DTC P0102

Circuit Description

The mass air flow (MAF) sensor is an airflow meter that measures the amount of air entering the engine. The powertrain control module (PCM) uses the MAF sensor signal in order to provide the correct fuel delivery for a wide range of engine speeds and loads. A small quantity of air entering the engine indicates a deceleration or idle. A large quantity of air entering the engine indicates an acceleration or high load condition. The MAF sensor has the following circuits:

- An ignition 1 voltage circuit
- A ground circuit

- A signal circuit

The PCM applies a voltage to the sensor on the signal circuit. The sensor uses the voltage in order to produce a frequency based on inlet air flow through the sensor bore. The frequency varies within a range of around 2,000 Hertz at idle to about 10,000 Hertz at maximum engine load. If the PCM detects a frequency signal lower than the possible range of a properly operating MAF sensor, DTC P0102 sets.

DTC Descriptor

This diagnostic procedure supports the following DTC:

DTC P0102 Mass Air Flow (MAF) Sensor Circuit Low Frequency

Conditions for Running the DTC

- The engine is running for more than 2 seconds.
- The engine speed is more than 400 RPM.
- The ignition 1 signal is more than 8 volts.
- The above conditions are met for more than 1 second.
- DTC P0102 runs continuously when the above conditions are met.

Conditions for Setting the DTC

The PCM detects that the MAF sensor frequency signal is less than 1,200 Hertz for more than 0.6 second.

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:

- An incorrectly routed harness--Inspect the harness of the MAF sensor in order to verify that it is not routed too close to the following components:
  - The secondary ignition wires or coils
  - Any solenoids
  - Any relays
  - Any motors
  - Any aftermarket accessories--Refer to Checking Aftermarket Accessories .
- 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.
- A wide open throttle (WOT) acceleration from a stop should cause the MAF Sensor g/s parameter on the scan

tool to increase rapidly. This increase should be from 6-12 g/s at idle to 230 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.

- A resistance of 15 ohms or more on the ground circuit or the ignition 1 circuit of the MAF sensor can cause this DTC to set.

If the condition is intermittent, refer to Testing for Intermittent Conditions and Poor Connections .

Test Description

The numbers below refer to the step numbers on the diagnostic table.

5. This step will determine if any mechanical faults have caused this DTC to set.
7. This voltage drop test will determine if high resistance has caused this DTC to set.
9. This step verifies the voltage signal from the PCM to the MAF sensor connector.
10. This step tests the signal circuit of the MAF sensor for a short to another 5-volt reference circuit.
11. This step will determine if the PCM is able to process the frequency signal that it receives from the MAF sensor.
14. This step will determine which portion of the circuit or which component is shorted to ground.
17. This step verifies that the signal circuit is not shorted to any other PCM circuit.

DTC P0102

Step	Action	Value(s)	Yes	No
Schematic Reference: Engine Controls Schematics				
1	Did you perform the Diagnostic System Check - Vehicle?	—	Go to Step 2	Go to Diagnostic System Check - Vehicle
2	1. Start the engine. 2. Observe the Mass Air Flow (MAF) Sensor parameter with a scan tool. Is the MAF Sensor parameter less than the specified value?	1,200 Hz	Go to Step 4	Go to Step 3

3	1. Observe the Freeze Frame/Failure Records for this DTC. 2. Turn OFF the ignition for 30 seconds. 3. Start the engine. 4. Operate the vehicle within the Conditions for Running the DTC. You may also operate the vehicle within the conditions that you observed from the Freeze Frame/Failure Records. Did the DTC fail this ignition?	—	Go to Step 4	Go to Diagnostic Aids
4	1. Observe the MAF Sensor parameter with a scan tool. 2. Move the harness and the connector of the MAF/intake air temperature (IAT) sensor. Does the movement of the harness or the connector affect the MAF Sensor parameter?	—	Go to Step 20	Go to Step 5
5	1. Turn OFF the ignition. 2. Inspect for the following conditions: - A restricted or collapsed air intake duct - A misaligned air intake duct - A dirty or deteriorating air filter element - Any objects blocking the air inlet screen of the MAF/IAT sensor - Any water intrusion in the Induction System - A restricted Exhaust System - Any contamination or debris on the sensing elements of the MAF sensor Did you find and correct the condition?	—	Go to Step 28	Go to Step 6
6	Inspect the fuse in the ignition 1 voltage circuit of the MAF sensor. Is the fuse open?	—	Go to Step 14	Go to Step 7

7	1. Turn ON the ignition, with the engine OFF. 2. Measure the battery voltage with a DMM. 3. Disconnect the MAF/IAT sensor. 4. Connect a test lamp between the ignition 1 voltage circuit of the MAF sensor and a good ground. Refer to Probing Electrical Connectors . 5. Connect the DMM to the probe of the test lamp and a good ground. Refer to Measuring Voltage Drop and Circuit Testing . Is the voltage within 0.50 volts of the specified value?	B+	Go to Step 8	Go to Step 21
8	**Important: All electrical components and accessories must be turned OFF.** 1. Turn OFF the ignition for 60 seconds to allow the control modules to power down. 2. Measure the resistance from the ground circuit of the MAF sensor to a good ground with a DMM. Refer to Circuit Testing . Is the resistance less than the specified value?	5 ohms	Go to Step 9	Go to Step 22

9	1. Turn ON the ignition, with the engine OFF. 2. Measure the voltage from the signal circuit of the MAF sensor to a good ground with a DMM. Refer to Circuit Testing . Is the voltage within the specified range?	4.8-5.2 V	Go to Step 10	Go to Step 13
10	1. Connect a 3-amp fused jumper wire between the signal circuit of the MAF sensor and a good ground. Refer to Circuit Testing . **Important: Running the engine with the MAF/IAT sensor disconnected may also set DTC P0113.** 2. Start the engine. 3. Observe the DTC Information with a scan tool. Do any additional DTCs set?	—	Go to Step 24	Go to Step 11
11	1. Turn OFF the ignition. 2. Connect the voltage supply and ground the black lead of the J 38522 Variable Signal Generator to the vehicle. 3. Connect the red lead of the J 38522 to the signal circuit of the MAF sensor. Refer to Probing Electrical Connectors . 4. Set the Duty Cycle switch of the J 38522 to Normal. 5. Set the Frequency switch of the J 38522 to 5 K. 6. Set the Signal switch of the J 38522 to 5 V. 7. Start the engine and allow it to idle. 8. Observe the MAF Sensor parameter with a scan tool. Is the MAF Sensor parameter within the specified range?	4,950-5,025 Hz	Go to Step 12	Go to Step 15
12	**Important: An abnormal resistance on the signal circuit will disable the MAF sensor frequency before the voltage starts to drop out of the correct parameter of 4.8-5.2 volts.** 1. Turn OFF the ignition. 2. Disconnect the powertrain control module (PCM). 3. Test the MAF sensor signal circuit for a high resistance and for a short to the IAT signal circuit. Refer to Circuit Testing and Wiring Repairs . Did you find and correct the condition?	—	Go to Step 28	Go to Step 18

13	Is the voltage less than the specified value?	4.8 V	Go to Step 15	Go to Step 16
14	**Important: The ignition 1 voltage circuit of the MAF sensor is spliced to other components of the vehicle.** Test the ignition 1 voltage circuit for a short to ground. Refer to Testing for Short to Ground and Wiring Repairs . Did you find and correct the condition? -	–	Go to Step 28	—
15	1. Turn OFF the ignition. 2. Disconnect the PCM. 3. Test the signal circuit between the PCM and the MAF sensor for the following conditions: - A high resistance - An open circuit - A short to ground Refer to Circuit Testing and Wiring Repairs . Did you find and correct the condition?	—	Go to Step 28	Go to Step 17
16	**Important: Disconnecting the PCM connectors may eliminate the short to voltage if the signal circuit is shorted to another PCM circuit.** 1. Turn OFF the ignition. 2. Disconnect the PCM. 3. Turn ON the ignition, with the engine OFF. 4. Measure the voltage from the signal circuit of the MAF sensor to a good ground with a DMM. Refer to Circuit Testing . Is the voltage more than the specified value?	0 V	Go to Step 23	Go to Step 17
17	Measure the resistance from the signal circuit of the MAF sensor to all other circuits at both PCM connectors with a DMM. Refer to Circuit Testing . Is the resistance less than the specified value?	∞ ohms	Go to Step 25	Go to Step 19
18	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 . Did you find and correct the condition?	—	Go to Step 28	Go to Step 26

19	Test for an intermittent and for a poor connection at the PCM. Refer to Testing for Intermittent Conditions and Poor Connections and Connector Repairs . Did you find and correct the condition?	—	Go to Step 28	Go to Step 27
20	Repair the wiring or the connector as needed. Refer to Wiring Repairs and Connector Repairs . Did you complete the repair?	—	Go to Step 28	—
21	Repair the high resistance or the open in the MAF sensor ignition 1 voltage circuit. Refer to Wiring Repairs . Did you complete the repair?	—	Go to Step 28	—
22	Repair the high resistance or the open in the MAF sensor ground circuit. Refer to Wiring Repairs . Did you complete the repair?	—	Go to Step 28	—
23	Repair the short to voltage in the MAF sensor signal circuit. Refer to Wiring Repairs . Did you complete the repair?	—	Go to Step 28	—
24	Repair the short between the MAF sensor signal circuit and the 5-volt reference circuit for which the DTC set. Refer to Wiring Repairs Did you complete the repair?	—	Go to Step 28	—

25	Repair the circuits that are shorted together. Refer to Wiring Repairs . Did you complete the repair?	—	Go to Step 28	—
26	Replace the MAF/IAT sensor. Refer to Mass Air Flow (MAF)/ Intake Air Temperature (IAT) Sensor Replacement . Did you complete the replacement?	—	Go to Step 28	—
27	Replace the PCM. Refer to Control Module References for replacement, setup, and programming. Did you complete the replacement?	—	Go to Step 28	—
28	1. Clear the DTCs with a scan tool. 2. Turn OFF the ignition for 30 seconds. 3. Start the engine. 4. Operate the vehicle within the Conditions for Running the DTC. You may also operate the vehicle within the conditions that you observed from the Freeze Frame/Failure Records. Did the DTC fail this ignition?	—	Go to Step 2	Go to Step 29
29	Observe the Capture Info with a scan tool. Are there any DTCs that have not been diagnosed?	—	Go to Diagnostic Trouble Code (DTC) List - Vehicle	System OK