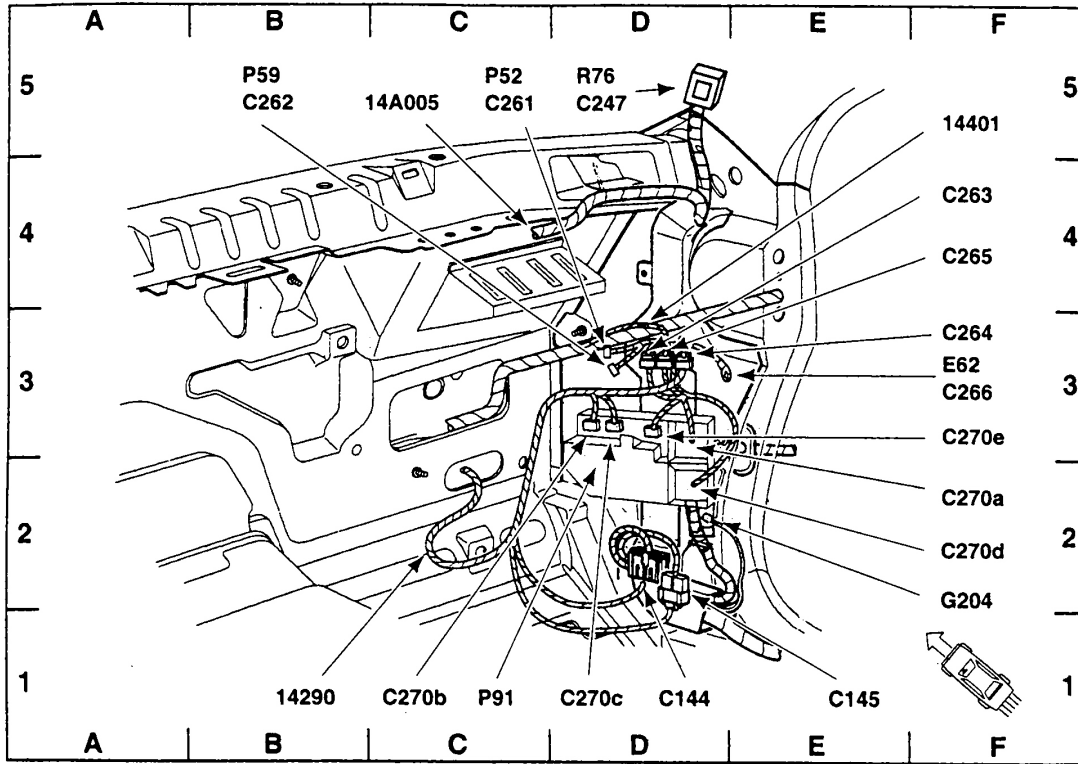
CENTRAL JUNCTION BOX

NOTE: Central junction box may also be referred to as passenger compartment fuse panel.

NOTE: Central junction box is located under passenger side kick panel. See [Fig. 1](#) .

2000 Lincoln LS

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Dash panel, RH front view

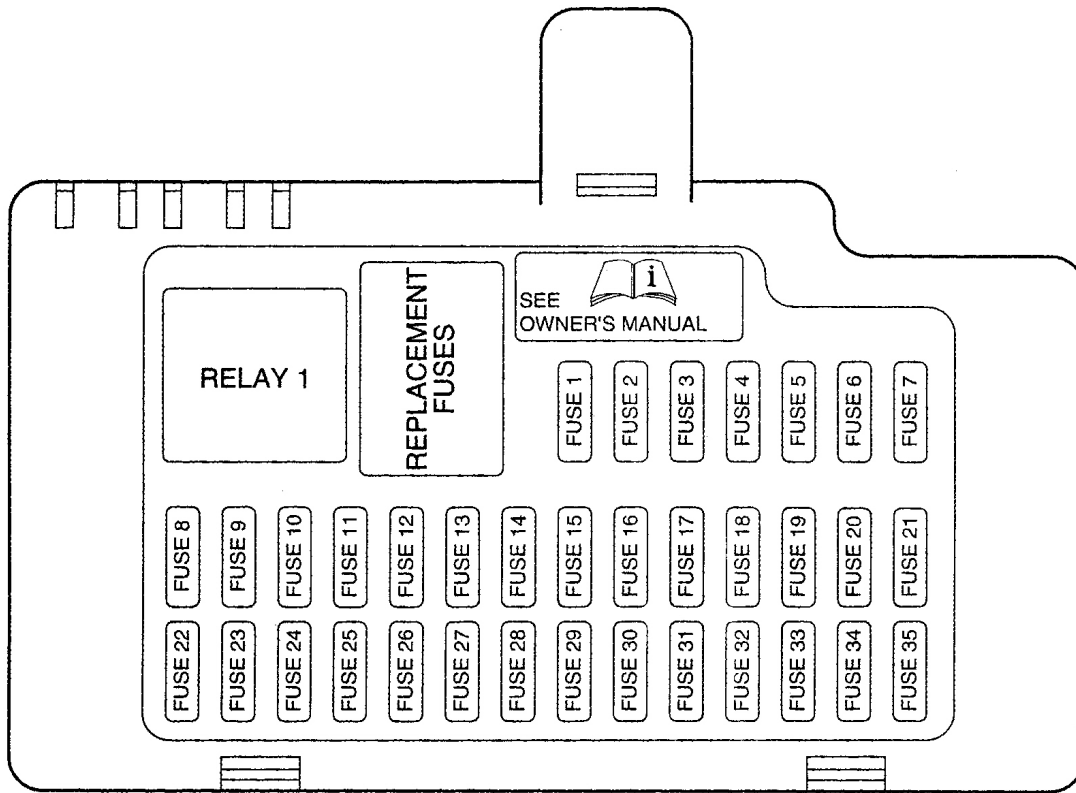
14A005	C 5	C270a	F 2
14290	B 1	C270b	C 1
14401	F 5	C270c	D 1
C144	D 1	C270d	F 2
C145	E 1	C270e	F 3
C247	D 5	E62 .. Footwell lamp, right front	F 3
C261	C 5	G204	F 2
C262	B 5	P52 .. Joint connector 1	C 5
C263	F 4	P59 .. Joint connector 2	B 5
C264	F 3	P91 .. Central Junction Box (CJB)	C 1
C265	F 4	R76 .. Window heater, right	D 5
C266	F 3		

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Fig. 1: Locating Instrument Panel Electrical Components
 Courtesy of FORD MOTOR CO.

2000 Lincoln LS

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Fig. 2: Identifying Central Junction Box Components

Courtesy of FORD MOTOR CO.

Fuse/Relay Location	Fuse Amp Rating	Description
1	5A	Starter Relay Coil
2	5A	Radio
3	5A	ABS/TCS/AdvanceTrac
4	5A	Cluster, PCM Relay, Fuel Pump Relay, REM, Transit Relay
5	5A	T/A Switch, O/D Cancel Switch, Autolamp Sensor, Heated Seat Modules
6	10A	OBD II
7	5A	DDM, DSM, Anti-theft LED, Security Horn, PCM, Power Mirror
8	5A	Right Front Turn, Right Front Repeater, Right Front Sidemarkers, Right Front Park Lamps
9	10A	Right Front Low Beam

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Fig. 3: Central Junction Box Legend (1 Of 2)

Courtesy of FORD MOTOR CO.

2000 Lincoln LS

2000 ELECTRICAL Fuses & Circuit Breakers - LS

Fuse/Relay Location	Fuse Amp Rating	Description
10	5A	Left Front Turn, Left Front Repeater, Left Front Sidemarkers, Left Front Park Lamps
11	10A	Left Front High Beam
12	10A	Headlamp Leveling
13	5A	Cluster
14	10A	RCM, DATC
15	5A	Not Used (Spare)
16	5A	E/C Mirror, Heated Seat Controls, RSM (Rain Sensor Module)
17	5A	RCM, Alternator Warning Lamp
18	20A	Radio, CIA
19	15A	Tilt/Tele Motors
20	10A	FEM, DATC, Cluster, Brake Shift Interlock, REM
21	10A	Power Folding Mirrors
22	10A	DDM
23	10A	Right Front High Beam
24	5A	PATS
25	10A	Left Front Low Beam
26	3A	Wiper Relay
27	10A	Radio, Cellphone
28	5A	Security Horn
29	5A	Trailer Tow Ignition Sense, VEMS, FEM
30	5A	FEM
31	—	Not Used
32	20A	Cigar Lighter
33	10A	Switch Backlighting
34	10A	Not Used (Spare)
35	5A	Stop Lamp Signal

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Fig. 4: Central Junction Box Legend (2 Of 2)

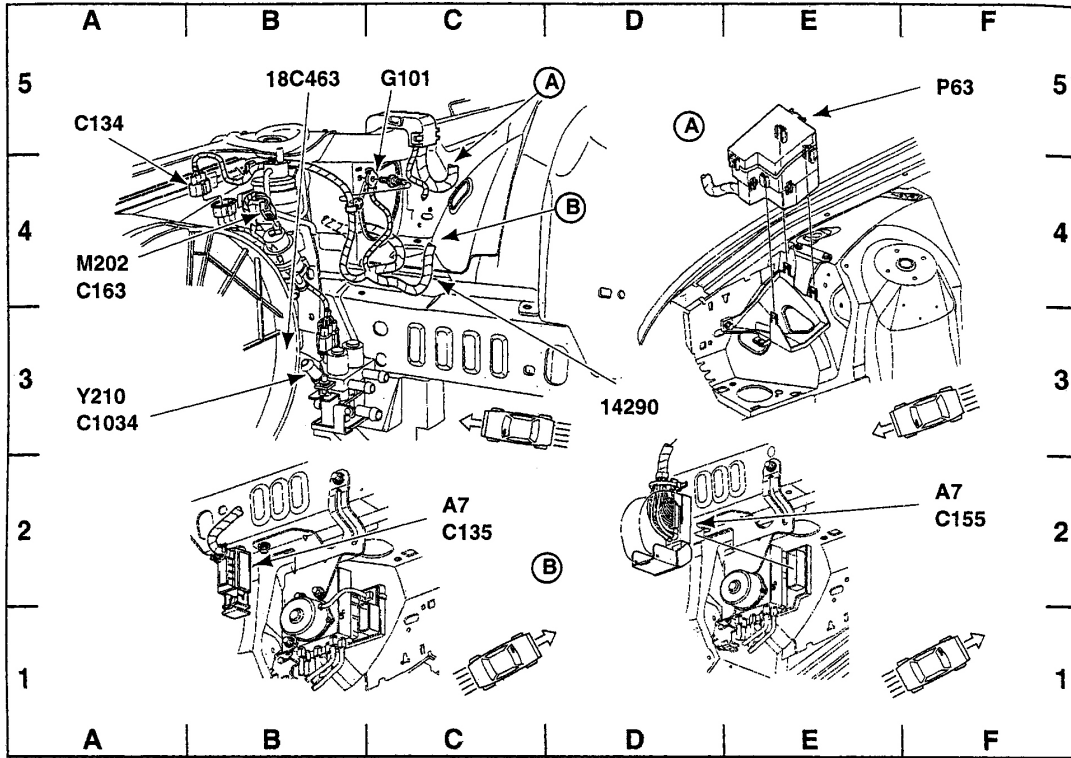
Courtesy of FORD MOTOR CO.

AUXILIARY JUNCTION BOX

NOTE: Auxiliary junction box is located on passenger's front corner of engine compartment. See Fig. 5.

2000 Lincoln LS

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RH engine compartment

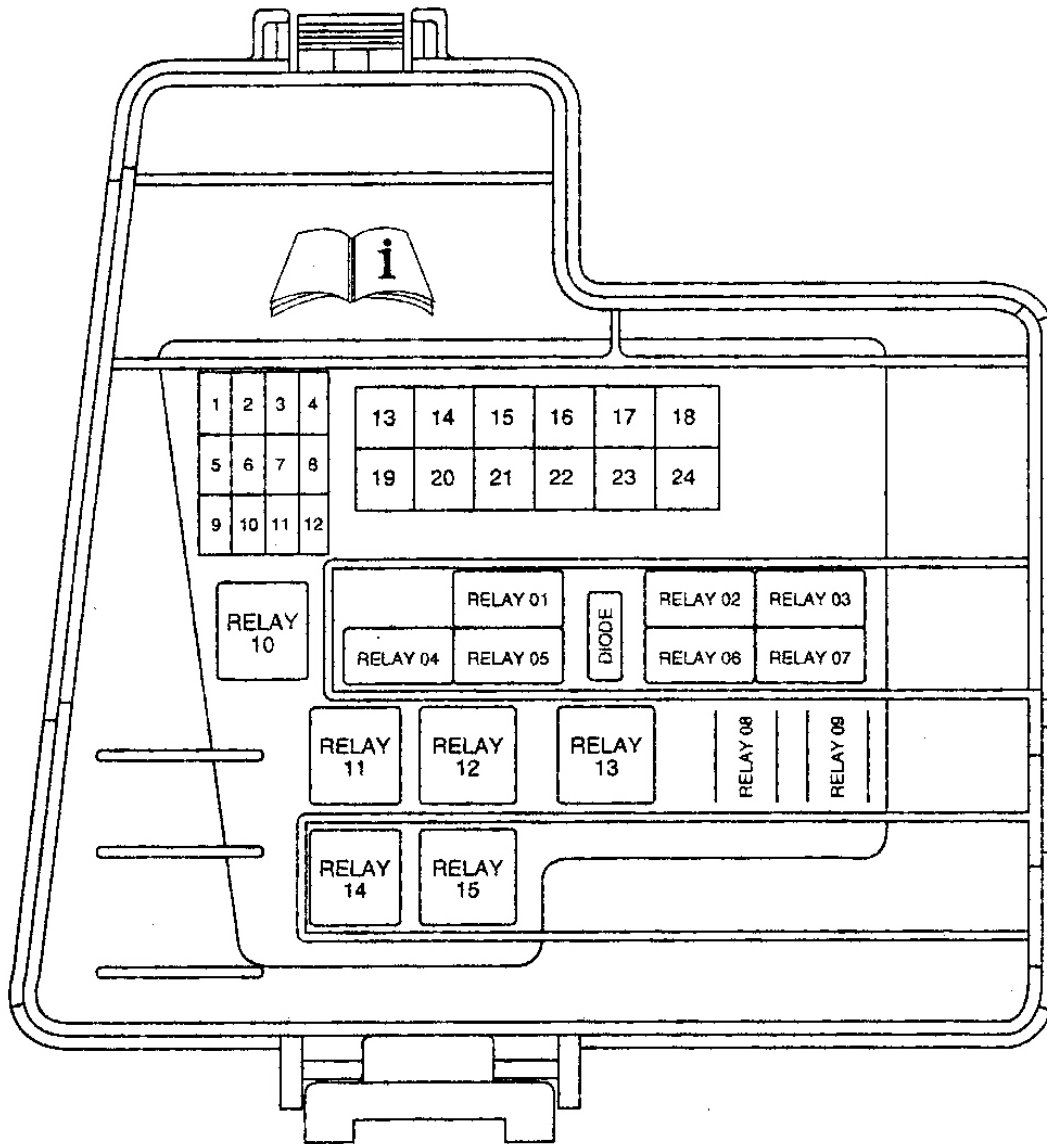
18C463	B 5	C163	A 4
14290	D 3	C1034	A 3
A7 ... ABS control module	C 2	G101	C 5
A7 ... ABS control module	F 2	M202 Auxiliary coolant pump motor	A 4
C134	A 5	P63 .. Auxiliary Junction Box (AJB), underhood	F 5
C135	C 2	Y210 . Coolant control valve solenoid	A 3
C155	F 2		

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Fig. 5: Locating Engine Compartment Electrical Components
 Courtesy of FORD MOTOR CO.

2000 Lincoln LS

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Fig. 6: Identifying Auxiliary Junction Box Components
Courtesy of FORD MOTOR CO.

2000 Lincoln LS

2000 ELECTRICAL Fuses & Circuit Breakers - LS

Fuse/Relay Location	Fuse Amp Rating	Description
1	10A*	A/C Clutch
2	10A*	Windshield Washer Pump
3	15A*	Fog Lamp
4	15A*	Horn
5	20A*	Fuel Injectors
6	15A*	Transmission Solenoid
7	—	Not Used
8	—	Not Used
9	—	Not Used
10	—	Not Used
11	15A*	HEGO's
12	10A*	COP's
13	30A**	Heated Wiper Park

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Fig. 7: Auxiliary Junction Box Legend (1 Of 2)
Courtesy of FORD MOTOR CO.

2000 Lincoln LS

2000 ELECTRICAL Fuses & Circuit Breakers - LS

Fuse/Relay Location	Fuse Amp Rating	Description
14	30A**	ABS Module
15	—	Not Used
16	30A**	Blower Motor
17	20A**	Thermactor Air Pump (Low Emission Vehicles Only)
18	40A**	PCM
19	—	Not Used
20	30A**	Wiper Motor
21	30A**	Starter Solenoid
22	30A**	ABS Motor
23	—	Not Used (Fuse Plug)
24	—	Not Used
Relay 01	—	Wiper Hi/Lo
Relay 02	—	Wiper Park
Relay 03	—	COP's and HEGO's
Relay 04	—	Windshield Washer
Relay 05	—	Auxiliary Coolant Pump (V8)
Relay 06	—	Horn
Relay 07	—	Fog Lamps
Relay 08	—	A/C Clutch
Relay 09	—	Wiper Run/Acc
Relay 10	—	Blower Motor
Relay 11	—	Not Used
Relay 12	—	Heated Wiper Park
Relay 13	—	Not Used
Relay 14	—	PCM Power
Relay 15	—	Starter Motor
Diode	—	PCM
*Mini fuses **Cartridge fuses		

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Fig. 8: Auxiliary Junction Box Legend (2 Of 2)

Courtesy of FORD MOTOR CO.

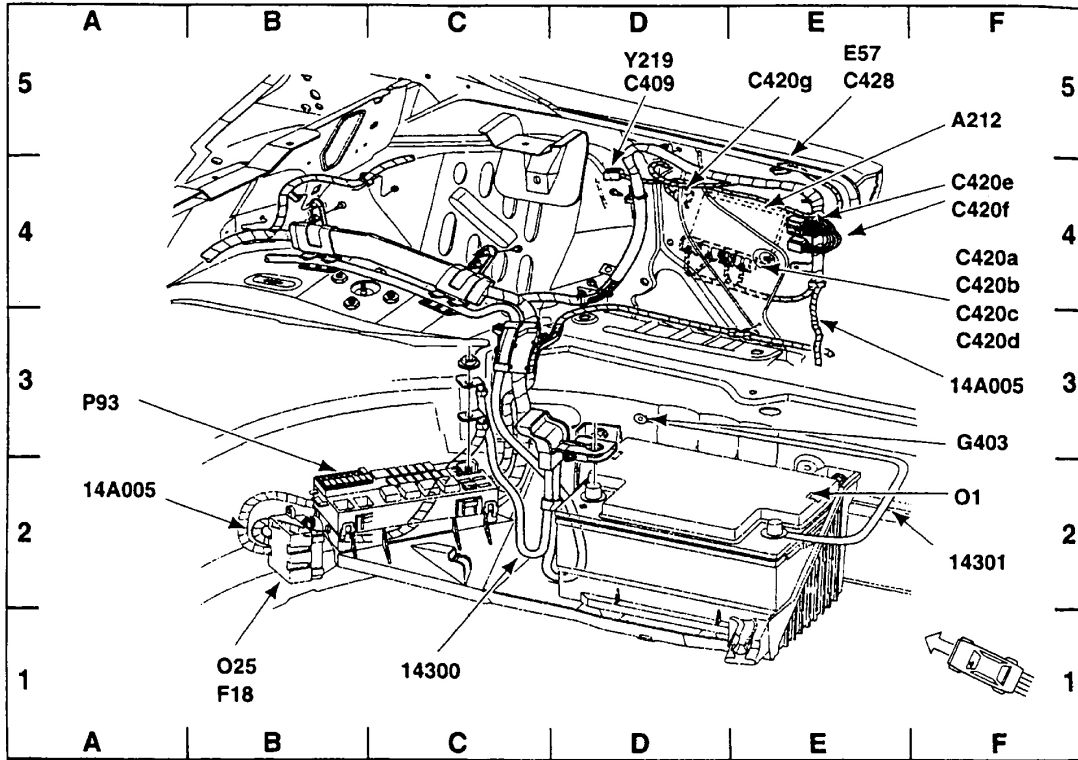
BATTERY JUNCTION BOX

NOTE: Battery junction box also referred to as rear power distribution box.

NOTE: Battery junction box is located in passenger's side of trunk, near battery. See Fig. 9.

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Luggage compartment, RH side, front

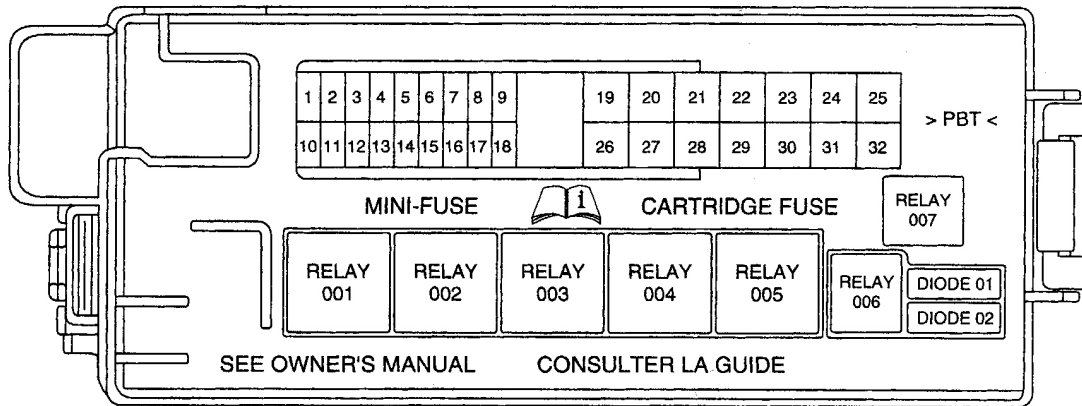
14A005	A 2	C420f	F 4
14A005	F 3	C420g	E 5
14300	C 1	C428	E 5
14301	F 2	E57 .. Luggage compartment lamp	E 5
A212 .. Rear Electronic Module (REM)	F 5	F18	B 1
C409	D 5	G403	F 3
C420a	F 4	O1 .. Battery	F 2
C420b	F 4	O25 .. Mega fuse	B 1
C420c	F 3	P93 .. Battery Junction Box (BJB)	A 3
C420d	F 3	Y219 .. Fuel door release solenoid	D 5
C420e	F 4		

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Fig. 9: Locating Electrical Components in Trunk
 Courtesy of FORD MOTOR CO.

2000 Lincoln LS

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G00097828

Fig. 10: Identifying Battery Junction Box Components

Courtesy of FORD MOTOR CO.

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2000 ELECTRICAL Fuses & Circuit Breakers - LS

Fuse/Relay Location	Fuse Amp Rating	Description
1	15A*	Decklid Release Solenoid
2	10A*	Right Rear Turn Lamp
3	5A*	Left Rear Stop Lamp
4	10A*	Fuel Door Release Solenoid
5	10A*	Courtesy and Map Lamps
6	10A*	Left Rear Turn and Back-up Lamps
7	5A*	Right Rear Stop Lamp
8	10A*	Center High Mounted Stop Lamp
9	5A*	Heated Mirror
10	—	Not Used
11	15A*	Heated Seats
12	5A*	Transit Relay (if equipped)
13	—	Not Used
14	5A*	Phone, CD, VEMS
15	5A*	Alternator Sense
16	20A*	Moonroof
17	15A*	Fuel Pump
18	20A*	Subwoofer Amplifier
19	20A**	REM - Left Rear Window
20	20A**	DDM - Driver Window
21	20A**	Driver Lumbar, Power Seats
22	20A**	Ignition
23	30A**	SSP4
24	30A**	SSP3
25	40A**	P-J/B
26	20A**	FEM - Front Passenger Window
27	30A**	SSP1
28	20A**	Passenger Lumbar, Power Seats
29	30A**	Rear Defroster

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Fig. 11: Battery Junction Box Legend (1 Of 2)

Courtesy of FORD MOTOR CO.

2000 Lincoln LS

2000 ELECTRICAL Fuses & Circuit Breakers - LS

Fuse/Relay Location	Fuse Amp Rating	Description
30	20A**	REM - Right Rear Window
31	—	Not Used
32	30A**	SSP2
Relay 001	—	SSP1
Relay 002	—	SSP4
Relay 003	—	Rear Defroster
Relay 004	—	SSP3
Relay 005	—	SSP2
Relay 006	—	Not Used
Relay 007	—	Fuel Pump
Diode 01	—	Not Used
Diode 02	—	Fuel Pump Motor
*Mini fuses **Maxi fuses		

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Fig. 12: Battery Junction Box Legend (2 Of 2)
Courtesy of FORD MOTOR CO.

2000 STARTING & CHARGING SYSTEMS**Generators & Regulators - LS****DESCRIPTION**

System consists of 110-amp generator, internal voltage regulator, battery, Powertrain Control Module (PCM), warning indicator, related fuses and wiring. PCM and generator communicate using pulse-width modulated signals. A dedicated line communicates desired charging rate from PCM to generator and a second dedicated line communicates load from generator to PCM.

Warning indicator should illuminate with ignition on, engine off. Warning indicator should not illuminate with ignition off, or with engine running. Generator and regulator cannot be serviced separately, and must be replaced as an assembly.

ADJUSTMENTS**BELT TENSION**

Vehicles are equipped with automatic drive belt tensioner. Drive belt does not require adjustment. Inspect condition and tension of generator drive belt prior to performing any on-vehicle charging system tests. Replace belt and/or repair tensioner mechanism if necessary.

TROUBLE SHOOTING

NOTE: See **TROUBLE SHOOTING** article in **GENERAL INFORMATION**.

PRELIMINARY CHECKS

- Verify battery condition.
- Inspect accessory drive belt and tensioner.
- Inspect battery junction box fuse No. 415 (5-amp).
- Inspect central junction box fuse No. 217 (5-amp).
- Check all connections for looseness or corrosion.

ON-VEHICLE TESTING**GENERATOR LOAD TEST**

Verify battery condition. Charge or replace as necessary. Connect load tester and ammeter according to tool manufacturer's instructions. With engine running at 2000 RPM and all accessories off, load system to determine generator voltage output. With engine running, turn A/C (if equipped) and headlights on, turn blower motor to high speed. Increase engine speed to 2000 RPM. Voltage should increase a minimum of .5 volt above base voltage.

GENERATOR NO-LOAD TEST

Verify battery condition. Charge or replace battery as necessary. Connect voltmeter positive lead to B+

2000 Lincoln LS

2000 STARTING & CHARGING SYSTEMS Generators & Regulators - LS

off. Read voltmeter when voltage stabilizes. Voltage should be 13-15 volts. If voltage is not as specified, replace generator. See **GENERATOR** under REMOVAL & INSTALLATION.

SELF-DIAGNOSTIC SYSTEM

RETRIEVING DIAGNOSTIC TROUBLE CODES

Connect New Generation Star (NGS) tester to Data Link Connector (DLC) and retrieve charging system Diagnostic Trouble Codes (DTCs). See **POWERTRAIN CONTROL MODULE (PCM) DIAGNOSTIC TROUBLE CODE (DTC) INDEX**. If any other Diagnostic Trouble Code (DTC)s are present, see SELF-DIAGNOSTICS - EEC-V article in ENGINE PERFORMANCE to diagnose fault. After repair is complete, clear DTCs. See **CLEARING DIAGNOSTIC TROUBLE CODES**. If no DTCs are present, repair by symptom. See **SYMPTOM INDEX** table under SYSTEM TESTS.

POWERTRAIN CONTROL MODULE (PCM) DIAGNOSTIC TROUBLE CODE (DTC) INDEX

DTC	Description	Perform Test
P1244	Generator Load Input Low	(1)
P1245	Generator Load Input High	(1)
P1246	Generator Load Input Failure	(1)

(1) See appropriate SELF-DIAGNOSTICS article in ENGINE PERFORMANCE to diagnose fault.

CLEARING DIAGNOSTIC TROUBLE CODES

Connect New Generation Star (NGS) tester to Data Link Connector (DLC). Using NGS tester manufacturer's instructions, clear Diagnostic Trouble Code (DTC)s.

SYSTEM TESTS

INTRODUCTION

Identify symptom and perform appropriate test. See **SYMPTOM INDEX**.

SYMPTOM INDEX

Symptom	Perform Test
Warning Indicator On With Engine Running, System Not Charging	<u>A</u>
System Overcharges	<u>B</u>
Warning Indicator On With Engine Running, System Is Charging	<u>C</u>
Warning Indicator Off With Ignition On	<u>D</u>
Warning Indicator Flickers, Or Is Intermittent	<u>E</u>

TEST A: WARNING INDICATOR ON WITH ENGINE RUNNING, SYSTEM NOT CHARGING

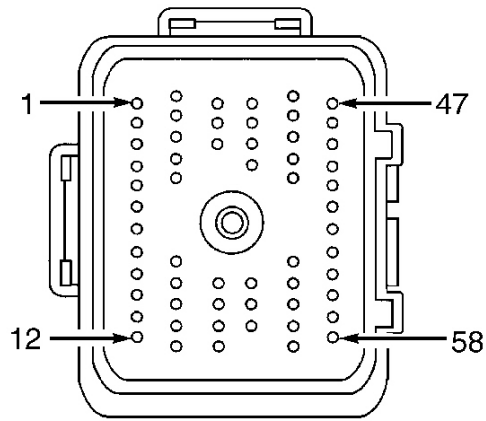
1. Connect NGS tester. Turn ignition on and perform PCM self-test. If any Diagnostic Trouble Code (DTC)s are retrieved, see **POWERTRAIN CONTROL MODULE (PCM) DIAGNOSTIC TROUBLE CODE (DTC) INDEX** table. If no DTCs are retrieved, go to next step.
2. Turn ignition off. Disconnect NGS tester and generator 3-pin connector. Turn ignition on. Measure voltage of Gray/Red wire at generator 3-pin connector. If voltage is not present, go to step 4. If

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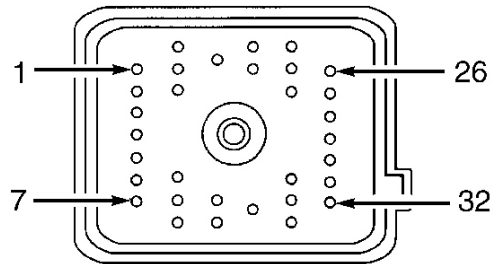
2000 STARTING & CHARGING SYSTEMS Generators & Regulators - LS

voltage is present, go to next step.

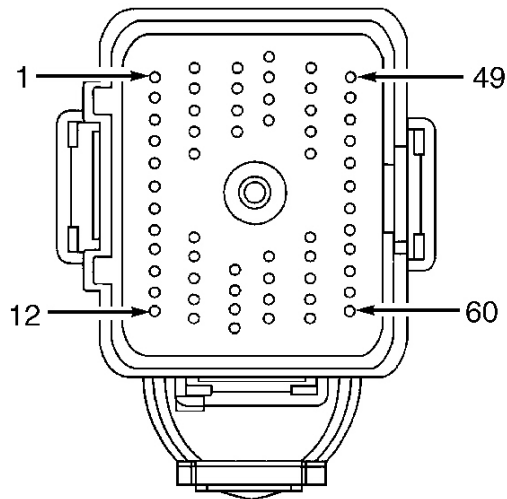
3. Turn ignition off. Disconnect PCM connector C175c. Measure resistance of Gray/Red wire between generator 3-pin connector and terminal No. 28 at PCM connector C175c. See **Fig. 1** . If resistance is 5 ohms or less, go to next step. If resistance is greater than 5 ohms, repair open in Gray/Red wire between generator and PCM. See **WIRING DIAGRAMS** . Retest system operation.
4. Connect PCM connector C175c. Check generator output. Perform **GENERATOR LOAD TEST** and **GENERATOR NO-LOAD TEST** under ON-VEHICLE TESTING. If generator is okay, go to next step. If generator is not okay, replace generator. See **GENERATOR** under REMOVAL & INSTALLATION.
5. Disconnect PCM connector C175c. Inspect connector for pushed out pins, corrosion or bent terminals. Repair as necessary. If connector is okay, reconnect and retest system operation. If fault is still present, replace PCM. Clear DTCs and repeat PCM self-test. If fault is still not present, system is operating correctly at this time.



C175a



C175b



C175c

G00011081

Fig. 1: Identifying Powertrain Control Module (PCM) C175c Connector Terminals
 Courtesy of FORD MOTOR CO.

TEST B: SYSTEM OVERCHARGES

1. Connect NGS tester. Turn ignition on and perform PCM self-test. If any Diagnostic Trouble Code (DTC)s are retrieved, see **POWERTRAIN CONTROL MODULE (PCM) DIAGNOSTIC TROUBLE CODE (DTC) INDEX** table. If no DTCs are retrieved, go to next step.

2. Turn ignition off. Disconnect NGS tester. Start engine. With engine running and all accessories turned off, measure voltage between battery terminals while varying engine speed. If voltage is greater than 15 volts, go to step 4 . If voltage is less than 15 volts, go to next step.
3. Turn ignition off. Disconnect generator 3-pin connector. Start engine. Check generator output. See **GENERATOR LOAD TEST** under ON-VEHICLE TESTING. If generator tests okay, go to next step. If generator does not test okay, replace generator. See **GENERATOR** under REMOVAL & INSTALLATION.
4. Measure voltage of Red wire at generator 3-pin connector. If voltage is less than .5 volt from battery voltage, replace generator. See **GENERATOR** under REMOVAL & INSTALLATION. Clear DTCs and retest system operation. If voltage is greater than .5 volt from battery voltage, repair high resistance in Red wire. See **WIRING DIAGRAMS** . Clear DTCs and retest system operation.

TEST C: WARNING INDICATOR ON WITH ENGINE RUNNING, SYSTEM IS CHARGING

1. Connect NGS tester. Turn ignition on and perform PCM self-test. If any Diagnostic Trouble Code (DTC)s are retrieved, see **POWERTRAIN CONTROL MODULE (PCM) DIAGNOSTIC TROUBLE CODE (DTC) INDEX** table. If no DTCs are retrieved, go to next step.
2. Turn ignition off. Disconnect NGS tester. Start engine. With engine running and all accessories turned off, measure voltage between battery terminals while varying engine speed. If voltage is greater than 15 volts, perform **TEST B: SYSTEM OVERCHARGES** . If voltage is less than 15 volts, go to next step.
3. Turn ignition off. Disconnect generator 3-pin connector. Turn ignition on. Measure voltage of Red wire at generator 3-pin connector. If battery voltage is present, go to next step. If voltage is not present, repair open or short in Red wire. See **WIRING DIAGRAMS** . Retest system operation.
4. Turn ignition off. Disconnect PCM connector C175c. Turn ignition on and observe warning indicator. If warning indicator is illuminated, repair short to ground in Gray/Red wire between generator and PCM. See **WIRING DIAGRAMS** . If warning indicator is not illuminated, go to next step.
5. Turn ignition off. Reconnect PCM connector C175c. Disconnect generator 3-pin connector. Check generator output. See **GENERATOR LOAD TEST** under ON-VEHICLE TESTING. If generator tests okay, go to next step. If generator does not test okay, replace generator. See **GENERATOR** under REMOVAL & INSTALLATION.
6. Disconnect PCM connector C175c. Inspect connector for pushed out pins, corrosion or bent terminals. Repair as necessary. If connector is okay, reconnect and retest system operation. If fault is still present, replace PCM. Clear DTCs and repeat PCM self-test. If fault is still not present, system is operating correctly at this time.

TEST D: WARNING INDICATOR OFF WITH IGNITION ON

1. Connect NGS tester. Turn ignition on and perform PCM self-test. If any Diagnostic Trouble Code (DTC)s are retrieved, see **POWERTRAIN CONTROL MODULE (PCM) DIAGNOSTIC TROUBLE CODE (DTC) INDEX** table. If no DTCs are retrieved, go to next step.
2. Turn ignition off. Disconnect NGS tester and generator 3-pin connector. Turn ignition on. Connect a fused (15-amp) jumper wire between generator 3-pin Gray/Red wire terminal and ground. If warning indicator illuminates, replace generator. See **GENERATOR** under REMOVAL & INSTALLATION. If warning indicator does not illuminate, go to next step.
3. Disconnect PCM connector C175c. Inspect connector for pushed out pins, corrosion or bent terminals. Repair as necessary. If connector is okay, reconnect and retest system operation. If fault is still present, replace PCM. Clear DTCs and repeat PCM self-test. If fault is still not present, system is operating correctly at this time.

TEST E: WARNING INDICATOR FLICKERS, OR IS INTERMITTENT

1. Connect NGS tester. Turn ignition on and perform PCM self-test. If any Diagnostic Trouble Code (DTC)s are retrieved, see **POWERTRAIN CONTROL MODULE (PCM) DIAGNOSTIC TROUBLE CODE (DTC) INDEX** table. If no DTCs are retrieved, go to next step.
2. Disconnect generator 3-pin connector. Inspect generator, battery and battery junction box for looseness, corrosion or bent terminals. Clean and tighten any loose connection. If connections are okay, reconnect generator 3-pin connector and go to next step.
3. Start engine. With engine running, inspect battery junction box fuse No. 415 (5-amp), by wiggling fuse and observing warning indicator. If warning indicator flickers, repair loose fuse connection. Retest system operation. If warning indicator does not flicker, go to next step.
4. With engine running and all accessories turned off, measure voltage between battery terminals. If battery voltage is greater than 15 volts, perform **TEST B: SYSTEM OVERCHARGES** . If battery voltage is less than 15 volts, go to next step.
5. Turn ignition off. Disconnect generator 3-pin connector. Connect a fused (15-amp) jumper wire between generator 3-pin Gray/Red wire terminal and ground. Turn ignition on and observe warning indicator. If warning indicator illuminates, go to next step. If warning indicator does not illuminate, repair open in Gray/Red wire. See **WIRING DIAGRAMS** . Retest system operation.
6. Turn ignition off. Connect generator 3-pin connector. Turn ignition on and observe warning indicator. If warning indicator illuminates, system is operating correctly at this time. Inspect circuits for intermittent opens or shorts. Retest system operation. If warning indicator does not illuminate, go to next step.
7. Disconnect PCM connector C175c. Inspect connector for pushed out pins, corrosion or bent terminals. Repair as necessary. If connector is okay, reconnect and retest system operation. If fault is still present, replace PCM. Clear DTCs and repeat PCM self-test. If fault is still not present, system is operating correctly at this time.

REMOVAL & INSTALLATION

CAUTION: When battery is disconnected, vehicle computer and memory systems may lose memory data. Driveability problems may exist until computer systems have completed a relearn cycle. See COMPUTER RELEARN PROCEDURES article in GENERAL INFORMATION before disconnecting battery.

GENERATOR**Removal & Installation (3.0L)**

Disconnect negative battery cable. Remove drive belt from pulley. Raise and support vehicle. Remove bolts, pin-type retainers and lower splash shield. Remove 3 mounting bolts from generator. Hand support generator and rotate to access electrical connections. Disconnect wiring from generator. Remove generator. To install reverse removal procedure. Tighten fasteners to specification. See **TORQUE SPECIFICATIONS** .

Removal (3.9L)

Disconnect negative battery cable. Remove engine cover and air cleaner inlet tube. Remove drive belt from pulley. Raise and support vehicle. Remove 5 bolts and lower splash shield. Remove generator mounting

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bolts. Rotate generator to access B+ terminal, and remove nut. Slightly lower generator and disconnect electrical connectors. Rotate and remove generator.

Installation

Position generator and connect electrical connectors. Rotate generator to access B+ terminal, install cable and nut. Install pivot bolt and nut, leave loose. Install generator expanding bushing/bolt assembly and tighten to specification in 2 steps. Install remaining mounting bolts and tighten to specification. See **TORQUE SPECIFICATIONS** table. Install lower splash shield. Lower vehicle, install drive belt to generator pulley and air cleaner inlet tube. Reconnect negative battery cable.

TORQUE SPECIFICATIONS

TORQUE SPECIFICATIONS

Application	Ft. Lbs. (N.m)
Generator Mounting Bolts (3.0L)	33 (45)
Generator Mounting Bolts (3.9L)	
Pivot & Lower Mounting Bolts	35 (48)
Generator Expanding Bushing/Bolt Assembly	
Step 1	15 (20)
Step 2	Turn Additional 90°
	INCH Lbs. (N.m)
Battery Ground Cable Bolt	89 (10)
Generator B+ Terminal Nut	7 (.8)

WIRING DIAGRAMS

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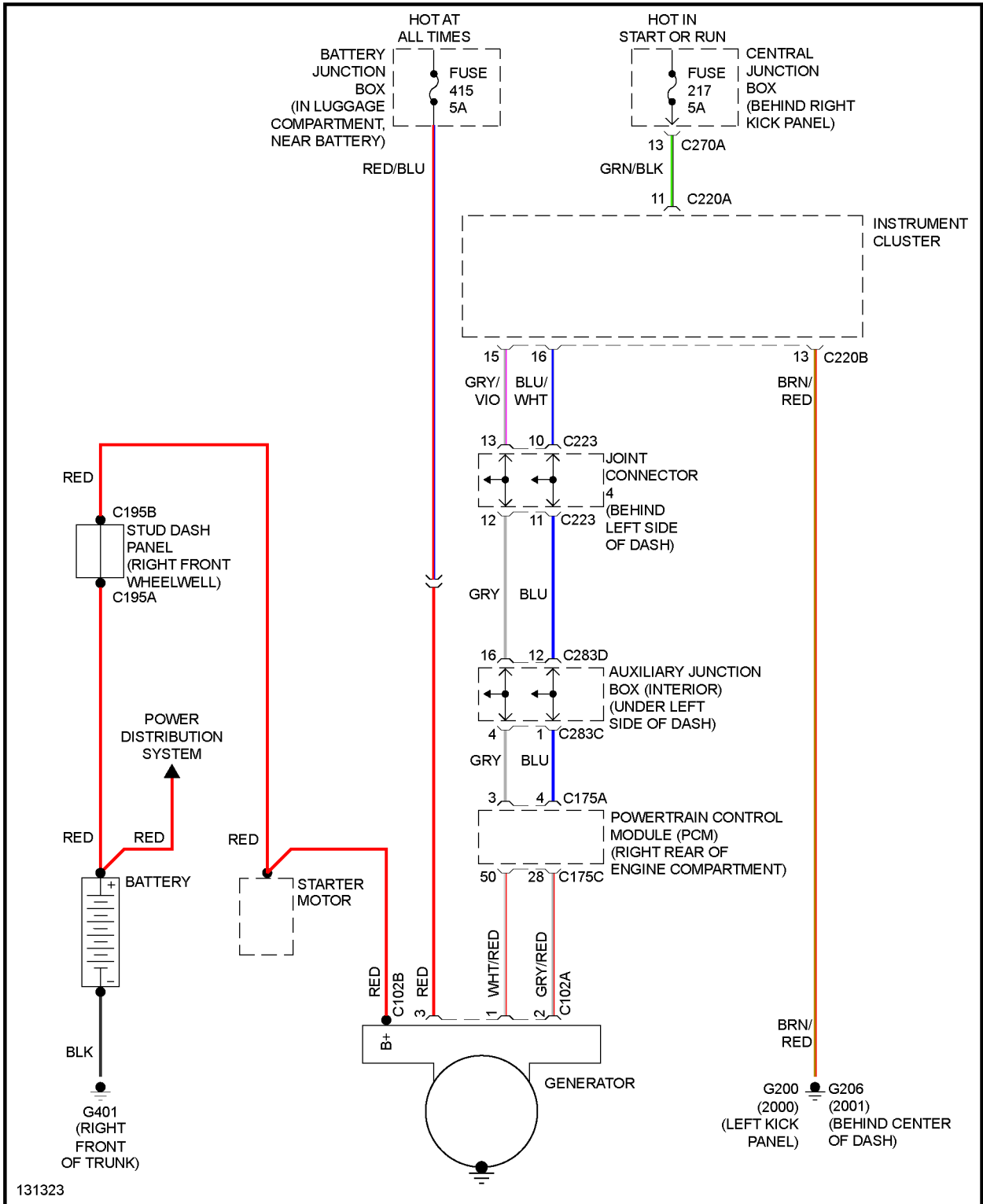


Fig. 2: Charging System Wiring Diagram (LS)

2000 STARTING & CHARGING SYSTEMS**Starters - LS****DESCRIPTION**

The starter is a gear-reduction motor with an externally-mounted solenoid. Starting system consists of a starter motor, solenoid, battery, ignition switch, Digital Transmission Range (DTR) sensor, starter relay, and interconnecting cables and wires.

ADJUSTMENTS**DIGITAL TRANSMISSION RANGE (DTR) SENSOR**

1. Place transmission in Neutral. Raise and support vehicle. Remove catalytic converter. Remove heat shield. Mark front driveshaft flex coupling components to ensure installation is in same position. Using Driveshaft Coupler Torquing Wrenches (205-474), loosen driveshaft coupler nut, located in front of driveshaft bushing. Remove front driveshaft flex coupling nuts. Do not remove flex coupling bolts. Slide driveshaft back to clear transmission flange. Support driveshaft and tighten coupler nut. Support transmission. Remove transmission mount. Lower transmission to access DTR sensor. Disconnect manual shift control cable.
2. Disconnect DTR electrical connector. Loosen DTR sensor bolts. Using DTR Sensor Aligner (T97L-70010-A), align DTR sensor slots. Tighten DTR sensor bolts to specification. See **TORQUE SPECIFICATIONS** . To complete assembly, reverse removal procedure. Use marks to align components in original positions. Use Loctite on flex coupling bolts.

TROUBLE SHOOTING

- Check battery for state of charge.
- Check cable connections at battery and starter motor.
- Ensure transmission is fully engaged in Park or Neutral.
- Check fuse F121 (30-amp) in auxiliary junction box, located underhood.
- Check fuse F22 (20-amp) in battery junction box, located on right side of trunk.
- Check fuse F201 (5-amp) in central junction box, located under right side of instrument panel.

ON-VEHICLE TESTING

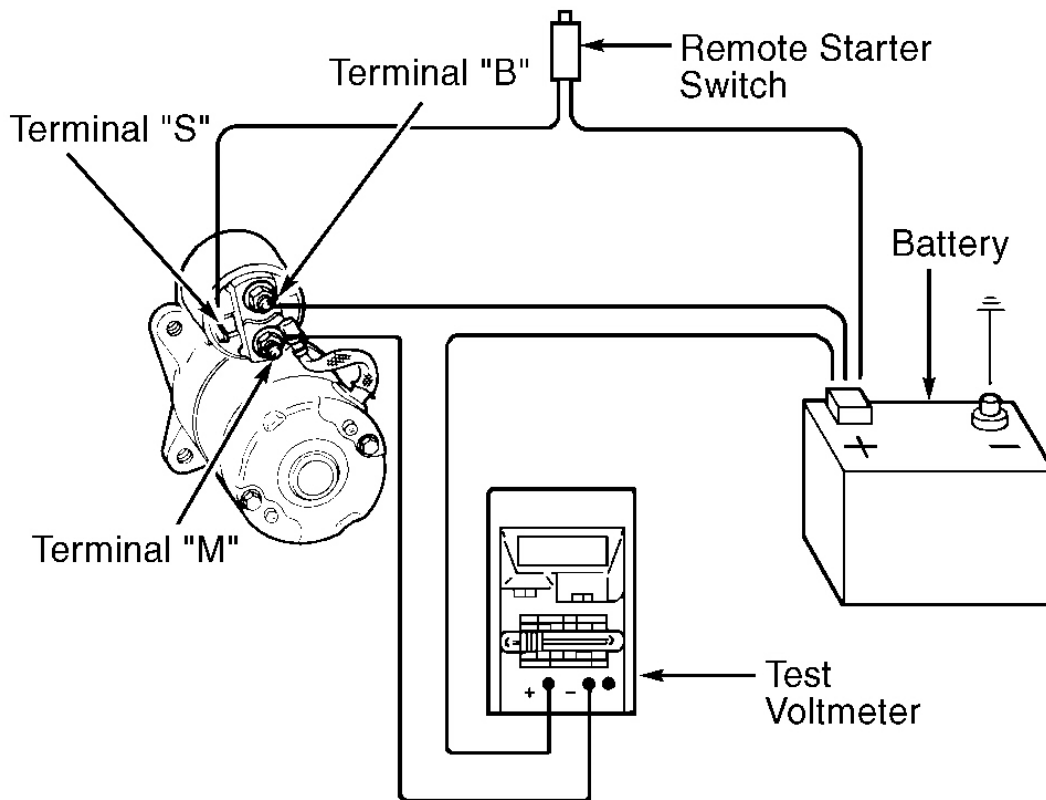
CAUTION: When battery is disconnected, vehicle computer and memory systems may lose memory data. Driveability problems may exist until computer systems have completed a relearn cycle. See **COMPUTER RELEARN PROCEDURES** article in **GENERAL INFORMATION** before disconnecting battery. Before testing starter, ensure transmission is in Park or Neutral.

CAUTION: Before testing starter, ensure transmission is in Park or Neutral.

VOLTAGE DROP TEST

NOTE: Make all voltmeter connections at component terminal rather than at cable or wire end.

1. Verify battery condition. Battery voltage should be 12 volts or more. Load test battery at approximately one-half cold cranking amperage rating. See load tester manufacturer's instructions. If battery voltage is less than 12 volts or loaded battery voltage is less than 9.6 volts, service battery or charging system as necessary.
2. Disconnect inertia fuel shutoff switch to disable fuel system. Connect remote starter switch between starter solenoid terminal "S" (Gray wire) and positive battery post. See **Fig. 1**.



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Fig. 1: Testing Voltage Drop
 Courtesy of FORD MOTOR CO.

3. Connect positive voltmeter lead to positive battery post, and negative lead to solenoid terminal "M" (solenoid-to-motor connection).
4. Engage remote starter switch. Voltmeter should indicate .8 volt or less. If voltmeter indicates more than .8 volt, go to next step. If voltmeter indicates .8 volt or less, go to **STARTER GROUND CIRCUIT TEST**.
5. Move negative voltmeter lead to solenoid terminal "B". Engage remote starter switch. If voltmeter still indicates more than .8 volt at terminal "B", go to next step. If voltmeter indicates less than .8 volt, proceed to the next test step.

through 5) . If voltmeter still indicates more than .8 volt at terminal "M" and less than .8 volt at terminal "B", solenoid contacts are bad. Replace starter motor. See **STARTER MOTOR** under REMOVAL & INSTALLATION.

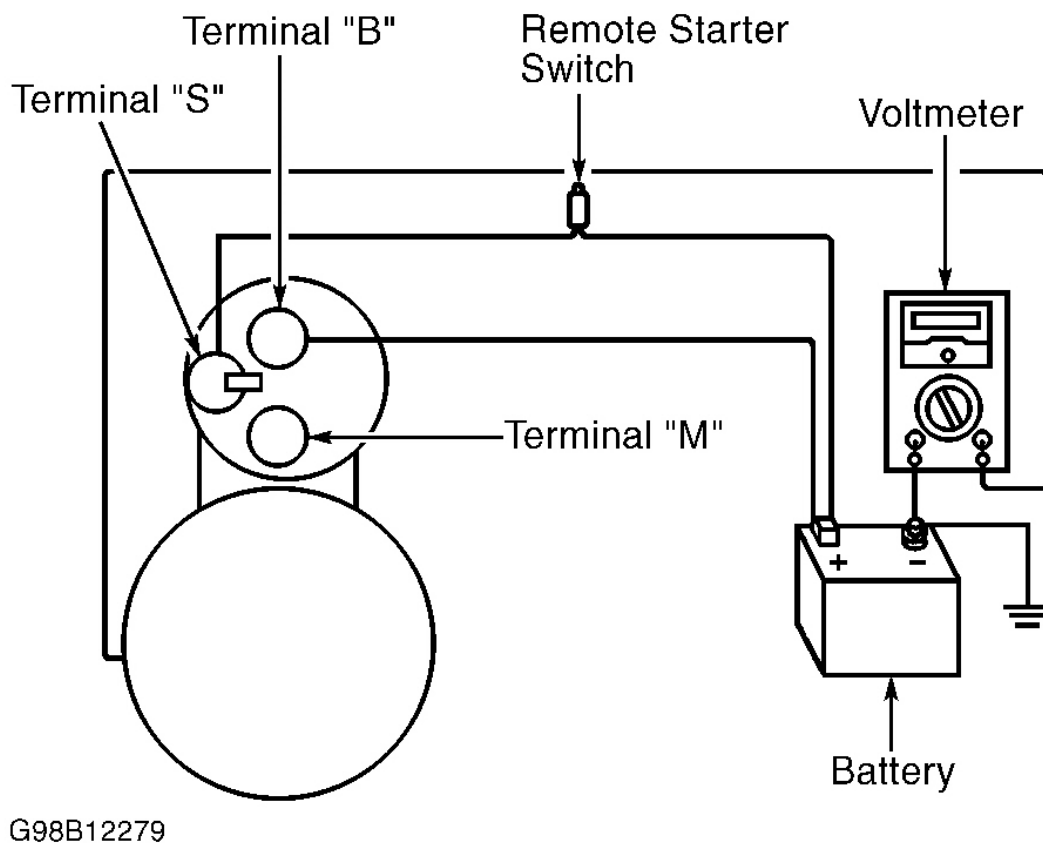
6. Clean cables and connections at solenoid and battery. If voltmeter still indicates more than .8 volt at terminal "B", replace battery cable.

NOTE: To locate excessive voltage drop, move voltmeter negative lead toward battery, and check each connection point. When high voltmeter reading disappears, problem is between last connection point and previous connection point.

STARTER GROUND CIRCUIT TEST

NOTE: Make all voltmeter connections at component terminal rather than at cable or wire end.

1. Disconnect inertia fuel shutoff switch to disable fuel system. Connect remote starter switch between starter solenoid terminal "S" (Gray wire) and positive battery post. See **Fig. 2** . Using a digital voltmeter set at lowest voltage scale, connect positive voltmeter lead to starter housing, and negative lead to negative battery post.
2. Engage remote starter switch while observing voltmeter. Voltmeter should indicate .5 volt or less. If voltmeter indicates more than .5 volt, clean negative cable connections at battery and chassis. Also clean engine ground cable connections at front cover and engine mount bracket. If voltage drop is still excessive, repair or replace negative battery cable and/or engine ground cable as necessary. Repeat starter circuit test after repair to ensure problem has been corrected. If battery and cables test okay and starter motor still cranks slowly or not at all, replace starter motor. See **STARTER MOTOR** under REMOVAL & INSTALLATION.



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Fig. 2: Testing Ground Circuit
 Courtesy of FORD MOTOR CO.

SYSTEM TESTS

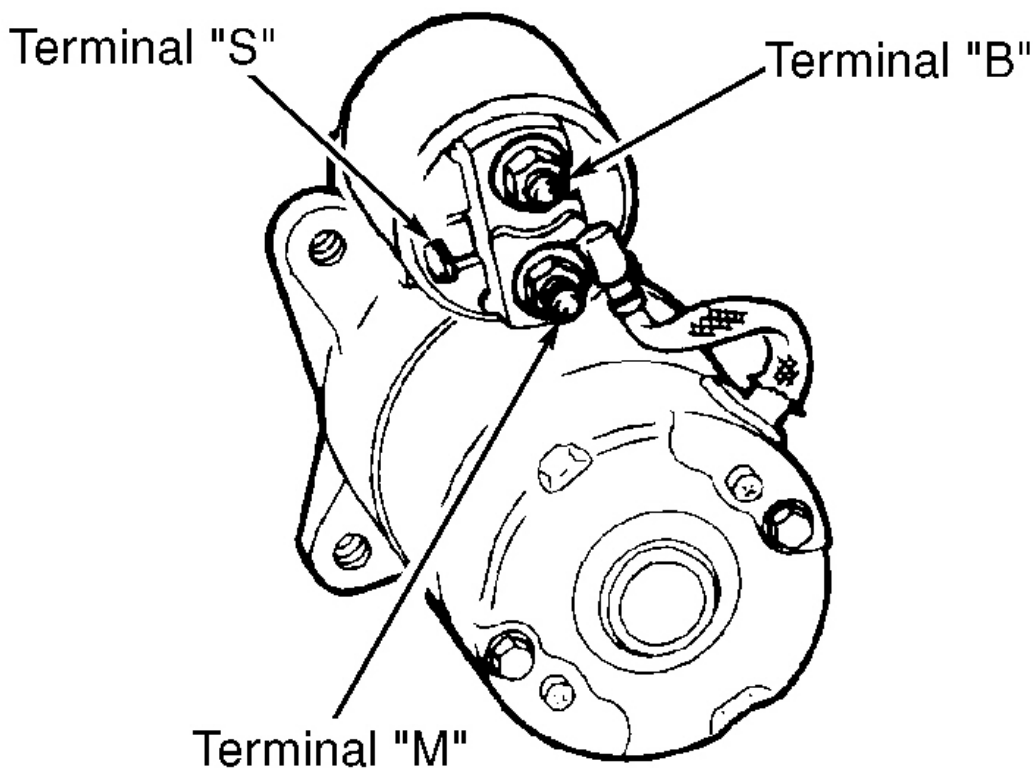
CAUTION: When battery is disconnected, vehicle computer and memory systems may lose memory data. Driveability problems may exist until computer systems have completed a relearn cycle. See **COMPUTER RELEARN PROCEDURES** article in **GENERAL INFORMATION** before disconnecting battery. Before testing starter, ensure transmission is in Park or Neutral.

STARTER DOES NOT CRANK

1. Check for Passive Anti-Theft System (PATS) Diagnostic Trouble Codes (DTC). See **PASSIVE ANTI-THEFT SYSTEMS - LS** article. If no PATS DTCs exist, go to next step. If any PATS DTCs exist, diagnose and repair as necessary.
2. Verify battery condition. Battery voltage should be 12 volts or more. Load test battery at approximately one-half cold cranking amperage rating. See load tester manufacturer's instructions. If battery is okay, go to next step. If battery voltage is less than 12 volts or loaded battery voltage is less than 9.6 volts, service battery or charging system as necessary. Check system operation.
3. Measure voltage between positive battery post and negative battery cable connection at engine block.

If voltage is more than 10 volts, go to next step. If voltage is 10 volts or less, replace battery ground cable. Check system operation.

4. Measure voltage between positive battery post and starter motor case. If voltage is more than 10 volts, go to next step. If voltage is 10 volts or less, clean starter mounting flange and ensure starter is mounted properly. Check system operation.
5. Measure voltage between starter motor terminal "B" and ground. See **Fig. 3**. If voltage is more than 10 volts, go to next step. If voltage is 10 volts or less, replace battery positive cable. Check system operation.



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Fig. 3: Identifying Starter Solenoid Terminals
Courtesy of FORD MOTOR CO.

6. Connect a heavy gauge jumper wire to starter terminal "B". Momentarily touch other end of jumper wire to starter terminal "S". If starter cranked engine, go to next step. If starter did not crank engine, replace starter. Check system operation.
7. Disconnect starter harness connector "S" (Gray wire). Measure voltage between starter harness connector "S" (Gray wire) and ground while turning ignition switch to START position. If voltage is 10 volts or less, go to next step. If voltage is more than 10 volts, clean or repair "S" terminal and connector. Check system operation.
8. Remove starter relay from Auxiliary Junction Box (AJB), located underhood. On manual transmission models, have a helper depress clutch. On all models, measure voltage between starter relay cavity No.

86 and ground while turning ignition switch to START position. See **Fig. 4** . If voltage is more than 10 volts, go to next step. If voltage is 10 volts or less, go to step 17 .

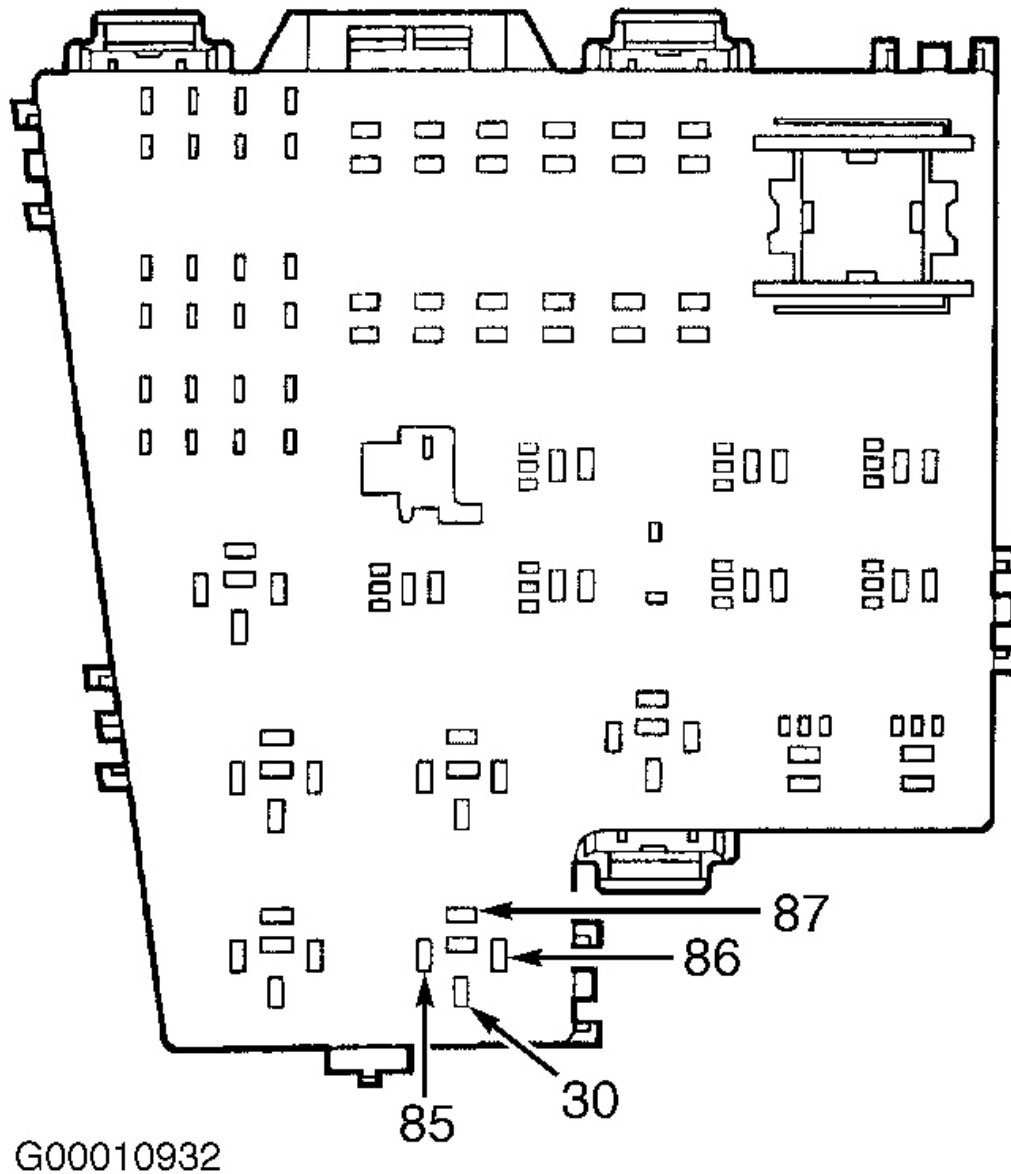


Fig. 4: Identifying Starter Relay Cavity Terminals
Courtesy of FORD MOTOR CO.

9. On manual transmission models, have a helper depress clutch. On all models, measure resistance between starter relay cavity No. 85 and ground while turning ignition switch to START position. If resistance is less than 5 ohms, go to step 14 . If resistance is 5 ohms or more, go to step 11 (M/T), or next step (A/T).
10. Disconnect 20-pin instrument cluster connector C220B. Measure resistance of Black/Yellow wire between starter relay cavity No. 85 and instrument cluster connector C220B terminal No. 18. See **Fig.**

5. If resistance is less than 5 ohms, replace instrument cluster. See ANALOG INSTRUMENT PANELS - LS article. If resistance is 5 ohms or more, repair open on Black/Yellow wire. After repairs, check system operation.

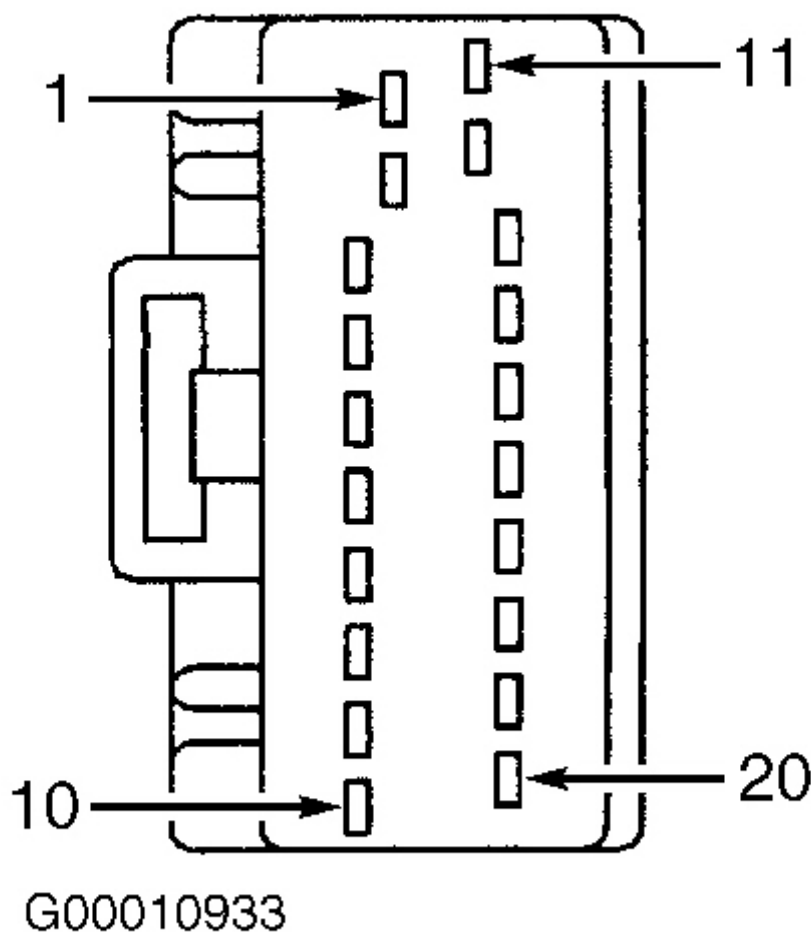
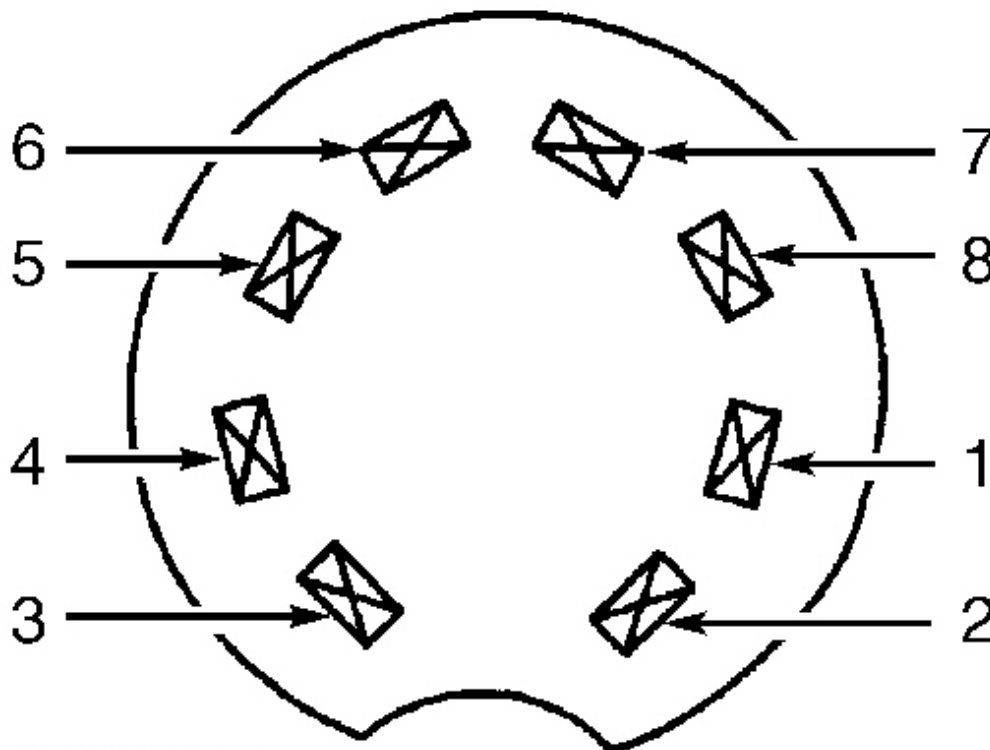


Fig. 5: Identifying Instrument Cluster Connector C200B Terminals
Courtesy of FORD MOTOR CO.

11. Disconnect 2-pin Clutch Pedal Position (CPP) switch connector. Measure resistance between CPP switch harness connector terminal No. 2 (Black/Yellow wire) and ground while turning ignition switch to START position. If resistance is less than 5 ohms, go to next step. If resistance is 5 ohms or more, go to step 13 .
12. Measure resistance of Black/Yellow wire between CPP harness connector terminal No. 1 and starter relay cavity No. 85. If resistance is less than 5 ohms, replace CPP switch. If resistance is 5 ohms or more, repair open in Black/Yellow wire. After repairs, check system operation.
13. Measure resistance of Black/Yellow wire between CPP switch harness connector terminal No. 2 and instrument cluster connector C220B terminal No. 18. If resistance is less than 5 ohms, replace instrument cluster. See ANALOG INSTRUMENT PANELS - LS article. If resistance is 5 ohms or

more, repair open in Black/Yellow wire. After repairs, check system operation.

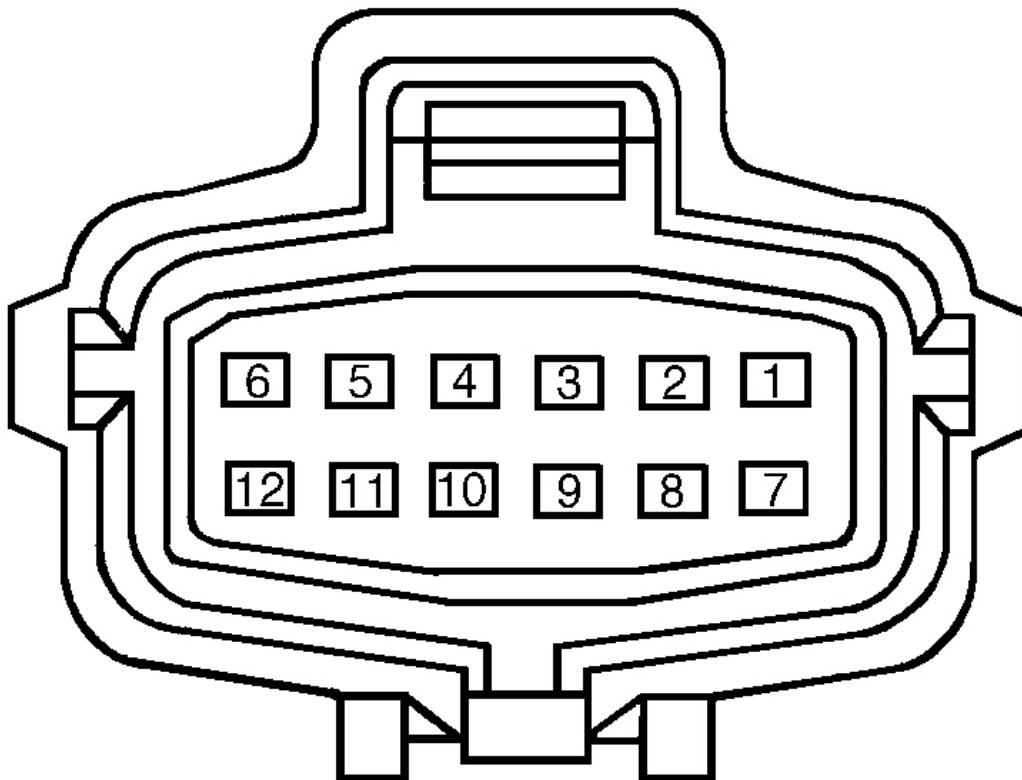
14. Measure voltage between starter relay cavity terminal No. 30 and ground. See **Fig. 4** . If voltage is more than 10 volts, go to next step. If voltage is less than 10 volts, repair open in power feed circuit to starter relay. See **WIRING DIAGRAMS** . Check system operation.
15. Disconnect starter terminal "S" connector (Gray wire). Measure resistance of Gray wire between starter relay cavity terminal No. 30 and starter harness connector. If resistance is less than 5 ohms, go to next step. If resistance is 5 ohms or more, repair open in Gray wire. Check system operation.
16. Measure resistance between starter relay cavity terminal No. 87 (Gray wire) and ground. If resistance is less than 10,000 ohms, repair short to ground in Gray wire. If resistance is 10,000 ohms or more, replace starter relay. After repairs, check system operation.
17. Remove fuse F201 (5-amp), located in Central Junction Box (CJB). CJB is located under right side of instrument panel. Check fuse F201. If fuse is okay, go to next step. If fuse is faulty, go to step 24 .
18. Measure voltage between input side of fuse F201 cavity in CJB and ground while turning ignition switch to START position. If voltage is less than 10 volts, go to next step. If voltage is 10 volts or more, go to step 22 .
19. Disconnect 8-pin ignition switch connector C250. Measure voltage between ignition switch harness connector C250 terminal No. 1 (Red wire) and ground. See **Fig. 6** . If voltage is 10 volts or more, go to next step. If voltage is less than 10 volts, repair open power feed circuit to ignition switch. See **WIRING DIAGRAMS** . Check system operation.



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Fig. 6: Identifying Ignition Switch Connector Terminals
 Courtesy of FORD MOTOR CO.

20. Measure resistance of Gray/Black wire between ignition switch harness connector C250 terminal No. 3 and input side of fuse F201 cavity in CJB. If resistance is less than 5 ohms, go to next step. If resistance is 5 ohms or more, repair open in Gray/Black wire. Check system operation.
21. Measure resistance between ignition switch harness connector C250 terminal No. 3 (Gray/Black wire) and ground. If resistance is less than 10,000 ohms, repair short to ground in Gray/Black wire. If resistance is 10,000 ohms or more, replace ignition switch. After repairs, check system operation.
22. Install fuse F201 (5-amp) in CJB. Disconnect Digital Transmission Range (DTR) sensor connector. DTR is located on left side of transmission. Measure voltage between DTR sensor harness connector terminal No. 10 (Gray/Orange wire) and ground while turning ignition switch to START position. See **Fig. 7** . If voltage is 10 volts or more, go to next step. If voltage is less than 10 volts, repair open in Gray/Orange wire. Check system operation.



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Fig. 7: Identifying Transmission Range Switch Harness Connector
 Courtesy of FORD MOTOR CO.

23. Measure resistance of Gray wire between DTR harness connector terminal No. 12 and starter relay cavity No. 86. If resistance is less than 5 ohms, adjust DTR switch. See **DIGITAL TRANSMISSION RANGE (DTR) SENSOR** under ADJUSTMENTS. If resistance is 5 ohms or more, repair open in Gray wire. After repairs, check system operation.

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24. Measure resistance between output side of fuse F201 cavity in CJB (Gray/Orange wire) and ground. If resistance is 10,000 ohms or more, go to next step. If resistance is less than 10,000 ohms, repair short to ground in Gray/Orange wire. Check system operation.
25. Measure resistance between DTR harness connector terminal No. 12 (Gray wire) and ground. If resistance is 10,000 ohms or more, go to next step. If resistance is less than 10,000 ohms, repair short to ground in Gray wire. Check system operation.
26. Connect DTR sensor connector. Install new fuse F201 (5-amp). Check system operation. If fuse fails, replace shorted DTR sensor. Recheck system operation.

UNUSUAL STARTER NOISE

1. Verify starter is installed properly. Ensure bolts are tight. Repair as necessary and check system for normal operation. If starter is mounted properly, go to next step.
2. Connect remote starter switch between starter terminal "B" (Red wire) and starter motor terminal "S" (Gray wire). Engage starter motor and verify noise is coming from starter motor. If noise is coming from starter motor, go to next step. If noise is not coming from starter motor, diagnose engine mechanical concern. See appropriate article in ENGINES.
3. Remove starter motor. See **STARTER MOTOR** under REMOVAL & INSTALLATION. Inspect flywheel ring gear for wear or damage. If ring gear is okay, replace starter motor. If ring gear is worn or damaged, replace ring gear and inspect starter drive gear. If drive gear is also damaged, replace starter motor.

BENCH TESTING

Information is not available from manufacturer.

REMOVAL & INSTALLATION

CAUTION: When battery is disconnected, vehicle computer and memory systems may lose memory data. Driveability problems may exist until computer systems have completed a relearn cycle. See **COMPUTER RELEARN PROCEDURES** article in **GENERAL INFORMATION** before disconnecting battery. Before testing starter, ensure transmission is in Park or Neutral.

STARTER MOTOR

Removal & Installation

Disconnect negative battery cable. Raise and support vehicle. Disconnect ground strap. Remove wiring. Remove starter bolts and starter. To install, reverse removal procedure. Tighten fasteners to specification. See **TORQUE SPECIFICATIONS**.

STARTER MOTOR SPECIFICATIONS

STARTER MOTOR SPECIFICATIONS

Application	Specification
Current Draw	

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Normal Load	130-220 Amps
No Load	60-80 Amps
Starter Circuit Voltage Drop	0.5 Volt

TORQUE SPECIFICATIONS

TORQUE SPECIFICATIONS

Application	Ft. Lbs. (N.m)
Driveshaft Coupling Nut	66 (90)
Flex Coupling Nuts	60 (81)
Transmission Mount Bolts	41(55)
Starter Motor Mounting Bolts	18 (25)
	INCH Lbs. (N.m)
Battery Cable Clamp Bolt	62-89 (7-10)
Solenoid "B" Terminal Nut	108 (12)
Solenoid "S" Terminal Nut	53 (6)
Starter Motor Ground Cable Nut	62-79 (7-9)

WIRING DIAGRAMS

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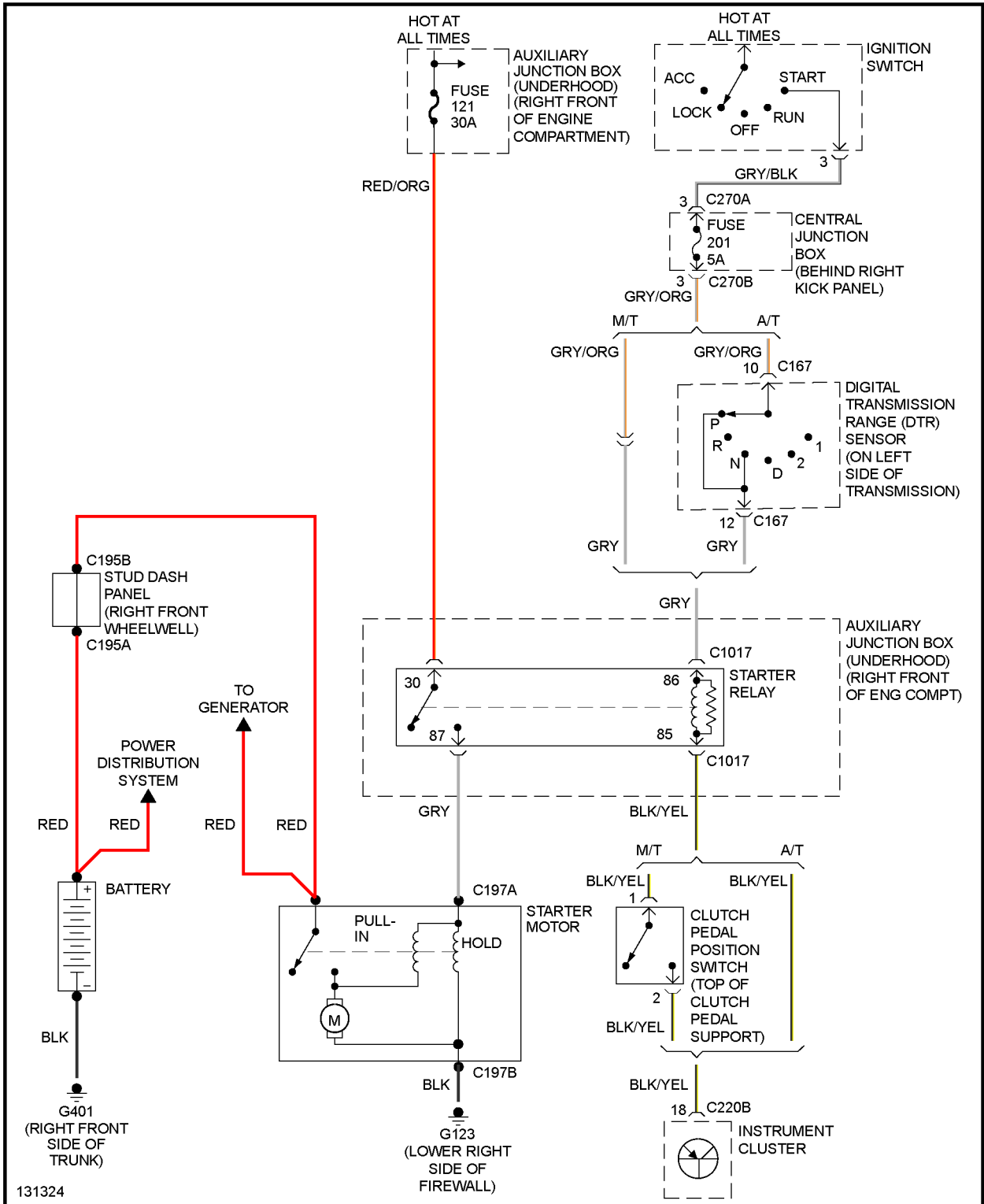


Fig. 8: Starter System Wiring Diagram (LS)