P0133 or P0153 HO2S Slow Response

Circuit Description

The wide band heated oxygen sensor (HO2S) measures the amount of oxygen in the exhaust system and provides more information than the switching style HO2S. The wide band sensor consists of an oxygen sensing cell, an oxygen pumping cell, and a heater. The exhaust gas sample passes through a diffusion gap between the sensing cell and the pumping cell. The engine control module (ECM) supplies a voltage to the HO2S and uses this voltage as a reference to the amount of oxygen in the exhaust system. An electronic circuit within the ECM controls the pump current through the oxygen pumping cell in order to maintain a constant voltage in the oxygen sensing cell. The ECM monitors the voltage variation in the sensing cell and attempts to keep the voltage constant by increasing or decreasing the amount of current flow, or oxygen ion flow, to the pumping cell. By measuring the amount of current required to maintain the voltage in the sensing cell, the ECM can determine the concentration of oxygen in the exhaust. The HO2S voltage is displayed as a lambda value. A lambda value of 1 is equal to a stoichiometric air fuel ratio of 14.7:1. Under normal operating conditions, the lambda value will remain around 1. When the fuel system is lean, the oxygen level will be high and the lambda signal will be high or more than 1. When the fuel system is rich, the oxygen level will be low, and the lambda signal will be low or less than 1. The ECM uses this information to maintain the correct air/fuel ratio.

DTC Descriptors

This diagnostic procedure supports the following DTCs.

- DTC P0133 HO2S Slow Response Bank 1 Sensor 1
- DTC P0153 HO2S Slow Response Bank 2 Sensor 1

Conditions for Running the DTC

- Before the ECM can report DTC P0133 or P0153 failed, DTCs P0101, P0121, P0122, P0123, P0221, P0222, P0223, P0336, P0338, P2237, and P2240 must run and pass.
- DTCs P0442, P0443, P0446, P0455, P0458, and P0459 are not set.
- The HO2S is at operating temperature.
- The HO2S is between 0.94–1.06 lambda.

- The engine speed is between 1,640–2,040 RPM.
- The volumetric efficiency is between 16.5–38.3 percent.
- The change in volumetric efficiency is less than 3 percent.
- The long term fuel trim correction is active.
- DTC P0133 and P0153 run continuously once the above conditions are met.

Conditions for Setting the DTC

- The ECM has determined that the dynamic value of the affected HO2S is less than a predetermined threshold.
- The above condition is met for more than 10.0 minutes.

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 on page 6-1209.

- The front wide band sensors do not toggle or switch like a switching HO2S. The front HO2S signals will be relatively stable for an idling engine.
- For an intermittent condition, refer to Intermittent Conditions.
- The following table illustrates the typical voltages for the HO2S circuits:

HO2S Voltages

• Ignition On, Engine Off • HO2S Disconnected	
HO2S Circuit	**Voltage**
Heater Control	4.6–5.0 V
Heater Supply Voltage	B+
Reference Voltage	2.6–3.1 V
Low Reference	2.2–2.7 V
Pump Current	Less than 0.5
Input Pump Current	Less than 0.5

DTC P0133 or P0153

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	**Important:** • DTC P0133 is for bank 1 sensor 1 and DTC P0153 is for bank 2 sensor 1. • DTC P0132 causes DTC P0153 to set. If DTC P0132 is set with DTC P0153, refer to DTC P0132 or P0152 on page 6-1321. • Inspect the heated oxygen sensor (HO2S) for being secure before proceeding with this DTC. A sensor that is loose could cause this DTC to set. 1. Allow the engine to reach operating temperature. 2. Operate the vehicle within the parameters specified in Conditions for Running the DTC. 3. Observe the diagnostic trouble code (DTC) information with a scan tool. Did DTC P0133 and/or DTC P0153 fail this ignition?	—	Go to Step 4	Go to Step 3

Step	Action	Values	Yes	No
3	1. Observe the Freeze Frame/Failure Records for this DTC. 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 4	Go to Diagnostic Aids
4	Did DTC P0133 and DTC P0153 fail this ignition cycle?	—	Go to Step 7	Go to Step 5
5	Inspect for an exhaust leak near the HO2S. Refer to Exhaust Leakage on page 6-2291 in Engine Exhaust. After you inspect the exhaust system, return to this diagnostic. Did you find and correct the condition?	—	Go to Step 8	Go to Step 6
6	Inspect or test for the following conditions: • Inspect that the HO2S is securely installed. • Inspect for corrosion on the HO2S terminals. • Inspect the terminal tension at the HO2S and at the engine control module (ECM). Refer to Testing for Intermittent and Poor Connections and Connector Repairs in Wiring Systems. • Inspect the HO2S wiring for damage. Did you find and correct the condition?	—	Go to Step 8	Go to Step 7

Step	Action	Values	Yes	No
7	Important: If both DTCs are set, determine and correct the cause of the contamination before replacing a sensor. Inspect for the following conditions: • Inspect for fuel contamination. Refer to Alcohol/Contaminants-in-Fuel Diagnosis (w/o Special Tool) or Alcohol/Contaminants-in-Fuel Diagnosis (w/ Special Tool). • Inspect for the correct RTV sealant. • Inspect for engine oil consumption. Refer to Oil Consumption Diagnosis Oil Consumption Diagnosis in Engine Mechanical -3.6L (LY7). • Inspect for engine coolant consumption. Refer to Loss of Coolant 1 in Engine Cooling. Replace the HO2S. Refer to the appropriate procedure: • Heated Oxygen Sensor (HO2S) Replacement Bank 1 Sensor 1 • Heated Oxygen Sensor (HO2S) Replacement Bank 2 Sensor 1 Did you complete the replacement?	—	Go to Step 8	—
8	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 9
9	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