

DTC P0102**Circuit Description**

The mass air flow (MAF) sensor is an air flow meter that measures the amount of air entering the engine. The MAF sensor used on this vehicle is a hot film meter (HFM) type. The engine control module (ECM) uses the MAF sensor signal in order to provide the correct fuel delivery for a wide range of engine speeds and loads. The MAF sensor signal is a function of the current required to keep the air flow sensing element at a fixed temperature. The air flowing through the sensor cools the sensing element. The amount of cooling is proportional to the amount of the air flow. As the air flow increases, more current is required in order to maintain the hot film at a constant temperature. The MAF sensor converts the changes in current to a voltage signal that is read by the ECM. The ECM calculates the air flow based on this voltage signal. The MAF sensor uses the following circuits in order to operate:

- The ignition 1 voltage
- The 5-volt reference
- The MAF sensor signal
- The low reference

The 5-volt reference for the MAF sensor is also supplied to additional sensors. For each of the sensors, the voltage is supplied on separate ECM terminals. The terminals are connected within the ECM to the same stabilized sensor supply voltage. The 5-volt reference is shared by the following sensors:

- The MAF sensor
- The accelerator pedal position (APP) sensor 1
- The fuel tank pressure (FTP) sensor
- The air conditioning (A/C) refrigerant pressure sensor

The low reference circuit of the MAF sensor is shared with the following components:

- The camshaft position (CMP) sensor
- The intake air temperature (IAT) sensor
- The engine coolant temperature (ECT) sensor

If the ECM detects the MAF sensor signal is less than the possible range of a properly operating sensor, DTC P0102 sets.

Conditions for Running the DTC

- The ECM has counted more than 20 crankshaft revolutions.
- The engine speed is more than 300 RPM.
- The engine has been running for more than 0.5 seconds in order to allow the MAF sensor hot film element to heat up.
- The ignition 1 signal is more than 10 volts.

Conditions for Setting the DTC

- The ECM detects that the MAF sensor signal is less than 0.42 volt for more than 2 seconds.

OR

- The MAF sensor signal is less than a calculated value using throttle position (TP) and engine speed.

Action Taken When the DTC Sets

- The control module illuminates the malfunction indicator lamp (MIL) on the second consecutive ignition cycle that the diagnostic runs and fails.
- The control module records the operating conditions at the time the diagnostic fails. The first time the diagnostic fails, the control module stores this information in the Failure Records. If the diagnostic reports a failure on the second consecutive ignition cycle, the control module records the operating conditions at the time of the failure. The control module writes the operating conditions to the Freeze Frame and updates the Failure Records.

Conditions for Clearing the MIL/DTC

- The control module turns OFF the malfunction indicator lamp (MIL) after 3 consecutive ignition cycles that the diagnostic runs and does not fail.

- A current DTC, Last Test Failed, clears when the diagnostic runs and passes.
- A history DTC clears after 40 consecutive warm-up cycles, if no failures are reported by this or any other emission related diagnostic.
- Clear the MIL and the DTC with a scan tool.

Diagnostic Aids

- Inspect for the following conditions:
 - A high resistance on any of the MAF sensor circuits except the low reference may cause this DTC to set intermittently and also result in poor engine performance.
 - A high resistance on the 5-volt reference of the MAF sensor may result in poor engine performance without setting this DTC.
 - A low minimum air rate through the sensor bore may cause this DTC to set at idle or during deceleration. Inspect for any vacuum leaks downstream of the MAF sensor.
 - Any contamination of the hot film element of the MAF sensor may cause this DTC to set.
 - A wide-open throttle acceleration from a stop should cause the MAF sensor g/s display on the scan tool to increase rapidly. This increase should be from 3–7 g/s at idle to 72 g/s or more at the time of the 1–2 shift. If the increase is not observed, inspect for a restriction in the Induction System or the Exhaust System.
- If the condition is intermittent, refer to [Intermittent Conditions](#).

Step	Action	Values	Yes	No
Schematic Reference: Engine Controls Schematics Connector End View Reference: Engine Control Module Connector End Views or Engine Controls Connector End Views				
1	Did you perform the Diagnostic System Check–Engine Controls?	—	Go to Step 2	Go to Diagnostic System Check - Engine Controls
2	<p>Important:: If you were sent here from DTC P0101, proceed to Step 3.</p> <ol style="list-style-type: none"> 1. Observe the Freeze Frame/Failure Records for this DTC. 2. Turn OFF the ignition for 60 seconds. 3. Start the engine. 4. Operate the vehicle within the Conditions for Running the DTC as specified in the supporting text, or as close to the Freeze Frame/Failure Records that you observed. <p>Does the DTC fail this ignition?</p>	—	Go to Step 3	Go to Diagnostic Aids
3	<p>Inspect the fuse in the ignition 1 voltage circuit of the mass air flow (MAF) sensor.</p> <p>Is the fuse open?</p>	—	Go to Step 10	Go to Step 4
4	<ol style="list-style-type: none"> 1. Turn OFF the ignition. 2. Inspect for the following conditions: <ul style="list-style-type: none"> ◦ A restricted air intake duct ◦ A collapsed air intake duct ◦ A misaligned air intake duct ◦ A dirty air filter element ◦ A deteriorating air filter element ◦ Any objects blocking the air inlet screen of the MAF sensor ◦ Any debris on the air diffuser of the MAF sensor ◦ Any debris or contamination on the sensing element of the MAF sensor 	—	Go to Step 20	Go to Step 5

	<ul style="list-style-type: none"> o Any vacuum leak downstream of the MAF sensor o Any type of restriction in the exhaust system—Refer to Restricted Exhaust (LA3, LY9) in Engine Exhaust. <p>Did you find and correct the condition?</p>			
5	<ol style="list-style-type: none"> 1. Start and idle the engine. 2. Observe the MAF sensor g/s with a scan tool. 3. Move the harness and the connector of the MAF sensor. <p>Does the movement of the harness or the connector affect the MAF sensor g/s?</p>	—	Go to Step 15	Go to Step 6
6	<ol style="list-style-type: none"> 1. Turn OFF the ignition. 2. Disconnect the MAF sensor harness connector. Refer to Mass Airflow Sensor with Intake Air Temperature Sensor Replacement. 3. Turn ON the ignition, with the engine OFF. <p>Important:: DO NOT use the low reference circuit located in the MAF/IAT connector for this test. Engine control module (ECM) damage will result.</p> <ol style="list-style-type: none"> 4. Measure the battery voltage with a DMM. 5. Connect a test lamp between the ignition 1 voltage circuit of the MAF sensor and a good ground. Refer to Circuit Testing in Wiring Systems. 6. Connect the DMM to the probe of the test lamp and a good ground. Refer to Circuit Testing in Wiring Systems. <p>Is the voltage within 0.50 volts of the specified value?</p>	B+	Go to Step 7	Go to Step 14
7	<p>Measure the voltage from the 5-volt reference circuit of the MAF sensor to a good ground with a DMM. Refer to Circuit Testing in Wiring Systems.</p> <p>Is the voltage within the specified range?</p>	4.8–5.2 V	Go to Step 8	Go to Step 9
8	<ol style="list-style-type: none"> 1. Connect a 3-amp fused jumper wire between the 5-volt reference circuit of the MAF sensor and the signal circuit of the MAF sensor. Refer to Circuit Testing in Wiring Systems. 2. Observe the MAF sensor parameter with a scan tool. <p>Is the MAF sensor parameter more than the specified value?</p>	4.8 wV	Go to Step 16	Go to Step 11
9	<p>Is the voltage less than the specified value?</p>	5 V	Go to Step 12	Go to Step 13
10	<p>Important:: The ignition 1 voltage circuit of the MAF sensor is spliced to other components of the vehicle.</p> <p>Test the ignition 1 voltage circuit of the MAF sensor for a short to ground. Refer to Circuit Testing, Testing for Short to Ground, and Wiring Repairs in Wiring Systems.</p> <p>Did you find and correct the condition?</p>	—	Go to Step 20	—
11	<ol style="list-style-type: none"> 1. Turn OFF the ignition. 2. Disconnect the ECM. 3. Test the signal circuit of the MAF sensor for the following conditions: <ul style="list-style-type: none"> o A high resistance o An open o A short to ground <p>Refer to Circuit Testing and Wiring Repairs in Wiring Systems.</p>	—	Go to Step 20	Go to Step 17

	Did you find and correct the condition?			
12	<p>1. Turn OFF the ignition. 2. Disconnect the ECM.</p> <p>Important: The 5-volt reference circuit is shared with other components of the vehicle.</p> <p>3. Test the 5-volt reference circuit of the MAF sensor for the following conditions:</p> <ul style="list-style-type: none"> o A high resistance o An open o A short to the low reference of the MAF sensor o A short to ground <p>Refer to Circuit Testing and Wiring Repairs in Wiring Systems.</p> <p>Did you find and correct the condition?</p>	—	Go to Step 20	Go to Step 17
13	<p>Important:: The 5-volt reference circuit is shared within the ECM with other components of the vehicle. Disconnecting the ECM may eliminate the short to voltage if the circuit is shorted to another ECM circuit. A short to voltage on the fuel tank pressure (FTP) sensor signal circuit will backfeed through the FTP sensor to the FTP 5-volt reference circuit.</p> <p>1. Turn OFF the ignition. 2. Disconnect the ECM connector containing the 5-volt reference circuit of the MAF sensor. Refer to Engine Control Module Replacement. 3. Turn ON the ignition, with the engine OFF. 4. Test the 5-volt reference circuit of the MAF sensor for a short to voltage. Refer to Circuit Testing and Wiring Repairs in Wiring Systems.</p> <p>Did you find and correct the condition?</p>	—	Go to Step 20	Go to Step 17
14	<p>Repair the high resistance or an open in the ignition 1 voltage circuit of the MAF sensor. Refer to Wiring Repairs in Wiring Systems.</p> <p>Did you find and correct the condition?</p>	—	Go to Step 20	—
15	<p>Repair the harness or the connections as necessary. Refer to Wiring Repairs and Connector Repairs in Wiring Systems.</p> <p>Did you complete the repair?</p>	—	Go to Step 20	—
16	<p>Test for an intermittent and for a poor connection at the MAF sensor. Refer to Testing for Intermittent Conditions and Poor Connections and Connector Repairs in Wiring Systems.</p> <p>Did you find and correct the condition?</p>	—	Go to Step 20	Go to Step 18
17	<p>Test for an intermittent, a shorted or poor connection at the ECM. Refer to Testing for Intermittent Conditions and Poor Connections and Connector Repairs in Wiring Systems.</p> <p>Did you find and correct the condition?</p>	—	Go to Step 20	Go to Step 19
18	<p>Replace the MAF/IAT sensor. Refer to Mass Airflow Sensor with Intake Air Temperature Sensor Replacement.</p> <p>Did you complete the replacement?</p>	—	Go to Step 20	—

19	Replace the ECM. Refer to Engine Control Module Replacement . Did you complete the replacement?	—	Go to Step 20	—
20	1. Clear the DTCs with a scan tool. 2. Turn OFF the ignition for 60 seconds. 3. Start the engine. 4. Operate the vehicle within the Conditions for Running the DTC as specified in the supporting text. Did the DTC fail this ignition?	—	Go to Step 2	Go to Step 21
21	Observe the Capture Info with a scan tool. Are there any DTCs that have not been diagnosed?	—	Go to Diagnostic Trouble Code (DTC) List	System OK

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