DTC P0101

DIAGNOSTIC INSTRUCTIONS

- Perform the **Diagnostic System Check - Vehicle** prior to using this diagnostic procedure.
- Review **Strategy Based Diagnosis** for an overview of the diagnostic approach.
- **Diagnostic Procedure Instructions** provides an overview of each diagnostic category.

DTC DESCRIPTOR

DTC P0101

Mass Air Flow (MAF) Sensor Performance

DIAGNOSTIC FAULT INFORMATION

Circuit	Short to Ground	High Resistance	Open	Short to Voltage	Signal Performance
Ignition 1 Voltage	P0031, P0037, P0100, P0458	P0100	P0100	-	P0100
MAF Sensor Signal	P0100	P0100	P0100	P0100	P0101, P0102, P0103
Ground	-	P0100	P0100	-	P0100

TYPICAL SCAN TOOL DATA

MAF Sensor

Circuit	Short to Ground	Open	Short to Voltage
Operating Conditions: Engine Running at various operating conditions **Parameter Normal Range:** 1,700-12,500 Hz			
Ignition 1 Voltage	65,535 Hz	65,535 Hz	-
MAF Sensor Signal	65,535 Hz	65,535 Hz	65,535 Hz
Ground	-	65,535 Hz	-

CIRCUIT/SYSTEM DESCRIPTION

The mass air flow (MAF) sensor is integrated with the intake air temperature (IAT) sensor. The MAF sensor is an air flow meter that measures the amount of air entering the engine. The engine control module (ECM) uses the MAF sensor signal to provide the correct fuel delivery for all engine speeds and loads. The MAF/IAT sensor has the following circuits:

- Ignition 1 voltage

- MAF sensor ground
- MAF sensor signal
- IAT sensor signal
- IAT low reference

The purpose of this diagnostic is to analyze the performance of the MAF sensor by comparing the measured airflow to the following 2 distinct models:

- The first model is separated into two parts. The first part is based on basic engine parameters and uses engine speed, and throttle angle as inputs. The second part is derived from long term fuel trim, at cruising speed and the ECM is looking for an adaptation value to be within a calibrated range.
- The second model uses the manifold absolute pressure (MAP) sensor for input, and the ECM is looking for an adaptation value to be within a calibrated range.

CONDITIONS FOR RUNNING THE DTC

- DTCs P0010, P0011, P0013, P0014, P0096, P0097, P0098, P0099, P0100, P0102, P0103, P0106, P0107, P0108, P0121, P0122, P0123, P0221, P0222, P0223, P0236, P0237, P0238, P0335, P0336, P2088, P2089, P2090, P2091, P2176, P2227, P2228, or P2229 is not set.
- The engine is running.
- The engine coolant temperature (ECT) is warmer than 10°C (50°F).
- The ignition 1 voltage signal is greater than 10 V.
- The change in the throttle position is less than 2 %.
- The charge air bypass valve is closed.
- Long term cruise fuel trim needs to be active and stable.
- This DTC runs continuously within the enabling conditions.

CONDITIONS FOR SETTING THE DTC

- The ECM detects that the measured MAF is not within range of the calculated airflow based on throttle angle and engine speed.

  AND

- The ECM detects a significant error in the long term fuel trim at cruising speed.

  OR

- The ECM detects that the measured MAF is not within range of the calculated model that is derived from MAP.

ACTION TAKEN WHEN THE DTC SETS

- DTC P0101 is a Type B DTC.

- The ECM will disable boost control, and limit the system to mechanical boost only, resulting in a substantial decrease in engine power.

CONDITIONS FOR CLEARING THE MIL/DTC

DTC P0101 is a Type B DTC.

DIAGNOSTIC AIDS

- The charge air cooler is connected to the turbocharger and to the throttle body by flexible ductwork that requires the use of special high torque fastening clamps. These clamps cannot be substituted. In order to prevent any type of air leak when servicing the ductwork, the tightening specifications and proper positioning of the clamps is critical and must be strictly adhered to.
- Use a solution of dish soap and water in a spray bottle to pinpoint any suspected air leaks in the induction system and in the charge air cooler assembly.
- A steady or intermittent high resistance of 15 ohms or greater on the ignition 1 voltage circuit will cause the MAF sensor signal to be increased by as much as 60 g/s.
- Certain types of contaminants on the MAF sensor heating elements act as a heat insulator, which will impair the response of the sensor to airflow changes. This condition will affect the Long Term Fuel Trim adaptation value.
- Depending on the current ambient temperature, and the vehicle operating conditions, a MAF sensor signal circuit that is shorted to the IAT signal circuit will increase or decrease the MAF sensor signal that is interpreted by the ECM. Additionally it may cause a rapid fluctuation in the IAT Sensor parameter.

REFERENCE INFORMATION

Schematic Reference

Engine Controls Schematics

Connector End View Reference

Component Connector End Views

Description and Operation

- **Turbocharger System Description**
- **Boost Control System Description**

Electrical Information Reference

- **Circuit Testing**
- **Connector Repairs**
- **Testing for Intermittent Conditions and Poor Connections**
- **Wiring Repairs**

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions

Scan Tool Reference

Control Module References for scan tool information

Special Tools

J 38522 Variable Signal Generator. See **Special Tools** .

CIRCUIT/SYSTEM VERIFICATION

1. Verify that restrictions do not exist in the exhaust system. Refer to **Restricted Exhaust** .
2. Verify that an exhaust leak does not exist, including the mating surface area between the turbocharger and the exhaust manifold.
3. Ignition OFF for 90 s, determine the current vehicle testing altitude.
4. Ignition ON, engine OFF, observe the scan tool BARO parameter, Boost Pressure Sensor parameter, and MAP Sensor parameter. Compare the parameters to the **Altitude Versus Barometric Pressure** table. The parameters should be within the specified range indicated in the table.
5. Engine operating at idle, observe the scan tool MAF Sensor parameter. The reading should be between 1,700-3,200 Hz.
6. A wide open throttle (WOT) acceleration from a stop should cause the MAF sensor parameter on the scan tool to increase rapidly. This increase should be from 2-6 g/s at idle to greater than 200 g/s at the time of the 1-2 shift.
7. Operate the vehicle within the Conditions for Running the DTC to verify the DTC does not reset. You may also operate the vehicle within the conditions that you observed from the Freeze Frame/Failure Records data.

CIRCUIT/SYSTEM TESTING

1. Verify the integrity of the entire air induction system including all turbocharger components by inspecting for the following conditions:
    - Any damaged components
    - Loose or improper installation
    - An air flow restriction
    - Vacuum leaks
    - A turbocharged air leak
    - Improperly routed vacuum hoses
    - In cold climates, inspect for any snow or ice buildup
    - Inspect the MAF sensor elements for contamination
2. Ignition OFF, disconnect the harness connector at the B75B MAF/IAT sensor.

3. Ignition OFF for 90 s, test for less than 5.0 ohms between the ground circuit terminal B and ground.
    - If greater than the specified range, test the ground circuit for an open/high resistance.
4. Ignition ON, verify that a test lamp illuminates between the ignition circuit terminal C and ground.
    - If the test lamp does not illuminate, test the ignition circuit for a short to ground or an open/high resistance.
5. Ignition ON, test for 4.8-5.2 V between the signal circuit terminal A and ground.
    - If less than the specified range, test the signal circuit for a short to ground or an open/high resistance. If the circuit tests normal, replace the K20 ECM.
    - If greater than the specified range, test the signal circuit for a short to voltage. If the circuit tests normal, replace the K20 ECM.
6. Ignition OFF, connect the red lead of the **J 38522** to the signal circuit terminal A at the MAF/IAT sensor harness connector. See **Special Tools** . Connect the battery voltage supply to B+. Connect the black lead to ground.
7. Set the **J 38522** Signal switch to 5 V, the Frequency switch to 5K, and the Duty Cycle switch to Normal. See **Special Tools** .
8. Engine Idling, observe the scan tool MAF Sensor parameter. The scan tool MAF Sensor parameter should be between 4,950-5,025 Hz.
    - If the MAF Sensor parameter is not within the specified range, replace the K20 ECM.
9. If all circuits test normal, test or replace the B75B MAF sensor.

REPAIR PROCEDURES

Perform the **Diagnostic Repair Verification** after completing the diagnostic procedure.

- **Mass Airflow Sensor Replacement**
- **Control Module References** for ECM replacement, setup, and programming

