# DTC P0135 or P0155

## Circuit Description

The heated oxygen sensor (HO2S) is a sensor designed to create a voltage relative to the oxygen content in the engine exhaust stream. The control module supplies the HO2S with signal high and low circuits. Voltage and ground are supplied to the HO2S heater and is commanded ON or OFF by the control module. The oxygen content of the exhaust indicates when the engine is operating lean or rich. When the HO2S detects that the engine is operating rich, the signal voltage is high, and decreases the signal voltage as the engine runs leaner. This oscillation above and below the bias voltage, sometimes referred to as activity or switching, can be monitored with the HO2S signal voltage.

The HO2S contains a heater that is necessary in order to quickly warm the sensor to operating temperature. The heater also maintains the operating temperature during extended idle conditions. The HO2S needs to be at a high temperature in order to produce a voltage. When the HO2S reaches operating temperature, the control module monitors the HO2S bias, or reference, voltage. The control module the HO2S signal voltage for Closed Loop fuel control. During normal Closed Loop fuel control operation, the control module will add fuel, or enrich the mixture, when the HO2S detects a lean exhaust content. The control module will subtract fuel, or lean-out the mixture, when the HO2S detects a rich exhaust condition.

This diagnostic trouble code (DTC) determines if the HO2S heater circuit is functioning properly by monitoring the time required for the HO2S to reach the operating temperature. This DTC sets when the powertrain control module (PCM) fails to detect HO2S voltage transitions above and below the bias range within a specified amount of time.

## Conditions for Running the DTC

- DTCs P0101, P0102, P0103, P0106, P0107, P0108, P0112, P0113, P0116, P0117, P0118, P0121, P0122, P0123, P0200, P0300, P0440, P0442, P0446, P0452, P0453, or P1441 are not set.
- The HO2S voltage is between 425-475 mV at engine startup.
- The intake air temperature (IAT) and the engine coolant temperature (ECT) are less than 50°C (122°F), and are within 8°C (14.5°F) of each other at engine start-up.
- The ignition 1 signal is between 9-18 volts.
- Intrusive tests are not in progress.
- The scan tool output controls are not active.

## Conditions for Setting the DTC

The HO2S voltage remains within 150 mV of the startup voltage for a predetermined amount of time, based on ECT and air flow.

## 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

## Important

Remove any debris from the PCM connector surfaces before servicing the PCM. Inspect the PCM connector gaskets when diagnosing or replacing the PCM. Ensure that the gaskets are installed correctly. The gaskets prevent water intrusion into the PCM.

- Use the Freeze Frame/Failure Records in order to help locate an intermittent condition. If you cannot duplicate the DTC, the information in the Freeze Frame/Failure Records can help to determine how many kilometers (miles) have occurred since the DTC set. The Fail Counter and the Pass Counter can also help determine how many ignition cycles the diagnostic reported a pass or a fail. In order to isolate when the DTC failed, operate the vehicle within the same Freeze Frame conditions such as RPM, load, vehicle speed, temperature, etc., that you observed. For an intermittent condition, refer to Intermittent Conditions . These conditions include:
  - The RPM
  - The vehicle load
  - The vehicle speed
  - The temperature
- The heater diagnostic will only run on a cold start and run once per ignition cycle.
- An oxygen supply inside the HO2S is necessary for proper operation. The HO2S wires provide the supply of oxygen. Inspect the HO2S wires and inspect the connections for breaks or for contamination. Refer to Heated Oxygen Sensor (HO2S) Wiring Repairs in Wiring Systems.

### Test Description

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

2. After the HO2S heater is commanded ON, the HO2S heater heats up causing the HO2S signal voltage to either increase or decrease. This indicates that the HO2S heater is OK.

6. Both HO2S sensors must be disconnected to isolate a short to ground in the HO2S heater high control circuit.

10. Resistance within the specified range indicates the HO2S heater is OK.

| Step | Action | Values | Yes | No |
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| *Schematic Reference: Engine Controls Schematics* | | | | |
| 1 | Did you perform the Diagnostic System Check-Engine Controls? | -- | Go to Step 2 | Go to Diagnostic System Check - Engine Controls |
| 2 | **Important**<br><br>If DTC P0300 is set, diagnose that DTC first. Refer to DTC P0300 .<br><br>**Important**<br><br>Allow the engine to cool for one-half hour before proceeding with this diagnostic. This allows the HO2S signal voltage to return to bias voltage, approximately 447 mV.<br><br>1. Install a scan tool.<br>2. Turn ON the ignition, with the engine OFF.<br>3. Command the HO2S heater ON with a scan tool.<br>4. Immediately observe the affected HO2S voltage for 2 minutes.<br><br>Does the HO2S voltage go from bias voltage to more than or less than the specified range? | 300-600 mV | Go to Step 3 | Go to Step 4 |
| 3 | 1. Observe the Freeze Frame/Failure Records data for this DTC.<br>2. Turn OFF the ignition for 30 seconds.<br>3. Start the engine.<br>4. Operate the vehicle within the Conditions for Running the DTC as specified in the supporting text, or as close to the Freeze Frame/Failure Records data that you observed.<br><br>Does the DTC fail this ignition? | -- | Go to Step 4 | Go to Intermittent Conditions |
| 4 | Are both DTC P0135 and P0155 set? | -- | Go to Step 6 | Go to Step 5 |
| 5 | 1. Turn OFF the ignition.<br>2. Disconnect the affected HO2S connector.<br>3. Probe the HO2S heater high control circuit with a test lamp connected to a good ground.<br>4. Turn ON the ignition, with the engine OFF<br>5. Command the HO2S heater ON with a scan tool. | -- | Go to Step 7 | Go to Step 8 |

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| | Does the test lamp illuminate? | | | |
| 6 | 1. Disconnect HO2S bank 1 sensor 1 connector.<br>2. Disconnect HO2S bank 2 sensor 1 connector.<br>3. Probe the HO2S bank 1 sensor 1 heater high control circuit with a test lamp connected to a good ground.<br>4. Turn ON the ignition, with the engine OFF.<br>5. Command the HO2S heater ON with a scan tool.<br><br>Does the test lamp illuminate? | -- | Go to Step 7 | Go to Step 8 |
| 7 | 1. Connect a test lamp between the affected HO2S heater high control circuit and the HO2S heater low reference circuit.<br>2. Command the HO2S heater ON with a scan tool.<br><br>Does the test lamp illuminate? | -- | Go to Step 9 | Go to Step 11 |
| 8 | 1. Disconnect the PCM connector containing the HO2S heater high control circuit. Refer to Powertrain Control Module (PCM) Replacement .<br>2. Test the HO2S heater high control circuit for an open or short to ground. Refer to Circuit Testing and Wiring Repairs in Wiring Systems.<br><br>Did you find and correct the condition? | -- | Go to Step 16 | Go to Step 12 |
| 9 | **Important**<br><br>Perform the following test on HO2S bank 1 sensor 1 and HO2S bank 2 sensor 1. A condition in either sensor will cause this DTC to set.<br><br>Test the HO2S heater high control circuit, sensor side, for a short to the HO2S body. Refer to Circuit Testing in Wiring Systems.<br><br>Did you find the condition? | -- | Go to Step 15 | Go to Step 10 |
| 10 | **Important**<br><br>Perform the following test on HO2S bank 1 sensor 1 and HO2S bank 2 sensor 1. A condition in either sensor will cause this DTC to set.<br><br>Measure the resistance between the HO2S heater high control circuit, sensor side, and the HO2S | 2-50 ohms | Go to Step 15 | Go to Step 13 |

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| | heater low reference circuit, sensor side. Refer to Circuit Testing in Wiring Systems.<br><br>Does the resistance of either sensor measure above or below the specified range? | | | |
| 11 | 1. Disconnect the PCM connector containing the HO2S heater low reference circuit. Refer to Powertrain Control Module (PCM) Replacement .<br>2. Test the HO2S heater low reference circuit for an open. Refer to Circuit Testing and Wiring Repairs in Wiring Systems.<br><br>Did you find and correct the condition? | -- | Go to Step 16 | Go to Step 12 |
| 12 | Inspect for poor connections at the harness connector of the PCM. Refer to Testing for Intermittent and Poor Connections and Connector Repairs in Wiring Systems.<br><br>Did you find and correct the condition? | -- | Go to Step 16 | Go to Step 14 |
| 13 | Inspect for poor connections at the harness connector of the affected HO2S. Refer to Testing for Intermittent and Poor Connections and Connector Repairs in Wiring Systems.<br><br>Did you find and correct the condition? | -- | Go to Step 16 | Go to Step 15 |
| 14 | Replace the PCM. Refer to Powertrain Control Module (PCM) Replacement .<br><br>Did you complete the replacement? | -- | Go to Step 16 | -- |
| 15 | Replace the affected HO2S. Refer to Heated Oxygen Sensor (HO2S) Replacement Bank 1 Sensor 1 or Heated Oxygen Sensor (HO2S) Replacement Bank 2 Sensor 1 .<br><br>Did you complete the replacement? | -- | Go to Step 16 | -- |
| 16 | 1. Use the scan tool in order to clear the DTCs.<br>2. Turn OFF the ignition for 30 seconds.<br>3. Start the engine.<br>4. Operate the vehicle within the Conditions for Running the DTC as specified in the supporting text.<br><br>Does the DTC run and pass? | -- | Go to Step 17 | Go to Step 2 |
| 17 | With a scan tool, observe the stored information, Capture Info.<br><br>Does the scan tool display any DTCs that you have not diagnosed? | -- | Go to Diagnostic Trouble Code (DTC) List | System OK |