

P0031, P0037, P0051, or P0057 HO2S Heater Control Circuit Low Voltage

Circuit Description

The heated oxygen sensor (HO2S) heater reduces the time required for the oxygen sensor to reach operating temperature and maintains the operating temperature during extended idle periods. When the ignition is turned to the ON position, ignition voltage is supplied directly to the sensor heater. The engine control module (ECM) controls the heater operation by first modulating the control circuit to ground when the sensors are cold. This prevents the possibility of thermal shock to the sensor, from condensation build-up on the sensor, by controlling the sensors rate of heating. After a predetermined amount of time, the ECM commands the heaters ON continuously. Once the sensor reaches operating temperature, the ECM may modulate the heater control circuit to ground, to maintain a desired temperature.

The ECM controls the heater by grounding the control circuit with a solid state device called a driver. The driver is equipped with a feedback circuit that is pulled-up to voltage. The ECM can determine if the control circuit is open, shorted to ground, or shorted to a voltage by monitoring the feedback voltage. If the ECM detects the control circuit voltage is less than a predetermined value when the circuit is commanded OFF, this DTC sets.

DTC Descriptors

This diagnostic procedure supports the following DTCs.

- DTC P0031 HO2S Heater Control Circuit Low Voltage Bank 1 Sensor 1
- DTC P0037 HO2S Heater Control Circuit Low Voltage Bank 1 Sensor 2
- DTC P0051 HO2S Heater Control Circuit Low Voltage Bank 2 Sensor 1
- DTC P0057 HO2S Heater Control Circuit Low Voltage Bank 2 Sensor 2

Conditions for Running the DTC

- The ignition 1 voltage is between 10–18 volts.
- The engine speed is more than 80 RPM.
- DTC P0031, P0037, P0051, and P0057 run continuously once the above conditions are met for more than 1 second.

Conditions for Setting the DTC

- The ECM detects a ground in the heater circuits of the HO₂S when the heater is commanded OFF.
- The condition exists for less than 6 seconds for DTCs P0031 and P0051 or the condition exists for less than 1 second for DTCs P0037 and P0057.

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.
- If the condition is intermittent, move the related harnesses and connectors, with the engine operating, while monitoring the circuit status for the component with a scan tool. The circuit status parameter changes from OK or Indeterminate to Fault if there is a condition with the circuit or a connection. The output driver module (ODM) information is in the ODM data list.

- Inspect the sensor pigtail or the harness for contacting the exhaust system.
- For an intermittent condition, refer to Intermittent Conditions.

Test Description

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

- If both DTCs are set for either the front sensors or the rear sensors, the ignition voltage circuit to the heaters may be open. The front sensors are fused separately from the rear sensors.
- The heater control circuit is equipped with a feedback voltage. This feedback voltage allows the ECM to determine if the heater control circuit is open, shorted to ground, or shorted to a voltage. If the feedback voltage on the control circuit is not within the specified range, there is a condition internal to the ECM.

DTC P0031, P0037, P0051, or P0057

Step	Action	Values	Yes	No
Schematic Reference: Engine Controls Schematics 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
2	1. Start the engine. 2. Allow the engine to idle for at least 30 seconds. 3. Observe the DTC information with a scan tool. Does DTC P0031, DTC P0037, DTC P0051, or DTC P0057 fail this ignition?	—	Go to Step 4	Go to Step 3

Step	Action	Values	Yes	No
3	<p>1. Observe the Freeze Frame/Failure Records for his DTC.</p> <p>2. Turn OFF the ignition for 30 seconds.</p> <p>3. Start the engine.</p> <p>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.</p> <p>Did the DTC fail this ignition?</p>	—	Go to Step 4	Go to Diagnostic Aids
4	<p>Are DTCs P0031 and P0051 set at the same time or are DTCs P0037 and P0057 set at the same time?</p>	—	Go to Step 7	Go to Step 5
5	<p>1. Turn OFF the ignition.</p> <p>Important: The ignition must be OFF when disconnecting or connecting the heated oxygen sensor (HO2S) electrical connector.</p> <p>2. Disconnect the appropriate HO2S.</p> <p>3. Turn ON the ignition, with the engine OFF.</p> <p>4. Measure the voltage between the heater control circuit of the HO2S and the engine control module (ECM) housing with a DMM.</p> <p>Is the voltage within the specified range?</p>	4.6–5.2 V	Go to Step 8	Go to Step 6
6	<p>1. Turn OFF the ignition.</p> <p>2. Disconnect the ECM.</p> <p>3. Test the heater control circuit between the HO2S and the ECM for a short to ground. Refer to Circuit Testing on page 8-1184 and Wiring Repairs in Wiring Systems.</p> <p>Did you find and correct the condition?</p>	—	Go to Step 10	Go to Step 9

Step	Action	Values	Yes	No
7	<p>Important: The ignition voltage circuit supplies voltage to other components. Make sure you test all circuits for a short to ground or test all components for being shorted that share the ignition voltage circuit.</p> <p>1. Repair the open or the grounded ignition 1 voltage circuit of the HO2S. Refer to Wiring Repairs in Wiring Systems.</p> <p>2. Replace the fuse if necessary.</p> <p>Did you complete the repair?</p>	—	Go to Step 10	—
8	<p>Replace the HO2S. Refer to the appropriate procedure:</p> <ul style="list-style-type: none"> • Heated Oxygen Sensor (HO2S) Replacement Bank 1 Sensor 1 on page 6-1658 • Heated Oxygen Sensor (HO2S) Replacement Bank 1 Sensor 2 on page 6-1659 • Heated Oxygen Sensor (HO2S) Replacement Bank 2 Sensor 1 on page 6-1660 • Heated Oxygen Sensor (HO2S) Replacement Bank 2 Sensor 2 on page 6-1662 <p>Did you complete the replacement?</p>	—	Go to Step 10	—
9	<p>Replace the ECM. Refer to Engine Control Module (ECM) Replacement on page 6-1648. Did you complete the replacement?</p>	—	Go to Step 10	—
10	<p>1. Clear the DTCs with a scan tool.</p> <p>2. Turn OFF the ignition for 30 seconds.</p> <p>3. Start the engine.</p> <p>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?</p>	—	Go to Step 2	Go to Step 11

Step	Action	Values	Yes	No
11	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

LAUNCH