

P0113 Intake Air Temperature (IAT) Sensor Circuit High Voltage

Circuit Description

The intake air temperature (IAT) sensor is an integral part of the mass air flow (MAF) sensor. The IAT sensor is a variable resistor that measures the temperature of the intake air. The engine control module (ECM) supplies 5 volts to the IAT signal circuit and supplies a ground to the low reference circuit. If the ECM detects a high IAT signal voltage, which is a low temperature indication, this DTC sets. The following table illustrates the difference between temperature, resistance, and voltage:

IAT	IAT Resistance	IAT Signal Voltage
Cold	High	High
Warm	Low	Low

DTC Descriptor

This diagnostic procedure supports the following DTC: DTC P0113 Intake Air Temperature (IAT) Sensor Circuit High Voltage

Conditions for Running the DTC

- The engine run time is more than 3 minutes.
- The engine is idling for more than 10 seconds.
- DTC P0113 runs continuously once the above conditions are met.

Conditions for Setting the DTC

The ECM detects that the intake air temperature is less than $\sim 42^{\circ}\text{C}$ ($\sim 43.6^{\circ}\text{F}$) for more than 3 seconds. The scan tool is limited to $\sim 40^{\circ}\text{C}$ ($\sim 40^{\circ}\text{F}$), so the diagnostic procedure uses $\sim 39^{\circ}\text{C}$ ($\sim 38^{\circ}\text{F}$) to determine if there is an IAT condition.

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 4 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

- Use the J 35616-C Connector Test Adapter Kit for any test that requires probing the ECM harness connector or a component harness connector.
- The lower connector of the ECM is connector C1 and the upper connector of the ECM is connector C2. Refer to Engine Controls Component Views .
- Use the Temperature vs Resistance table in order to test the IAT sensor at various temperature levels in order to evaluate the possibility of a skewed sensor. A skewed sensor could result in a driveability condition. If the engine has sat overnight, the intake air temperature and the engine coolant temperature values should display within a few degrees. If the temperatures are not within 3°C (5°F), refer to Temperature vs Resistance - Engine Coolant Temperature (ECT) Sensor.
- For an intermittent condition, refer to Intermittent Conditions.

Test Description

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

2. This step determines that a condition exists. If the temperature is less than the specified value, test for a condition in the circuits of the IAT sensor.

5. This step tests for high resistance in the low reference circuit of the MAF/IAT sensor. The MAF sensor and the IAT sensor share the low reference circuit. If there is a condition with the low reference circuit, a MAF and IAT sensor DTC may set. The ECM must be completely powered down to obtain an accurate resistance reading. It may take up to 30 minutes for the ECM to power down after the ignition key is removed. Removal of the ECM/TCM fuse allows the ECM to power down completely.

6. This step tests the low reference circuit for a short to voltage. The control module or the sensor may be damaged if the circuit is shorted to battery voltage. Ensure that a short to voltage is repaired before replacing any components.

11. Inspect the MAF/IAT sensor connector for water intrusion, corrosion, and bent or damaged terminals.

12. Inspect the ECM connectors for water intrusion, corrosion, and bent or damaged terminals.

DTC P0113

Step	Action	Values	Yes	No
Schematic Reference: Engine Controls Schematics on page 6-1196 Connector End View Reference: Engine Control Module (ECM) 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

Step	Action	Values	Yes	No
2	<ol style="list-style-type: none"> Turn ON the ignition, with the engine OFF. Observe the IAT sensor parameter with a scan tool. <p>Is the temperature less than the specified value?</p>	-39°C (-38°F)	Go to Step 4	Go to Step 3
3	<ol style="list-style-type: none"> Observe the Freeze Frame/Failure Records for this DTC. Turn OFF the ignition for 30 seconds. Start the engine. 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. <p>Did the DTC fail this ignition?</p>	—	Go to Step 4	Go to Diagnostic Aids
4	<ol style="list-style-type: none"> Turn OFF the ignition. Disconnect the mass air flow (MAF)/intake air temperature (IAT) sensor. Refer to Mass Air Flow (MAF)/Intake Air Temperature (IAT) Sensor Measure the voltage from the signal circuit of the IAT sensor to the engine control module (ECM) housing with a DMM. <p>Is the voltage within the specified range?</p>	4.8–5.2 V	Go to Step 5	Go to Step 7
5	<ol style="list-style-type: none"> Turn OFF the ignition. Remove the ECM/TCM fuse from the underhood electrical center. Measure the resistance between the low reference circuit of the MAF/IAT sensor and the ECM housing with a DMM. <p>Is the resistance less than the specified value?</p>	5 W	Go to Step 11	Go to Step 6

Step	Action	Values	Yes	No
6	<p>1. Install the ECM/TCM fuse into the underhood electrical center.</p> <p>2. Turn ON the ignition, with the engine OFF.</p> <p>3. Measure the voltage between the low reference circuit of the MAF/IAT sensor and the ECM housing with a DMM.</p> <p>Is the voltage less than the specified value?</p>	1.0 V	Go to Step 10	Go to Step 13
7	<p>Is the voltage more than the specified value?</p>	6 V	Go to Step 8	Go to Step 9
8	<p>Important: The control module or the sensor may be damaged if the circuit is shorted to battery positive voltage.</p> <p>Test the signal circuit of the IAT 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 16	Go to Step 12
9	<p>Test the signal circuit of the IAT sensor for an open, or for high resistance</p> <p>Did you find and correct the condition?</p>	—	Go to Step 16	Go to Step 12
10	<p>Test the low reference circuit of the MAF/IAT sensor for an open or a high resistance. Did you find and correct the condition?</p>	—	Go to Step 16	Go to Step 12
11	<p>Test for shorted terminals and for poor connections at the MAF/IAT sensor. Refer to Testing for Intermittent and Poor Connections and Connector Repairs in Wiring Systems.</p> <p>Did you find and correct the condition?</p>	—	Go to Step 16	Go to Step 14

Step	Action	Values	Yes	No
12	Test for shorted terminals and for poor connections at the ECM. Refer to Testing for Intermittent and Poor Connections and Connector Repairs in Wiring Systems. Did you find and correct the condition?	—	Go to Step 16	Go to Step 15
13	Important: The control module or the sensor may be damaged if the circuit is shorted to battery positive voltage. Repair the short to voltage in the low reference circuit of the MAF/IAT sensor. Refer to Wiring Repairs in Wiring Systems. Did you complete the repair?	—	Go to Step 16	—
14	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 16	—
15	Replace the ECM. Refer to Engine Control Module (ECM) Replacement. Did you complete the replacement?	—	Go to Step 16	—
16	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 17
17	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