

## P0101

### DTC P0101

#### CIRCUIT DESCRIPTION

The mass air flow (MAF) sensor is an air flow meter that measures the amount of air entering the engine. The powertrain control module (PCM) uses the MAF sensor signal to provide the correct fuel delivery for all engine speeds and loads. A small quantity of air entering the engine indicates a deceleration or idle condition. 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 to produce a frequency based on the inlet air flow through the sensor bore. The frequency varies within a range of near **2,000 Hertz** at idle to near **11,500 Hertz** at maximum engine load. The PCM uses the following sensor inputs to calculate a predicted MAF value:

- The manifold absolute pressure (MAP) sensor
- The intake air temperature (IAT) sensor
- The engine coolant temperature (ECT) sensor
- The engine speed (RPM)

The PCM compares the actual MAF sensor frequency signal to the predicted MAF value. This comparison will determine if the signal is stuck based on a lack of variation, or is too low or too high for a given operating condition. If the PCM detects the actual MAF sensor frequency signal is not within a predetermined range of the calculated MAF value DTC P0101 sets.

#### DTC DESCRIPTOR

This diagnostic procedure supports the following DTC:  
DTC P0101 Mass Air Flow (MAF) Sensor Performance

#### CONDITIONS FOR RUNNING THE DTC

- DTCs P0068, P0102, P0103, P0106, P0107, P0108, P0120, P0220, P0442, P0443, P0446, P0449, P0452, P0453, P0455, P0496 and P2135 are not set.
- The engine is cranking or running.
- The ignition 1 signal is between **11-18 volts** .
- The throttle position (TP) indicated angle is less than **95 percent** .
- The change in the TP indicated angle is less than **5 percent** .
- The MAP sensor is less than **80 kPa** .
- The change in the MAP sensor is less than **3 kPa** .
- The above conditions are met for **1.5 seconds** .
- DTC P0101 runs continuously when the above conditions are met.

#### CONDITIONS FOR SETTING THE DTC

The PCM detects that the actual MAF sensor frequency signal is not within a predetermined range of the calculated MAF value for more than **4 seconds** .

#### 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 the harness of the MAF sensor 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
- A low minimum air rate through the sensor bore at idle or during deceleration may cause this DTC to set. Inspect for the following conditions:
- Any deposits on the throttle plate or in the throttle bore
- Any vacuum leak downstream of the MAF sensor
- Inspect for any contamination or debris on the sensing elements of the MAF sensor.
- Inspect the air induction system for any water intrusion. Any water that reaches the MAF sensor will skew the sensor and may cause this DTC to set.
- Inspect the secondary air injection system (AIR) for any water intrusion.
- A wide open throttle acceleration from a stop should cause the MAF sensor parameter on the scan tool to increase rapidly. This increase should be from **5-12 g/s** at idle to **200 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.
- Inspect for a skewed or stuck ECT sensor.
- A high resistance of **15 ohms** or more on the ignition 1 voltage circuit may cause the DTC to set. A high resistance may cause a driveability concern before this DTC sets.
- The barometric pressure that is used to calculate the predicted mass air flow value is initially based on the MAP sensor at key ON. When the engine is running the BARO value is continually updated near wide open throttle. A skewed MAP sensor will cause the calculated mass air flow value to be inaccurate and may result in a no start condition. The value shown for the MAP sensor parameter varies with the altitude. With the ignition ON and the engine OFF, **101 kPa** is the approximate value near sea level. This value will decrease by approximately **3 kPa** for every **305 meters (1,000 feet)** of altitude.
- A high resistance on the low reference circuit of the MAP sensor may cause this DTC to set.
- A short to voltage on the **5 volt** reference circuit of the MAP sensor may cause this DTC to set.

If the condition is intermittent, refer to Intermittent Conditions. [See: Initial Inspection and Diagnostic Overview/Diagnostic Strategies/Intermittent Conditions](#)

#### TEST DESCRIPTION

| Step | Action   | Values  | Yes  | No  |
|------|--|---------|--|---|
| 1    | Did you perform the Diagnostic System Check – Vehicle?   | —       | Go to Step 2   | Go to <a href="#">Diagnostic System Check - Vehicle</a> |
| 2    | Observe the Diagnostic Trouble Code (DTC) Information with the scan tool.<br>Does the scan tool display any DTCs set other than DTC P0068 or DTC P0101?  | —       | Go to <a href="#">Diagnostic Trouble Code (DTC) List - Vehicle</a> | Go to Step 3  |
| 3    | Attempt to start the engine.<br>Does the engine start?   | —       | Go to Step 4   | Go to Step 5  |
| 4    | <ol style="list-style-type: none"> <li>1. Observe the Freeze Frame/Failure Records for this DTC.</li> <li>2. Turn OFF the ignition for 30 seconds.</li> <li>3. Start the engine.</li> <li>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.</li> </ol> Did the DTC fail this ignition?   | —       | Go to Step 5   | Go to Diagnostic Aids                                   |
| 5    | <b>Important:</b><br><br><b>The Altitude vs. Barometric Pressure table indicates a pressure range for a given altitude under normal weather conditions. Weather conditions consisting of very low or very high pressure and/or temperature may cause a reading to be slightly out of range.</b><br><br><ol style="list-style-type: none"> <li>1. Turn ON the ignition, with the engine OFF.</li> <li>2. Observe the MAP sensor kPa parameter with a scan tool.</li> <li>3. The manifold absolute pressure (MAP) sensor pressure should be within the specified range for your altitude. Refer to Altitude vs Barometric Pressure .</li> </ol> Is the MAP sensor pressure within the specified range, as indicated on the altitude vs. barometric pressure table? | —       | Go to Step 6   | Go to DTC <a href="#">P0106</a>                         |
| 6    | <ol style="list-style-type: none"> <li>1. Observe the MAP sensor parameter with a scan tool .</li> <li>2. Start the engine.</li> </ol> Does the MAP sensor parameter decrease?   | —       | Go to Step 7   | Go to DTC <a href="#">P0106</a>                         |
| 7    | <ol style="list-style-type: none"> <li>1. Idle the engine.</li> <li>2. Observe the MAP sensor parameter with a scan tool.</li> <li>3. Increase the engine speed slowly to 3,000 RPM and then back to idle.</li> </ol> Does the MAP sensor parameter change smoothly and gradually through the specified range of the test?   | —       | Go to Step 8   | Go to DTC <a href="#">P0106</a>                         |
| 8    | <ol style="list-style-type: none"> <li>1. Turn OFF the ignition for 30 seconds.</li> <li>2. Turn ON the ignition with the engine OFF.</li> <li>3. Observe the TP indicated angle parameter with a scan tool.</li> <li>4. Depress the accelerator pedal completely.</li> </ol> Is the TP indicated angle parameter within the specified range?  | 95–100% | Go to Step 9   | Go to DTC <a href="#">P0120</a>                         |

| Step | Action   | Values | Yes  | No            |
|------|--|--------|--|---------------|
| 9    | <ol style="list-style-type: none"> <li>1. Turn OFF the ignition.</li> <li>2. Inspect for the following conditions: <ul style="list-style-type: none"> <li>o An improperly routed mass air flow (MAF) sensor harness</li> <li>o A restricted or collapsed air intake duct</li> <li>o A misaligned air intake duct</li> <li>o A dirty or deteriorating air filter element</li> <li>o Any objects blocking the air inlet screen of the MAF sensor, if equipped</li> <li>o Any contamination or debris on the sensing elements of the MAF sensor</li> <li>o Any water intrusion in the induction system</li> <li>o Any water intrusion in the secondary air injection (AIR) system</li> <li>o Any vacuum leak downstream of the MAF sensor</li> <li>o A skewed or stuck engine coolant temperature (ECT) sensor</li> <li>o Any type of restriction in the exhaust system—Refer to <a href="#">Restricted Exhaust</a> .</li> </ul> </li> </ol> <p>Did you find and correct the condition?</p> | —      | Go to Step 14  | Go to Step 10 |
| 10   | <ol style="list-style-type: none"> <li>1. Disconnect the harness connector of the MAF sensor.</li> <li>2. Measure the battery voltage with a DMM.</li> <li>3. Turn ON the ignition, with the engine OFF.</li> <li>4. Connect a test lamp between the ignition 1 voltage circuit of the MAF sensor and a good ground.</li> <li>5. Connect a DMM to the probe of the test lamp and a good ground.</li> </ol> <p>Is the voltage within 0.50 volts of the specified value?</p>   | B+     | Go to Step 11  | Go to Step 12 |
| 11   | <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 .</p> <p>Did you find and correct the condition?</p>  | —      | Go to Step 14  | Go to Step 13 |
| 12   | <p>Repair the high resistance in the ignition 1 voltage circuit of the MAF sensor.</p> <p>Did you complete the repair?</p>   | —      | Go to Step 14  | —             |
| 13   | <p>Replace the MAF/intake air temperature (IAT) sensor.</p> <p>Did you complete the replacement?</p>   | —      | Go to Step 14  | —             |
| 14   | <ol style="list-style-type: none"> <li>1. Clear the DTCs with a scan tool.</li> <li>2. Turn OFF the ignition for 30 seconds.</li> <li>3. Start the engine.</li> <li>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.</li> </ol> <p>Did the DTC fail this ignition?</p>  | —      | Go to Step 2   | Go to Step 15 |
| 15   | <p>Observe the Capture Info with a scan tool.</p> <p>Are there any DTCs that have not been diagnosed?</p>  | —      | Go to <a href="#">Diagnostic Trouble Code (DTC) List - Vehicle</a> | System OK     |

#### Steps 9-15

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

5. This step will determine if the MAP sensor pressure is within the proper range for a given altitude.
6. This step will determine if the MAP sensor voltage is within the proper range at idle.
7. This step will determine if the MAP sensor responds properly to the change in manifold pressure.
8. This step will determine if the throttle position (TP) sensors are operating properly.
9. This step will determine if any mechanical faults have caused this DTC to set.
10. This voltage drop will determine if high resistance has caused this DTC to set.

