## DTC P0106

## DTC Descriptor

DTC P0106: Manifold Absolute Pressure (MAP) Sensor Performance

## **Diagnostic Fault Information**

**Important:** Always perform the <u>Diagnostic System Check - Vehicle</u> prior to using this diagnostic procedure.

Circuit	Short to Ground	High Resistance	Open	Short to Voltage	Signal Performance
5-Volt Reference	P0107, P0452, P0522, P0532, P0641	P0106, P0107	P0107	P0106, P0108, P0453, P0533, P0641	P0106, P0107
MAP Sensor Signal	P0107	P0106, P0107	P0107	P0108	P0106, P0107, P1101
Low Reference		P0106, P0108	P0106, P0108		P0106, P0108

## Typical Scan Tool Data

#### **MAP Sensor**

Circuit	Normal Range	Short to Ground	Open	Short to Voltage	
5-Volt Reference		10 kPa	10 kPa	104 kPa	
MAP Sensor Signal	12-103 kPa	10 kPa	10 kPa	104 kPa	
Low Reference			80-103 kPa		

## **Circuit Description**

The intake flow rationality diagnostic provides the within-range rationality check for the mass air flow (MAF), manifold absolute pressure (MAP), and the throttle position (TP) sensors. This is a model-based diagnostic containing 4 separate models for the intake system.

- The throttle model describes the flow through the throttle body and is used to estimate the MAF through the throttle body as a function of barometric pressure (BARO), TP, intake air temperature (IAT), and estimated MAP. The information from this model is displayed on the scan tool as the MAF Performance Test parameter.
- The first intake manifold model describes the intake manifold and is used to estimate MAP as a function of the MAF into the manifold from the throttle body and the MAF out of the manifold caused by engine pumping. The flow into the manifold from the throttle uses the MAF estimate calculated from the above throttle model. The information from this model is displayed on the scan tool as the MAP Performance Test 1 parameter.
- The second intake manifold model is identical to the first intake manifold model except that the MAF sensor measurement is used instead of the throttle model estimate for the throttle © 2011 General Motors Corporation. All rights reserved.

air input. The information from this model is displayed on the scan tool as the MAP Performance Test 2 parameter.

• The fourth model is created from the combination and additional calculations of the throttle model and the first intake manifold model. The information from this model is displayed on the scan tool as the TP Performance Test parameter.

The estimates of MAF and MAP obtained from this system of models and calculations are then compared to the actual measured values from the MAF, MAP, and the TP sensors and to each other to determine the appropriate DTC to fail. The following table illustrates the possible failure combinations and the resulting DTC or DTCs.

MAF Performance Test	MAP Performance Test 1	MAP Performance Test 2	TP Performance Test	DTCs Passed	DTCs Failed
Х	Х	ОК	ОК	P0101, P0106, P0121, P1101	None
ОК	ОК	Fault	ОК	P0101, P0106, P0121, P1101	None
Fault	ОК	Fault	ОК	P0106, P0121, P1101	P0101
ОК	Fault	Fault	ОК	P0101, P0121, P1101	P0106
Fault	Fault	Fault	ОК	P0121, P1101	P0101, P0106
Х	Х	ОК	Fault	P0101, P0106, P1101	P0121
ОК	ОК	Fault	Fault	P0101, P0106, P0121, P1101	None
Fault	ОК	Fault	Fault	P0101, P0106, P0121	P1101
Х	Fault	Fault	Fault	P0101, P0106, P0121	P1101

#### **Conditions for Running the DTC**

- DTCs P0102, P0103, P0107, P0108, P0112, P0113, P0117, P0118, P0335, P0336 are not set.
- The engine speed is between 450-6,800 RPM.
- The IAT Sensor parameter is between -7 and +125°C (+19 and 257°F).

- The ECT Sensor parameter is between 70-125°C (158-257°F).
- DTC P0106 runs continuously when the above conditions are met.

#### Conditions for Setting the DTC

The ECM detects that the MAP sensor pressure is not within range of the calculated pressure that is derived from the system of models for more than 0.5 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.

#### **Reference Information**

#### Schematic Reference

Engine Controls Schematics

#### **Connector End View Reference**

- Engine Controls Connector End Views
- Engine Control Module Connector End Views

#### **Electrical Information Reference**

- <u>Circuit Testing</u>
- <u>Connector Repairs</u>
- <u>Testing for Intermittent Conditions and Poor Connections</u>
- <u>Wiring Repairs</u>

#### Scan Tool Reference

- Scan Tool Data List
- <u>Scan Tool Output Controls</u>

## **Circuit/System Verification**

**Important:** Verify that the engine is in good mechanical condition before continuing with this diagnostic.

- Verify the integrity of the air induction system by inspecting for the following conditions:
  - Any damaged components
  - Loose or improper installation
  - Improperly routed vacuum hoses
  - Any vacuum leak
  - Any type of restriction
  - A MAP sensor seal that is missing or damaged
- Verify that restrictions do not exist in the MAP sensor vacuum source.
- · Verify that restrictions do not exist in the exhaust system. Refer to Restricted Exhaust .
- A skewed or stuck engine coolant temperature (ECT) or IAT sensor will cause the calculated models to be inaccurate and may cause this DTC to run when it should not. Refer to <u>Temperature Versus Resistance</u>.
- The BARO that is used by the ECM to calculate the air flow models is initially based on the MAP sensor at ignition ON. When the engine is running, the ECM will continually update the BARO value near wide open throttle using the MAP sensor and a calculation. A skewed MAP sensor will cause the BARO value to be inaccurate. Use the scan tool and compare the BARO parameter at ignition ON to the Altitude vs. Barometric Pressure Table. Refer to <u>Altitude</u> <u>Versus Barometric Pressure</u>
- A skewed MAP sensor will also cause the first and second intake manifold models to disagree with the actual MAP sensor measurements. Use the scan tool and compare the MAP Sensor parameter to a known good vehicle, under various operating conditions.
- Inspect for the following conditions:
  - Incorrect cam timing--Refer to Timing Chain and Sprocket Replacement .
  - Worn piston rings--Refer to Engine Compression Test .

## Circuit/System Testing

- 1. Turn ON the ignition, with the engine OFF.
- 2. Disconnect the MAP sensor.

# **Important:** Certain resistances will not be detectable if a test lamp is not connected to provide a circuit load.

- 3. Connect a test lamp between the MAP sensor 5-volt reference circuit and a good ground.
- 4. Measure for a proper range of 4.8-5.2 volts between the MAP sensor 5-volt reference circuit and a good ground.

If the voltage is less than the specified range, then test the circuit for an open, or high resistance. If the circuit tests normal, replace the ECM.

If the voltage is more than the specified range, then test the circuit for a short to voltage.

If the circuit tests normal, replace the ECM.

5. With the MAP sensor still disconnected, use the scan tool to observe the MAP Sensor parameter for the proper value of less than 12 kPa.

If the MAP Sensor parameter is more than 12 kPa, then test the MAP sensor signal circuit for a short to voltage. If the circuit tests normal, replace the ECM.

- 6. Connect a 3-amp fused jumper wire between the MAP sensor 5-volt reference circuit and the MAP sensor signal circuit.
- 7. Use the scan tool to observe the MAP Sensor parameter for the proper value of more than 103 kPa.

If the MAP Sensor parameter is less than 103 kPa, then test the MAP sensor signal circuit for high resistance. If the circuit tests normal, replace the ECM.

- 8. Turn OFF the ignition, and all electrical accessories. Allow sufficient time for the control module to power down before taking a resistance measurement.
- 9. Measure for a proper value of less than 10 ohms of resistance between the low reference circuit of the MAP sensor and a good ground.

If the resistance is more than 10 ohms, then test the circuit for high resistance. If the circuit tests normal, replace the ECM.

10. If the MAP sensor circuits test normal, then replace the MAP sensor.

#### **Repair Instructions**

- Manifold Absolute Pressure Sensor Replacement
- Control Module References for ECM replacement, setup, and programming