Mod Mafia
Maintenance Manual

By Dave Breggin

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Introduction

The Hummer, like most exotic motor vehicles, has some special needs. There are some quirks in the service and maintenance procedures. Because of the military heritage, and the low volume of civilian vehicles produced, the maintenance procedures are not well documented or understood.

The factory Service Manual is well written, thoroughly illustrated, and quite comprehensive. It is written for the trained professional Hummer mechanic. It is also around 1500 pages long. Periodic maintenance procedures for the Hummer are published in the Owner's Manual (not particularly comprehensive) and in various locations throughout the Service Manual.

The purpose of this book is to gather together, in one place, a detailed description of all of the routine maintenance tasks required for the Hummer. It will assist the owner or casual Hummer mechanic with these normal maintenance and service procedures. It also includes a few sections about special systems and troubleshooting.

Scope

This book will describe, in detail, each of the service procedures recommended by the manufacturer. It also describes any special tools or techniques recommended or required for each procedure.

This book will not instruct you in how to select or use tools. It will not instruct you in basic procedures. This book is not intended for the complete novice – some basic level of familiarity with tools and their use is assumed. Likewise, it is responsibility of the mechanic to know how to properly dispose of all waste materials such as used motor oil or spilled Diesel fuel.

Although this book contains information useful to any Hummer mechanic, it is not intended to replace or supercede the factory Owner's Manual or Service Manual. AM General is still the definitive source for procedures and requirements.

Model Differences

Civilian Hummers were produced beginning in late 1992. In 1994, AM General changed the engine, transmission, and transfer case. In 1995 and 1996 a gasoline-engine was available. Starting in 1996, a turbo was added to the Diesel engine.

The majority of the information applies equally to all models of Hummers. This book concentrates on 1994 and later Diesel Hummers. Some coverage of the 1992 and 1993 models is included, as is some information about the gas engine trucks. In most cases, notations are made where there are significant differences.

Most privately owned military HMMWVs are very similar to the 1993 and earlier civilian Hummers. There are many differences, however, and this book makes no attempt to cover the HMMWV.

Content and Copyright

All the content in this book is original. The pictures are of Hummers owned by members of the Colorado Hummer Club, and are used with permission. The diagrams are original works of the author. The information is collected from a variety of sources, including AM General Hummer Service Manuals and Hummer Owner's Manuals for various model-year Hummers. It reflects the experiences of the author, other Hummer owners, and Hummer professionals. This book is not endorsed by AM General, and the author is not affiliated in any way with AM General.

About the Author

Dave Breggin purchased his 1995 Diesel Hummer Wagon new in June of that year. He has performed all of the non-warranty work on his vehicle, and has made extensive modifications to it.

Dave is the founder and President of the Colorado Hummer Club (CHC). He conducts a variety of workshops about Hummer maintenance and operation and is a frequent trail leader for club activities. Dave is also a member of The Hummer Club, Inc. (the national Hummer club), has helped to organize events for them, and contributes technical articles to the club's newsletter.

Dave is also a frequent contributor to the humvee.net web site, and is the Hummer expert "Dave the Hummer Guy" on that site.

Acknowledgements

Christine Best, Bob Brauch, and Doug Zirkle provided invaluable assistance in editing and proofreading this book.

A Few Notes

Safety

This book assumes that you know how to work safely and to use tools safely. For instance, you should know that any time you lift a vehicle you should place a jack stand or similar device under it in order to make working under the vehicle safe. Unlike other similar books, this book will not remind you of this every time it suggests that you lift a vehicle. You should already know this, and I don't wish to waste the space and print to continually repeat it.

Locking Fasteners

AM General always recommends replacing all locking fasteners when they are removed. All lockwashers, all locknuts, all cotter keys. This is because it is not easy to describe how to determine if such locking fasteners can safely or reliably be reused. If you are not certain that such locking fasteners can safely be reused, do not re-use them. Period.

Seals and Gaskets

AM General procedures direct that all gaskets, O-rings, and seals be replaces whenever they are removed. This includes the two-piece wheel O-rings, geared hub fill plug gaskets, and many others. In many cases, these seals can be reused. If you are not sure such seals or gaskets are in good condition and can be re-used, do not re-use them. Whether you re-use them or not, check frequently for leaks.

Frequently Asked Questions

Q: Can the corner garage or "while-you-wait lube shop" do the "A" service?

A: It is unlikely that they will know about, much less be able to perform, all of the items necessary to complete the "A" service. They can usually do an adequate job of the lube and oil change. Remember, however, that there are nearly 30 grease points on the Hummer, including some inside the cab under the dash.

Q: The "A" service is really just a lube and oil change, right?

A: Although the Lube and Oil Change are certainly among the most important items on the "A" service checklist, there is much more. All of the gear boxes (hubs, diffs, t-case, tranny, and engine) should be checked for correct fluid level and for signs of leaking or contamination. All of the hinges and control linkages should be lubricated. The suspension arms should be checked, the tires should be checked for wear and balance, and the halfshaft bolts should be checked. Correct operation of the CTIS and Winch should also be verified. Early detection of problems in these areas contributes greatly to vehicle reliability.

Q: If I use good synthetic oil, do I still have to change the oil as often?

A: The only way to tell if the oil change can be delayed or skipped is by having a sample of the oil tested. Also, Diesel engines contaminate their oil with sulfuric acid (among other things). If you really want to use the same oil for a longer period, you should check into oil additives available for this purpose. The bottom line is that the "extra expense" of changing the oil as prescribed in the service schedule is really inexpensive insurance. Even if you do extend the life of the oil, the other "A" service items still need to be done on schedule.

Q: Why does the "C" service cost so much?

A: Time is money. The complete "C" service, when performed correctly, can take an experienced technician from 6 to 10 hours.

Q: If I add a snorkel to my air intake, can I go in deeper water?

A: The rated fording depth for the military HMMWV (without the deep water kit) and the (Diesel) civilian Hummer are 30". (The gas Hummer is rated to 24".) When you ford water, the longer you stay in the water and the deeper the water, the more likely it is that water will enter the gear boxes (and gas engine starter motor) through the seals. The military HMMWV deep water kit extends the air intake and the exhaust. More importantly, it has a system that pressurizes the gear boxes proportional to the depth of the water in order to help keep water from entering through the seals. Also note that the electronics on the military trucks are sealed, whereas the civilian versions are not. None of the doors are watertight. The instructions for the military deep water kit include: "…enter the water to 30 inch depth, stop and open all of the doors allowing the truck to fill with water, then proceed into deeper water…". This is to help with traction when fording – if the truck is filled with air, it tends to float a bit thus reducing traction.

Even with the military deep water kit, the gear boxes should all be check for water contamination as soon after completing fording as is practical.

FLUIDS AND FILTERS

Air Filter – Check and Clean

Description

The Air Filter is checked as part of the "B" Service.

Tools and Supplies

½" shallow socket
5/8" socket or wrench
Air Filter (2 filters for gas Hummer)

Fasteners

Fastener	Wrench Size	Loctite	Torque	Notes / Special Tools
Air Cleaner Clamp Bolt	½"			Diesel only
Air Filter Nut	5/8"			Diesel; gasket on nut
Air Filter Nut	5/8"			Gas, gasket on nut, 2 filters

Notes / Special Instructions – Diesel

- The Air Filter Clamp Bolt should be positioned at about 3 o'clock to 5 o'clock. Any higher and it may damage the hood.
- The Air Filter can be cleaned by gently knocking it on the ground to dislodge dirt. Blowing gently from the inside using compressed air (do not exceed 30 psi) can also help. Be careful not to get any dirt on the inside of the filter.
- The Filter Canister Gasket and the "duck bill" valve on the drain keep water out of the filter area.
- Some Hummers and HMMWVs are equipped with an Air Filter Restriction Gauge. This gauge holds and displays the peak vacuum on the engine side of the filter. It indicates when the filter is clogged and restricting airflow to the engine. A restricted filter should be cleaned or replaced, regardless of mileage or service schedule.
- Aftermarket re-usable filters (e.g. K & N) are available for the Hummer. Follow the manufacturer's instructions regarding cleaning and/or replacement of this filter element.

Notes / Special Instructions – Gas

- AMG does not recommend re-use of Air Filters on Gas Hummers.
- Gas Hummers have two Air Filters. (Diesel Hummers have only one.)

Procedure – Diesel

Diesel Hummers have one Air Filter located near the passenger-side Hood Snubber. (Gas Hummers have two Air Filters, one on each side of the engine.)

Remove Air Filter

1. Loosen the Cover Clamp Bolt. It is not usually necessary to remove this bolt completely.
2. Remove the clamp ring and the filter cover together.
   - It may be necessary to gently pry the cover loose from the gasket. If the cover is bent during prying, it should be straightened before re-assembly.
   - It is not necessary to remove the ring from the cover. Loosen it just enough to release the lip on the filter canister.
   - It may be necessary to loosen the three clamps that hold the filter canister in place.
   - Clean and inspect the Gasket. Replace if necessary.
3. Remove the Air Filter.
   - Remove the retaining nut.
   - Pull gently on the removal ring. It may be necessary to work the filter loose by gently moving it from side to side.

Inspect Air Filter

1. Check the inside of the filter for dirt or debris.
   - Dirt on the inside of the filter indicates the filter is damaged and must be replaced.
2. Check the outside of the filter for dirt.
   - Large amounts of dirt or dust probably cannot be effectively cleaned from the filter.
   - Inside the filter canister, there is an air baffle. This baffle will leave a portion of the filter cleaner than the rest of the filter. This can be used to help evaluate how dirty the filter is.
   - Compare the color of the filter element on the outside with the color on the inside. Great color difference indicates the filter should probably be replaced.
3. Inspect the gasket area on the filter for damage. Replace if a good seal cannot be made when re-installed.
4. If the filter is not damaged or badly clogged, it can usually be cleaned and re-used.

Inspect Air Filter Canister

1. Check the Air Intake. Refer to Illustration 1.
   - The air intake should be clean of dirt and debris both on the inside and the outside. Dirt in this area indicates a damaged filter.
   - There may be a small drop of oil on the lip of the Air Intake. This is normal. Larger amounts of oil, or oil staining on the air filter, indicate a possible problem with the engine or the CDR valve.
2. Check Drain Area.
   - In the back of the filter canister is a small drain hole. This is to allow sand and water to exit the canister.
   - Dirt and debris in this area is normal. Small amounts of water are also normal after deep fording or driving during wet weather.
   - The drain has a “duck-bill” valve on it. Make sure this valve has not been sucked into the air filter canister, and that it closes properly.
3. ATF anywhere inside the Filter Canister may indicate the “Vampire” – see special section.

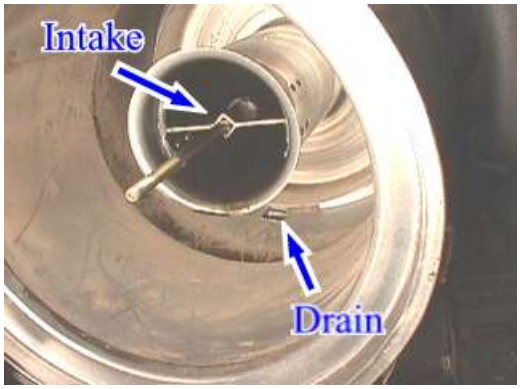

Illustration 1 - Inside Air Filter Canister

Install Air Filter

1. Clean loose dirt and debris from the Canister.
2. Insert the Filter into the Canister.
   - The filter should slide in easily.
   - To fully seat the gasket on the filter and to position the filter over the retaining shaft, it may be necessary to raise or "move around" the inboard and/or outboard part of the filter. This can be done by pulling on the removal ring while pushing on various parts of the outside of the filter. (This is similar to holding a coffee cup by the small loop-type handle and keeping the cup level by pushing on the side of the cup below the handle.)
3. Secure the Filter.
   - Inspect the rubber gasket on the Filter Retaining Nut. Replace if damaged.
   - Install and tighten the Nut.
4. Close the Filter Canister.
   - Make sure the Filter Removal Ring is flat against the Filter.
   - Clean the Filter Canister Gasket area.
   - Position the Canister Cover and the Retaining Ring behind the Hood Snubber and work the Retaining Ring around the outside of the canister end.
   - Position and tighten the Clamp Bolt. The bolt should be positioned at about 3 o'clock to keep it from contacting the hood.
   - If using a deep socket on this bolt, be careful that the bolt does not pinch and trap the socket. A shallow socket is recommended.
   - Re-tighten the three filter canister mounting clamps.
5. Reset the Air Filter Restriction Gauge, if so equipped.
   - On HMMWVs, this gauge is located on the dash.
   - On Hummers, this gauge may be located under the hood, or almost anywhere.

Procedure – Gas

Remove Air Filters

1. Loosen Wing Nut on end of Filter Canister.
   - Wing nut may or may not be captive to the end of the Canister.
2. Remove the Filter Canister Cover.
   - Pull the Removal Ring on the Cover.
   - Pry gently if needed. Use care not to damage the Cover or gasket.
   - Clean and inspect the Filter Canister Gasket. Replace if damaged. (The gasket is not a separate piece.)
3. Remove the Filter.
   - Remove the nut and washer retaining the filter.
   - Remove the filter element.

Inspect Air Filter

Note: AMG does not recommend re-use of Air Filters on Gas Hummers.

Install Air Filters

1. Clean loose dirt and debris from the Canister.
2. Insert the Filter into the Canister.
   - Make sure the retaining bolt passes through the hole in the end of the filter.
   - Make sure the filter is fully seated in the canister.
3. Secure the Filter with the washer and nut.
4. Close the Filter Canister.
   - Clean and inspect the filter canister gasket. Replace if damaged. (The gasket is not a separate piece.)
   - Secure the Filter Canister Cover with the wing nut.

Chassis Lube

Description

Chassis Lube and "Oil Can Points" are lubricated as part of the "A" Service.
Under "Severe Operating Conditions", the Chassis Lube should be performed daily.

Related Tasks

Some of the grease points are listed on the "Per Wheel Checklist".

Special Tools

Grease Gun
Jack

Fluids Required

Type	Specification	Quantity
Grease	Standard chassis grease	
White Grease	White Lithium grease	
Silicone	Silicone spray	

Notes / Special Instructions

- Clean fittings before attaching grease gun to avoid forcing dirt through the fitting and into the joint.
- How Much Grease Is Enough?
  - On ball-type joints (Ball Joints, Tie Rod Ends), add grease until it begins to inflate the boot, or until it begins to leak out.
  - On U-joints, add grease until it begins to leak, or until a "popping" or "crackling" sound is heard. (It is desirable to add grease until all four caps are leaking to ensure that all of the bearings are lubricated. This is not always possible, however.)
  - On Slip Joints, add a small amount of grease only. These joints do not usually require much grease, and overfilling them can cause problems.
  - On Pivot Joints (idler arm), add grease until be begins to leak out.
- Clean excess grease from fitting and boot areas when finished.
- If a joint will not accept grease without excessive force:
  - Try flexing or unloading the joint.
  - Make sure that the grease fitting is not plugged.
  - If necessary, remove the grease fitting and clean it.
- When replacing any parts with grease fittings:
  - Part must be greased before use.
  - Install part before adding grease.
  - Part may require large amount of grease on initial lubrication.
- Normally Aspirated (non-turbo) Hummers also have a grease fitting on the throttle pedal where it passes through into the engine compartment. This fitting is for use upon installation and after extended fording operations only. It is not included by AMG on the list of lube fittings for the "A" Service.
- AMG recommends that, under "Severe Operating Conditions", the Hummer be lubed more frequently than the "A" Service schedule. This is particularly important for the steering and suspension parts. Refer to the "Severe Operating Conditions" section of this manual.

Procedure

Overview

- Oil Can Points should be lubricated with Silicone Spray or a Spray Lubricant, except as noted.
- It may be necessary to rotate the drive shafts and/or the steering shaft to gain access to some of the grease fittings. Rotating the drive shaft is described later in this section.
- The owner's manual describes and lists both grease fittings and "oil can points".
- A right-angle grease gun nozzle may be required for access to some fittings.
- Refer to "Notes" section for "how much grease is enough".

Illustration 1 – Ball Joint Grease Fittings

List of Grease Fittings

- Ball Joints (8)
  - Upper and Lower at each wheel (Illustration 1). Some 1995 and earlier ball joints do not have grease fittings.
- Tie Rod Ends (6)
  - Inner at each front wheel (Illustration 2).
  - Outer at each wheel (Illustration 3).
- Front Drive Shaft (5)
  - 3 U-joints.
  - 2 Slip Joints.
- Rear Drive Shaft (2)
  - 2 U-joints.
- Idler Arm (2)
- Pitman Arm (1)
- Steering Shaft (3)
  - U-joint near Steering Gear, under hood.
  - U-joint under dash.
  - Slip joint under dash (not present on all trucks).
- Tire Carrier pivot (if equipped, varies individually).
- Can Carrier pivot (if equipped, varies individually).
- Swiveling Pintle Hook (if equipped, varies individually).

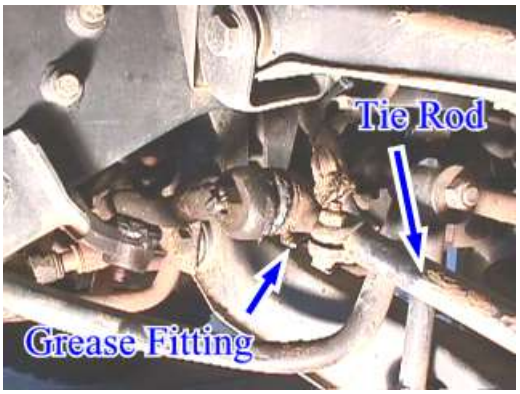

Illustration 2 – Inner Tie Rod End Grease Fitting

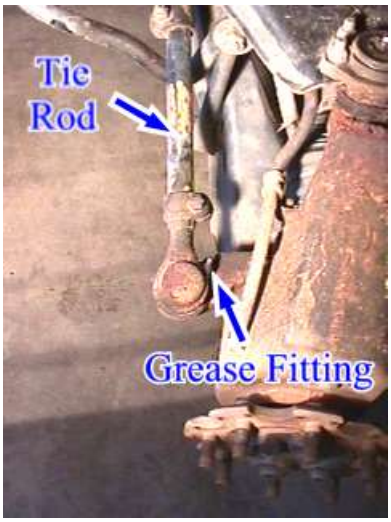

Illustration 3 – Outer Tie Rod End Grease Fitting

List of Oil Can Points

Spray Lubricant
- Hood Hinges.
- Tailgate Hinges (if equipped).
- Barn Door Hinges, Latches, Levers (if equipped).
- Door Hinges, Latches, Levers.
- Bumper D-shackles
- Mirror Break-away.
- CTIS fittings

Silicone Spray
- Shift Lever Boots (inside cab).
- Parking Brake Lever & Boot (inside cab).
- Brake Pedal.
  - 2 pivot points.
  - Brake Piston pivot and boot.
- Transmission Shift Linkages (under truck).
- Transfer Case Sift Linkage (under truck).

- Hood Stops (2).
  - Use White Grease.
  - Side stops (near hood latches).
  - Lightly coat mating surfaces.

Rotating Drive Shaft

1. Chock a wheel that is not being lifted.
2. Place transfer case shifter in N (neutral).
3. If rotating the rear drive shaft, do not set the parking brake.
4. Raise tire off ground.
   - Refer to Tire/Wheel Assembly section for procedure.
   - To rotate front drive shaft, lift one front wheel.
   - To rotate rear drive shaft, lift one rear wheel.
5. Slowly rotate lifted wheel until grease fitting on drive shaft is accessible.

Differential – Fluid Check and Change

Description

Fluid Level should be checked (“A” Service)
Differential should be checked for leaks (“A” Service)
Fluid should be added as needed to maintain correct level
Fluid should be replaced as needed
Fluid should be replaced at 12,000 miles.

Related Tasks

Check Brakes.
Check Halfshaft Bolts.

Tools and Supplies

Oil Drain Pan
Torque Wrench
Medium Socket Extension

Special Tools

3/8” Hex Key Socket
Gear oil dispenser or pump

Fluids Required

Type	Specification	Quantity
Differential Oil	80W-90	2 qt.

Fasteners

Fastener	Wrench Size	Loctite	Torque	Notes / Special Tools
Fill and Drain Plug	3/8” Hex Key	PST	13 - 18 lb ft	Pipe thread – do not over-tighten.
Cover Bolts	½”	-	16 lb ft	
Differential Mounting Bolts	15/16”	Blue	110 - 140 lb ft	
Output Flange Nut	1-1/8”	Blue	166 - 196 lb ft	Use Blue RTV on inner Seal
U-joint to Pinion Yoke	5/16”	-	13 - 18 lb ft	¼” fine thread
	3/8”	-	27 lb ft	5/16” fine thread

Notes / Special Instructions

- Drain Plug has a magnet.
- Driveline Protection does not need to be removed for these procedures.
- Replacing the Differential Fluid is not on the AMG service schedule after the first 12,000 miles but should probably be done every 12,000 miles (with the “C” Service).

Procedure

Check Fluid Level

1. Remove Fill Plug.
   - Fill plug is located on the front of the Front Differential, and on the rear of the Rear Differential.
   - Clean the area around the fill plug before removing.
   - Make sure the Hex Key is fully inserted into the fill plug. Clean the hole with a pick if necessary.
2. Check Fluid Level.
   - Fluid should be at or just below the bottom of the Fill Plug hole.
   - Fluid should not be black or gritty.
   - If fluid is low, check for leaks.
   - If fluid is high, check for water or ATF contamination.
3. Clean and install Fill Plug.
   - Clean thread area.
   - Apply Loctite PST.
   - Do not over-tighten.

Check for Leaks

The Differential has 5 seals, as described in the first 3 steps below.

1. Input shaft seal.
   - Drips or wetness on the Differential housing near the drive shaft.
2. Output shaft inner seal (2).
   - Wetness on either side of the brake rotor and/or the half-shaft flange.
3. Output shaft outer seal (2).
   - Drips or wetness on the Differential housing near the brake rotor.
4. Check the Drain Plug for signs of leaking.
5. Check the Fill Plug for signs of leaking.
6. Check the cover for signs of leaking.

Replace Fluid

1. Check Fluid Level (leave fill plug out).
2. Remove Drain Plug.
   - Drain plug is located in the bottom of the Differential.
   - Clean the area around the drain plug before removing.
   - Position the drain pan below the drain plug.
   - Make sure the hex key is fully inserted into the drain plug. Clean with a pick if necessary.
   - Check the drain plug magnet for metal pieces or excessive sludge.
3. Allow fluid to drain and check for contamination.
   - Water contamination may indicate a seal leak or vent line failure.
   - ATF contamination may indicate the “Vampire” – refer to special section.
4. Clean and install Drain Plug.
   - Clean Magnet.
   - Clean thread area.
   - Apply Loctite PST.
   - Do not over-tighten.
5. Fill Differential with gear oil.
   - Correct level is at bottom of fill hole.
6. Clean and install Fill Plug.
   - Refer to Check Fluid Level above.

Engine Coolant – Fluid Check and Replacement

Description

Coolant Level should be checked (“A” Service)
Coolant should be replaced (“C” Service)

Tools and Supplies

Large screw driver
Pliers
Large catch pan(s)

Special Tools

Antifreeze tester

Fluids Required

Type	Specification	Quantity
Antifreeze		Approx. 3 gal.
Distilled water	Consumer/drinking grade	Approx. 4 gal. for refill, more for flushing (see text)

Notes / Special Instructions

- Always relieve system pressure before working on the cooling system
- Use care when draining hot fluid or working on hot engines
- Cooling system capacity is approximately 26 quarts (6-1/2 gallons)
- Antifreeze should be diluted per the manufacturer’s instructions
- Use consumer-grade distilled water to help prevent contamination of the system
- Some antifreeze is toxic and should be kept away from pets and wildlife
- Be sure to dispose of drained antifreeze properly

Procedure

Relieve System Pressure

1. If system is hot, cover surge tank cap with heavy cloth.
2. Carefully loosen surge tank cap and allow pressure to escape.
3. Remove surge tank cap.

Check Fluid

1. Fluid level should be in the marked range on the Surge Tank. Refer to Illustrations 1 and 2.
2. Check fluid using antifreeze tester.
   - Relieve system pressure and remove Surge Tank Cap
   - Check fluid – follow instructions supplied with tester
   - Verify protection – refer to owner's manual
   - Replace Cap

Drain Cooling System

1. Relieve system pressure and remove Surge Tank Cap
2. Open Drain. Refer to Illustration 3.
   - Position drain pan
   - Open Drain by turning counter-clockwise
   - Close Drain when drain pan is full – empty or replace
3. Close Drain
   - Turn clockwise
   - Do not over tighten

Illustration 1 – Surge Tank

Illustration 2 – Surge Tank Cap and Fill Line

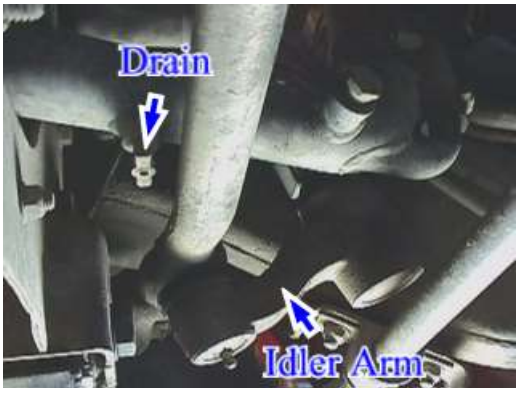

Illustration 2 – Drain Valve

Flush Cooling System

AM General procedures do not include flushing the cooling system. Flushing is probably a good idea, however, as it helps to remove contaminants and will dilute any residual coolant that is not drained. Flushing may be repeated several times until drained water is relatively free of discoloration and contaminants.

1. Refill System.
    - Make sure Drain Valve is closed.
    - Open Heater Control Valve.
        a) Turn Ignition Switch "On"
        b) Turn heater control to hottest setting
        c) Turn Ignition Switch "Off"
    - Fill system with distilled water.
    - Replace Surge Tank Cap.
2. Start engine and let idle.
    - Operate at fast idle (1500 rpm).
    - Operate until engine thermostat opens (engine reaches operating temperature).
3. Allow Coolant to circulate for several minutes.
4. Stop Engine.
5. Drain Coolant. (Refer to procedure above.)

Refill Cooling System

1. Refill System.
    - Make sure Drain Valve is closed.
    - Open Heater Control Valve.
        d) Turn Ignition Switch "On"
        e) Turn heater control to hottest setting
        f) Turn Ignition Switch "Off"
    - Fill system with Antifreeze diluted with distilled water per instructions.
    - Make sure fluid level is between marks on the Surge Tank.
    - Replace Surge Tank Cap.
2. Start engine and let idle.
    - Operate at fast idle (1500 rpm).
    - Operate until engine thermostat opens (engine reaches operating temperature).
3. Allow Coolant to circulate for several minutes.
4. Stop Engine.
5. Relieve Cooling System pressure (procedure above).
6. Open Bleed Valves to bleed air bubbles.
    - Bleed Valve located on Thermostat Housing.
    - Some trucks have additional Valve near top of radiator.
    - Refer to Illustrations 4 through 8 for locations.
    - Open with screw driver.
    - Close when air bubble has escaped.
7. Check Coolant Level, and add antifreeze mix as required.
8. Restart engine and allow to come to operating temperature.
9. Check system for leaks.

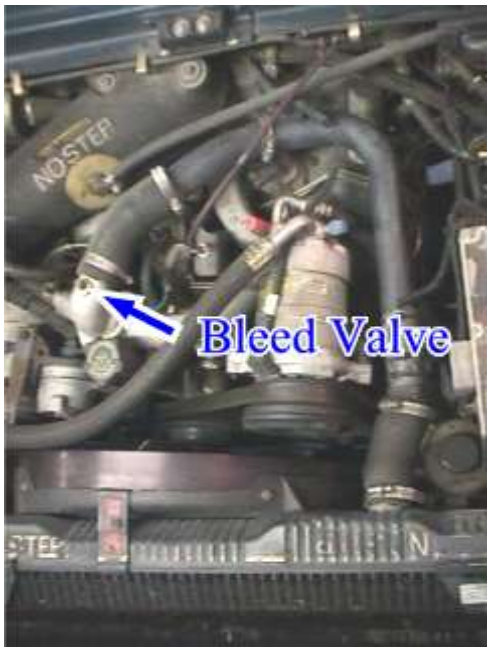

Illustration 4 – N/A Bleed Valve

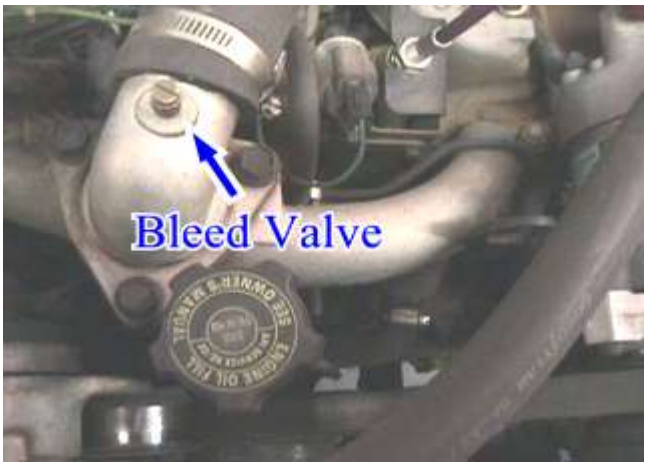

Illustration 5 – N/A Bleed Valve, Detail

Illustration 6 – Turbo Bleed Valve

Illustration 7 – Turbo Bleed Valve, Detail

Illustration 8 – Radiator Bleed Valve, Detail

Engine – Oil and Filter Change

Description

Engine Oil Level is checked at every fueling.
Engine Oil and Oil Filter are changed as part of the "A" Service.

Related Tasks

Refer to the "A" Service checklist.
Oil change is easier to perform when the Driveline Protection Center Section is removed.

Tools and Supplies

Oil Filter(s)
Oil Drain Pan
14 or 15 mm Wrench or Socket
Torque Wrench

Special Tools

Oil Filter Wrench

Fluids Required

Type	Specification	Quantity
Engine Oil	(see table)	7-1/2 or 8 qts.

Oil Specifications

Temperature Range	Specification
60°F (16°C) and Below	SAE 10W-30
0°F (-18°C) and Above	SAE 15W-40
32°F (0°C) and Above	SAE 30W (Preferred)

Fasteners

Fastener	Wrench Size	Loctite	Torque	Notes / Special Tools
Oil Drain Plug	14 or 15 mm	-	20 lb ft	
Oil Pan Bolts	10 mm	-	17 lb ft	

Notes / Special Instructions

- If the engine has more than one oil filter, all filters should be changed at the same time.
- If the engine has more than one oil filter, additional oil will be necessary.
- Some Hummers are full at about 7-1/2 quarts while others require 8 quarts.
- Some Hummer Oil Drain Plugs require a 14mm wrench, others a 15mm wrench.
- Oil specification is determined by the expected temperature range before the next oil change. Refer to your Owner's Manual.

Oil and Filter Change Procedure

1. Position Oil Drain Pan
   - Drain pan must be able to hold 2 gallons.
   - When the drain plug is removed, the oil may stream out some distance from the drain hole.
   - If the Driveline Protection Center Section is not removed, the draining oil will stream onto the Protection and spray all around. Some type of funnel or deflector should be used to prevent this.
2. Remove the drain plug.
   - Clean the drain plug area before removing the plug.
   - Drain plug has a magnet. Check for metal pieces or excessive sludge.
3. Remove Oil Filter(s).
   - Position Oil Drain Pan beneath the filter.
   - Use Oil Filter Wrench to loosen filter.
   - The gasket usually comes off with the filter. Make sure it is not stuck to the Filter mount.
4. Install new Oil Filter(s).
   - Clean oil filter gasket seating area on the engine.
   - Dampen the gasket on the filter with motor oil. Failure to do this will make the filter very difficult to remove next time. Used oil is OK for this.
   - Tighten the oil filter as described in the instructions for the filter. Usually, this is about ¾ turn after gasket makes contact with the mount. Do not over-tighten.
5. Clean and Install Drain Plug.
   - If the plug has a plastic gasket, make sure it is clean and in good condition.
   - If the plug has a built-in rubber gasket, make sure it is in good condition. Wet the rubber gasket with engine oil to make removal easier.
6. Refill engine with oil.
   - Fill with the correct amount of oil (use 7-1/2 if you are not sure). Do not overfill.
   - Start the engine and let idle. Do not rev the engine.
   - Make sure the oil pressure comes up to normal operating range. This may take several seconds longer after changing the oil filter, but usually less than 10 seconds.
   - Continue to let the engine idle for a few minutes and check for leaks at the oil filter(s) and oil drain plug.
7. Check Oil Level.
   - See Owners Manual for details.
   - Stop engine and wait about a minute for the oil to drain down into the pan.
   - Oil level should be within the indicated range on the dipstick. Add oil if needed.

Fluid Level Check

Description

Fluid Levels are checked as part of the “A” Service.
Under “Severe Operating Conditions”, Fluid Levels should be checked daily.

Notes / Special Instructions

- This sheet is provided as a checklist for fluids to be checked. It does not contain complete procedures for any of the fluid checks.
- AMG recommends that under “Severe Operating Conditions” the Fluids should be checked daily for Proper Level and for Contamination. Refer to Severe Operating Conditions section.

Procedure

Each of the following should be checked.

Engine Oil

1. Refer to "Engine – Oil and Filter Change" Section for Checking Procedure.
2. Engine Oil is replaced as part of the "A" Service.

Engine Coolant

1. Refer to Engine Coolant – Fluid Check and Replacement for Checking and Replacement Procedures.
2. Engine Coolant is replaced as part of the "C" Service.

Transmission Fluid

1. Refer to "Transmission – Fluid and Filter Change" section for Checking Procedure.
2. Transmission Fluid is replaced as part of the "C" Service.

Transfer Case Fluid

1. Refer to "Transfer Case – Fluid Check and Replacement" Section for Checking Procedure.
2. Transfer Case Fluid is replaced as part of the "C" Service.

Differential Fluid

1. Refer to "Differential – Fluid Check and Change" Section for Checking Procedure.

Geared Hub Fluid

1. Refer to "Geared Hub – Fluid Check and Replacement" Section for Checking Procedure.

Power Steering Fluid

1. Refer to the Owners Manual for Checking Procedure.

Brake Fluid

1. Refer to "Brakes – Checking" Section for Checking Procedure.
2. Do Not Overfill.
    - Do not top off the reservoir. As the brakes wear, the fluid level drops. When new pads are installed, the fluid level is raised. If the reservoir does not have enough room for this extra fluid, it will spill out.
    - Metal Brake Fluid Reservoir should always be at least 2/3 full.
    - Plastic Brake Fluid Reservoir should always be in the marked range.

Windshield Washer Fluid

1. Refer to Owners Manual for Checking Procedure.

Fuel Filter Replacement - Diesel

Description

Fuel Filter condition is checked as part of the "A" Service, and may be replaced.
The Fuel Filter is replaced as part of the "B" Service, regardless of condition.
Dirty Diesel fuel can clog the Filter, requiring more frequent replacement.

Related Tasks

This procedure usually drips Diesel fuel on parts of the truck near the engine, and on the shop floor. It is recommended to perform this replacement after all other tasks have been performed.

Tools and Supplies

Oil Drain Pan
¾" Open End Wrench (for fuel injectors – refer to text)

Special Tools

Jumper Wire
Oil Filter Wrench (band- or strap-type)
7/8" Flare Fitting Wrench

Fasteners

Fastener	Wrench Size	Loctite	Torque	Notes / Special Tools
Filter Retaining Ring	Oil Filter	-	-	Hand Tighten Only
Injector Lines	7/8"	-	24 lb ft	Use Flare Fitting Wrench
Injector Nozzle	¾"	-	44 - 60 lb ft	

Notes / Special Instructions

- If there is any possibility that the Fuel Pump may be bad, do not open or remove the Fuel Filter if a replacement Fuel Pump is not available. A truck may still run (although with reduced performance) with a failed Fuel Pump. If air gets into the fuel system, a working Pump is required to bleed the air and get the engine to run.
- Any time air gets into the fuel system the air must be bled out. This includes checking the filter (whether replacing it or not), and running out of fuel.
- If the engine runs out of fuel, it may also be necessary to bleed the injector pump. This is not usually necessary when changing the fuel filter.
- To check the condition of the Fuel Filter, remove the Filter far enough to observe the color of the Filter Element. If it is significantly discolored, it should be replaced. Bleed the filter after checking.
- The gasket on the Filter comes off easily. Use care not to dislodge the gasket when inserting the Filter into the bowl. Press down only on the top of the filter, not around the gasket area.
- Replacing the Fuel Filter on the Gas Hummer is a much different procedure. It is located along the frame on the passenger-side of the truck, near the transfer case. Flair Fitting wrenches may be required, or the filter may be attached via hose clamps. Bleeding is not required.

Procedure

Replace Filter

1. Locate Fuel Filter.
   - Filter is located on the drivers-side of the engine, below the windshield. See Illustration 1.
2. Remove the Retaining Ring.
   - This Ring is plastic.
   - This Ring should be Hand Tightened only.
   - If it is too tight to remove, use a strap- or band-type Oil Filter Wrench.
   - Retain the Ring for use with the new Filter.
3. Remove the Filter.
   - Position the Drain Pan below the Filter. It may catch some of the spilled fuel.
   - The Filter can be loosened by turning slightly, and by movement from side-to-side.
   - The Filter, Bleed Screw, and metal dome are all one piece. Refer to Illustration 2.
   - The paper label on the top of the filter is designed to assist in removal of the Filter. This usually does not work, however.
   - Remove the Filter by pulling it up and out of the Filter Bowl.
   - Make sure the rubber gasket and the metal regaining ring are removed. (Usually they remain attached to the Filter.)
   - The filter will drip fuel as it is removed.
4. Insert the New Filter.
   - The Fuel Filter Bowl has one wide tab, and the Filter has one wide slot. Use care to align them with each other. Illustration 3 shows the Fuel Filter Bowl, and Illustration 4 shows the slots in the Fuel Filter (pictured from the bottom of the filter).
   - Carefully seat the Fuel Filter completely into the Filter Bowl. Use care not to dislodge the Gasket.
5. Reinstall the Retaining Ring.
   - Hand tighten the Retaining Ring. Do not use tools.
6. Bleed the Fuel Filter (see below).

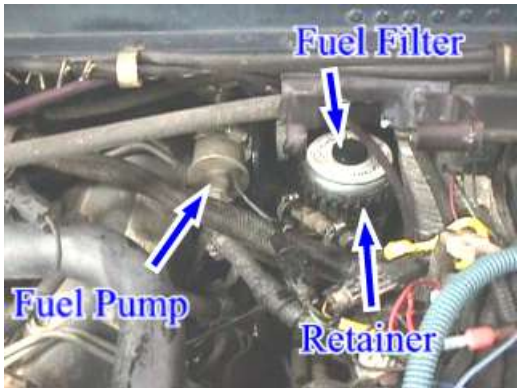

Illustration 1 – Fuel Filter Location

Illustration 2 – Fuel Filter and Retaining Ring

Illustration 3 – Fuel Filter Bowl

Illustration 4 – Fuel Filter

Bleed Fuel Filter

1. Open the Bleed Valve on the top of the filter.
   - The Bleed Valve is the plastic wheel with the hole on top near the edge.
   - Unscrew the Bleed Valve about 1 to 2 full turns.
   - Do not remove the Bleed Valve.
2. Place a rag around the top of the Fuel Filter.
   - The rag may collect some of the fuel that is leaked out during bleeding.
   - Do not obstruct view or operation of the Bleed Valve.
3. Run the Fuel Pump – Non-Turbo.
   - Disconnect the Fuel Pump electrical connector.
     1. Refer to Illustration 1 for Fuel Pump location
     2. The electrical connector is only a few inches from the Pump
   - Connect one end of a Jumper Wire to battery power. Battery power connections are available near the Fuel Pump – actual location varies by model year.
   - Connect the other end of the Jumper Wire to the Gray wire from the Fuel Pump. The Pump should begin running.
   - Very soon after starting the Fuel Pump, fuel will come out of the top of the Bleed Valve. Proceed immediately to "Bleed the Air".
   - If the Pump does not begin running, disconnect the Jumper Wire. It may be necessary to connect the other (Black) wire from the pump to vehicle ground. Use another Jumper Wire for this. Reconnect the first Jumper Wire to start the Pump.
   - If the Pump still does not run, re-check the Jumper Wire connections. Use a light bulb to test the Jumpers and the power connections.
   - If the pump still does not run, it may be defective and require replacement.
4. Run the Fuel Pump – Turbo.
   - Note: If a helper is not available, use the Non-Turbo procedure above.
   - Have a helper turn the ignition key to the "On" position. The pump should begin to operate. Do not start the engine.
   - Very soon after starting the Fuel Pump, fuel will come out of the top of the Bleed Valve. Proceed immediately to "Bleed the Air".
   - The fuel pump will operate for about 30 seconds after the key is turned to the "On" position. If additional operation is required, turn the key "Off" and then back "On" for another 30 seconds of pump operation.
5. Bleed the Air.
   - As soon as clean fuel (no bubbles) is coming out of the Bleed Valve, close the Valve.
   - The fuel stream may just dribble out, or it may stream out a few inches.
   - Close the Valve by turning it clockwise (tightening) until it seats. Hand tighten only – do not over-tighten.
6. Turn off the Fuel Pump.
   - Disconnect the Jumper Wire(s), or turn the key "Off".
   - Reconnect the Fuel Pump electrical connector if necessary.
7. Check for Leaks.
   - Run the engine.
   - Check for leaks around the Fuel Filter Bowl area.
   - Dripping may be caused by fuel spilled while changing the Filter or bleeding the Filter. Double check any dripping.

Bleed Injector Pump

Note: This procedure is not needed when changing the Fuel Filter. It is sometimes required when the truck runs out of fuel.

1. Bleed the Fuel Filter (procedure above).
2. Loosen Injector Line.
   - Select a convenient injector. Usually bleeding only one is sufficient.
   - Loosen line, but do not remove. 1 to 2 turns is usually enough. Use a 7/8" Flare Fitting Wrench.
   - Hold the injector with a ¾" open-end wrench to prevent turning.
3. Crank Engine.
   - Make sure nothing is near or contacting any moving parts of the engine, fan, and belt(s).
   - Have a helper try to start the engine.
   - As the engine cranks, fuel and bubbles will come from the loosened Injector line.
   - Once the air is purged, the engine will usually start (although it may run rough). Proceed to the next step (Tighten the Injector Line).
   - If no fuel leaks out, there may be other problems such as a failed injector pump.
   - If fuel leaks out without bubbles and the truck will still not start, it may be necessary to bleed additional Injector Lines.
4. Tighten the Injector Line.
   - Tighten the injector line before turning the engine off to prevent getting air into the system again.
   - Hold the injector with a wrench to prevent turning.
5. Check for Leaks.
   - With the engine running, check for leaks around the Injector(s).

Geared Hub – Fluid Check and Replacement

Description

Fluid Level should be checked (“A” Service)
Hub should be checked for leaks (“A” Service)
Fluid should be replaced as needed
Fluid should be replaced at 12,000 miles

Related Tasks

Refer to “Per Wheel Checklist”

Tools and Supplies

Oil Drain Pan
1” Socket or Wrench
5/16” Hex Key
Torque Wrench

Special Tools

Gear oil dispenser

Fluids Required

Type	Specification	Quantity
Gear Oil	80W-90	½ Qt

Fasteners

Fastener	Wrench Size	Loctite	Torque	Notes / Special Tools
Fill Plug	1”	-	8-13 lb ft	Nylon gasket
Drain Plug	5/16” hex key	PST	8-13 lb ft	Magnet; Pipe thread – do not over-tighten; 8mm may fit better
Access Cover Bolts	½”	Blue	15 lb ft	
Input Seal Plate Bolts	9/16”	Blue	30 lb ft	
Steering Cover Bolts	¾”	Blue	65 lb ft	
Access Plug	3/8” square		8-13 lb ft	Nylon gasket

Notes / Special Instructions

- If the hex key is not fully inserted into the drain plug, the plug may be damaged.
- PST not required on fill plug (uses gasket instead).
- Gear Oil at the CTIS hole in the center of the spindle indicates a possible spindle seal leak. This may also result in air leakage.
- Although more difficult, it is possible to check the fluid level of the hub without removing the tire/wheel assembly.
- Replacing the Geared Hub fluid is not on the AMG service schedule (after the first 12,000 miles) but should probably be done every 12,000 miles (with the "C" Service).

Procedure

Check Fluid Level

3. Remove Fill Plug.
    - Fill and Drain Plug locations shown in Illustration 1.
    - Clean area around fill plug before removing.
4. Check fluid.
    - Fluid should be at or just below the bottom of the fill plug hole.
    - Fluid should not be black or gritty.
    - If fluid is low, check for leaks.
    - If fluid is high, check for water or ATF contamination.
5. Clean and install fill plug.
    - Check fill plug gasket – replace if damaged.

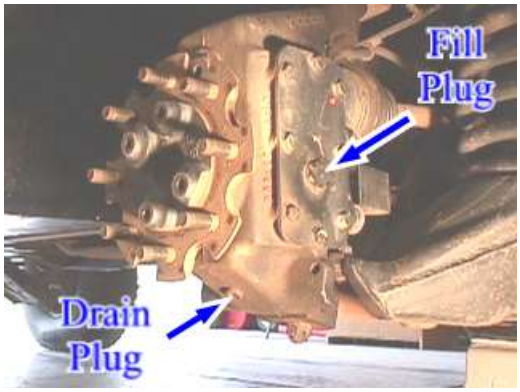

Illustration 1 – Fill and Drain Plugs

Check Hub for Leaks

4. Hub should be checked for signs of leaking at the following locations:
- Spindle Seal (the spindle is the part with the wheel lugs)
- Half Shaft Retaining Bolt Access Cover (above spindle)
- Half Shaft Seal
- Fill and Drain Plugs
- CTIS hose fitting
- Cover and Access Plates
- Vent Line Fitting
- Gear Oil dripping from CTIS hole in spindle (small amount of water is normal)

Check Hub Spindle

10. Check Hub Spindle Bearing.
    - Spindle should rotate easily (to the extent that the driveline lash allows).
    - Spindle should not move side-to-side.
    - Spindle should not move in-and-out.
11. Check Wheel Studs.
    - Wheel Studs should be securely attached.
    - Wheel Studs should not be cracked, bent, or damaged.
    - Wheel Stud Threads should be in good condition.

Replace Fluid

1. Check Fluid Level (leave fill plug out).
2. Remove Drain Plug.
    - Fill and Drain Plug locations shown in Illustration 1.
    - Clean area around drain plug before removing.
    - Position drain pan below hub before removing plug.
    - Make sure hex key is fully inserted into drain plug. Clean with a pick if necessary.
    - Check magnet in drain plug for metal pieces or excessive sludge.

12. Allow fluid to drain, and check fluid for contamination.
    - Water contamination may indicate a seal leak or a vent line failure.
    - ATF contamination may indicate the "Vampire" – refer to special section.

13. Clean the drain plug, apply Loctite PST, and re-install.
14. Fill Hub with gear oil.
    - Correct level is at bottom of fill plug hole.

15. Clean and install fill plug.
    - Check fill plug gasket – replace if damaged.

Transfer Case – Fluid Check and Replacement

Description

Fluid Level is checked as part of the "A" Service.
Fluid is replaced as part of the "C" Service.

Related Tasks

During the "C" Service, the Vehicle Speed Sensor should also be cleaned.
During the "A" Service, and anytime leaking is detected, the "Rubber Plug" should be checked.

Tools and Supplies

Oil Drain Pan
30mm Socket or 10mm Hex Key Socket
Torque Wrench
1" Wrench or Deep Socket

Special Tools

ATF pump or dispenser

Fluids Required

Type	Specification	Quantity
ATF	Dexron III	2-1/2 qts.

Fasteners

Fastener	Wrench Size	Loctite	Torque	Notes / Special Tools
Fill and Drain Plugs	30 mm	-	35 lb ft	Plastic Gasket
Fill and Drain Plugs	10 mm Hex Key	PST	15 – 25 lb ft	Pipe Thread – do not over tighten
Vehicle Speed Sensor	1"	-		Rubber O-ring
Case Half Bolts	15 mm & 10mm 12-point	-		

Notes / Special Instructions

- The smell of burned transmission fluid is usually described as similar to “burnt almonds”.
- Fluid Level can be checked without removing the Transfer Case Skid Plate.
- Transfer Case Skid Plate should be removed before draining fluid.
- There is a large magnet in the bottom of the Transfer Case. The Case must be disassembled to remove and clean this magnet. The magnet is not easily visible through the Drain Plug hole. The magnet does not require routine cleaning.
- The Vehicle Speed Sensor is magnetic and can collect sludge. Damage or too much sludge will interfere with the sensor operation. This can cause problems with transmission shifting, speedometer, and cruise control.
- Some late-model Hummers (2000 and later) do not have the Rubber Plug (or the access hole).
- The Transfer Case can get hot when driven at sustained high speed. Some Transfer Cases seem to run hotter than others do. The Transfer Case is cooled by the transmission cooling circuit. Problems in the transmission or transmission cooling circuit can cause or contribute to Transfer Case overheating. If the Transfer Case fluid is burned, check the transmission fluid for signs of burning also. The engine coolant temperature gauge will not indicate anything about transmission or Transfer Case temperatures.
- If the Hummer has an aftermarket Transfer Case cooler, additional steps may be required to drain and/or fill the Transfer Case. Additional fluid may also be required. Some aftermarket coolers also have filters. Such filters should be changed at the same time as the fluid.

Procedure

Check Fluid Level

1. Remove Fill Plug
   - Illustration 1 shows the location of the Fill Plug.
   - Clean the area around the plug before removal.
2. Check Fluid Level.
   - Correct level is at or just below the bottom of the fill plug hole.
   - Low fluid may indicate a leak.
   - High Fluid Level may indicate contamination.
   - Very high Fluid Level is a symptom of the "Vampire" – refer to special section.
3. Check Fluid Condition.
   - Check fluid for contamination.
   - Check fluid for dirt, grit, or particles.
   - Check fluid for burned appearance or smell. Replace burned fluid.
4. Clean and reinstall Fill Plug.
   - If the fill plug has a plastic gasket, check it for damage.
   - If the Fill Plug uses a hex key, use Loctite PST on the threads.

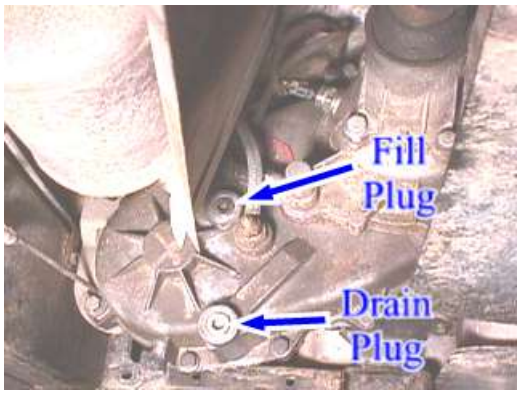

Illustration 1 – Transfer Case Fill and Drain Plugs

Replace Fluid

Note: Transfer Case Skid Plate should be removed for this procedure. Refer to the section on Drive Line Protection.

1. Remove Fill Plug.
   - Refer to above procedure for plug removal.
   - Leave the plug out for refilling.
2. Drain the Fluid.
   - Illustration 1 shows the location of the Drain Plug.
   - Position the drain pan below the Drain Plug.
   - Fluid may stream rearward when draining. As much as 12" or more is not unusual.
   - Drain Plug does not have a magnet.
3. Check fluid for contamination or metal pieces.
4. Clean and reinstall Drain Plug.
   - If the Drain Plug has a plastic gasket, check it for damage.
   - If the Drain Plug uses a hex key, use Loctite PST on the threads.
5. Fill Transfer Case with fluid.
   - Correct level is at bottom of the Fill Plug hole.
   - Some type of pump or dispenser is required.
6. Reinstall Fill Plug.
   - Refer to above procedure for replacing Fill Plug.

Check Vehicle Speed Sensor (VSS)

1. Disconnect VSS Wiring Connector
   - Illustration 2 shows the location of the VSS.
   - Connector has 2 plastic clips that must be unhooked to allow removal. Be careful not to break the clips.
2. Remove Vehicle Speed Sensor.
   - VSS has a rubber O-ring on it.
3. Check Vehicle Speed Sensor.
   - Small amount of sludge is normal.
   - Metal pieces indicate a possible Transfer Case problem.
   - Excessive sludge or damage to the end of the sensor indicates that a Shim Washer may be required. Illustration 3 shows this Shim Washer. Contact AMG or a Hummer Dealer for more information.
4. Clean and reinstall Vehicle Speed Sensor.
   - Clean all sludge from the VSS.
   - Clean and inspect the O-ring for damage.
   - Wet the O-ring with ATF before installation. This will allow easier removal.
5. Reconnect VSS Connector.
   - Connector is keyed for correct alignment.
   - Be sure retaining clips are correctly engaged.

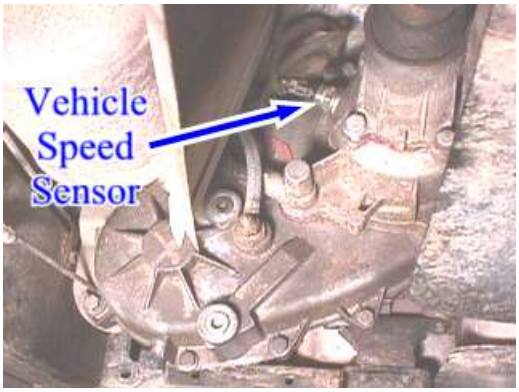

Illustration 2 – Vehicle Speed Sensor

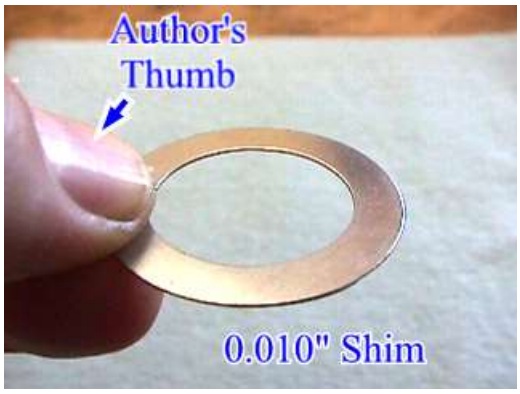

Illustration 3 – Shim Washer

Check Transfer Case Rubber Plug

1. Check that the Rubber Plug is still in the Transfer Case.
    - The Rubber Plug is pressed into a manufacturing access hole. This hole is about ¼" in diameter. The Plug has a "button top", and can be felt easily. If it is missing, the hole can be felt.
    - The Rubber Plug is very difficult to see with the transfer case skid plate in place.
    - The Rubber Plug is located about 1" forward of the Sector Shaft, on the side of the Transfer Case. Follow the shift linkage rearward to the transfer case shift arm. This arm is fastened to the Sector Shaft.
    - Illustration 4 shows this location on a transfer case "on the bench". View is from the side of the transfer case with most of the attachments removed but noted.
    - Illustration 5 shows the rubber plug in place, with the skid plate removed for visibility. View is from below, looking up, with the front of truck to the left. (The long hose clamp is only on the author's truck.)
    - If Rubber Plug is loose, brittle, or leaking, it should be replaced.
    - Beginning some time in 2000, the access hole was eliminated. If your truck does not have the hole, it does not need the Plug.

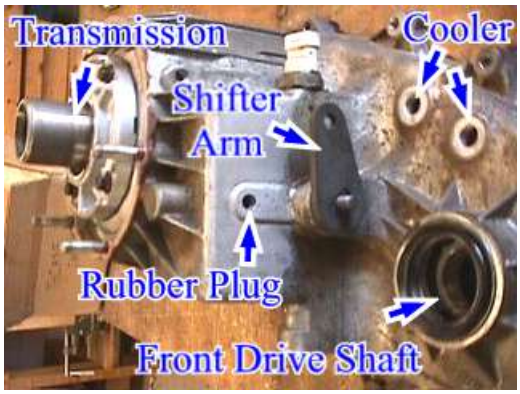

Illustration 4 – T-case "on the bench"

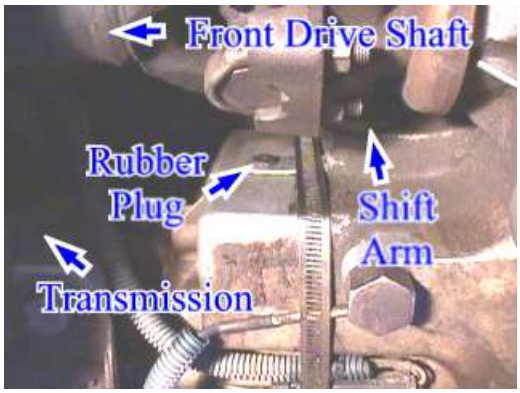

Illustration 5 – T-case Rubber Plug

Transmission – Fluid and Filter Change

Description

Transmission Fluid Level is checked as part of the "A" Service, and at every fueling.
Transmission Fluid is changed and Filter replaced as part of the "C" Service.

Related Tasks

Driveline Protection Center Section must be removed for this procedure.
For the 4-speed, the transfer case protection must be removed for this procedure.

Tools and Supplies

Drain Pan
10 mm and 13mm sockets with short extension
½" wrench or socket
¾" short socket with short extension
7/8" socket, 13/16" wrench
Transmission Filter and ATF

Special Tools

Spray cleaner and lint-free cloth
10 mm flex socket
½" flex socket
Torx T-55
Hydraulic Bottle Jack and Wood Block
Funnel for adding ATF

Fluids Required

Type	Specification	Quantity
ATF	Dexron III	4 to 5-1/2 qt. (5 for 3-speed)

Fasteners

Fastener	Wrench Size	Loctite	Torque	Notes / Special Tools
Drain Plug	½"	-	25 lb ft	Magnet on Plug, 4-speed
Drain Plug	9/16"	-		Magnet on Plug, 3-speed
Drain Plug	Torx T-55 or 15 mm	-	25 lb ft	Recessed
Transmission Pan	½"	-	12 lb ft	3-speed only
Filter Retaining Bolt	½"	-		3-speed only
Transmission Pan	10 mm	-	18 lb ft	4-speed only
Transmission Shift Bracket	13 mm	-	18 lb ft	Pan bolts that hold Bracket – 4-speed only
Transfer Case Mounting Bolts	¾"	-		
Cross-member Frame Bolts	13/16" & 7/8"	-		

Notes / Special Instructions

- ’94 – ’96 use a different Filter than ’97 and later Hummers. (Refer to Illustration 7.) The late-model Filter has 4 legs on the bottom. Be sure to use the correct Filter.
- The 3-speed Transmission (’93 and earlier) requires a different filter. (Refer to Illustration 8). The changing procedure is similar but not identical.
- For Hummers with the 4-speed Transmission, the Frame Cross-member must be removed to allow the pan to be removed. This is not required with the 3-speed.
- The dipstick tube should be checked for cracks or fractures, and should be securely inserted into the transmission body.
- There is a short “DOT” cable fastened between the frame and one of the cross-member bolts. This cable may be frayed and could be quite sharp, particularly near the ends.
- The inside of the Transmission must be kept clean of dirt, grit, and lint.
- Use care not to disturb the wires, connectors, etc. inside the Transmission when removing or installing the Pan and the Filter.
- The Hummer Transmission does not have any facility for draining the Torque Converter. Only part of the fluid will be replaced by this procedure. This is in accordance with AMG procedures and recommendations. There is a procedure for flushing the torque converter and transmission cooling circuit, however special equipment is required. Refer to the service manual for details.
- There is a magnet inside the Transmission Pan (4-speed).
- There is a magnet on the Drain Plug (3-speed, and some 4-speed).
- Make sure that wind will not blow dust or dirt into the Transmission.
- Make sure that wind will not blow draining fluid away from the drain pan.
- The amount of fluid drained varies greatly from one truck to another. If practical, check the fluid level before draining and measure the amount of fluid drained. Begin filling the Transmission by adding that amount and then check the level.

Procedure

Fluid Level Check

1. Requirements:
   - Truck must be parked on a level surface.
   - Engine should be idling in Park or Neutral.
   - Transmission should be warm for the most accurate level reading. If it is cold, the fluid level will be slightly lower.
   - While holding the truck with the brake, shift into each transmission shifter position for about 5 seconds.
   - Return the shifter to Park or Neutral before checking.
2. Following Fluid Addition:
   - Allow time for fluid to drain down the dipstick tube. 2 minutes is usually sufficient. Be cautious of false level readings because of fluid in the tube getting on the dipstick.
3. Check Fluid Level.
   - Remove dipstick, clean, and replace briefly.
   - Fluid should be in the marked range.
   - Owner's manual contains information about fluid level, checking, and dipstick removal.

Replace Fluid and Filter

1. Set Parking Brake or chock wheels.
2. Check Transmission Fluid Level (see above section).
3. Remove Driveline Protection.
   - Center Section must be removed.
   - (4-speed only) Transfer case skid plate must be removed.
   - Refer to Driveline Protection section.
4. Drain transmission Fluid.
   - Illustration 1 shows the Recessed Drain Plug from the outside. (Driveline Protection still in place.)
   - Illustration 2 shows the non-recessed Drain Plug from the inside.
   - Position Drain Pan below the Drain Plug. With non-recessed Drain Plug, fluid may stream out a short distance.
   - Clean the area around the drain plug.
   - Remove the Drain Plug.
   - Recessed Drain Plug does not allow complete draining of the pan. Some fluid will remain inside.
   - If practical, measure the amount of fluid drained. Use this as a starting point when refilling the Transmission. If fluid level was not correct when checked prior to draining, adjust this amount accordingly.
   - If there is a magnet on the drain plug, check it for metal bits and excess sludge.
5. Reinstall the Drain Plug.
   - Clean and inspect the Drain Plug and gasket.
   - Wet the rubber gasket of the Recessed Drain Plug with ATF.
   - Reinstall and torque the drain plug.

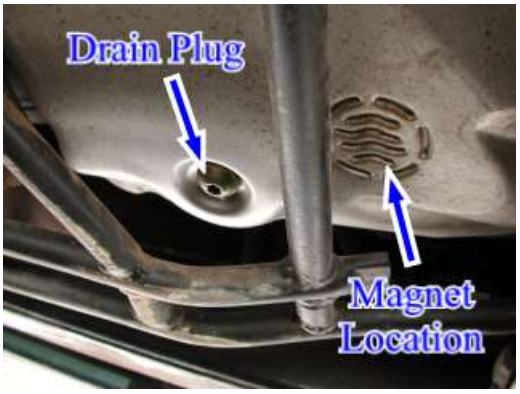

Illustration 1 – Recessed Drain Plug

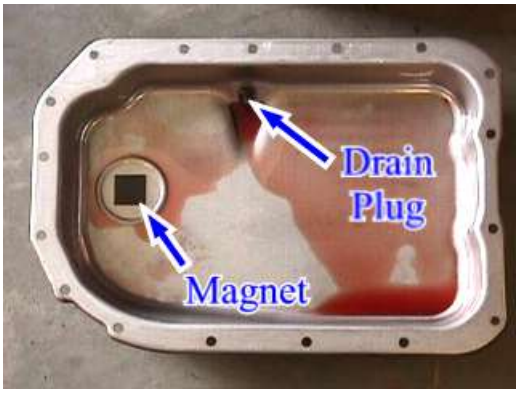

Illustration 2 –Drain Plug

6. (4-speed only) Remove two bolts fastening Transfer Case Mount to Transfer Case.
7. (4-speed only) Position the Jack and Wood Block as shown in Illustration 3.
    - For clarity, this picture is shown with the Frame Cross-member already removed.
    - The Wood Block is to protect the Transfer Case.
    - Raise Jack until Transfer Case just lifts free of Mount.
8. (4-speed only) Remove Frame Cross-member.
    - Remove Two Nuts holding Frame Cross-member. It may not be necessary to hold the bolt on the side with the "DOT" cable.
    - It may be necessary to pry the Frame Cross-member out of the support brackets. Use care - Cross-member is heavy.
9. Remove Transmission Pan.
    - Clean the area around and above the edges of the Transmission pan.
    - The Transmission Pan is held in place by 17 bolts around the edges. (13 bolts for the 3-speed)
    - Several bolts may require a flex socket to clear the exhaust cross pipe. Failure to fully seat the socket may damage the bolts and make removal difficult. Damaged bolts should be replaced.
    - Remove the Pan Bolts. Leave one bolt on each corner finger-tight until all other bolts are removed. This will keep the pan from falling or spilling fluid.
    - While supporting the Pan, remove all remaining bolts.
    - Carefully lower the Transmission Pan. Keep the Pan level to avoid spilling fluid still in the Pan.
    - (4-speed only) Push the Transmission Shift Bracket to the rear of the truck and slightly turn the Pan to help it clear the Bracket.
    - Use care not to bump or disturb parts inside the transmission.
    - Fluid will likely continue to drip from the bottom of the Transmission. You may blot this area with a lint-free cloth or paper towel. Use care not to get dirt, debris, or lint in the Transmission.
    - Illustration 4 shows the inside of the Transmission and the Transmission Filter.
    - (4-speed only) Retain the Pan Gasket – it is usually reusable.
10. Remove the Transmission Filter.
    - The transmission filter is removed by pulling downward on the corner where it is attached while turning back-and-forth.
    - The 3-speed filter is also loosely retained by a bolt and sleeve (Illustration 9). In the 4-speed, there are no other fasteners.
    - Additional fluid may drain from the filter as it is moved.

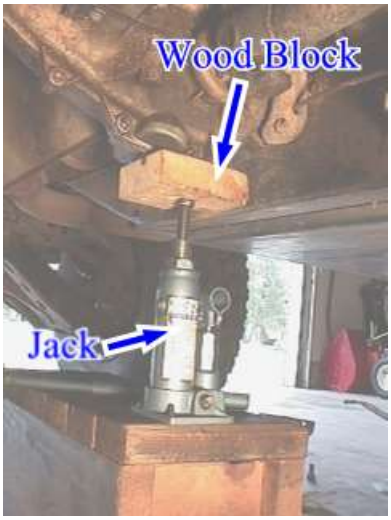

Illustration 3 – Jack Position

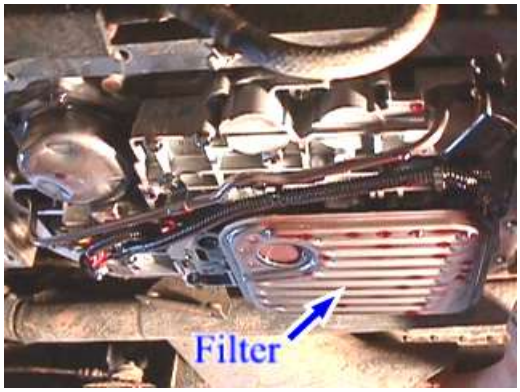

Illustration 4 –Transmission Filter

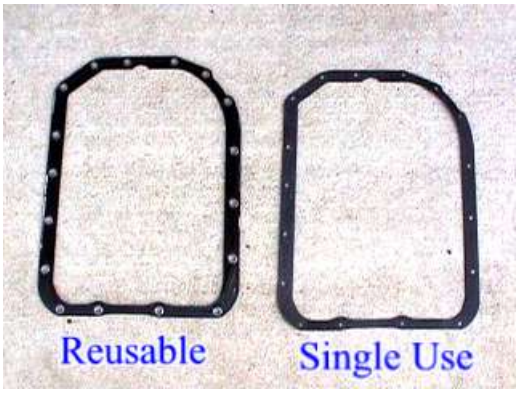

Illustration 5 – Transmission Pan Gaskets

11. Clean the Transmission Pan.
    - The transmission pan should be drained of any remaining fluid.
    - There is a magnet attached to the bottom of the pan (4-speed). It should be examined for metal pieces or excess sludge. Refer to Illustrations 1 and 2 for magnet location.
    - The magnet should be removed and cleaned.
    - Clean the inside of the Pan and the Gasket areas on the Pan and the Transmission. Position the magnet back in the Pan.
    - The factory Pan Gasket can usually be reused (4-speed only). It can be identified by the stiff center (sandwiched between layers of rubber) and the exposed metal areas around the bolt holes. Illustration 5 shows both types of Pan Gaskets.
    - If the Pan Gasket is to be reused, clean it and examine it for damage.
12. Replace Transmission Filter.
    - Illustration 6 shows a typical Transmission Filter (4-speed).
    - Illustration 7 shows the different Filters used in the Hummer 4-speed transmission. Note the legs on the bottom of the late-model Filter. Be sure to use the correct Filter.
    - The seal fits around the neck on the filter and usually remains in the transmission. If undamaged, the seal can be reused. Check the seal for damage and replace if necessary.
    - Position the new Filter inside the Transmission and twist it as you push it into place. Wetting the tip of the tube with ATF can make installation easier.
    - Reinstall the Filter Retaining Bolt and Sleeve (3-speed).
    - When finished, the filter must be in the same position as the original was before removal.
    - Be careful not to disturb anything else inside the Transmission.
13. Reinstall the Transmission Pan.
    - Position the Pan Gasket on top of the Transmission Pan.
    - Push the Transmission Shift Bracket to the rear to help it clear the edge of the Pan (4-speed only). Carefully position the pan in place. Be careful not to disturb anything inside the Transmission.
    - Hold the transmission pan in position and finger-tighten several bolts to hold it in place. Make sure the Pan Gasket is in the correct position.
    - Loosely install all Pan Bolts. Use care not to cross-thread the bolts.
    - Tighten the Pan Bolts in a circular sequence. Refer to Diagram 1 for 4-speed. Use similar pattern for 3-speed.

Illustration 6 – Transmission Filter (4-speed)

Illustration 7 – Early and Late Filters.

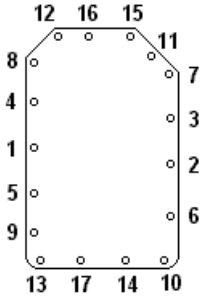

Diagram 1 – Pan Bolt Tightening Sequence (4-speed)

14. Reinstall the Frame Cross-member (4-speed only).
    - Position the Frame Cross-member in the support brackets. It may be necessary to pry, hammer, or jack the Cross-member. If necessary, file the end(s) of the Cross-member to allow clearance. Do not file more than necessary to allow easy fit.
    - Tighten the two mounting bolts and nuts.
    - Install and finger-tighten the bolts that hold the Mount to the Transfer Case. If the holes will not align, it may be necessary to loosen the bolts that hold the Transfer Case Mount to the Cross Member.
    - Lower and remove the Jack supporting the Transfer Case.
    - Tighten the Mounting Bolts into the Transfer Case.
15. Add Fluid and Check Level.
    - Fluid is added through the Dipstick tube using a funnel.
    - Add an amount of ATF equal to the amount drained. If the amount drained is not known, start with 4 quarts. Check Fluid Level (refer to section above).
    - Add additional fluid as needed. Do not overfill.
    - If overfilled, fluid can be removed through the dipstick tube with a suction device and hose, or by removing the Pan Drain Plug briefly.
16. Check for Leaks.
    - Allow engine to idle for several minutes (or take a short test drive).
    - Check for dripping fluid or leaks around the Pan and Drain Plug.
    - Recheck Fluid Level.
17. Reinstall Driveline Protection.

Illustration 8 – Transmission Filter (3-speed)

Illustration 9 – Filter Retaining Bolt (3-speed only)

STEERING AND SUSPENSION

Ball Joints - Check

Description

The manufacturer recommends that the Ball Joints are checked as part of the "B" Service. They should probably be checked as part of the "A" service, and after operation in severe conditions (see Severe Operating Conditions section).
The Tire Movement Method of checking the Upper Ball Joint is much faster than the Pry Bar Method.

Related Tasks

Refer to "Per Wheel Checklist".

Tools and Supplies

Jack
Wrenches and Shallow Sockets: ½", 9/16", 5/8", 11/16", depending upon fasteners
Short socket extension
Torque Wrench

Special Tools

Pry Bar
Large Groove Joint Pliers
Ball Joint removal requires one of the following special tools to separate the Ball Joint from the geared hub

- Screw-type Ball Joint Separator
- "Tuning Fork" or "Pickle Fork" type Ball Joint Separator

Torque on the Upper Ball Joint to Geared Hub mounting nut can be set or checked (without removing the Halfshaft) using a 15/16" Crow's Foot

Fasteners

Fastener	Wrench Size	Loctite	Torque	Notes / Special Tools
Control Arm Mounting Bolts				
Upper 5/16"	½"	-	24 lb ft	Early years
Lower/Upper, 3/8" fine thread	9/16"	-	28 lb ft	
Lower/Upper, 3/8" coarse thread	9/16"	-	37 lb ft	
Lower, 7/16" coarse thread	5/8" & 11/16"	-	65 lb ft	
Geared Hub Mounting Bolts				
Upper	15/16"	-	65 lb ft	
Lower	15/16"	-	73 lb ft	

Notes / Special Instructions

- When checking the lower Ball Joint, make sure the fulcrum of the pry bar is not pressing against the top of the Ball Joint. Pressing against the Ball Joint instead of the mounting bolts may damage the Ball Joint.
- The Ball Joint shaft (with the castle nut fastener) is a tapered shaft. Tightening the castle nut wedges the tapered shaft into the tapered hole in the geared hub. Separating this joint requires a Ball Joint separator of some type. The screw-type separators are slower, and a large one is required because of the size of the Ball Joint. The "tuning fork" type separator usually damages the boot beyond reuse, and should therefore be avoided if the Ball Joint is to be reused. If the fork must be used, lubrication and careful positioning may reduce damage to the boot.
- When replacing Ball Joints, uppers and lowers can be distinguished by the grease fitting location: fitting on top of upper; fitting on side of lower.
- Some early upper Ball Joints had a small cylinder-shaped dome with a flat top, with or without a grease fitting in the side. This style of Ball Joint is no longer available.
- A variety of fasteners were used on the various Ball Joints in various model year Hummers. Torque specifications for each type of fastener are included.

Tips for Replacement

- Removing the Ball Joint Center Stud from the Geared Hub allows better access to the bolt heads on the Lower Ball Joint.
- Upper Ball Joint Center Stud torque can be set using a Crow's Foot on a torque wrench, or by removing the Halfshaft. When using the Crow's Foot, position it at 90 degrees to the torque wrench to maintain accurate torque readings. (Refer to the torque wrench operations manual for alternate procedures.)

Procedure

Check Lower Ball Joint

1. Raise and Support Lower Control Arm.
   - Refer to Tire/Wheel Assembly section for lifting procedure.
   - This procedure should be performed with the tire/wheel assembly installed.
2. Insert Pry Bar (Illustration 1).
   - The fulcrum of the pry bar should be on one of the Ball Joint mounting bolts.
   - The tip of the pry bar should be under the housing of the geared hub.
3. Pry downward on the handle of the pry bar.
   - Light force required.
   - Movement in the Ball Joint of more than ¼" indicates replacement is required.

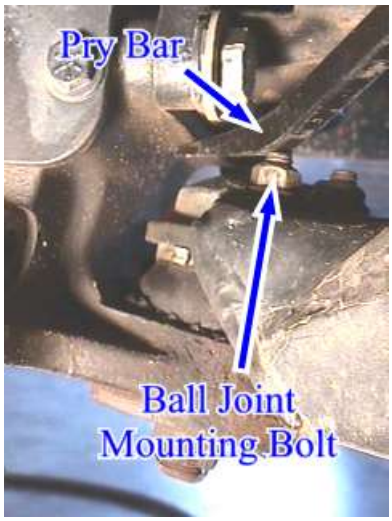

Illustration 1 – Pry bar Position, Lower Ball Joint

Check Upper Ball Joint, Tire Movement Method

1. Raise and Support Lower Control Arm.
   - (Same requirement as above procedure).
2. Firmly grasp the top of the tire and attempt to move it in-and-out.
   - Any movement or looseness indicates some type of problem that should be identified. Use Pry Bar Method (below) to identify Upper Ball Joint as source of problem.

Check Upper Ball Joint, Pry Bar Method

1. Raise and Support Lower Control Arm.
   - Refer to Tire/Wheel Assembly section for lifting procedure.
   - This procedure may be performed with or without the tire/wheel assembly installed.
2. Insert Pry Bar (Illustration 2).
   - Fulcrum against upper control arm.
   - Tip against top of Geared Hub.
3. Pry upward on the handle of the pry bar.
   - Light force required.
   - Movement of more than 1/8" in the Ball Joint indicates replacement is required.
4. Position large groove joint pliers as shown in Illustration 3.
   - One jaw on top of Upper Ball Joint flange.
   - Other jaw below geared hub where Ball Joint is attached
5. Squeeze pliers together.
   - Moderate force required.
   - Movement of more than 1/8" in the Ball Joint indicates replacement is required.
6. Combined movement from steps 3 and 4 exceeding 1/8" total indicates replacement is required.

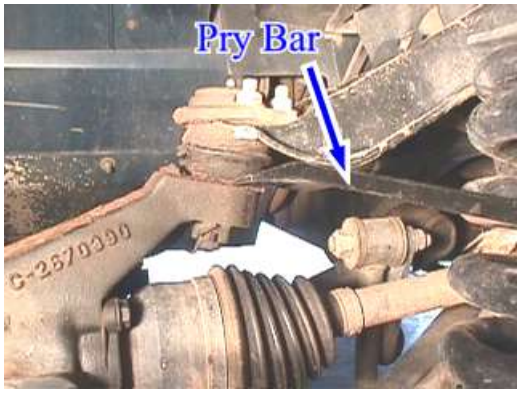

Illustration 2 – Pry Bar Position, Upper Ball Joint

Illustration 3 – Pliers Position, Upper Ball Joint

Check Ball Joint Boots

1. Ball Joint Boots (both Upper and Lower) should be checked for the following:
    - Boot missing
    - Cracks, splits, or tears.
    - Excessive grease leaking
2. Any of these indicate that the boot should be replaced.
    - At this time, boots are not available separately. This means that the complete Ball Joint assembly may need to be replaced.

Check Ball Joint Fasteners

1. Check for missing fasteners.
2. Check for evidence of Ball Joint movement relative to the control arm.
3. Check torque on the fasteners holding the Ball Joint to the control arm.
4. Castle nuts (holding the Ball Joints to the geared hub) should be checked:
    - Nut should not be loose.
    - Cotter Key should be in place and not bent or damaged.

Idler Arm and Pitman Arm - Check

Description

The manufacturer recommends checking the Idler Arm and Pitman Arm as part of the "B" service. They should probably be checked as part of the "A" service, and following severe operation (refer to the Severe Operating Conditions section).
The Idler Arm and Pitman Arm can also be checked via the "Steering System Check" procedure.

Related Tasks

See "Per Wheel Checklist".
When checking the Idler Arm and Pitman Arm, the front Tie Rod Ends are also easily checked. Refer to Steering System Check and Tie Rod Ends Check sections for details.

Special Tools

Jack
Gear Puller
Ball Joint Separator

Fasteners

Fastener	Wrench Size	Loctite	Torque	Notes / Special Tools
Idler Arm to Frame	5/8" & 11/16" or 18 mm	-	60 lb ft	
Idler Arm to Center Link	15/16"	-	80 lb ft	
Pitman Arm to Steering Gear	1-5/16"	-	185 lb ft	33mm may fit better
Pitman Arm to Center Link	15/16"	-	80 lb ft	

Notes / Special Instructions

- A locating diagram for steering parts can be found in the Reference section.
- The Pitman Arm is located on the driver's side of the truck. It is attached to the output shaft on the steering gear. When steering, this arm moves the Center Link left and right. (Illustration 4)
- The Idler Arm is located on the passenger's side of the truck. It is attached to the frame. When steering, this arm keeps the Center Link correctly aligned. (Illustration 5)
- Alignment (toe-in) should be checked after replacing these parts.
- Some time in the '95 model year, AMG changed to a heavy duty Center Link, Idler Arm, and Pitman Arm. This center link can be identified by measuring the thickness of the link where the Idler Arm or Pitman Arm are attached. The original Center Link was 7/8" thick, and the new Center Link is 1" thick. When using the newer style Idler Arm or Pitman Arm with the older style Center Link, a 1/8" spacer (e.g. washers) must be used under the nut. If this is not done, the cotter key will not retain the nut correctly.

Tips on Idler Arm and Pitman Arm replacement

- When removing the Pitman Arm from the steering gear, a gear puller must be used. Illustration 1 shows a typical gear puller used for this purpose.
- To remove the Idler Arm or the Pitman Arm from the Center Link, a "tuning fork" type ball joint separator may be used. While convenient, this tool will destroy the boot on either Arm. If the Arm is to be re-used, a gear puller should be used instead.
- The newer "Problem Solver" style Idler Arm requires a spacer and longer bolts. Illustration 2 shows the old-style and new-style Idler Arms. Illustration 3 shows the new-style arm with the spacer and the old-style arm without. The spacer goes between the Idler Arm and the Frame. Both the spacer and the new bolts are supplied by the factory with the replacement Arm. Some time in mid-2002, Moog changed the spacer arrangement. The new model, shown in Illustration 4, shows the permanently attached spacers, and the oversize washers and metric bolts now provided with the Idler arm.
- It is not necessary to remove the Drive Line Protection to remove the Idler Arm or Pitman Arm. It may be necessary to turn the wheels to remove the Pitman Arm.
- After installation, clearance should be checked between the Idler Arm and the lower radiator hose. If necessary, gently pry the hose away from the Idler Arm.

Illustration 1 – Gear Puller

Illustration 2 – Old and New Idler Arm

Illustration 3 – Spacer

Illustration 4 – Newer Spacer

Checking Procedure

Check Pitman Arm

1. Raise and Support Lower Control Arm, Driver's Side.
   - Refer to Tire/Wheel Assembly section for lifting procedure.
   - This procedure should be performed with the tire/wheel assembly installed.
2. Grasp the tire at the front and rear.
3. Alternately push the wheel in at the front and the rear.
   - Push as if you were trying to turn the wheel left and right by pressing on the sides of the tire.
   - Any looseness may indicate a problem that should be isolated to determine the cause.
   - Any movement in the Pitman Arm or the joint where it attaches to the Center Link indicates replacement is necessary.

Check Idler Arm

1. Raise and Support Lower Control Arm, Passenger's Side.
   - Refer to Tire/Wheel Assembly section for lifting procedure.
   - This procedure should be performed with the tire/wheel assembly installed.
2. Grasp the tire at the front and rear.
3. Alternately push the wheel in at the front and the rear.
   - Push as if you were trying to turn the wheel left and right by pressing on the sides of the tire.
   - Any looseness may indicate a problem that should be isolated to determine the cause.
   - More than a small amount of vertical movement in the Idler Arm indicates replacement is necessary.
   - Any movement in the Idler Arm joint where it attaches to the Center Link indicates replacement is necessary.

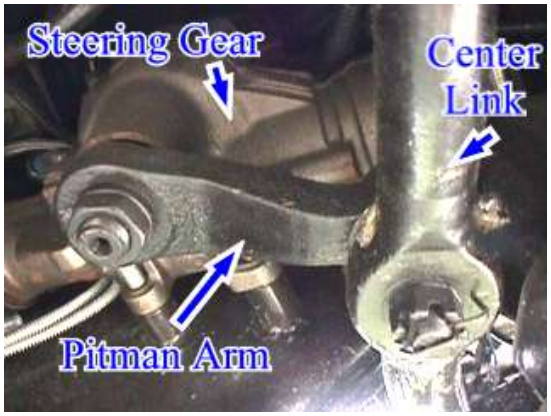

Illustration 4 – Pitman Arm

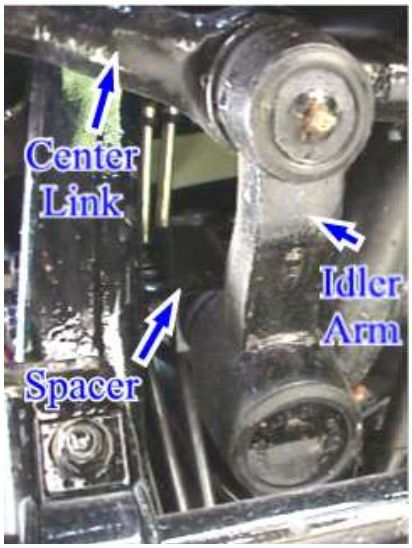

Illustration 5 – Idler Arm

Steering System Check

Description

The Steering System is checked as part of the "B" Service.
The Steering System should be checked any time that a steering-related problem is suspected.

Related Tasks

Ball Joints – Check (for Lower Ball Joints)
Geared Hub – Check (for Hub Spindle Check)
Suspension Check

Tools and Supplies

Helper

Fasteners

Fastener	Wrench Size	Loctite	Torque	Notes / Special Tools
Idler Arm Mounting Bolts	5/8" & 11/16"	-	60 lb ft	
Steering Gear Mounting Bolts	5/8"	Blue 242	60 lb ft	

Notes / Special Instructions

- This procedure does not check the Lower Ball Joints or Hub Spindles.
- This procedure does not check the Suspension Parts.
- This procedure does not check any of the Rear components.

Check Steering System

1. Set parking brake.
2. Start engine.
   - Leave transmission in P (Park).
3. Turn the Steering Wheel.
   - Have the Helper turn the Steering Wheel.
   - Turn the Steering Wheel back and forth just enough to see movement in the front tires.
   - It is not necessary to actually move the front tires on the ground.
   - The Steering Wheel should be turned back-and-forth (Left to Right and back to Left) at the rate of about 1 or 2 times per second.
4. From under the vehicle, watch the steering components. Look for following:
   - Movement in the Steering Shaft U-joints (above the steering gear).
   - Looseness or movement of the Steering Gear where it attaches to the frame.
   - Looseness or movement in the Pitman Arm where it attaches to the Steering Gear.
   - Looseness in the Pitman Arm where it attaches to the Center Link.
   - Looseness or movement of the Idler Arm where it is attached to the frame.
   - Looseness in the Idler Arm where it attaches to the Center Link.
   - Looseness in the Idler Arm pivot joint. (Vertical movement in the Idler Arm where it attaches to the Center Link.)
   - Looseness in the Tie Rod Ends
   - Looseness or movement in the Upper Ball Joints.
5. Stop Engine.
6. Check Steering Gear Mounting Bolts.
   - Steering Gear Bolts are located on the frame on the driver's side just behind the upper control arm. (Illustration 1)
   - Turn the wrench firmly clockwise (tighten). Do not significantly exceed the correct torque setting. Bolt should not turn.
   - If you exceed the torque setting and turn the bolt, the Loctite will no longer hold. The bolt must be removed and reinstalled.
   - Check all 3 bolts.
7. Check Idler Arm Mounting Bolts.
   - Idler Arm Bolts are located on the frame on the passenger's side, just behind the upper control arm.
   - Turn the wrench firmly clockwise (tighten). Do not significantly exceed the correct torque setting. Bolt and Nut should not turn.
   - Check both Mounting Bolts.

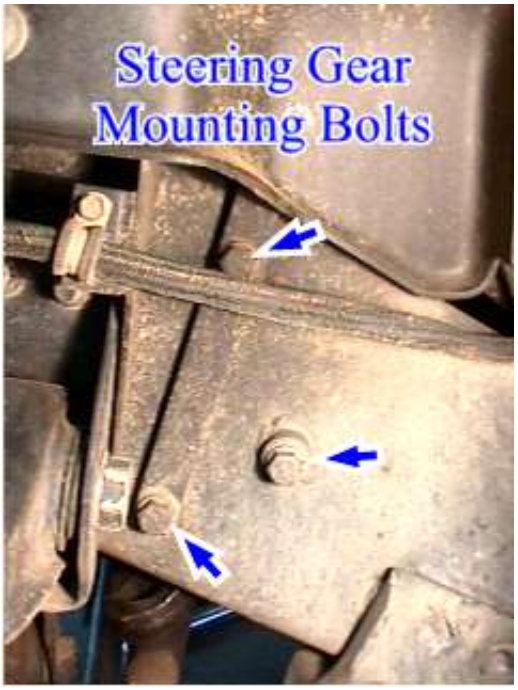

Illustration 1 – Steering Gear Mounting Bolts

8. Check Frame.
    - Visually check the frame near each of the bolt holes.
    - Look for small cracks near the bolt holes on both the inside and the outside of the frame. See Illustration 2.
    - If either the Idler Arm or Steering Gear moves but the Mounting Bolts are not loose, cracking in the Frame is suspected.

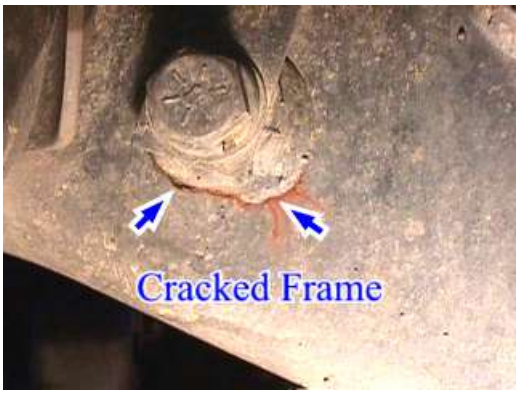

Illustration 2 – Cracked Frame near Steering Bolt

Suspension - Check

Description

The Suspension Check is performed as part of the "A" Service.

Related Tasks

This check is part of the Per Wheel checklist

Fasteners

Fastener	Wrench Size	Loctite	Torque	Notes / Special Tools
Control Arm Busing Bolts	1-1/8""	-	260 lb ft	

Notes / Special Instructions

- When assembled at the factory, the Shocks have a protective wrapper on them. This wrapper is to protect the Shock from paint overspray. After painting, this wrapper no longer serves any purpose, but it is not usually removed at the factory. Once the suspension has been exercised, this protective wrapper is broken. This wrapper tends to collect dirt, mud, debris, and any oil that leaks out of the seal. Because of this, it is recommended that this wrapper be removed. It can usually be torn away using pliers and a wire hook or bent coat hanger.
- If a shock is covered (or partially covered) by lightweight oil, it may be leaking. If this oil is from somewhere else on the truck, the spring will usually also be covered.
- The shock can be removed by removing the top mounting bolt (above the spring), and the two bolts holding the lower shock mount to the lower control arm (on the bottom of the arm). No further disassembly of the truck is required.

Checking Procedures

Control Arms

1. Each Upper and Lower Control Arm should be checked for:
    - Damage or cracks.
    - Looseness or evidence of movement at bushings (where control arm is mounted to the bracket on the frame).
    - Mounting bolts tight.

Springs

1. Each spring should be checked for:
   - Damage or cracks.
   - Collapsed coils.
2. Check for correct position of spring coil lower end.
   - Gap should be about 1/16” to 1/8”.
   - Refer to Illustration 1.

Illustration 1 – Spring Position

Shocks

1. Each shock should be checked for:
   - Damage.
   - Looseness of mounting bolts.
   - Oil leaking.

Front Stabilizer

1. The Front Stabilizer bar (also referred to as the anti-sway bar or simply the sway bar) should be checked for:
   - Damage.
   - Looseness in mounting bolts.
   - Loose, damaged, or missing bushings.
2. The Connecting Links (connecting the Stabilizer to the Lower Control Arms) should be checked for:
   - Damage.
   - Looseness in mounting bolts.
   - Loose, damaged, or missing bushings.

Tie Rod Ends – Check

Description

Tie Rod Ends are checked as part of the "B" Service.
The Tie Rod Ends can also be checked via the "Steering System Check" procedure.

Related Tasks

See the "Per Wheel Checklist".
When checking the front Tie Rod Ends, the Idler Arm, Pitman Arm, and Ball Joints are also easily checked. Refer to the appropriate section for details.

Special Tools

Jack

Fasteners

Fastener	Wrench Size	Loctite	Torque	Notes / Special Tools
Castle Nut	1-1/16"	-	70 lb ft	
Clamp Bolts	5/8" & 11/16"	-	55 lb ft	Positioning is Critical in Front!
Radius Rod End Bolt	1-1/8"	-	260 lb ft	

Notes / Special Instructions

- Front Tie Rods have a Tie Rod End at each end. In the rear, the rods are called Radius Rods, and they have a Tie Rod End only at the wheel end.
- Tie Rods and Radius Rods are adjusted by loosening the clamps and rotating the Tie Rod. One Tie Rod End is Right-hand threaded while the other is Left-hand threaded. Rotating the Tie Rod changes the length of the Tie Rod, thus adjusting the toe-in (part of the Alignment) of the tire.
- The Tie Rod clamp nearest the wheel must be turned to face away from the wheel. Failure to do so may cause damage to the tire, wheel, or wheel balance weights.
- The Tie Rod clamp farthest from the wheel must be turned to face away from the anti-sway bar in the front. Failure to do so may cause the clamp to hit the anti-sway bar and/or other front end parts.
- Radius Rod clamp bolt positioning is not critical because the rear wheels to not steer.
- The Radius Rod End is Right-hand threaded. The Tie Rod End at the rear wheel is Left-hand threaded.
- Originally, the Tie Rod End at the center link is Right-hand threaded, and the Tie Rod End at the wheel is Left-hand threaded. NOTE: If the Tie Rod was ever removed it may have been installed backwards. Always check the thread direction before adjusting Tie Rods or replacing the front Tie Rod Ends.

Tips on Tie Rod Replacement

- When removing a Tie Rod End from the Tie Rod, count the number of turns required. Install the new end with the same number of turns. This will usually be very close to the correct Toe Alignment.
- After replacing Tie Rods or Ends, Toe Alignment must be checked.
- Tie Rod Ends often seize up, and may require penetrating oil and great force to "break loose". Heating the Tie Rod or End is not usually helpful. When assembling a new Tie Rod, application of anti-seize compound is recommended.

Checking Procedure

1. Raise and Support Lower Control Arm.
    - Refer to Tire/Wheel Assembly section for lifting procedure.
    - This procedure should be performed with the tire/wheel assembly installed.
2. Grasp the tire at the front and rear.
3. Alternately push the wheel in at the front and the rear.
    - Push as if you were trying to turn the wheel left and right by pressing on the sides of the tire.
    - Any looseness may indicate a problem that should be isolated to determine the cause.
    - Any movement in the Tie Rod Ends indicates replacement is necessary.

TIRES AND WHEELS

Wheel Alignment Check

Description

The Wheel Alignment Check is performed as part of the "B" service
The Wheel Alignment Check should be performed any time uneven or unusual tire wear is observed
The Wheel Alignment Check should be performed after replacing Tie Rod Ends, Idler Arm, or Pitman Arm

Related Tasks

If checking is being performed as part of a regular service, it should be done before any of the wheels are raised.

Tools and Supplies

Tape Measure

Special Tools

String or heavy thread, about 50 feet long
Two small clamps or clothespins
Golf pencil or similar spacer (refer to text)

Fasteners

Fastener	Wrench Size	Loctite	Torque	Notes / Special Tools
Tie Rod Clamp Bolts	5/8" & 11/16"	-		Position critical in front
Cam-type Caster/Camber	1-1/8"	-	300 lb ft	'97-1/2 and later

Notes / Special Instructions

- Wheel Alignment must be measured with the truck suspension in normal driving position. If one or more of the wheels has been raised (e.g. by jacking), the suspension must be re-settled. This is most easily done by driving the vehicle forward about one truck-length. Typically, the truck is backed out of the service area, and then driven back into place.
- The truck must be on a flat, nearly level surface.
- The truck must not noticeably lean to one side or the other.
- The String method of measuring Thrust Angle can also be used to adjust the toe-in, but only if the front and rear track width (width of wheels) is nearly identical.
- Adjustment of Caster and Camber are beyond the scope of this manual. This is better left to experienced personnel with the appropriate equipment. Specifications for these are included in this section, as are many other tips that may be helpful for shops unfamiliar with the Hummer.
- All alignment work should be performed with the vehicle at typical weight (e.g. normal cargo), and with the tires at the correct pressure for hard surfaces.
- The torque specification in this manual for the cam-type Caster/Camber adjustment is higher than the AMG recommendation. This is required to reliably maintain the adjustment.

Overview

This page will provide a summary of the terminology used in describing wheel alignment.

Note: All diagrams are greatly exaggerated for clarity.

Toe-in

Toe-in is the measure of the distance between the fronts and the rears of the tires on a particular axle. (Figure 1)

This difference can be measured as a distance, or as an angle.

On the Hummer, the front tires are closer together at the front than at the rear, and the rear tires farther apart at the front than at the rear.

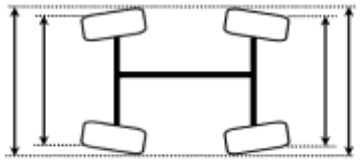

Figure 1 – Toe-in

Thrust Angle

When the Toe-in is set, both tires on an axle should have the same angle with respect to the vehicle. Any deviation from this may cause handling problems and increased tire wear. The Thrust Angle for an axle is the average of the angles of the two tires (with respect to the vehicle).

If the rear is misaligned, the rear of the truck tends not to follow the front (Figure 2). If the front is misaligned, the steering wheel must be held at an angle for the truck to drive in a straight line.

On the Hummer, the thrust angles should always be zero.

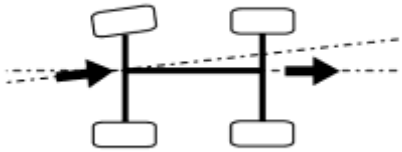

Figure 2 – Thrust Angle

Caster

On steering axles (front on most vehicles), there is an axis of rotation of the tires as they steer. The angle between this axis and vertical is known as the Caster. (Figure 3)

On the Hummer, only the front tires steer, so only the front tires should have the Caster set. Since the rear suspension is almost exactly the same as the front, it is theoretically possible to set the rear caster as well. Without steering rear tires, however, it is not useful.

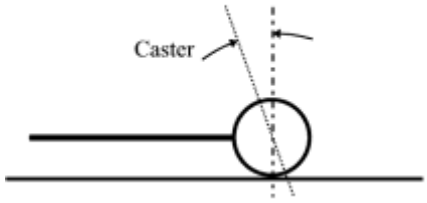

Figure 3 – Caster

Camber

Since most paved roads are crowned in the center to promote drainage, the tires of most vehicles are set to a slight angle in order to meet the road squarely. The angle between this alignment and vertical is known as Camber. (Figure 4)

On the Hummer, both the front and rear tires are set to be slightly wider at the top than at the bottom.

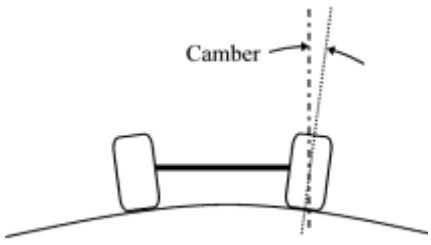

Figure 4 – Camber

Wheel Alignment Check

Toe-in Check

1. Park the truck on a flat, level surface.
   - Steering should point straight ahead.
   - Drive the truck straight for at least 5 feet.
2. Measure across the front and the rear of the front tires.
   - Take the measurement as close to the front and rear of the tires as possible without the tape measure contacting the underside of the truck.
   - Not all tire tread patterns have a center line, so be certain to measure from/to the same points on the front and the rear.
3. Compare the difference in measurements to the specifications listed in the table.
4. Repeat the process in the rear.
   - Remember, on the front axle, the fronts should be closer and on the rear axle, the fronts should be farther apart.
5. If the Toe-in must be adjusted, use the Thrust Angle Check procedure to determine how much each tire should be adjusted.
6. Toe-in is adjusted by changing the length of the Tie Rods.
   - Illustration 1 shows the right front Tie Rod Assembly (inner Tie Rod End not shown).
   - Loosen both clamps.
   - Rotate the Tie Rod Sleeve (center section).
   - Rotation in one direction lengthens the Tie Rod, while rotation in the other direction shortens it.
   - Each full rotation of the Tie Rod Sleeve changes the Toe-in by about ¾ of an inch (17 mm) for original-size tires.
   - After adjusting, drive the truck forward about 1 truck-length to re-settle the suspension and re-check the Toe-in.
   - After adjustment is completed, re-tighten the clamps.

NOTE: Clamp position is critical on the front – the outboard clamp must face forward, and the inboard clamp must face rearward (Illustration 1). Failure to do so may result in damage to the tire, wheel, or wheel balance weights.

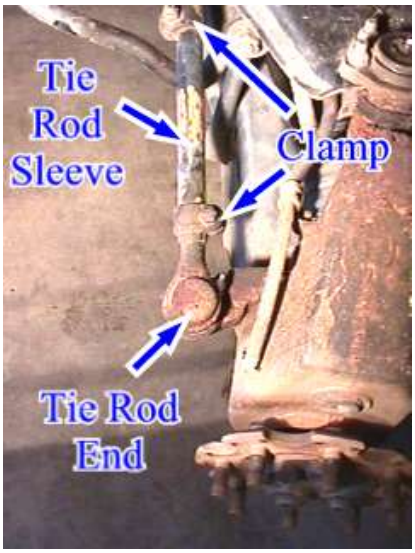

Illustration 1 – Tie Rod Assembly

Thrust Angle Check

Note: This method of checking the Thrust Angle only works if the truck does not lean to one side or another because of suspension height differences. (Front and rear need not be the same.)

1. Park the truck on a flat, level surface.
   - Drive the truck straight for at least 5 feet.
   - Steering should point straight ahead.
   - Steering wheel should be centered to check front thrust angle.
2. Wrap the string around the tires on the truck.
   - Fasten one end to a part of the trailer hitch using a clamp or clothespin.
   - Maintain tension on the string as you guide the string around all four tires, crossing each as close to the center as possible without the string contacting any part of the truck body.
   - After running the string completely around the truck, fasten the other end to the trailer hitch with the other clamp or clothespin.
   - Make sure the string crosses each tire on the sidewall, not on a raised letter or other blemish.
   - Make sure the string is not in contact with any other part of the truck.
3. Measure and record the distance at each tire.
   - Refer to Figure 5 for this step.
     a. this figure shows a top view of the right rear tire (or the left front tire)
     b. the other axle of the truck is to the right
   - Place a spacer under the string near the high-point of the sidewall bulge.
     a. a golf pencil or similar lightweight object may be used
   - Position the spacer such that the string just touches the other sidewall bulge.
     a. too far forward will lift the string completely off of the sidewall Contact Point
     b. too far rearward will allow the string to bend at the sidewall Contact Point

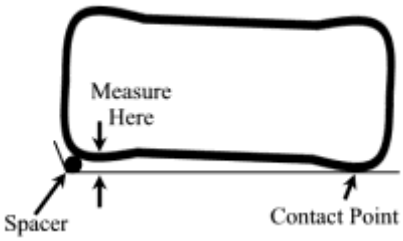

Figure 5 – Thrust Measurement

   - Problems with spacer placement.
     a. if the Toe adjustment is correct (or somewhat close), the spacer position should look similar to Figure 5
     b. if the string gaps at the contact point without any spacer, measure at the "Contact Point" and consider the measurement to be negative (and note that the Toe must also be adjusted)
     c. if a larger spacer is required, use a larger spacer (and note that the Toe may also need to be adjusted)
   - Carefully measure the distance between the string and the high-point of the sidewall bulge.
4. Using these distances, compare the angel of each tire on an axle.
   - If the distances are the same, the Thrust Angle for that Axle is OK.
   - If the distances are the same and the Toe-in requires adjustment, adjust both tires equally in order to maintain the correct Thrust Angle.
   - If the distances are different and the Toe-in is OK, both tires should be adjusted in the same direction in order to correct the Thrust Angle.
   - If the distances are different and the Toe-in requires adjustment, adjust each wheel separately such that both the Toe-in and the Thrust Angle are correct.
5. The angle of each tire is adjusted by rotating the Tie Rod Sleeve, as described in the Toe-in Check section above.

Camber Check

1. Park the truck on a flat, level surface.
   - Steering should point straight ahead.
   - Drive the truck straight for at least 5 feet.
2. Visually check the angle of the tire with respect to the side of the truck.
   - All tires should lean out slightly at the top.
   - If any tires lean in at the top (Illustration 2), adjustment is required.
   - Note characteristic tire wear in Illustration 2 – inner tread area is almost bald.

Illustration 2 – Incorrect Camber

Caster Check

Caster is not easily measured without specialized equipment. While driving, if the steering does not tend to return to center, the caster may require adjustment.

Alignment Specifications

Current AM General procedures list two sets of alignment specifications. The "Service Checking" specs are used to determine whether an alignment is necessary, and the "Service Setting" specs are used to set the alignment if needed. The Service Checking specs have a wider range than the Service Setting specs. The alignment should be the same on the left and right sides within the listed amount ("must be same within").

Also note that the vehicle should be loaded as it typically is when driven. Vehicle load changes the suspension geometry somewhat, which needs to be accounted for when aligning the Hummer.

Service Checking				
	Caster (degrees)	Camber (degrees)	Toe (total, degrees)	Toe (total, inches) *
Front	+1.5 to +4.0	0 to +1.75	0 to +0.50	0" to +5/16"
Rear	n/a	-0.1 to +1.0	-0.50 to 0	-5/16" to 0"
(must be same within)	1.0	1.0	0.10	1/16"

Service Setting				
	Caster (degrees)	Camber (degrees)	Toe (total, degrees)	Toe (total, inches) *
Front	+2.5 to +3.5	0 to +0.50	0 to +0.38	0" to +1/4"
Rear	n/a	+0.25 to +0.75	-0.38 to 0	-1/4" to 0"
(must be same within)	0.50	0.50	0.10	1/16"

* Toe-in (in inches) measured with original size tires

Tire/Wheel Assembly - Removal and Installation

Description

The tire/wheel assembly should be removed for the following:

- Tire/Wheel Balance check ("A" Service)
- Rotate Tires ("B" Service)
- Tire/Wheel maintenance

Related Tasks

- Alignment check should be preformed before raising any tires.
- Many regular maintenance tasks can be performed more easily with the tire/wheel raised or removed. Refer to the "Per Wheel Checklist" for details.

Tools and Supplies

¾" Open-end Wrench
5/8" Socket and short extension
7/8" Deep Socket
Torque Wrench

Special Tools

- Floor Jack
- Jack Stand(s)

Fasteners

Fastener	Wrench Size	Loctite	Torque	Notes / Special Tools
CTIS Guard	5/8"	-	55 lb ft	
CTIS Valve	¾"	PST		Pipe thread – do not over-tighten
Lug Nuts, one-piece wheels	7/8"	-	140 lb ft	
Lug Nuts, two-piece wheels	7/8"	-	110 lb ft	Tapered side toward wheel, do not over-tighten

Notes / Special Instructions

- Small amounts of water dripping from the CTIS valve or the hub center is normal. Air compressor systems often have water condensation in them.
- Gear oil dripping from the CTIS valve or the hub center indicates a possible spindle seal leak in the geared hub. Air leaking may also result from these seals leaking. Refer to the CTIS section.
- Over-tightening the lug nuts on two-piece wheels may result in permanent lock-nut behavior. Though still safe to use, this may cause considerable difficulty in changing a tire/wheel without power tools.
- Tapered Lug nuts must be installed with the tapered side toward the wheel.
- Flanged Lug nuts must be installed with the flange side toward the wheel.
- Some aftermarket CTIS guards require that the CTIS hose be positioned between the narrow guard-mounting holes instead of the wide ones.

Removal Procedure

1. Disengage all 4 CTIS valves at the center of the Hub.
   - Valve is released by pressing the small release lever and moving the valve outward about ¼". Refer to owner's manual for details.
   - Each axle's wheels are connected together via the CTIS system. Opposite tire will deflate when removing the CTIS valve if its valve has not been disengaged. Depending upon model year and selector settings, both axles may be connected together as well.
2. If rotating tires, mark each tire as to its "new" location.
   - Refer to owner's manual for rotation pattern.
3. Remove CTIS guard.
4. Remove CTIS Valve from hub.
5. Loosen but do not remove the 8 lug nuts.
   - The 8 lug nuts are located near the center of the wheel.
   - DO NOT loosen the 12 wheel nuts (located near the outer edge) on two-piece wheels.
   - If using impact tools for the lug nuts, you may skip this step.
6. Raise Tire/Wheel.
   - Position floor jack as shown in Illustration 1.
   - If using the stock jack, refer to the owner's manual for positioning and operation.
   - Lifting more than is minimally necessary may make reinstalling the wheel more difficult.
7. Support frame with jack stand for safety.
8. Remove 8 lug nuts.
   - The 8 lug nuts are located near the center of the wheel.
   - DO NOT remove the 12 wheel nuts (located near the outer edge) from two-piece wheels.
9. Remove tire/wheel assembly.
   - Note: Tire/wheel assembly can weigh as much as 155 lbs. (or more).

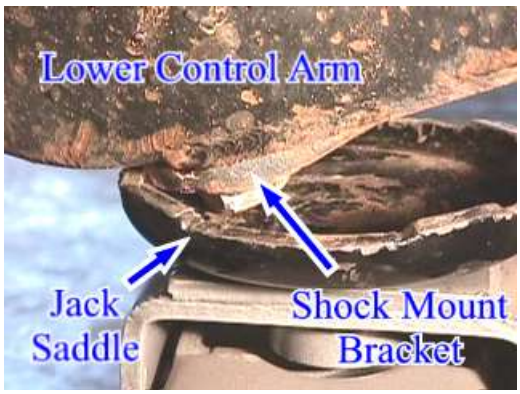

Illustration 1 – Jack Position

Installation Procedure

1. Install tire/wheel onto lugs.
   - Wheel can be lifted easily by positioning a pry bar under the tire and lifting it with the pry bar.
   - Note that the CTIS hose must be positioned between the wide guard-mounting holes. (Illustration 2) Failure to correctly align the CTIS hose will prevent proper installation of the CTIS guard.
2. Install and tighten each lug nut.
   - Must be tightened <u>in sequence</u>. Figure 1 shows the tightening sequence.
   - Must be tightened to the specified torque. Do not over-tighten.
   - On two-piece wheels, tapered side of lug nut should face toward wheel.
3. Apply Loctite PST to the CTIS valve and thread it into the center of the hub. Do not over-tighten.
4. Re-install CTIS guard.
5. After completing all tire/wheel work, re-connect (pop-in) each of the 4 CTIS valves.

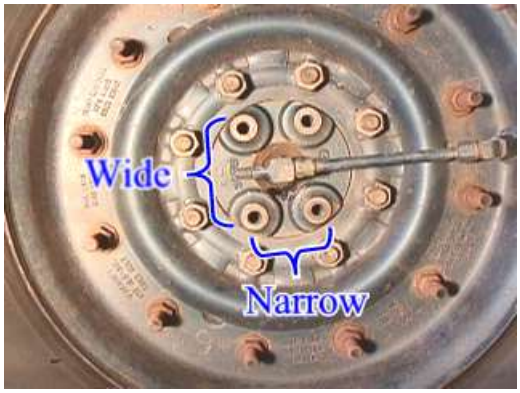

Illustration 2 – CTIS line position

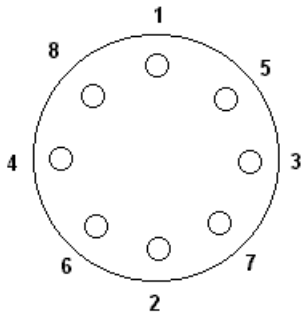

Figure 1 – Lug Nut Tightening Sequence

SYSTEMS

ABS Sensors - Check

Description

The ABS sensors should be checked as part of the “A” service.
The ABS sensors should be checked whenever ABS or TT4 systems do not function correctly

Related Tasks

This procedure is part of the Per Wheel checklist.

Notes / Special Instructions

- ABS and TT4 are only on 1999 and later Hummers.
- The ABS Sensors are also the TT4 sensors.
- The TT4 and ABS systems are controlled by (the same) computer. If there is a system failure, the ABS light on the instrument panel will usually come on. Failure codes can be read from the OBD-II system.
- The ABS and TT4 computer will time-out after about 1 minute of continuous operation. It will automatically reset after some period of non-use.
- At the time of this writing, checking the ABS sensor is not part of the AMG recommend service procedure.

Procedure

ABS Sensor Check

1. There is an ABS sensor located at each geared hub. Illustration 1 shows the right-front sensor as viewed from above.
   - The Sensor is magnetic and works by sensing the movement of the Tone Ring past the Sensor face.
   - Small amounts of dirt, mud, water, or debris do not ordinarily interfere with Sensor operation.
2. Check that the sensor is near but not touching the Tone Ring.
   - Clearance should be about the thickness of a sheet of writing paper.
   - The face of the Sensor (opposite the wire) should be perpendicular to the Tone Ring.
   - Check that the Sensor and mounting bracket are not loose
3. Check the condition of the sensor wire.

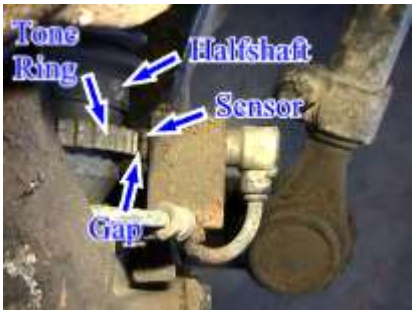

Illustration 1 – ABS Sensor Location

ABS System Diagnosis

If the ABS or TT4 system operation is suspected of causing a problem, disable the system and repeat the test.

1. The ABS and TT4 system is activated by a number of relays.
   - The relays are located under the hood, on the driver's side, just forward of the windshield, under a plastic cover.
2. Locate and unplug the main control relay.
   - The system can be completely disabled by removing the main control relay.
   - There is a diagram on the under side of the plastic ABS cover that identifies all of the components, including the main relay.
3. Repeat the test and observe the system/vehicle behavior.
4. Restore the main control relay.
   - Running the truck with the relay removed causes a system fault, and the ABS light may remain on or remain on longer at startup.
   - The fault code can be cleared by using a fault code reader.
   - The fault code can be cleared by disconnecting the main batteries for a few minutes (this will clear all codes in all computers).

CTIS System - Check

Description

The CTIS System is checked as part of the "A" service

Related Tasks

Some parts of this procedure are preformed as part of the Per Wheel checklist

Tools and Supplies

¾" open end wrench

Fasteners

Fastener	Wrench Size	Loctite	Torque	Notes / Special Tools
CTIS Guard	5/8"	-	55 lb ft	
CTIS Valve	¾"	PST		Pipe thread – do not over-tighten

Notes / Special Instructions

- Early model Hummers have a selector valve located near the driver's right knee. Late model Hummers have a selector switch near the Inflate / Deflate switch.
- If the CTIS overpressure valve releases at a low pressure, the tires cannot be fully inflated.
- If the CTIS overpressure valve releases at a pressure that is too high or not does not release at all, great care must be used not to over-inflate the tires. The system will still work correctly, but if you forget that you have the system set to inflate, "bad things" can happen.
- Checking the CTIS compressor intake line is described in the Central Vent System section.

Procedure

Check System Integrity

1. System integrity is easily tested by observing the system for leaks.
   - Less than about 2 lbs of air loss overnight on either axle is considered acceptable.
   - This test is performed with all CTIS valves in place and popped-in and selector valve (early model) to “None”.
2. Isolate any leaking to Tire/Wheel or CTIS System.
   - On early model Hummers, set selector valve to “None”.
   - Pop out both CTIS valves on the axle that is loosing air.
   - If system looses air (gauge on dash), leak is in CTIS system or one of the CTIS valve.
   - If tires loose air, leak is in Tire/Wheel.
3. Identify source of air leak in CTIS system.
   - Air leaks can be tracked down by listening for escaping air, or by using soapy water.
   - Check all hose connections.
   - Examine all hoses for signs of melting or damage.
   - A leaking spindle seal will cause air to escape through the vent line attached to the geared hub – check for this by removing the vent hose, attaching a short piece of hose, and holding the open end of the hose in a cup of water – look for bubbles of air escaping.

Check Pump and Inflate / Deflate

1. Select the Front Axle.
   - Selector valve (early model) or selection switch should be set to Front.
2. Briefly operate the CTIS system Inflate switch.
   - Pump should run.
   - Selected axle(s) should show slow increase in air pressure.
3. Briefly operate the CTIS system Deflate switch.
   - Air should be heard escaping from the general area of the CTIS pump.
   - Selected axle(s) should show decrease in air pressure.
   - Air flow should stop when the switch is released.
4. Restore correct air pressure after testing.

Check CTIS Overpressure Valve

1. Select the Front Axle and pop out both front CTIS valves.
2. Briefly operate the CTIS system Inflate switch.
   - Air pressure on the front axle gauge should quickly rise to between 40 and 50 lbs.
   - Air should be heard escaping (loud, repeated “puff” from the area of the CTIS compressor) and pressure should be reduced.
   - Air pressure should stay in or below the 40 to 50 lb range.
   - If the pressure rises higher than about 60 lbs, turn off the pump immediately.
3. If pressure rises too high, or not is high enough, the CTIS overpressure valve should be repaired or replaced.

Driveline Protection – Removal and Installation

Description

Driveline Protection is composed of 5 basic parts, and the associated fasteners.

- Front Differential Protection
- Center Driveline Protection
- Rear Differential Protection
- Transfer Case Skid Plate
- Fuel Tank Skid Plate

Ordinarily, the fuel tank skid plate does not need to be removed.

Related Tasks

The following table lists several common maintenance and repair tasks, and which protection piece requires removal.

Task	Driveline Protection Section	Notes
Replace rear brake pads	Rear Differential Protection	Outboard rear mounting brackets must also be removed.
Replace Halfshaft	Front Differential Protection	Right Front Only
Drain Transfer Case	Transfer Case Skid Plate	
Change Transmission Filter	Center Driveline Protection	

Tools and Supplies

½" and 9/16" Wrenches and Sockets
9/16" Open-end Wrench

Special Tools

9/16" ratcheting box end wrench

Fasteners

All fasteners consist of a bolt, two flat washers, and a lock nut. One washer is positioned under the head of the bolt, the other under the nut.

Fastener	Wrench Size	Loctite	Torque	Notes / Special Tools
(various)	½"	-	27 lb ft	
(various)	9/16"	-	48 lb ft	

Notes / Special Instructions

- When removing the center Driveline Protection section, center the steering to allow better access to some of the front mounting bolts.
- The Rubber Washers are frequently lost or damaged. A simple replacement can be made from a short section of bicycle inner tube with two holes cut in it to allow the mounting bolt to pass through. The inner tube piece is then slipped over the end of the Driveline Protection. Illustration 3 shows this type of replacement for the rubber washers. The rubber washers are intended to reduce noise and/or vibration, and may safely be omitted.
- Dirt and debris tend to collect on the side plates used to support the center section. Use caution not to get this debris in your eyes (or other orifices). Also, this debris must be cleared away before the fasteners are tightened. Failure to do so may damage the fasteners, and / or cause the center section to come loose.
- Each side plate has 4 bolts attaching to the center section. Conventional automotive wisdom indicates that these bolts should be installed with the nut on the bottom. The supporting theory is that if the nuts come off, the bolts will still help to retain the affected part. In the particular case of these fasteners, if they are installed with the nut on the bottom, the ends of the bolts tend to become damaged. This makes removal and reuse of these bolts very difficult. Since all of the nuts are locknuts they do not tend to come off. Further, these fasteners are not critical to the positioning, retention, or operation of the center section. They are primarily to prevent rattling between the center section and the support brackets.
- During removal, it may be necessary to loosen all fasteners before some may be removed.
- If the Center Section is bent, removal and installation are more difficult. It may be necessary to use a jack to position the section such that the front bolts can be inserted or removed.
- When tightening the fasteners, it is important to tighten the frame cross-member bolts first. These bolts have less allowance for positioning than the others. It is equally important to insert and hand tighten all fasteners before completely tightening any. Tightening the fasteners may cause further misalignment, making further fastener installation quite difficult.

Procedure

Remove Driveline Protection

1. Remove all fasteners.
    - Illustration 1 shows some of the frame spacers used for attaching the driveline protection. These spacers are not retained in the frame, and may move out of position when the bolt is removed. Leaving the bolt partially in place may help prevent the spacers from slipping out of position.
    - Support Protection section as last fastener(s) are removed
    - Center Driveline Protection Section is HEAVY – approximately 60 lbs. – use care when removing.
    - The rear of the main section is held in place by bolts passing through brackets. It is not necessary to completely remove these brackets. Illustration 2 shows a position of these brackets that will allow removal and reinstallation of the center section.

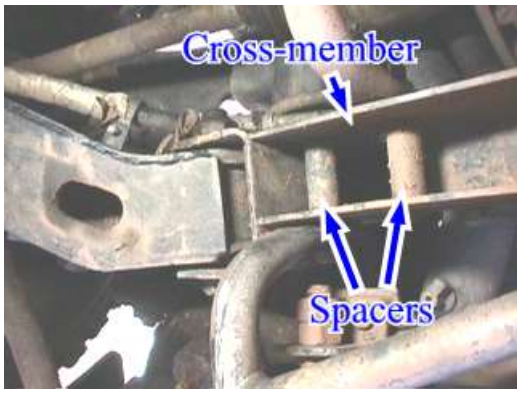

Illustration 1 – Frame Spacers

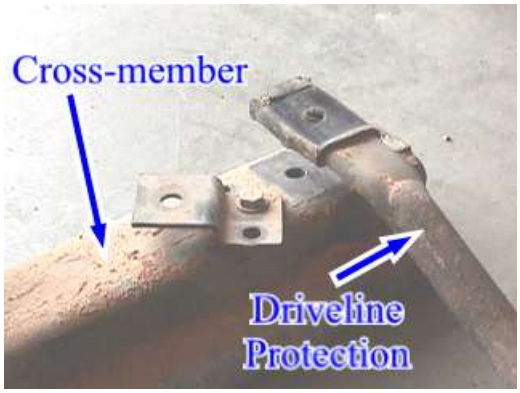

Illustration 2 – Brackets

Reinstall Driveline Protection

1. Position Protection Section and secure with fasteners.
    - Hand tighten only
2. Install all fasteners
    - Be sure all frame spacers are in position.
    - Make sure rear of main section has rubber washers positioned correctly (Illustration 3).
    - Hand tighten only. Tightening fasteners before all other fasteners are in place may prevent insertion of some fasteners.
    - Some bending, jacking, and/or prying may be necessary if the Driveline Protection has been bent, even slightly.
3. Tighten all fasteners to specified torque.
    - Begin with fasteners that attach to the frame cross members.
    - The Frame Cross-member Bolt near the Driver-side front Brake Rotor may require an open-end wrench. A box-end wrench may become captured.

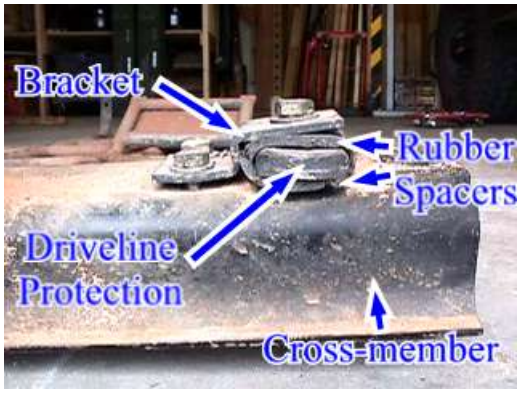

Illustration 3 – Rubber Washers

Vent Lines – Check

Description

Vent Lines are checked as part of the "A" Service

Related Tasks

Checking the wiring harness involves many of the same locations as the Vent Lines.

Notes / Special Instructions

- The Vent Lines at the front Hubs are made from rubber. All other Vent Lines are made from hard plastic.
- The vent lines usually do not have fasteners (except the rubber lines).

Procedure Overview

Why the Central Vent System

As gear boxes warm up or cool down, they expand and contract. They also build up pressure and vacuum. Vents are needed to equalize the pressure differences. If the gear boxes are not vented, this pressure can expel fluids and/or suck water or other contaminants through the seals.

If the vent is not protected is some way, contaminants such as water, mud, and dirt may enter the gear box through the vent.

In the Hummer, all of the gear box vents are connected together, and then connected to the engine air intake just before the Air Filter. (Illustration 1 shows this Vent Line connection.) This system allows all of the gear box Vents to be protected from external contamination. Proper operation of this system is essential to prolonging the life of the gear boxes.

Although not strictly part of the Central Vent System, the CTIS Compressor Intake Line should also be checked. This line connects between the CTIS Compressor and the Air Intake just above the engine. Illustration 2 shows this Line.

Illustration 1 – Vent Line Connection at Air Filter

Illustration 2 – CTIS Air Intake Line

Indications of Vent Line Problems

Kinked Vent Lines can cause seal leakage, water contamination, and missing Transfer Case Rubber Plug.

Openings of any type in the Central Vent System can cause fluid contamination of one or more of the components.

List of Components

The following components are vented through the Central Vent System.

- Front and Rear Differential.
- All 4 Geared Hubs
- Transmission
- Transfer Case
- Winch Motor (1999 and earlier Hummers with factory Warn winch)
- Air Filter (for pressure equalization)

Vent Line Connections

There are a number of "T" fittings in the system.

- Between the rear Hubs and the rear Differential
- Between the rear Hubs and the main line
- Between the main line and the Transfer Case
- Between the main line and the Transmission
- Between the main line and the Air Filter
- Between the main line and the front Hubs
- Between the front Hubs and the front Differential
- Between the front Hubs and the Winch Motor

There are also fittings where the line changes from hard plastic to rubber for the front Geared Hubs.

Vent Line Checking

All of the vent lines need to be checked for:

- Kinks
- Cracks
- Wear
- Melting
- Connections separating at fittings

Pay particular attention to these places when checking Vent Lines:

- Front and rear Hubs where the lines must flex or may rub on suspension parts.
- Near the passenger side of the engine.
- On top of the Transmission (some transmissions have sharp places on the casting on the top).
- Near brake or exhaust components.

BRAKES AND HALFSHAFTS

Brakes – Checking

Description

The Brake system should be checked as part of the "A" Service.

Related Tasks

Halfshaft Bolt Check

Tools and Supplies

Pry Bar

Special Tools

No special tools are required for checking the Brakes. See "Tips on Brake Pad Replacement" (later in this section) for special tools used when replacing the Brake Pads.

Fluids Required

Type	Specification	Quantity
Brake Fluid – non-TT4 Hummers	DOT 5 (Silicone)	
Brake Fluid – TT4 Hummers	DOT 3	
Guide Pin Lube	Teflon	

Fasteners

Fastener	Wrench Size	Loctite	Torque	Notes / Special Tools
Brake Adapter to Differential	15/16"	Blue	110 – 140 lb ft	
Caliper Yoke to Adapter	9/16"	Red	40 lb ft	
Caliper Guide Pins	7mm Hex Key	Red	30 lb ft	
Brake Caliper Bleed Screw	3/8"	-	6 – 15 lb ft	Protective Rubber Cap
Brake Line Fittings	3/8" & 5/8"	-	-	Flare fitting

Notes / Special Instructions

- When checking Brake pads, make sure wear is close to even between Pads on a Brake, and between Brakes on an Axle. Uneven wear may indicate sticking Guide Pins or other problems.
- When replacing Pads, be sure to use the same type of Pad (i.e. lining material) on all brakes.
- When replacing Pads, replace all 4 Pads on an axle at the same time.
- It is not unusual for the Rear Brakes to wear faster than the Front Brakes on the Hummer.
- DOT 5 Brake Fluid usually contains some type of dye (yellow or purple). DOT 3 usually does not.
- DO NOT MIX DOT 3 and DOT 5 Brake Fluid (except in emergency).

Brake System Symptoms

- Warped Rotors may cause Low-speed Surging.
- Air bubbles in the brake lines may cause Soft Brake Pedal feel.
- Dirt or debris may cause Brake Squeal. (Some slight squealing is normal for disk brakes.)
- Sticking or Misadjusted Parking Brake may cause excessive Rear Brake Wear.

Procedure

Check Pad Wear

1. Visually Inspect Brake Pads.
    - Illustration 1 shows the (passenger-side front) Brake Caliper area. Illustration 2 shows the details of the Brake Pads.
    - The Pad Lining is located between the Brake Rotor and the Brake Pad Backing Plates.
    - If any Brake Pad Lining is less than 1/8" thick (about the thickness of 2 US pennies) all the Pads on that axle should be replaced.
    - If Pad Lining wear (on a Brake) is more than slightly uneven, the Guide Pins may be sticking. Illustrations 4 and 5 show the guide pins.

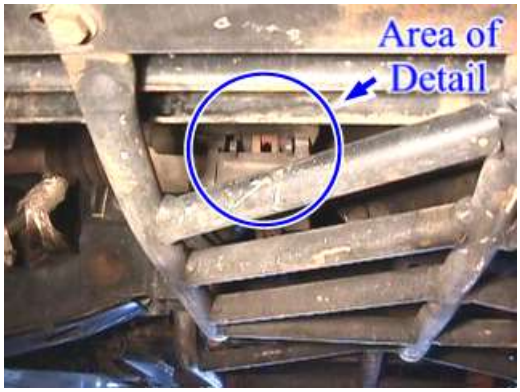

Illustration 1 – Brake Caliper

Check Brake Rotor

1. Visually check the Rotor
    - Check the surfaces where the Pads press.
    - Check for scratches, scoring, or cracking.

Brake Fluid Level Check

1. Do Not Overfill.
    - Do not top off the reservoir. As the brakes wear, the fluid level drops. When new pads are installed, the fluid level is raised. If the reservoir does not have enough room for this extra fluid, it will spill out.
    - Metal Brake Fluid Reservoir should always be at least 2/3 full.
    - Plastic Brake Fluid Reservoir should always be in the marked range.
2. Check Owners manual for specific checking procedure.

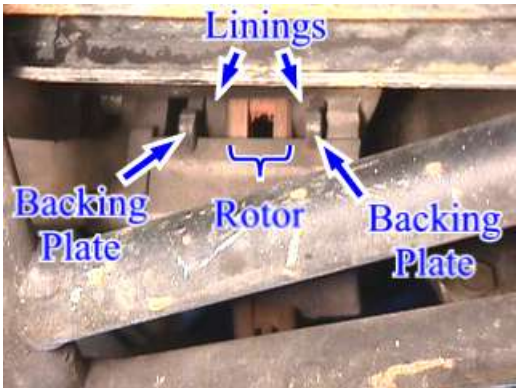

Illustration 2 – Brake Caliper Detail

Parking Brake Cable Adjustment

1. Check tension on Parking Brake Cable.
    - Illustration 3 shows the passenger-side parking brake arm. On the Hummer, the Parking Brake activates only the rear brakes. Cable should be checked on both rear brakes.
    - Check should be performed with the Parking Brake released (off).
    - Cable should be tight enough that there is no free play in the clevis. If it is too loose, the brake may not be fully activated when the lever is set.
    - Cable should be loose enough that it can be deflected by hand. If the Cable is too tight, the brake may not be fully released when the lever is released.
    - Parking Brake Arm should rest against the housing.
2. The Parking Brake is adjusted by rotating the end of the Parking Brake Lever near the Driver's seat. Refer to the Owners Manual for specific adjusting procedures.

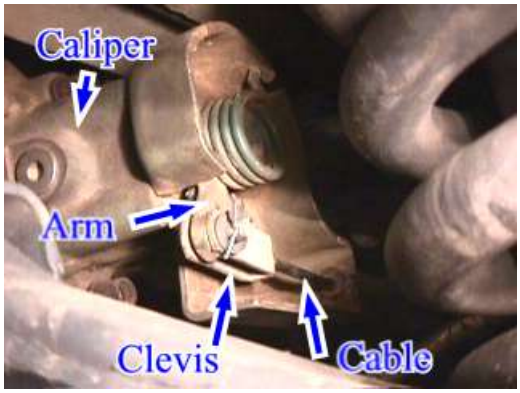

Illustration 3 – Parking Brake Arm

Check Brake Adapter Mounting Bolts

1. Visually Check Brake Adapter Mounting Bolts.
   - There are two mounting bolts, one above the other.
   - Illustration 4 shows the location of one of these bolts.
2. Use Pry Bar to Check Brake Adapter Mounting Bolts.
   - Gently pry between the Differential and the Brake Adapter. There should not be any movement.

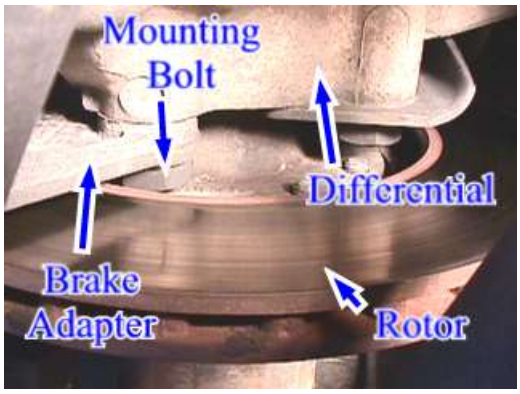

Illustration 4 – Brake Adapter Mounting Bolt

Check Brake Yoke Mounting Bolts

1. Visually Check Brake Yoke Mounting Bolts.
   - There are two mounting bolts, one above the other.
   - Illustration 5 shows the location of one of these bolts.

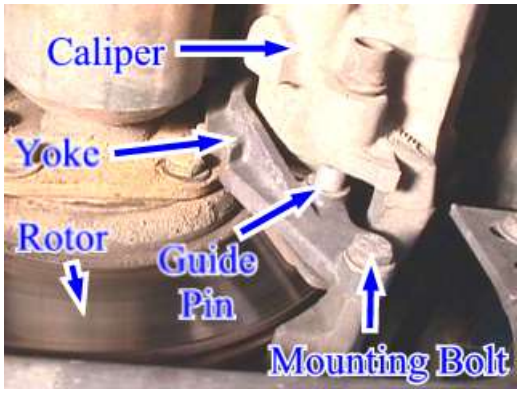

Illustration 5 – Brake Yoke Mounting Bolt

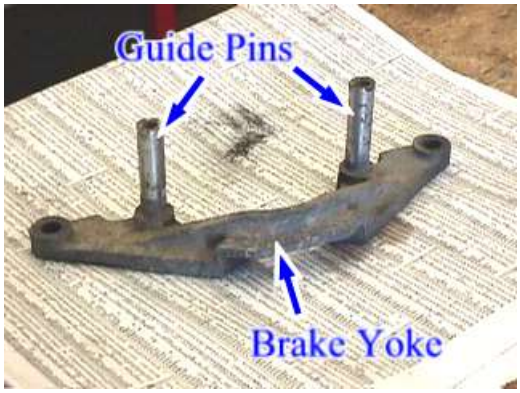

Illustration 6 – Brake Yoke and Guide Pins

Tips on Brake Pad Replacement

Illustration 7 – Brake Piston Compression Tool

Illustration 8 – Brake Yoke Mounting Bolt Tool

- Rear Brake Caliper Piston must be rotated as it is compressed. This is necessary to compress the parking brake auto-adjustment mechanism. Illustration 7 shows a special tool used to perform this operation. The socket is fitted over the end of the piston. The tool has two hex locations for turning with a wrench or socket, one for turning the piston and one for compressing it. The tool is used to alternately compress, and then turn the brake piston.
- Upper Brake Yoke Mounting Bolts are difficult to reach with ordinary hand tools. Illustration 8 shows a special tool used to remove and install these bolts.
- Before compressing brake pistons, check the condition of the rubber boot. If the boot is torn or melted, dirt may get into the brake mechanism and cause it to freeze up. Rebuilding the caliper is recommended if dirt contamination is suspected.
- When compressing the Brake Caliper Pistons, Brake Fluid will be forced out of the system and into the reservoir. Make sure there is enough room in the reservoir for this fluid.
- Brake guide pins (Illustration 6, previous page) should be cleaned and lubricated with a Teflon Guide Pin lubricant.
- Sometimes, after changing brake pads, excessive vibration or shuddering may occur when stopping. This is usually caused by a slight misalignment between the brake pads and the rotor. This is normal, varies somewhat from one truck to another, and is not adjustable. The simplest treatment for this condition is to perform two or three "hard stops" with the truck. From about 55 or 60 mph, use the brakes to quickly slow down to about 10 mph. Do not lock the tires. (Do not do this more than two or three times without allowing the brakes to cool down first.) Be sure to perform this procedure where you are not a hazard to other traffic.

Tips on Brake Rotor Replacement

- Replacing the Rotors required removal of the Brake Caliper and Pads as well as disconnecting the inboard end of the Halfshaft.

Halfshaft Bolt Check

Description

Although checking the Halfshaft bolts is not part of the AMG scheduled maintenance, the bolts should be checked every time you have the chance. At a minimum, they should be checked at every "A" Service.

Related Tasks

Check Brakes

Tools and Supplies

15 mm Wrench or Socket
3/8" Drive Handle and short extension
9/16" Socket
Pry Bar

Special Tools

Rethreading tap, 10mm x 1.5

Fasteners

Fastener	Wrench Size	Loctite	Torque	Notes / Special Tools
Halfshaft Flange bolt	15mm	Red 272	57 lb ft	
Halfshaft Retaining Bolt	9/16"	Blue 242	37 lb ft	In Hub, behind Access Cover
Access Cover, w/ Gasket	3/8" square	-	15 lb ft	In Hub; use socket extension
Access Cover, w/o Gasket	3/8" square	PST	15 lb ft	In Hub; use socket extension; pipe thread – do not over-tighten

Notes / Special Instructions

- Loose Halfshaft Flange Bolts sometimes manifest as a "clunk" or slack in the drive train. It clunks one way when you accelerate and the other way when you brake. Is it sometimes audible when starting from a stop. (This symptom can be caused by other problems as well.)
- Loose Halfshaft Flange Bolts can be caused by Differential Mounting Bolts coming loose, or Brake Mounting Bolts coming loose. Refer to the "Brakes - Checking" section.
- As Halfshaft Flange Bolts back out, they come in contact with the Brake Yoke. They can easily destroy this yoke and cause the brake caliper to come loose. The bolts can also shear off and allow the Halfshaft to come loose from the brake rotor. A flopping Halfshaft makes a lot of noise at any speed.
- Replacing the Right Front Halfshaft requires that the front Driveline Protection section be removed.
- Over-tightening the Halfshaft Flange Bolts can warp the Brake Rotor causing vibration during braking.
- When removing or reinstalling the Halfshaft Retaining Bolt, use care that the Lockwasher does not fall into the Geared Hub.
- When installing the Halfshaft Flange Bolts, replace the lockwashers unless you are certain that they can be reused. The manufacturer recommends always replacing the lockwashers.

Procedure

General

There are 6 Flange Bolts on each Halfshaft, arranged in pairs. The bolts fasten the Halfshaft and the Brake Rotor to the Differential Output Flange.

It will be necessary to rotate the Halfshaft to gain access to all of the bolts (unless the brake caliper is removed). This procedure is described below.

If ANY of the Flange Bolts on a halfshaft are loose, ALL 6 bolts should be removed and reinstalled.

Chock the truck carefully. Turning the Halfshaft Flange Bolts can cause the truck to move.

Check Halfshaft Flange Bolts

1. Visual Check.
    - Make sure all bolts appear tight. No gaps or spaces under the heads.
    - Halfshaft bolts should have lockwashers under the heads. There are several types of lockwashers in use, depending upon model year and lockwasher upgrade.
    - Standard split-type lockwashers should be completely flat.
    - Nordlock lockwashers are made from two separate washers (see illustration 1). On these washers, the "ramp" sides should be facing each other and the ribbed sides should face the bolt head and the flange. Make sure that the pieces are not split, cracked, or missing. There should be no gaps.
    - Bellville washers are ridged on one side, and are slightly conical in shape (see illustration 2). These washers are specifically designed for applications with high thermal stress. These lockwashers are not available from the manufacturer.
    - Check all 6 bolts.
2. Torque Check.
    - Place the wrench or torque wrench on the head of a bolt.
    - Turn the wrench gently in either direction. Bolt should not turn.
    - Turn the wrench firmly clockwise (tighten). Do not significantly exceed the correct torque setting. Bolt should not turn.
    - If you exceed the torque setting and turn the bolt, the Loctite will no longer hold. The bolt must be removed and reinstalled, and the lockwasher may need to be replaced.
    - Check all 6 bolts. It may be necessary to rotate the Halfshaft for access.

Illustration 1 – Nordlock Lockwasher

Illustration 2 – Belleville Washer

Remove and Reinstall Halfshaft Flange Bolts

1. Chock a wheel (or set the parking brake if not working in the rear).
2. Remove Halfshaft Bolts.
   - If you are not removing the Halfshaft, the bolts should be removed and reinstalled in pairs. This will preserve the alignment of the rotor and differential output flange.
3. Clean Halfshaft Bolts and Bolt Holes.
   - The thread area of the bolts should be cleaned using a wire brush.
   - The thread area of the Differential Output Flange can be cleaned using a rethreading tap if the correct size. Alternatively, a bolt can be inserted and removed.
4. Check the Lockwashers
   - If you are not certain that the lockwashers can be reused, replace them. Current manufacturer recommendation is the Nordlock lockwasher.
5. Reinstall Halfshaft Bolts.
   - Place a drop or two (no more) of Loctite 272 (High-strength Red) on the bolt threads about ¼" from the tip of the bolt.
   - Reinstall the Bolts, making sure not to cross-thread them.
   - Carefully torque the bolts. Over-tightening can warp the brake rotor causing vibrations during braking.

Checking Halfshaft Retaining Bolt

1. Remove Access Cover.
   - Tire/wheel assembly must be removed.
   - Rotate the Halfshaft such that the cutout between wheel lugs allows access to the Access Cover. See section below.
   - Clean the area around the Cover.
   - Remove the Cover using a 3/8" extension and drive handle.
2. Check Bolt Torque.
   - Place the socket or torque wrench on the head of the bolt.
   - Turn gently in either direction. Bolt should not turn.
   - Turning the Halfshaft Retaining Bolt will cause the Hub Spindle to rotate. It may be necessary to hold the Hub flange with a pry bar to keep it from moving while tightening the Retaining Bolt. Use care not to damage the wheel lugs with the pry bar.
   - Turn clockwise (tighten) firmly. Do not significantly exceed the correct torque setting. Bolt should not turn.
   - If you exceed the torque setting and turn the bolt, the Loctite will no longer hold. The bolt must be removed and reinstalled.
3. Replace Access Cover
   - Clean the thread area of the Cover.
   - If the Cover has a plastic Gasket, clean and inspect the Gasket. Replace if necessary.
   - If the Cover does not have a plastic Gasket, apply Loctite PST to the thread area.
   - Install and torque the Access cover using a torque wrench and a short 3/8" extension.

Rotating a Halfshaft

1. Chock a wheel (or set the parking brake if not working in the rear).
2. For the Halfshaft you are working on, raise the wheel off the ground. (Refer to the section on Tire/Wheel Removal for lifting procedures.)
3. Shift the Transfer Case into Neutral (N).
4. Rotate the Halfshaft as needed. Halfshaft can be rotated as follows:
    - Turn the tire/wheel.
    - Turn the driveshaft.
    - Turn the halfshaft itself.
    - Insert a screwdriver into the edge of the brake rotor and turn the brake rotor.
5. Lock the Halfshaft in position for wrenching. Halfshaft can be locked as follows:
    - Lower the wheel.
    - Apply Parking Brake (rear only).
    - Shift Transfer Case out of Neutral (with Transmission in Park).
    - Placing a screwdriver into the edge of the brake rotor and holding it against the wrenching.

MISCELLANEOUS

CDR Valve– Check

Description

Diesel Only
The CDR Valve is checked as part of the “A” Service.

Related Tasks

Fuel Vent Line Filter - Check

Tools and Supplies

Screwdriver or Socket for Hose Clamp

Notes / Special Instructions

- The CDR Valve is similar to the PCV valve on gasoline engines.
- Non-working CDR Valve can cause oil dripping in the Air Filter Canister. Refer to the Air Filter section.

Procedure

CDR Valve Check

1. Remove CDR Valve.
   - Illustration 1 shows the location of the CDR valve.
   - Remove Valve from vehicle by removing hose clamp and by pulling Valve out of rocker cover.
2. Visually check for oil saturation or sludge buildup.
   - Replace if necessary.
3. Re-install the CDR valve.

Illustration 1 – CDR Valve Location

Diesel Lift Pump – Check

Description

Checking the Lift Pump is not part of the AMG routine service procedures.
The Lift Pump should be checked any time a fuel delivery problem is suspected.

Related Tasks

Fuel Filter Replacement

Special Tools

Jumper Wire
Fuel Pressure Gauge
Adapter (see Notes)

Notes / Special Instructions

- The Lift Pump is the main fuel pump in the Diesel Hummer. It is often referred to as the Lift Pump to differentiate it from the Injector Pump.
- If a fuel delivery problem is suspected, be sure to check the operation of the Lift Pump before opening any part of the fuel system. If there is any possibility that the Lift Pump may be bad, do not open or remove the Fuel Filter unless a replacement Lift Pump is available. A truck may still run (although with reduced performance) with a failed Lift Pump. If air gets into the fuel system, a working Lift Pump is required to bleed the air and get the engine to run.
- The Fuel Pump on the Gas Hummers is quite different, and is located inside the Fuel Tank. The Fuel Pump on the HMMWV is mechanical and engine driven. These procedures do not apply to either the Gas Hummer or the HMMWV.
- When operating, the Lift Pump makes a soft "putting" sound. On turbo-equipped Hummers, the pump will run for about 30 seconds when the key is first turned to "On". After starting, the Pump only runs when there is engine oil pressure. In the non-turbo trucks, the Lift Pump only runs when there is oil pressure or when the engine is cranking. If the pressure sensor has failed, the Lift Pump will not run at all. This Pressure Sensor is not the same one used for the Oil Pressure Gauge on the Hummer Instrument Panel.
- The Pump cannot usually be easily heard from the driver's seat over the noise of a running engine. If the Pump is louder than normal, it may be failing or the Fuel Filter may be clogged. A clogged Fuel Filter can cause a Lift Pump to fail.
- Illustration 1 shows a common Vacuum / Pressure gauge used for testing fuel pumps. The adapter was made from an Aurora 3GD06 Charging Hose (purchased from Grainger).
- Fuel pump pressure gauges are available commercially with various adapters included.

Illustration 1 – Pressure Gauge and Adapter

Procedure

If the truck will not run, perform the Pressure Sensor Test (later in this section) to verify that the Lift Pump circuit is working.

Pressure Test, Turbo

1. Remove the cap from the pressure test point.
   - The pressure test point is usually located on the mounting bracket for the A/C compressor. Illustration 2 shows this test point.
2. Attach pressure gauge to test valve.
   - This fitting is the same as those used on some older A/C systems.
   - Do not allow air to enter the fuel system.
3. Start engine and run at idle.
   - Pressure should be at least 3-5 lbs.
4. Stop engine and remove pressure gauge.
   - Do not allow air to enter the fuel system.
   - Diesel fuel may be forced into the gauge – be sure to clean it afterward.

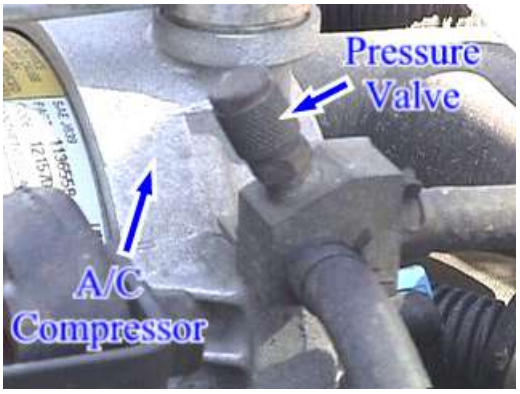

Illustration 2 – Pressure Test Location, Turbo

Pressure Test, NA

The 1995 and earlier Hummers have a spigot-type drain valve for the Fuel Filter. This valve can be used to attach a Pressure Gauge via a rubber hose. Illustration 3 shows the location of this valve.

Illustration 3 – Drain Valve Location

Illustration 4 shows the spigot-type valve.

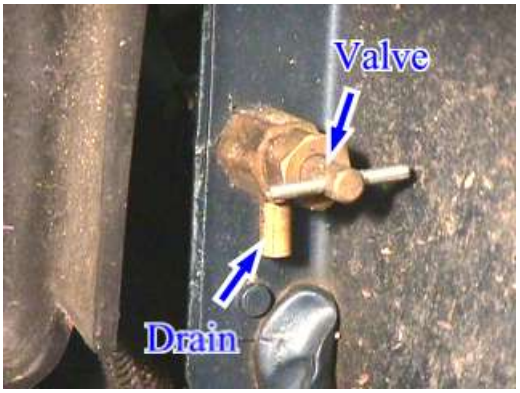

Illustration 4 – Early-style Drain Valve (NA)

Illustration 5 shows the 1996 and later model drain valve. This type of drain valve dumps fuel behind the flange where it is mounted. This procedure cannot be used on this type of valve.

1. Attach Pressure Gauge.
   - Attach rubber hose from Pressure Gauge to the Drain part of the valve.
2. Start engine and run at Idle.
3. Read Pressure.
   - Open the Drain Valve. About 1 turn is sufficient.
   - Pressure should be at least 3-5 lbs.
4. Close Drain Valve.
   - Drain Valve should be closed before removing the pressure gauge.
5. Stop engine and remove pressure gauge.
   - Do not allow air to enter the fuel system.
   - Diesel fuel may be forced into the gauge – be sure to clean it afterward.

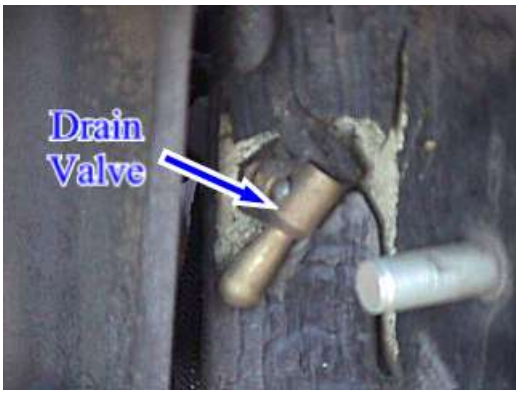

Illustration 5 – Late-style Drain Valve (Turbo)

Pump Volume Test

This test is performed with the engine off. The Fuel Filter must be bled when finished.

Note: Some fuel pressure testing gauges have a connection specifically for testing fuel flow. Follow the directions provided with the gauge.

1. Disconnect the fuel line between the Lift Pump and the Fuel Filter at the Filter housing.
2. Direct the fuel line at an empty container, ½ pint or larger.
3. Operate the lift pump.
   - Pump may be operated using the jumper wire method described below.
   - On the turbo-equipped truck, the ignition switch may be turned to the "On" position by a helper.
4. Check the volume of fuel pumped into the container.
   - Pump output should be at least ½ pint per 15 seconds.
5. Reconnect the fuel line.
6. Bleed the Fuel Filter (refer to the Fuel Filter section).

Oil Pressure Sensor Test

If the Lift Pump runs while the engine is operating, the Oil Pressure Sensor is most likely working. The easiest way to test the Pressure Sensor is to bypass it and see if the Lift Pump runs.

1. If the truck will not start, try starting it with the pump running via the Jumper Wire method (described below).
   - Use care that the Jumper Wires do not come into contact with the engine fan or fan belt(s) or other moving parts.
   - If the truck now starts, the Pressure Sensor is suspected. Be sure to check the wiring to the Pump and the Pressure Sensor.
2. If the truck runs, verify that the Lift Pump is not running.
   - On turbo-equipped trucks, be sure to wait long enough that the turbo-engine start cycle is no longer running the Lift Pump. 1 minute is sufficient.
   - With the hood up and the Pump in view, its operation can usually be easily heard as a soft "putting" sound. Its operation can also be felt. Caution – the Pump may be hot.
   - Verify that the pump works by using the Jumper Wire method below. If the pump works when jumped but not while the engine is running, the pressure sensor is suspected. Be sure to check the wiring to the Pump and the Pressure Sensor.

Jumping the Lift Pump

This method is used to run the Lift Pump when the engine is not running. It is used for diagnostic purposes, and for bleeding the fuel system.

Illustration 6 – Fuel Pump Location

1. Disconnect the Fuel Pump electrical connector.
   - Refer to Illustration 6 for Fuel Pump location.
   - The electrical connector is only a few inches from the Pump.
2. Run the Fuel Pump.
   - Connect one end of a Jumper Wire to battery power. Battery power connections are available near the Fuel Pump – actual location varies by model year.
   - Connect the other end of the Jumper Wire to the Gray wire from the Fuel Pump. The Pump should begin running.
   - If the Pump does not begin running, disconnect the Jumper Wire. It may be necessary to connect the other (Black) wire from the pump to vehicle ground. Use another Jumper Wire for this. Reconnect the first Jumper Wire to start the Pump.
   - If the Pump still does not run, re-check the Jumper Wire connections. Use a 12-volt light bulb to test the Jumpers and the power connections.
   - If the Pump still does not run, it may be defective and require replacement.
3. Be sure to reconnect the Fuel Pump electrical connector when finished.

Engine Mount – Check

Description

Engine Mounts are checked as part of the "A" Service

Fasteners

Fastener	Wrench Size	Loctite	Torque	Notes / Special Tools
Mount to Lower Bracket	¾"	-	90 lb ft	
Mount to Upper Bracket	9/16"	-		
Upper Bracket to Engine Block	9/16"	-	30 lb ft	

Notes / Special Instructions

- There are two Engine Mounts, one on either side of the engine. The two mounts are the same. The Engine Mount is constructed of two metal plates with various holes and studs. These metal plates are bonded together with a piece of rubber about 1 inch thick. There is no interlocking of the two metal plates – once the rubber bonding fails the two plates are free to separate completely.
- As the Engine rotates, it tends to stretch the driver-side Engine Mount, and compress the passenger-side Mount. The passenger-side Engine Mount almost never fails.
- A bad or failed Engine Mount will usually allow very noisy contact between the fan and the fan shroud. Damage to either the fan or the fan shroud is likely. The water pump and the fan clutch may also be damaged. This noise and contact will usually happen only in low range operation.
- A failed Engine Mount may not be noticed in high range. Ordinary driving in high range (no rapid acceleration) usually does not produce enough engine torque to stress the Engine Mount enough to make fan contact. With care, a truck with a failed Engine Mount can be safely driven on-road in high range.
- If you are not sure whether an Engine Mount is bad, have a reliable assistant perform the Engine Mount Stress test while you observe the Engine Mount directly. The Engine Mount is most easily seen from below the truck (Illustration 2).

Notes on Engine Mount Replacement

- It may be easier to remove the Engine Mount and the Upper Bracket as a unit.
- To raise the engine, place a wood block across the rear of the oil pan, near the lip, and lift gently with a jack. Raise the Engine only enough to free the Engine Mount. Use care not to bend the fan or fan shroud. Refer to the service manual for the complete procedure.

Check Engine Mount

1. Open hood so you can observe Engine movement.
2. Set parking brake.
3. Start Engine.
4. Place Transfer Case in L (low).
5. Stress the Engine Mount.
   - Hold the truck with the foot brake.
   - Put the transmission in 1.
   - Gently press the accelerator pedal. Do not allow the truck to move.
6. Check the Engine for movement.
   - If the Engine Mount is good, the engine will raise only a small amount, and not easily. Do not over stress the Engine or Mount.
   - If the Engine Mount has failed, the engine will raise up easily. Use care not to damage the fan or fan shroud.
   - If the Engine Mount is bad (partially failed), the engine will rise up easily, but perhaps not enough to cause much fan contact.
7. A bad or failed Engine Mount should be replaced promptly.

Illustration 1 – Engine Mount

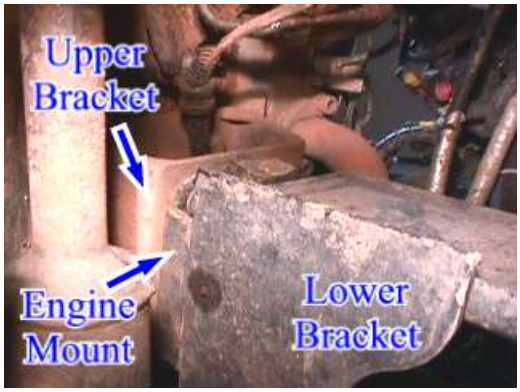

Illustration 2 – Engine Mount and Brackets

Illustration 3 – Bad Engine Mount

Fuel Vent Line Filter - Check

Description

The Fuel Vent Line Filter is checked as part of the "B" Service.

Related Tasks

CDR Valve - Check

Notes / Special Instructions

- A plugged Vent Line Filter can cause fuel tank pressure problems. Fuel tank problems can cause distortion of the fuel tank and/or engine performance problems. They can also cause difficulty in removing the fuel tank fill cap or fuel spraying out of the fuel fill tube when the cap is removed. (Blocked or kinked fuel tank vent lines can cause these same symptoms.)
- On 1996 and later Hummers, the auxiliary fuel tank also has a Vent Line Filter. It is located inside the rear fender near the auxiliary fuel fill tube.

Procedure

Filter Check

1. Locate the Filter.
   - Illustration 1 shows the location of the Filter for the main tank.
   - 1996 and later Hummers have a separate Filter for the auxiliary tank. It is located high inside the rear fender near the fuel fill tube for the auxiliary tank.
2. Make sure the Filter vent is clean and unobstructed.
3. Remove the Fuel Filler Cap.
   - Observe pressure difference. (Should be none.)
   - Pressure difference may be caused by blocked Filter, or by blocked or kinked Fuel Vent Lines.
4. Repeat procedure on auxiliary tank and Filter, if so equipped.

Illustration 1 – Fuel Line Vent Filter Location

Hoses - Check

Description

Cooling System Hoses are checked as part of the “B” Service
A/C System operation is checked as part of the “B” Service
Power Steering System is inspected as part of the “C” Service

Notes / Special Instructions

- The cooling system on the Hummer is somewhat more complex than many other vehicles.
- This section deals with the Diesel-engine Hummer only. Gas-engine Hummers are similar but not identical.
- The main heater unit varies greatly from year to year, with some mid-year changes as well. The hoses and associated plumbing is similar, though not identical.
- Vent hoses are covered in the Vent Lines section.
- A/C system should be evacuated by a licensed professional prior to removing/replacing any H/C hoses.
- The Hummer has four radiators:
    1. Main Engine coolant and engine oil
    2. Transmission
    3. A/C (if equipped)
    4. Power Steering (located near front of other radiators, or on rear of the engine fan cowl near the power steering pump)

Locations

Engine and Radiator Hoses

Radiator hoses are the large-diameter hoses that connect the engine to the radiator.

Illustration 1 shows the upper radiator hoses for a NA Diesel engine. There are two hoses connected via a pipe.

Illustration 2 shows the upper radiator hose for a Turbo Diesel engine.

The lower radiator hoses connect to the water pump and the bottom of the radiator. They are connected via a pipe. A hose from the bottom of the surge tank is also connected to this pipe. The cooling system drain petcock is located in this pipe.

Illustration 3 shows the thermostat bypass hose. One end connects to the water outlet crossover, the other end connects to the water pump. This hose is significantly smaller than the radiator hoses.

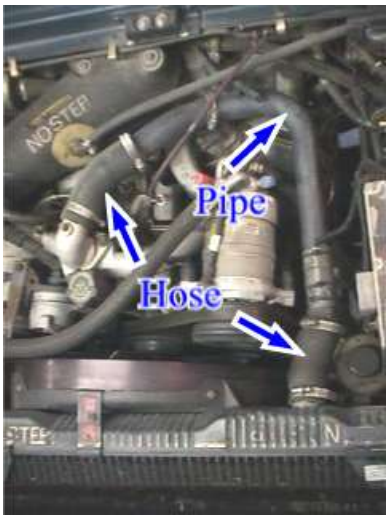

Illustration 1 – Upper Radiator Hoses, 6.5l NA engine

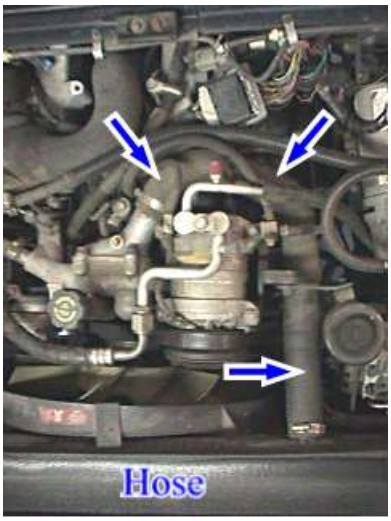

Illustration 2 – Upper Radiator Hoses, 6.5l Turbo engine

Illustration 3 – Bypass Hose

Heater Hoses

The heater hose circuit begins at the water pump, travels through the main heater, then through the auxiliary heater (if equipped), and finally to the crossover.

Illustration 4 shows some of these hoses.

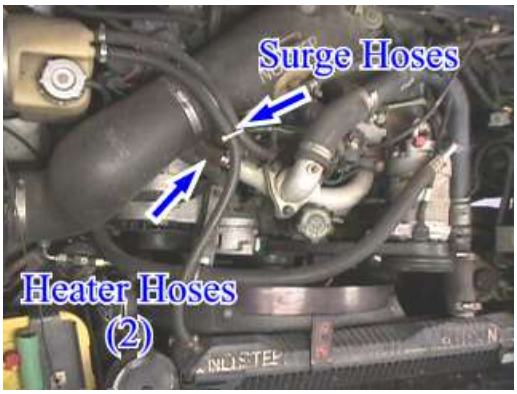

Illustration 4 –Heater Hoses, Surge Hoses

Surge Tank Hoses

The Surge Tank is connected via small-diameter hoses to the crossover and the radiator. Illustration 4 shows these hoses. It is also connected on the bottom, via a larger hose, to the lower radiator hose pipe.

The pressure relief hose (attached near the base of the cooling system fill cap) is routed down below the bottom of the engine, but is not attached to anything. This hose directs overflow away from engine components.

A/C Hoses

The A/C hose circuit begins at the A/C Compressor. It travels through the evaporator in the main heater box (in the cab), then through the evaporator in the auxiliary heater box (if equipped), then to the receiver/dryer (approximate size and shape of a beverage can), then the A/C condenser (radiator), and finally back to the A/C Compressor.

This system should be evacuated by a licensed professional before any part of it is opened or serviced.

All A/C hoses are high-pressure lines with permanent fittings on the ends.

Oil Cooling Hoses

Engine oil is also circulated through the main engine radiator. The hose connections to the engine are near the oil filter. The connections on the radiator are on the driver's side of the radiator itself. These are small-diameter rubber hoses.

Transmission / Transfer Case Cooling Hoses

The transmission cooling circuit begins at the transmission, on the passenger's side of the vehicle. It travels via a metal line up and over the transmission, and is connected to the intercooler in the transfer case (near the top on the driver's side) via a short rubber hose. Another short rubber hose connects the output of the intercooler to a metal line that returns to the vicinity of the origin of the circuit on the passenger's side of the transmission. There the circuit connects to a "T", with one leg going to the bypass valve, and the other to the radiator. Upon return from the radiator, the circuit is connected to another "T", with one leg connected to the other side of the bypass valve, and the other leg connected back to the transmission. The lines running to and from the radiator are metal, with rubber lines near the radiator. They are attached to the passenger's side of the radiator.

The bypass valve is designed to permit the transmission to continue to operate in the event that the radiator becomes plugged.

Power Steering

The Power Steering circuit begins at the Power Steering Pump. It is connected to the Brake Power Assist (Diesel only), then to the Steering Gear, then the Radiator, and finally returning to the Pump.

In some Hummers the Power Steering Fluid reservoir is integral with the pump, and on others it is a separate unit connected to the pump via a rubber hose.

The Power Steering Radiator is much smaller than the other radiators. It is usually located at the front edge of the radiator stack, or on the back of the engine fan cowl near the power steering pump.

Power Steering System hoses (except for the one connected to the external reservoir) are high-pressure lines with permanent fittings on the ends.

Procedure

Checking Hoses and Lines

1. Hoses should be checked for Leaks.
    - Look for signs of wear, abrasion, or fraying.
    - Look for wetness or dripping.
2. Hoses should be checked for integrity.
    - Check hoses for bulges.
    - Check hoses for weakness or softness, particularly near the clamps or fittings.
3. Weak, damaged, or bulging hoses should be replaced.
4. Leaking at hose ends may sometimes be fixed by tightening the clamp(s).
5. Metal lines should be checked for kinks, abrasions, or other damage.
    - Damaged metal line should be repaired or replaced.
    - Typical repair is to remove the damaged section and replace with a short piece of rubber hose and appropriate clamps. The cut ends of the metal line must be flared slightly to help retain the hose.
6. Fittings on pre-terminated (e.g. A/C or P/S) hoses should be checked for signs of damage or leaking.
    - High-pressure lines (pre-terminated) cannot be repaired – they must be replaced.

Serpentine Belt – Check and Replace

Description

The Serpentine Belt should be checked as part of the "B" Service.

Tools and Supplies

Ratchet Handle (3/8" or ½", depending upon Belt Tensioner)
Serpentine Belt

Notes / Special Instructions

- Any time a Serpentine Belt breaks or melts, check all of the various pulleys that it turns. A seized pulley can ruin a new belt in less than a mile.
- The Serpentine Belt is used for the 6.5-liter engine only. The 6.2-liter engine uses a different belt arrangement.
- The Turbo and the NA use a slightly different length belt, and they are not interchangeable.

Procedure

Check Serpentine Belt

1. Visually Inspect the Belt.
   - Look for signs of wear or fraying.
   - Check the back (ribbed) side for missing sections. Some cracks (see Illustration 1) are OK. This is easy to examine where the belt passes over the fan / water pump pulley.
   - Check for signs of burning or melting. This may indicate a seized pulley.
2. Check Belt Length.
   - Belt length is indicated by the marks on the Belt Tensioner. Illustration 2 shows these marks.
   - Belts stretch with use. When a Belt has stretched too much, correct tension cannot be maintained and the Belt must be replaced.

Illustration 1 – Minor Cracks in Serpentine Belt

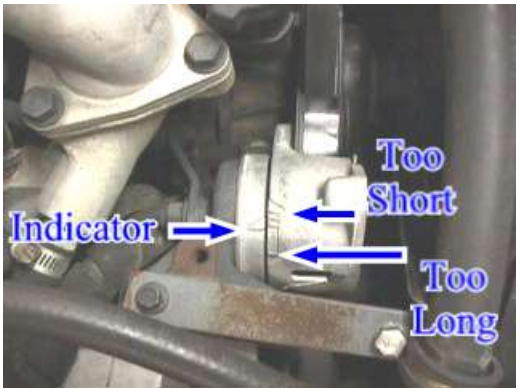

Illustration 2 – Belt Tensioner and Belt Length Indication

Replace Serpentine Belt

1. Remove Old Belt.
   - Release tension by inserting the correct size socket wrench (either 3/8" or ½") into the square hole on the Tensioner and pulling toward the passenger side of the truck.
   - Move the belt away from the Tensioner Pulley and release the Tensioner.
   - Remove old belt. It is not routed over the engine fan.
2. Install New Belt.
   - There is a belt routing diagram in the engine compartment. It is usually located on top of the battery hold-down bracket. This diagram shows how the new belt is routed. See Illustration 3.
   - Route the belt as required, except for the Tensioner Pulley. It may be necessary to position parts the belt from under the truck.
   - Move the Tensioner Pulley upward by pulling on the socket wrench handle. Position the belt under the Tensioner Pulley. Release the Tensioner and allow the Pulley to tension the Belt. Check the indicator for correct Belt length.
   - Re-check that the Belt is correctly routed and fully on each pulley.
   - Remove the socket wrench handle.
3. Test the New Belt.
   - Start the engine and let it idle.
   - Make sure Belt is in correct position on all pulleys.
   - Re-check the Belt Length Indicator for correct Belt Length.

Illustration 3 – Belt Routing Diagram

Winch – Operation Check

Description

Winch Operation should be checked as part of the "A" Service.
Winch Operation should also be checked before using the Winch.

Tools and Supplies

Winch Controller
Wood Block
Protective Gloves (leather)

Fasteners

Fastener	Wrench Size	Loctite	Torque	Notes / Special Tools
Winch Line Anchor	5/16" Hex Key	-	-	

Notes / Special Instructions

- Refer to the Owners Manual for safe and correct operating procedure.
- Winch Motor Operation should always be checked before unspooling Winch Line.
- While most Winches are similar in layout and operation, this procedure is specific to the factory Warn winch.
- Late Model (2000 and later) Winch Motors are not sealed, and are not connected to the central vent system.

Procedure

Winch Motor Operation

1. Set the Winch Clutch to “Free”. (Illustration 1)
   - Refer to diagram on Winch (Illustrations 2 and 3).
2. Connect Winch Controller. (Illustrations 4 and 5)
   - Remove protective cap on top of Winch and connect the Controller. (Illustration 6) Refer to Owners Manual.
   - It may be necessary to partially lower the brush guard in order to connect the Winch Controller.
3. Secure Winch Spool.
   - The Winch Spool should be secured using the Wood Block. Press and hold the Wood Block against the Line on the Spool to prevent the Spool from turning. This is done to prevent the cable from becoming loose on the Spool.
   - DO NOT hold the Spool by hand. If the Winch Clutch is not fully disengaged, the Spool will turn and injury may result.
4. Activate Winch Motor.
   - Briefly run Winch Motor in the “Spool Out” mode.
   - Winch Motor should run, but Spool should not turn.
   - If Spool turns, double check that the Winch Clutch is fully disengaged.
   - If Spool does not turn, run the Winch Motor for several seconds in each direction.
   - If Winch Motor will run in “Spool Out”, but not in “Spool In”, run in “Spool Out” for about 20 to 30 seconds and try again.
   - If Winch Motor will not run in the Spool In direction, DO NOT unspool any cable – you will not be able to get it re-spooled.

Illustration 1 – Winch Clutch Lever

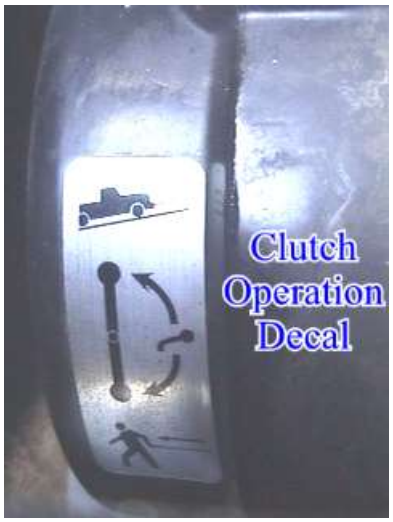

Illustration 2 – Winch Operation Diagram

Illustration 3 – Winch Operation Decals

Illustration 4 – Late Model Winch Controller

Illustration 5 – Early Model Winch Controller

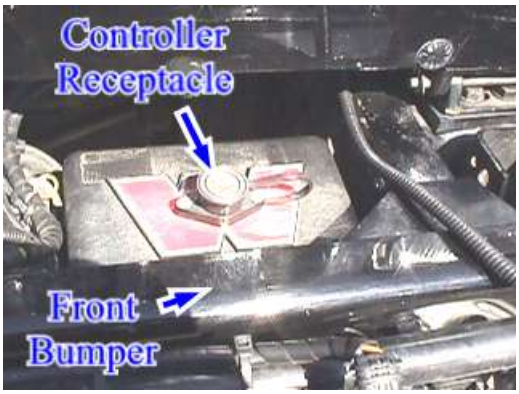

Illustration 6 – Winch Controller Receptacle

Winch Operation

Notes:

- Perform Winch Motor Test before testing Winch Operation.
- Always use Protective Gloves when handling Winch Line.
- Winch Operation and Winch Line Inspection can usually be combined.

1. Spool out at least 30 feet of Winch Line.
   - Set Winch Clutch to "Free". Refer to diagram on Winch (Illustration 1).
   - Pull Line out by pulling on the Hook or Line.
   - DO NOT power out the Winch Line. If the line will not pull out, attach the Hook to something and slowly back the truck away.
   - When rewinding the Winch Line, it must be wound onto the Spool smoothly and evenly. It may be necessary to spool out more than 30 feet if the Line is loose or unevenly wound on the Spool.
2. Engage Winch Clutch.
   - Refer to diagram on Winch (Illustration 1).
3. Rewind Winch Line.
   - Apply tension to the Winch Line. Hand Tension Only until at least 3 wraps are on the Spool.
   - DO NOT let the line slide through your hands, even when using Protective Gloves. Use a hand-over-hand technique or a helper holding onto the Hook to maintain tension.
   - Activate the Winch Controller in the "Spool In" mode.
   - Line should wind onto Spool tightly and evenly with no gaps.
   - Stop when the Hook is about 3 feet away from the winch.
4. Stow the Winch Line.
   - Maintain Tension on the Winch Line at all times.
   - Attach the Hook to one of the front D-rings.
   - Loop something around the Winch Line in order to maintain tension. Use a rope, strap, piece of wire, or Protective Glove (remove hand first). DO NOT put anything around the Winch Line that should not be pinched or crushed. (Remove when finished.)
   - Slowly Spool-In the Line. Activate the Winch Motor for brief periods until the line it taught. Do not over-tension the Line.
5. Remove and Stow Winch Controller.
   - Remove the Winch Controller and stow it in the vehicle.
   - Replace the protective cover over the controller connector on the Winch.
   - Raise and secure the Brush Guard, if needed.

Winch Line Inspection

Note: It may be necessary to unspool most or all of the Winch Line to inspect it.

1. Winch Line should not have any kinks. DO NOT attempt to straighten out kinks – it will weaken the cable even more.
2. Winch Line should not be broken or frayed.
3. Winch Line should be securely attached to the Spool.
4. Hook should be securely attached and in good condition.
5. When Spooled, Line should be tightly and evenly wrapped with no gaps.

Tips on Winch Line Replacement

The set screw that holds the Winch Line onto the Spool does not have to hold any of the Winch load. All it does is hold the cable end while spooling the Line. Always make sure there are 3 full wraps on the Spool before pulling any load with the Winch.

As a field repair, the end of the Winch Line can be held in place using duct tape or almost anything. Be sure to get at least 6 full wraps before using the Winch for heavy pulling.

To evenly cut a cable without fraying, bind it tightly with tape where the cut will be made and then cut it using a hack saw or cable cutter.

Winch Controller Wiring Diagrams

Diagrams 1 and 2 show the Early Model Winch Controller Plug and Receptacle wiring (1999 and earlier).

- For Power In, Controller connects terminals A and B.
- For Power Out, Controller connects terminals B and C.

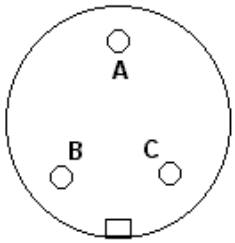

Diagram 1 – Early Winch Controller Plug Diagram

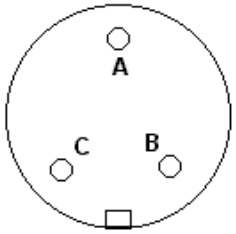

Diagram 2 – Early Winch Controller Receptacle Diagram

Diagrams 3 and 4 show the Late Model Winch Controller Plug and Receptacle Wiring (2000 and later).

- For Power In, Controller connects terminals A and C.
- For Power Out, Controller connects terminals A and B

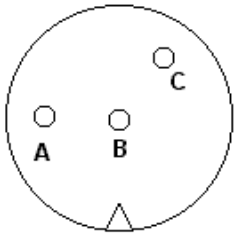

Diagram 3 – Late Winch Controller Plug Diagram

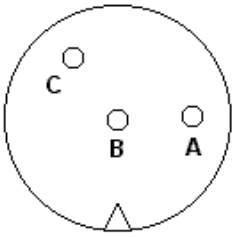

Diagram 4 – Late Winch Controller Receptacle Diagram

REFERENCE

“Vampire” – Special Section

Overview

“Vampire” is a nickname describing a particular mode of failure in the Hummer. Fluid disappears from the Transmission without a trace – “…as if sucked out by a ‘Vampire’…”.

Description

Transfer Case Cooling System – Normal Operation

The Transfer Case has an Internal Cooler Loop inside the case. The Transmission circulates its fluid through this Loop and then through the Transmission Cooler in order to cool both components. Illustration 1 shows this Cooling Loop.

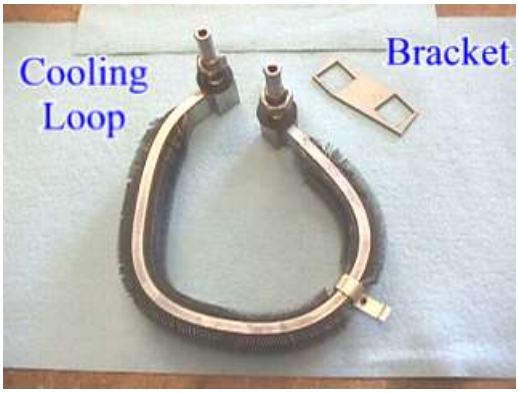

Illustration 2 - Transfer Case Cooling Loop and Installation Bracket

“Vampire” Failure

The Transfer Case Internal Cooler Loop can develop a leak. Fluid from the Transmission leaks into the Transfer Case. Once the Transfer Case is filled, Transmission Fluid will be forced into the Central Vent System. This can cause ATF contamination of any or all of the components connected to the Central Vent System. If the Central Vent System is restricted, the pressure can force the “Rubber Plug” out of the side of the Transfer Case. Operating the Transmission with low fluid levels can severely damage it.

“Vampire” Prevention

The only preventative known as of this printing is to separate the Transmission cooling system from the Transfer Case and provide a separate cooling system for the Transfer Case. Several people, including the author, have developed such systems. There are currently no commercial after-market kits available, however.

“Vampire” Symptoms

Often, the first symptom is that of Transmission Slipping. Checking the Transmission Fluid Level shows the fluid to be very low, but there is little or no sign of leakage. The Fluid “disappears”, hence the “Vampire” moniker.

“Vampire” symptoms include:

- Slipping Transmission
- Fluid dripping from the Air Filter Drain Valve inside the passenger-side front wheel well (Diesel Hummers)
- Very low Transmission Fluid Level
- Very high Transfer Case Fluid Level
- Much Fluid leaking from the Transfer Case rear seal
- Fluid Leaking from the Transfer Case “Rubber Plug” (See Transfer Case section for a description of the location)
- High Fluid Levels or ATF Contamination of any of the components connected to the Central Vent System (components are listed later in this section)

"Vampire" Cause

The "Vampire" is usually caused by incorrect installation of the Internal Cooling Loop into the Transfer Case. The Cooling Loop is a soldered aluminum piece, and is attached to the Transfer Case Housing by two nuts. If the threaded parts of the Cooling Loop are not supported correctly while tightening these nuts, the Loop will be stressed (slightly bent). This stress will usually result in a fracture, causing the leak and the problems.

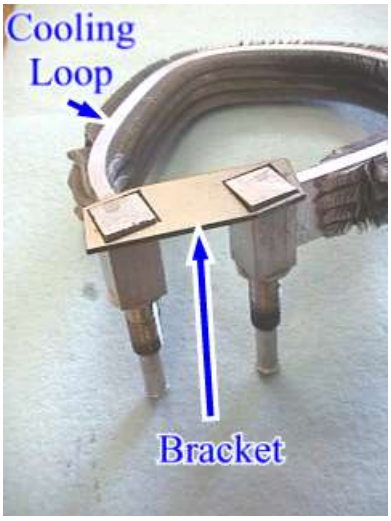

Illustration 3 - Cooling Loop with Bracket In Place

The length of time to failure can vary greatly. It can take a few weeks, or many months. Some people have reported "Vampire attacks" having occurred well after 30 months. It does not seem to be strongly related to driving technique or the amount of off-highway driving. There is, however, some indication that severe shock to the truck can cause the Vampire. Note the updated Cooler Loop (Illustrations 3 and 4) has 2 support tabs, where the earlier version had only one.

Once the "Vampire" has been repaired, it can strike again if the new Cooling Loop is not correctly installed. AMG now supplies a small bracket with the Cooling Loop to assist in correct installation. Illustration 2 shows this bracket in place on the Cooling Loop. This bracket may also be installed permanently by placing it over the threaded mounts prior to installation (Illustration 3). Care must still be used, however – this bracket is not "magic". Also note the updated Installation Bracket (Illustration 5), with relief cutouts for the soldered areas.

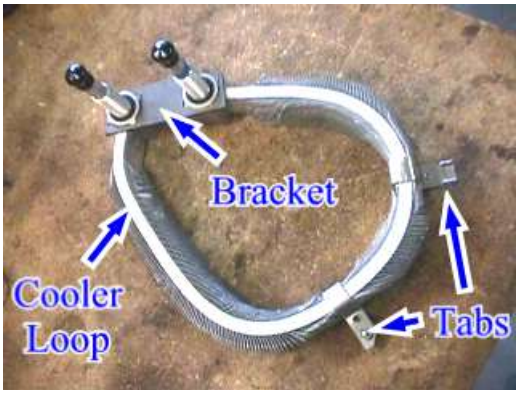

Illustration 4 - Updated Cooler Loop with Bracket In Place

Illustration 5 – Updated Cooler Loop Installed

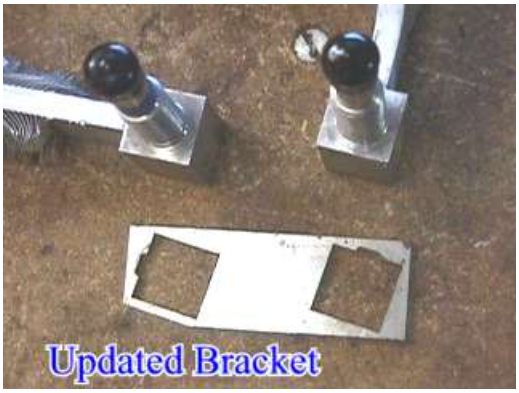

Illustration 5 – Updated Installation Bracket

“Vampire” Cure

The obvious part of the “Cure” is to replace the Internal Cooling Loop inside the Transfer Case, and to correct the fluid levels in the Transfer Case and Transmission. There is much more to repairing the Hummer than this however!

Low Fluid Level can quickly ruin a Transmission. The Transmission should be checked for contamination, burned fluid, and proper operation. This is usually best performed by a shop specifically equipped for Transmission testing.

Following is a list of components joined by the Central Vent System. Each of these components should be examined for contamination by ATF (except the Transmission and Transfer Case, of course).

- Transmission
- Transfer Case
- Differentials
- Geared Hubs
- Air Filter(s)
- Winch Motor (1999 and earlier Hummers)

The Air Filter(s) and the winch motor do not normally contain any type of fluid. If ATF is found, all traces should be removed.

If the Fluid in the other components is contaminated, it must be replaced. If the Fluid Level is high, contamination is suspected. The most reliable way to check for ATF contamination is to completely drain the fluid.

The Vent Lines must all be cleared of ATF. This can be accomplished by disconnecting, one-at-a-time, the vent lines from each component and gently blowing into the vent line where it connects to the engine air intake (near the air filter). (For the Transmission, the dipstick can be removed instead of removing the vent line. For the Transfer Case, Differentials, and Geared Hubs the fill plug can be removed instead of removing the vent line.)

The Transfer Case must be rebuilt in order to replace the Cooling Loop. If the “Rubber Plug” came out, or the cooling loop was disconnected but not sealed, the Transfer Case Fluid may have been contaminated. If the Hummer was driven at high speed with the Transfer Case Cooling Loop disconnected, it may have overheated. The Transfer Case should be carefully inspected for wear and damage when it is rebuilt.

“Vampire” First Aid

The “Vampire” is often first detected “in the field”. The first choice is to flat-bed the truck to a repair facility. If that is not practical, here is a description of what should be done, in sequence, and why.

1. Keep the Transmission Fluid Level up. Low Fluid can damage a Transmission very quickly.
   - Add Transmission Fluid to (somewhere near) the correct level.
   - Do this immediately and then drive to a location where it is safe to perform the next steps.
2. Stop the leak so that the Transmission Fluid Level stays high enough for proper operation.
   - Park on a (mostly) level spot and stop the engine.
   - Be aware that the fluid and parts may be hot.
   - A pair of short rubber hoses connects the Transmission Cooling Circuit to the Transfer Case Internal Cooling Loop. These hoses are located on the front of the Transfer Case, high on the driver’s side of the vehicle. The cooling lines from the Transmission need to be disconnected from the Transfer Case, and connected to each other to preserve the Transmission Cooling Circuit flow. Bending one of the short rubber hoses around to the other cooling line thus connecting the two Transmission Cooling Circuit lines can usually do this. The hose clamps already on the hoses can be re-used to hold the hose in the new configuration. This operation is usually easier with a slightly longer piece of hose (8 to 12 inches).
   - Use care that the hose connecting the two cooling lines is not kinked or otherwise restricting fluid flow.
   - Use care around the exhaust system and other hot components. Also, this job can be messy because some ATF will leak out of one or both of the lines when the hoses are disconnected.
   - If this repair cannot be accomplished, check the Transmission Fluid Level about every 10 minutes of low-speed driving. DO NOT operate the vehicle at high speed.
3. Adjust the Transfer Case Fluid Level, if possible.
   - Usually, the Transfer Case will be overfilled. Park in a level spot and remove the Fill plug, allowing the excess fluid to drain out. If at all possible, collect this fluid and take it with you rather than dumping it on the ground. In an emergency, and when no other ATF is available, this fluid can also be re-used in the transmission if it is kept clean.
   - Leaving excess fluid in the Transfer Case may contribute to overheating of the Transfer Case and / or further contamination of the other components connected to the Central Vent System.
4. Prevent further contamination of the Transfer Case, if possible. It is important to prevent water, mud, and even fine dust from entering the Transfer Case via the (now cracked) Cooling Loop or the “Rubber Plug” hole.
   - If the “Rubber Plug” is missing, plug the hole with something. A bolt of the right size can be carefully threaded into the hole. A piece of wood can be cut and shaved and jammed into the hole. A small bolt can be wrapped in adhesive tape and pushed into the hole. If a solvent is available, you can clean the outside of the Transfer Case and cover the hole with adhesive tape. Note: anything put into the hole in the Transfer Case that extends more than about ¼” into the case may interfere with Transfer Case shifting.
   - The Internal Cooling Loop lines should be closed off. This can be done using one of the short pieces of rubber hose that originally connected to the Transmission Cooling Circuit. No fluid will flow, so the connecting hose does not have to allow fluid flow. The Internal Cooling Loop cannot be repaired, so you can even pinch the connections closed if necessary.
5. Re-check the Transmission Fluid Level.

6. Attempt to drive the truck out.
    - Once the Transmission has the correct Fluid Level, there is no reason not to attempt to drive the truck. If the Transmission is damaged, it may work for some time before failing completely. If the Transmission is not damaged, driving it in this condition (with the correct fluid level) will not damage it further. There is no way (in the field) to determine the extent of damage to the Transmission.
    - Use care not to overheat the Transfer Case. The Cooling Loop is disconnected, so there is no internal cooling at all. Speeds of 45 mph or less will not usually overheat the Transfer Case regardless of ambient temperature. Sustained speeds higher than 45 mph will cause the Transfer Case to heat up, and will eventually burn the fluid and possibly the gears inside. Speeds of up to about 60 MPH can be maintained for no longer than about 30 minutes before allowing the Transfer Case to cool for about 30 minutes.
    - In an emergency, the truck can be driven for several hours at any speed. The Transfer Case may be ruined, but it will probably not fail during normal (on-highway) driving.

Reference - Steering

General

Illustration 1 shows the steering components on a Hummer. This picture was taken from below, with the front of the vehicle toward the bottom of the picture.

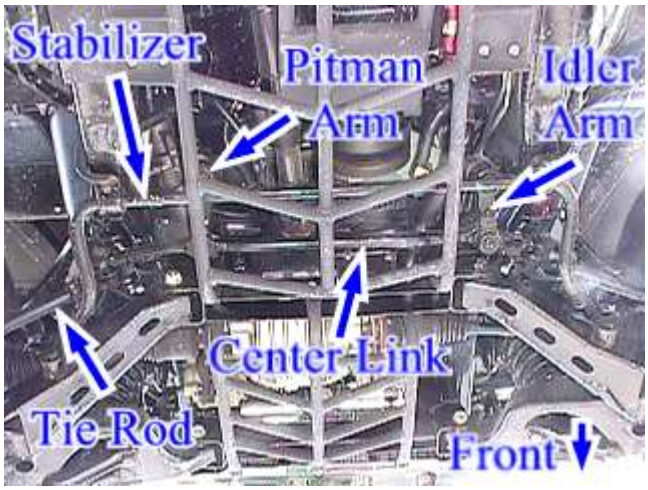

Illustration 1 – Steering Components

Theory of Operation

Figure 1 shows a simplified block diagram of the steering components as viewed from above, with the front of the vehicle to the top of the figure.

The upper half of the diagram shows the components when steering straight. The lower half shows the same components when steering to the left. When turning, the steering gear turns the Pitman Arm toward one side of the vehicle. This pushes the Center Link to that side. The Idler Arm keeps the Center Link in alignment, perpendicular to the vehicle. When the Center Link is moved to one side, the Tie Rods are also moved in the same direction. This movement of the Tie Rods turns the Geared Hubs (not shown), thus steering the vehicle.

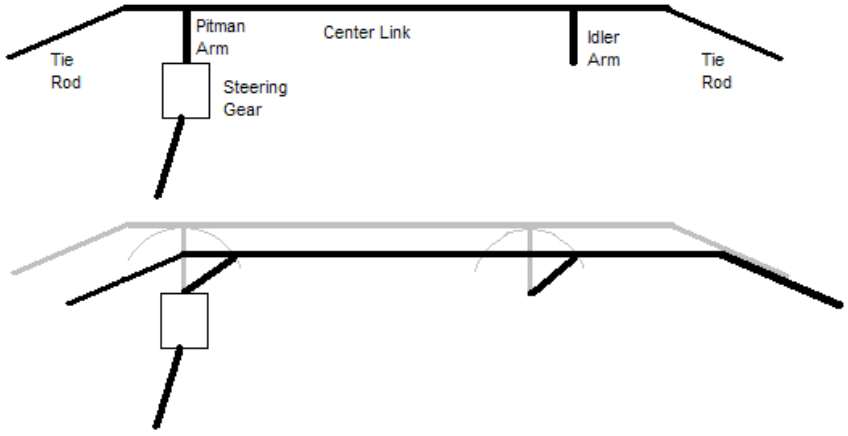

Figure 1 – Steering Components

Severe Operation

Description

Normal operation includes:

- City/highway driving on hard surface roads
- Minimal operation on unpaved road surfaces

Severe operation includes:

- Extensive off-road driving
    - Extended operation in rough terrain
    - Stream fording
    - Salt water fording
    - Sustained operation in sand, mud, snow, or dirt surfaces
- Salt water fording
- Commercial use
    - Regular operation as a delivery or service vehicle
- Sustained operation in high ambient temperatures
- Trailer towing
- Prolonged daily operation in heavy traffic when ambient temperatures are high

Service Intervals

If the truck is used frequently in severe operating situations, AM General recommends performing the scheduled maintenance on an hourly basis, rather than on a mileage schedule.

Maintenance after Severe Operation

AM General recommends the following additional maintenance be performed immediately after severe off-road operation:

- Wash vehicle underbody, driveline, brake components, steering and suspension parts
- Check underbody and driveline components for impact damage
- Check for leaks and loose parts
- Examine all gear box vent lines and check fluids for signs of water contamination
- Water contamination in the transmission will require replacement of the fluid and filter and a complete flush of the transmission cooler and lines
- Check engine, transmission, and transfer case fluid levels
- Check power steering and brake system fluid levels
- Check brake pads for contamination by dirt, mud, sand, etc.
- Change engine oil and filter
- Lubricate all steering and suspension grease points and body lubrication points
- Check engine air filter

Maintenance Schedule

Service	Months *	Miles	Hours (normal)	Hours (severe)
A	6	3,000	100	50
A & B	12	6,000	200	100
A	18	9,000	300	150
A & B & C *	24	12,000	400	200
A	30	15,000	500	250
A & B	36	18,000	600	300
A	42	21,000	700	350
A & B & C	48	24,000	800	400
Etc.				

* Notes:

- Perform maintenance by Months only if Mileage not reached first
- Per AM General, only the first "A & B & C" service (at 12,000 miles) includes replacing the fluids in the differentials and geared hubs. It is probably a good idea to change them at every C service.

Metric Equivalents

Following is a table of common fractional and metric sizes, sorted by size.

Wrench Size Equivalents						
Size (mm)	Size (in)	Size		Size (mm)	Size (in)	Size
3	0.118	3		26.99	1.063	1-1/16
3.18	0.125	1/8		27	1.063	27
3.97	0.156	5/32		28	1.102	28
4	0.157	4		28.58	1.125	1-1/8
4.76	0.188	3/16		29	1.142	29
5	0.197	5		30	1.181	30
5.56	0.219	7/32		30.16	1.188	1-3/16
6	0.236	6		31	1.220	31
6.35	0.250	1/4		31.75	1.250	1-1/4
7	0.276	7		32	1.260	32
7.94	0.313	5/16		33	1.299	33
8	0.315	8		33.34	1.313	1-5/16
9	0.354	9		34	1.339	34
9.53	0.375	3/8		34.93	1.375	1-3/8
10	0.394	10		35	1.378	35
11	0.433	11		36	1.417	36
11.11	0.438	7/16		36.51	1.438	1-7/16
12	0.472	12		37	1.457	37
12.70	0.500	1/2		38	1.496	38
13	0.512	13		38.10	1.500	1-1/2
14	0.551	14		39	1.535	39
14.29	0.563	9/16		40	1.575	40
15	0.591	15		41	1.614	41
15.88	0.625	5/8		41.28	1.625	1-5/8
16	0.630	16		42	1.654	42
17	0.669	17		43	1.693	43
17.46	0.688	11/16		44	1.732	44
18	0.709	18		44.45	1.750	1-3/4
19	0.748	19		45	1.772	45
19.05	0.750	3/4		46	1.811	46
20	0.787	20		47	1.850	47
20.64	0.813	13/16		47.63	1.875	1-7/8
21	0.827	21		48	1.890	48
22	0.866	22		49	1.929	49
22.23	0.875	7/8		50	1.969	50
23	0.906	23		50.80	2.000	2
23.81	0.938	15/16		51	2.008	51
24	0.945	24				
25	0.984	25				
25.40	1.000	1				
26	1.024	26				

Bolt Torque

All torque figures are for clean, dry threads. For lubricated threads, the torque must be reduced by between 25% and 55%, depending upon the lubricant.

Inch-size bolt threads are measured in threads per inch.

Metric bolt threads are measured in pitch (distance between threads).

Maximum Torque (lb-ft) for common bolts sizes

	Coarse				Fine			
Bolt Size	Threads	Grade 2	Grade 5	Grade 8	Threads	Grade 2	Grade 5	Grade 8
1/4	20	6	10	14	28	7	11	15
5/16	18	12	19	29	24	13	21	32
3/8	16	20	33	47	24	22	36	51
7/16	14	32	54	78	20	35	59	85
1/2	13	47	78	119	20	51	85	130
9/16	12	69	114	169	18	75	124	184
5/8	11	96	154	230	18	105	168	251
3/4	10	155	257	380	16	169	280	414
7/8	9	206	382	600	14	225	416	654
1	8	310	587	903	14	338	640	984

	Coarse				Fine			
Bolt Size	Pitch	Gr. 4.8	Gr. 8.8	Gr. 10.9	Pitch	Gr. 4.8	Gr. 8.8	Gr. 10.9
6	1.00	5	10	13				
8	1.25	13	25	31	1.00	14	27	34
10	1.50	25	50	62	0.75	27	55	68
12	1.75	44	87	109	1.50	48	95	119
14	2.00	70	139	174	1.50	76	152	190
16	2.00	109	215	269	1.50	119	234	293
18	2.50	150	297	372	1.50	164	324	405
22	2.50	290	572	717	1.50	316	623	782
24	3.00	367	725	909	2.00	400	790	991

CHECKLISTS

Following are samples of the checklists.

Separate printable copies of these checklists are included in the Checklists folder of this CD.

Maintenance Sequence

Overview

This section lists the recommend sequence of the maintenance tasks, and the reason(s) for the recommendation.

Sequence

The first check to be made should be the Alignment Check. This procedure must be performed before any of the tires are lifted off the floor. With some care, this check can be safely performed on a hot vehicle.

The remainder of the tasks can be divided into three general groups:

- Per-Wheel tasks
- Fluid and Filter changes
- Other tasks

The Fluid and Filter changes should not be performed on a hot vehicle. If the vehicle is hot, perform the Per-Wheel tasks first, then the Fluid & Filter changes. This usually allows enough time for the truck to cool down. The transmission usually takes the longest to cool.

Rotating the tires can easily be performed during the Per-Wheel checklist. Begin by marking each tire with its new location. Start the checklist with one of the rear tires, and leave that corner of the truck supported on a jack stand. The second tire removed should be where the first one will be re-installed, and so on. When checking the Idler Arm and Pitman Arm, the opposite-side front tire/wheel assembly must be in place and on the ground. Starting with a rear wheel ensures that at least one front wheel will be in place at all times.

Other Tasks include checking the lighting, lubricating door hinges and shift linkages, etc. These can be done at any convenient time during the service.

The Fuel Filter change should be performed last. Because fuel is usually spilled during the procedure, it makes any following work more difficult and/or messier.

Transmission Fluid Check (following filter change) can be combined with checking the Fuel system for leaks following the filter change. Both of these procedures require that the vehicle be started and operated at idle for a short period. This can cause the exhaust to become hot, which could make other procedures more difficult / dangerous.

In summary, following is the recommend sequence when performing a “C” service:

1. Check Wheel Alignment
2. Perform items on the Per-Wheel Checklist, including rotating the tires
3. Perform items on the Lube and Oilcan Checklists
4. Remove the Drive Line Protection Center Section
5. Perform the remaining Fluid and Filter changes, excluding “Fuel Filter Change” and “starting the truck and checking the transmission fluid level” (both performed later)
6. Re-install the Drive Line Protection
7. Perform all remaining Master Checklist items
8. Change Fuel Filter
9. Start Truck, check Engine and Transmission Fluid levels and check for leaks

Per Wheel Checklist

Per Wheel Checklist

Front L	Front R	Rear L	Rear R	Description	Notes
☐	☐	☐	☐	CTIS Guard	
☐	☐	☐	☐	CTIS Hose & Valve	
☐	☐	☐	☐	Lower Ball Joint	
☐	☐	☐	☐	Upper Ball Joint	
☐	☐			Tie Rod Ends	
		☐	☐	Radius Arm Ends	
	☐			Idler Arm	
☐				Pitman Arm	
☐	☐	☐	☐	Tire Balance	
☐	☐	☐	☐	Tire Condition / Wear	
☐	☐	☐	☐	Spring	
☐	☐	☐	☐	Shock	
☐	☐	☐	☐	Upper Control Arm	
☐	☐	☐	☐	Lower Control Arm	
☐	☐	☐	☐	Control Arm Mounting Bolts	
☐	☐			Stabilizer and Connecting Links, fasteners and bushings	
☐	☐	☐	☐	Vent Lines	
☐	☐	☐	☐	CTIS Lines & Guards	
☐	☐	☐	☐	TT4 / ABS Sensors	
	☐			Idler Arm Mounting Bolts	
☐				Steering Gear Mounting Bolts	
☐	☐	☐	☐	Upper Ball Joint Mounting Bolts	
☐	☐	☐	☐	Lower Ball Joint Mounting Bolts	
☐	☐	☐	☐	Upper Ball Joint Boot	
☐	☐	☐	☐	Lower Ball Joint Boot	
☐	☐			Inner Tie Rod End Boot	
☐	☐	☐	☐	Outer Tie Rod End Boot	
☐	☐	☐	☐	Half Shaft Boot	
☐	☐	☐	☐	Hub Seals	
☐	☐	☐	☐	Hub Fluid Level	
				Lube	
☐	☐	☐	☐	CTIS Valve	
☐	☐	☐	☐	Upper Ball Joint	
☐	☐	☐	☐	Lower Ball Joint	
☐	☐	☐	☐	Outer Tie Rod End	
☐	☐			Inner Tie Rod End	

Lubrication Checklist

Lubrication Checklist

Oil Can Points

✓	Description	Notes
	Hood Hinges	
	Tailgate Hinges	
	Barn Door Hinges, Latches, Levers (wagon)	
	Door Hinges, Latches, Levers	
	Mirror Break-away *	
	CTIS Fittings *	
	Shift Lever Boots	
	Parking Brake Lever	
	Brake Pedal	
	Transmission Shift Linkage	
	Transfer Case Shift Linkage	
	Door Wiring Harness *	
	Hood Stops (grease)	

Lube Points

✓	Description	Notes
	Ball Joints (8)	
	Tie Rod Ends (6)	
	Front Drive Shaft (5)	
	Rear Drive Shaft (2)	
	Idler Arm (2)	
	Pitman Arm (1)	
	Steering Shaft (3)	
	Tire Carrier *	
	Can Carrier *	
	Pintle Hook *	

* - Not on AMG maintenance list

Service Checklist

Date _____ Mileage _____ r 2.3 dgb

Owner _____ VIN _____ 7/29/2001

3k	6k	12k	✓	Description	Notes
x				Engine Oil & Filter	
x				Lube (sheet attached)	
x				"Oil Can" points (sheet attached)	
	x			Air Filter	
c	x			Fuel Filter (Check at 3k, Replace at 6k)	
		x		Cooling System & Fluid	
		x		Transmission Fluid & Filter	
				Fluid Levels	
x				Power Steering	
x		r		Cooling System	
x				Brake System	
x		r		Transmission	
x		r		Transfer Case	
x				Geared Hubs	
x				Differentials	
x				Lighting	
x				CDR Valve	
x				Control Arms, Springs, Shocks	
x				Check Geared Hubs for Leaks	
x				Check Diffs for Leaks	
x				Check Tire/Wheel Balance	
x				Check Wheel Bolt & Nut Torque	
x				Check Vent Lines	
x				Check Winch Operation	
x				Inspect U-joints	
x				Inspect Shift Linkages	
x				Inspect Accelerator Linkage (NA Only)	
x				Inspect Engine Mounts	
x				Inspect Brakes (rotors, pads, mounting)	
*				Inspect TT4 / ABS Sensors	
*				Inspect CTIS (pump, overpressure valve)	
*				Check Halfshaft Bolts	
	x			Inspect Injector Pump, Lines, Fittings	
	x			Check Batteries	
	x			Inspect Belts & Hoses	
	x			Inspect Heat Shields & Exhaust System	
	x			Inspect & Rotate Tires	
	x			Check Wheel Alignment	
	x			Inspect Halfshaft Boots & Ball Joint Seals	
	x			Inspect Steering Column & U-joints	
	x			Inspect Steering Linkages and Ball Joints	
	x			Check Fuel Tank Vent Line Filter	
	x			Inspect Frame	
		x		Inspect Surge Tank, Radiator Stack, Fan Shroud, P/S Cooler	
		x		Inspect Fuel Tank(s), Lines, Cap(s)	
		x		Inspect Wiring Harness	
		x		Inspect Power Steering System	
		*		Test Mirror Break-away	
		*		Clean Speed Sensor	